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Russian LNG – Trio jostling for position

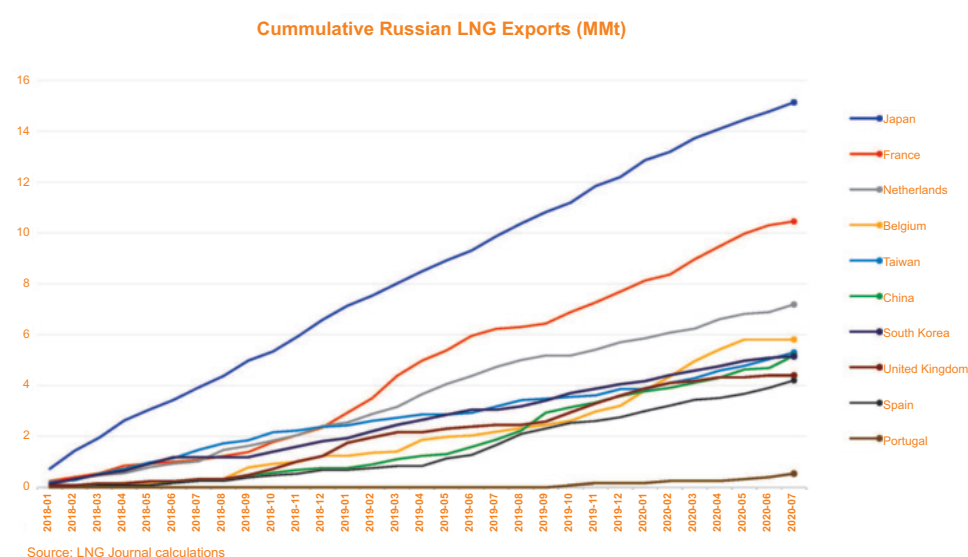
Over the past decade, partial liberalisation of the Russian gas market has led to the emergence of a trio of competing LNG developers – Novatek, Gazprom and Rosneft. However, the two state-controlled giants are still grappling with their prospective LNG roles whilst Novatek is going 'all-in'. Market Editor Alexander Wilk reports

For roughly a decade Russia has pursued ambitious LNG development plans as it saw emerging gas powers such as Qatar and Australia delve into high value Asian markets. Traditionally a pipeline exporter, Russia previously found expansion in Asia's JKT market (Japan-Korea-Taiwan) a difficult nut to crack since these countries are not easily reached via pipeline. Nevertheless, we have observed a concerted push by both the Russian state and emerging LNG specialist Novatek to make serious new inroads into the world's LNG markets since 2013.

Since the commissioning of Yamal LNG in 2016, Novatek has become Russia's de facto LNG champion and has aggressive growth plans over the next decade to cement that position. On Novatek's plans alone, Russia would be propelled among the world's top five LNG producers by the middle of the next decade. Moreover, Yamal LNG exports via the Northern Sea Route made the project a torchbearer for trade with Northeast Asia and China in particular, whereby a high value product – LNG – is pushing the door open and pulling further investment in its wake. Meanwhile, following prodding by the Kremlin, both Rosneft and Gazprom have also recognised the potential of LNG in capturing more market share.

Urgent action required

Russia's role as a major pipeline player had traditionally dictated Gazprom's market strategy. In the 2000s, however, Gazprom became synonymous with delay and indecision as it announced a number of projects, including Shtokman, Baltic



and Vladivostok LNG, only to then postpone or cancel them altogether. Meanwhile, Russia's Law on Gas Exports of 2006 guaranteed Gazprom a comprehensive gas export monopoly. Russian law on hydrocarbon production generally distinguishes between output earmarked for domestic consumption and exports, which require a special set of permits that can make it challenging for smaller producers to develop and run assets independently.

Whilst Russia thus remained the world's largest pipeline gas exporter, the country's share in global LNG markets came under severe threat of fading into insignificance as existing exporters such as Qatar and Australia ramped up production capacity. As a result, Russian LNG exports on flat-out production amounted to just 9.8 million tonnes (mmt) in 2012. Whilst impressive for the country's only LNG outlet at the time (Sakhalin-2 LNG), it also highlighted demand for Russian LNG and the

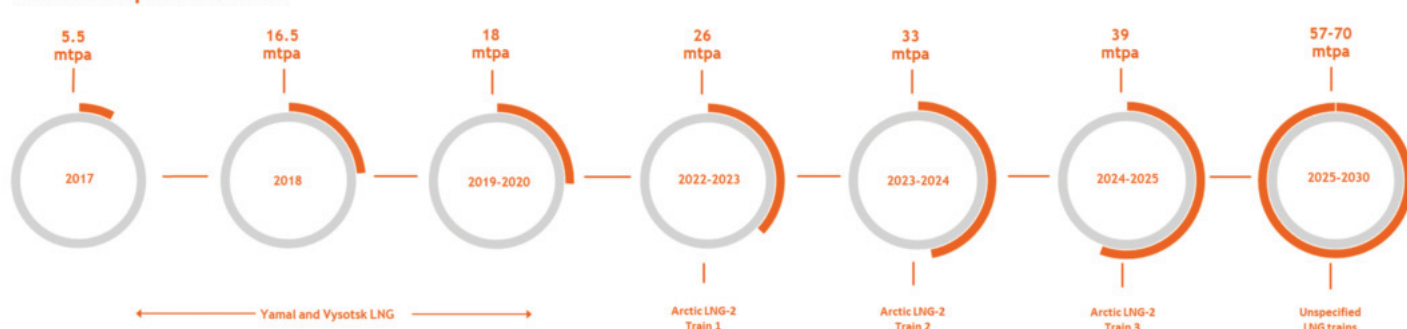
limitation of available capacity to capture more market share. Its main competitors for Asian markets – Qatar, Indonesia, Malaysia and Australia – each shipped at least twice that amount, our data shows.

Partial liberalisation

The Russian government subsequently made the swift development of LNG exporting capacity a political and commercial priority. Since December 2013, Russian gas export policy has opened up to competition as the Kremlin had grown increasingly impatient with Gazprom's sluggish development of additional gas exporting channels to lucrative Far Eastern markets in particular. Notably, these efforts have not just been limited to Asia. With the ascent of Novatek's Yamal LNG, exports to Europe are closing the gap to Japan on a cumulative basis.

Nevertheless, Gazprom still dominates its domestic market, producing and controlling the majority of Russian gas

Novatek Expansion Plans



Adapted from Novatek's 'Expanding Our Global LNG Footprint', 2018-2030



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flows via pipelines, a circumstance that continues to impact the country's LNG prospects. Russian LNG capacity remains relatively small compared to its gas resource base and overall gas pipeline capacity. However, there are strong currents within the country keen to change that status quo.

Gazprom - Pipelines first, LNG second

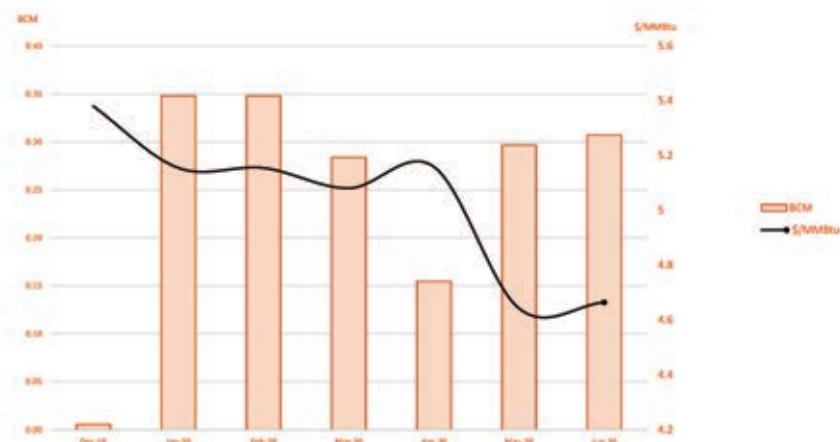
Russian gas policy has traditionally been focussed on a single-channel approach, which entailed concentrating both market power and expertise in a single entity: Gazprom.

Gazprom is synonymous with Russia's pipeline business. Consequently, when originally tasked with finding marketing solutions for new giant gas resources – the offshore Shtokman field and the Siberian Chayandinskoye gas field cluster, for example – Gazprom was keen to marry its pipeline expertise with LNG exports. However, pipelines were always envisioned in a lead role, with LNG merely bolted on. This introduced additional complexity into these LNG developments because pipelines are of strategic importance to energy security and therefore tend to have 'locked-in' capacities. Importantly, these projects we conceived at times when energy prices were high and rising, which meant that post-2014/15, when hydrocarbon prices tumbled, these proposals either vanished or were shrunk down.

Vladivostok LNG: With Vladimir Putin's second inauguration as President in March 2012, Gazprom came under political pressure to develop gas flows from Siberia and Russia's Far East for promising Asian markets. It was subsequent to this presidential reminder that Gazprom announced plans to build an LNG plant at Vladivostok in 2013/14.

Initially, Gazprom and a Japanese consortium called the Japan Far East Gas company (JFEG) agreed in principle to build a 15 million tonnes per annum (mtpa) LNG plant at Perevoznaya Bay. JFEG is made up of Itochu (32.5 percent), JAPEX (32.5 percent), Marubeni (20%), INPEX (10 percent), and Itochu's subsidiary Cieco (5 percent). The project was to be a key component of bringing flexible Gazprom supply to rich Northeast Asian markets. In our view, the project's close proximity to Japan, as well as the involvement with a Japanese consortium, suggests most exports would have been directed to that country. However, no specific announcements were made at the time.

Gazprom Exports via Power of Siberia



Source: LNG Journal calculations, Chinese Government Data

Vladivostok LNG hinged on the development of the Chayandinskoye gas field cluster and associated pipeline infrastructure, which evolved to become the Power of Siberia pipeline. Additional gas from Gazprom's Sakhalin assets would have been insufficient to supply another large-scale LNG plant. Accordingly, plans included a pipeline connector to transport Siberian feedgas to Vladivostok.

Nevertheless, these considerations became moot in 2015, when oil – and consequently gas – prices collapsed. As a result, Gazprom abandoned the idea of large-scale LNG production in Vladivostok and prioritised the completion of Power of Siberia, but without the Vladivostok connector. Notably, Power of Siberia began first exports in December 2019 and while it remains far off its design capacity, it has nonetheless somewhat helped Gazprom weather some of the worst price effects of the prevailing spot LNG market in the Pacific Basin.

Meanwhile, the Vladivostok LNG concept received a drastic re-design, and has been effectively downgraded to a much smaller 1.5mtpa facility with estimated project costs of US\$2 billion and planned start-up in 2020, according to reports citing the Russian Ministry of Energy. Due to its smaller size, the plant would now be able to be supplied from additional Sakhalin feedstock via the Sakhalin-Khabarovsk-Vladivostok pipeline, we think. Meanwhile, although details on the progress of construction and any sales contracts are scarce, we think it is possible that the plant may form part of a long-term strategy to provide LNG as marine fuel and LNG bunkering. On occasion, we have already observed Gazprom-controlled vessels on Sakhalin-2 business make stopovers at Vladivostok.

Baltic LNG: Prior to the development of Yamal LNG and the Nord Stream pipeline duo, an LNG outlet on the Baltic coast was firmly in Gazprom's sight. Again,

LNG was to play a secondary role to conventional pipeline exports with a relatively small 5mtpa plant to help export Shtokman gas. With the demise of the Shtokman development in 2012, however, Gazprom and Shell agreed a much more substantial liquefaction plant of 10-15mtpa close to Ust-Luga, the connection point between Russia's Yamal-Europe and Northern Lights pipelines and the newly built Nord Stream pipelines. Shell is among few LNG players with its own proprietary gas liquefaction technology suitable for large-scale developments. However, Gazprom was still reluctant to focus solely on large-scale LNG. Instead, the company wanted to modify the project into a joint LNG/petrochemical development, with the LNG component reduced by up to 13 percent. Information provided by Gazprom suggests to us the company's prime motivation is to build and maintain a wide portfolio around its pipeline network, without wanting to focus solely on one type of gas product. Accordingly, the modified Baltic LNG plan also included the production of 4mmt of ethane and 2.2mmt of LPG, with various polymers also among the projected output. Shell subsequently withdrew from the project and thereby also removed access to its liquefaction technology, according to an interview with Cedric Cremers, Chairman of Shell Russia, by Russian news agency Tass. Gazprom announced it would nonetheless go ahead with the project and expects to commission the first train of the complex in 2H 2023 and the second train in late 2024. In our view, however the absence of Shell's expertise has increased the risk of delays to, or even cancellation of, the Baltic LNG project.

Novatek – Russia's new LNG champion

As outlined above, prior to the commissioning of Yamal LNG, Gazprom's Sakhalin-2 LNG plant was the country's only LNG outlet. Writing in 2013, the

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author observed a distinct shift in the Kremlin from favouring Gazprom in all matters gas to assigning to Novatek greater freedom to develop and trade internationally some of Russia's vast gas reserve. Spurred by this freedom, the company's latest annual report pegs proved and probable natural gas reserves for its project consortia at 3,901 billion cubic metres (bcm) with proved reserves of 2,234 bcm. Novatek's share of reserves are led by the massive South-Tambeyskoye field, which the company quotes as containing 414 bcm of proved net natural gas reserves. Notably, these figures are based on SEC reserves methodology, which tends to be more conservative than its Russian counterpart.

Novatek has been moving fast to bring those reserves to market, led by the posterchild of large-scale LNG developments: Yamal LNG. Perhaps lesser known is the small-scale Cryogas-Vysotsk project close to the Finnish border, which began operations in 2019 by bunkering LNG as marine fuel. Novatek also entered into a joint-venture with Belgian gas infrastructure group Fluxys to develop Rostock LNG, a medium-scale LNG transshipment terminal with roughly 0.3mtpa of capacity. At the end of 2019, the project had completed its front-end engineering and design work (FEED) and an application for a construction permit had been submitted. Meanwhile, Novatek has been keen to continue where it left off with Yamal LNG, moving on to the even larger Arctic LNG-2 development.

Arctic LNG-2: In complete contrast to Gazprom, Novatek has been keen to develop its gas reserves almost exclusively to support multiple LNG outlets along the coast of the Yamal peninsula, the company's centre of operation. Through the development of Yamal LNG, the company delivered one of Russia's most prominent energy success stories of recent years, commissioning its four trains on schedule. Importantly, the company patented its own liquefaction technology – Arctic Cascade – in 2018, which is showcased in Yamal's add-on 'micro-train' (0.9mtpa) that was commissioned this year and is likely to prove instrumental in the successful development of its Arctic LNG-2 project through greater liquefaction efficiencies.

Arctic LNG -2 is Novatek's second large-scale LNG project based on the Utrenneye field located on the Gydan Peninsula approximately 70 km across the Ob Bay from Yamal LNG. As of

December 2019, Utrenneye's proved reserves amounted to 461 bcm.

In September 2019, the Arctic LNG-2 consortium, comprising Novatek, Total, subsidiaries of China National Petroleum Corporation (CNPC), CNOOC and Japan Arctic LNG (a consortium of Mitsui and JOGMEC), made the Final Investment Decision (FID).

The project involves the development of the Utrenneye field, construction of the Utrenniy terminal and three natural gas liquefaction trains on gravity-based structures (GBS), porting principles of offshore oil platform construction to the LNG sphere. Each GBS train will have the capacity to produce 6.6mtpa of LNG and the project will have cumulative stable gas condensate capacity up to 1.6mtpa. The total LNG capacity of the three trains will be 19.8mtpa. Novatek highlights that the GBS-LNG design concept as well as extensive localisation of equipment and materials manufacturing in Russia will considerably reduce costs per tonne of capacity. The plant's first train is to be launched in 2023, with trains 2 and 3 to follow in 2024 and 2026, respectively.

Obskiy LNG: Not stopping at Arctic LNG-2, Novatek is also looking to employ its newly patented liquefaction technology at the 5mtpa Obskiy LNG project, which will use a modified version of the technology. Importantly, successful implementation of the concept would prove the viability of Novatek's approach to LNG production for smaller fields both on land and near-shore, in our view. The project's resource base comprises the relatively small Verkhnetiuteyskoye and West-Seyakhinskoye fields located in the north-eastern part of the Yamal Peninsula. Together, they provide roughly 159 bcm of proved reserves. However, Novatek has yet to make FID on the project but envisages commercial start-up in 2024.

Rosneft – the revival of a revival

Perhaps triggered by Gazprom's LNG ambitions in Northeast Asia, Rosneft's Far East LNG Project (Sakhalin-I) was aimed at developing a second liquefaction plant in Russia's Far East to supply Asian markets together with US energy major ExxonMobil. The two companies already co-operate on the Sakhalin-I oil and gas fields and Sakhalin-I gas could be used to supply a potential LNG plant, which could either be built on Sakhalin Island or in the region of Khabarovsk. To date, most of Rosneft's gas has been reinjected into its oil fields to maintain pressure for

sustained crude production. In essence, this signifies the crux of Rosneft's struggling LNG ambitions: the company has always been an oil producer first, leaving the gas business to Gazprom and Novatek.

Far East LNG: Nevertheless, in June 2013, Rosneft created an impressive roster of potential LNG customers, including Japan's Marubeni (1.25mtpa), the Sakhalin Oil and Gas Development Company (1mtpa) and Vitol (2.75mtpa), who all signed heads of agreement contracts with deliveries to start in 2019. Unfortunately, this has not happened. Rosneft was put under financial sanctions by both the European Union and the United States in 2014 and 2015, respectively, which made it difficult for the company to procure foreign investments. Although the original project consortium around ExxonMobil and Rosneft attempted to revive the project in early 2018, the attempt failed. An announcement in December 2019, however, indicates a second revival of the project with many of the original partners – including Rosneft – involved. According to Nikkei, the new project will have 6.2 mtpa of capacity at a projected cost of US\$9 billion. The new joint venture ordinarily planned to award FEED work and start marketing activities in Asia in spring 2020, with FID in 2021 and first gas in 2027. However, the prevailing market pressures resulting from COVID-19 seem to have hampered progress with no further announcements to date.

Conclusion

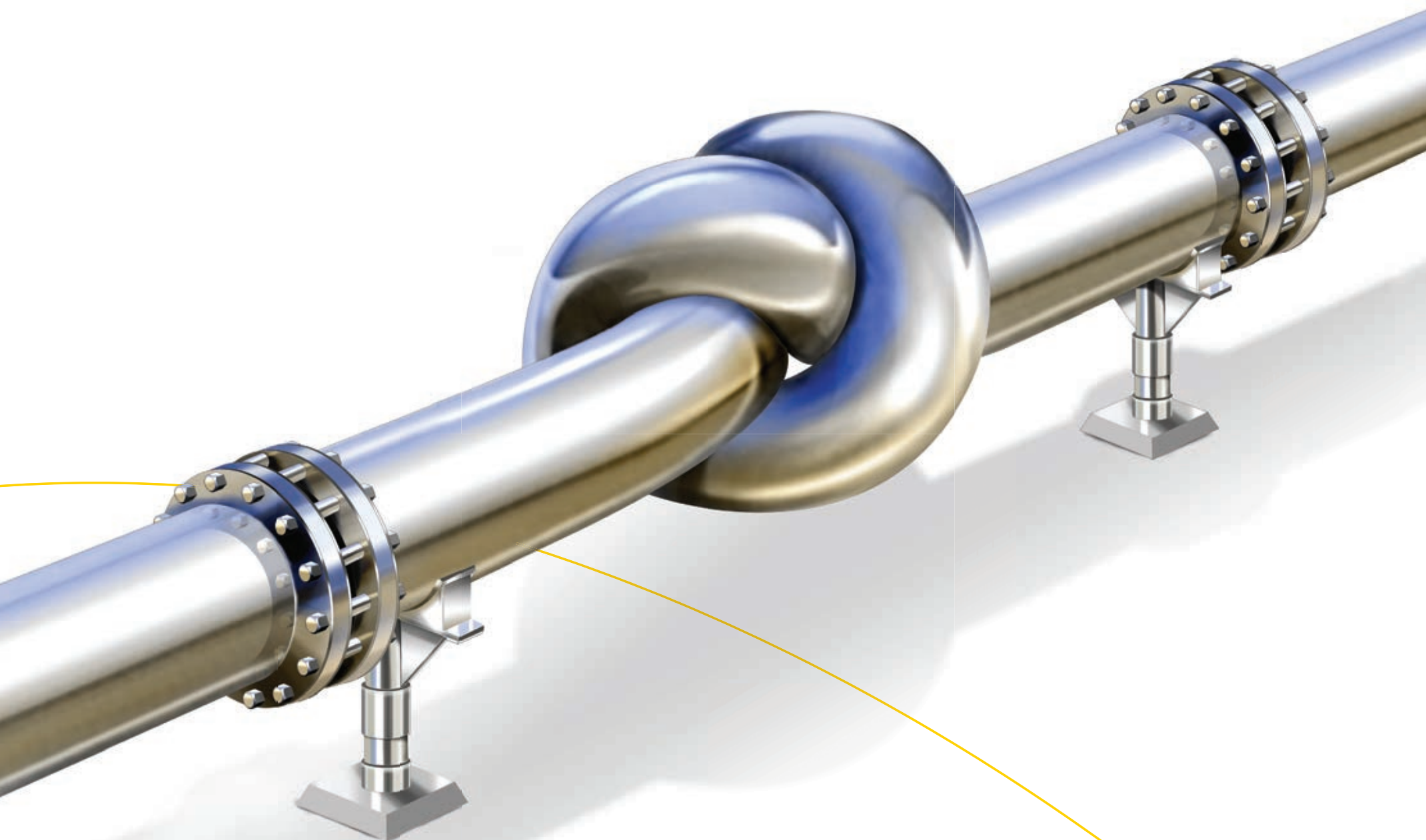
Russia is an enviable position both geographically and geologically. Spanning from Europe to Asia, the country is in a prime position to market its vast gas resources to two of the most lucrative areas both via pipelines and LNG. Until 2013, stringent monopoly laws prevented a more dynamic Russian gas economy. Instead, energy interests were entrenched, resulting in the loss of market share in lucrative Asian markets. Although the Russian government has been keen to reverse those effects by lifting monopoly rights and fostering more competition among the country's big energy companies, capturing Russia's LNG potential is unlikely to be easy. So far, only Novatek seems prepared to go 'all in' with LNG. Meanwhile, the country's de facto state-controlled energy giants Gazprom and Rosneft struggle to either expand or gain a foothold in the more

dynamic LNG market. In our view, Gazprom in particular finds it difficult to depart from its long-established modus operandi of pumping large volumes through its vast pipeline network on long-term contracts. On the one hand this model helps to weather low price periods, but on the other the company is clearly keen to build a more diversified gas marketing portfolio without a clear LNG focus – and whilst it may not look it currently, LNG is among the highest value gas available.

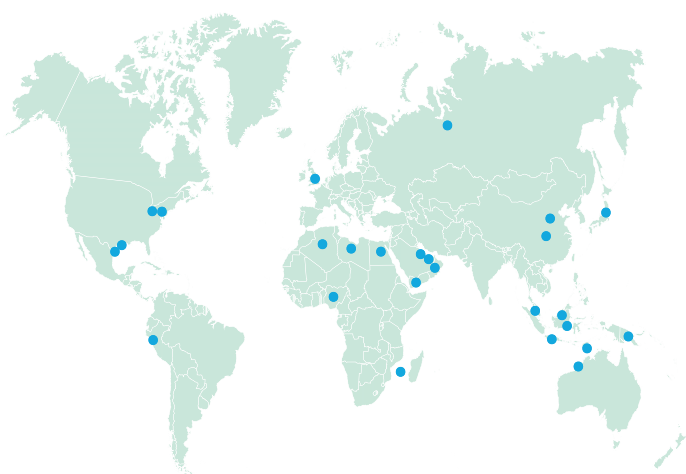
Meanwhile, given the much more prominent positions of both Novatek and Gazprom in the Russian gas economy, we struggle to see a long-term position for Rosneft as a major gas exporter. Considering the rapid progress Novatek has hitherto made in the LNG market as well as Gazprom's varied efforts in diversifying its gas export portfolio backed by vast pipeline capacity, Rosneft is under pressure to demonstrate is capable developing significant LNG capacity. Evidently, its project proposals have drawn significant investor interest, but the company's closeness to the Kremlin – whilst helpful inside Russia – has at times hampered progress internationally.

Instead, we see a different picture emerging. Rather than all three companies trying to implement a roster of LNG proposals, we see the big three being naturally drawn to their respective strengths. As such, Novatek has clearly picked the role of Russia's LNG specialist, trail-blazing project developments in the arctic and setting out to develop new proprietary liquefaction technology. Notably, the bulk of planned LNG capacity growth is set to derive from Novatek projects. In contrast, Gazprom and Rosneft are still vying for foreign technology input, which has often hampered progress in the past. Meanwhile, Gazprom remains the pipeline specialist of the trio and the company seems reluctant to separate this business strand from LNG. Unfortunately, this has often increased project complexity and overall costs. Finally, Rosneft remains one of Russia's leading oil producers, but with relatively little apparent scope of catching up to either Novatek or Gazprom in terms of physical gas marketing capacity.

Whether or not the trio will end up at such a 'division of labour' remains to be seen. What is clear, however, is that Russia has continued to take strides on a steep growth trajectory that promises to extend over the next decade. ■



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Can cost cutting revive Alaska LNG despite sluggish demand?

Rigorous cost-cutting is meant to save Alaska LNG – the world's most expensive liquefaction project. Can it? Markets Editor Anja Karl investigates

ExxonMobil and BP, together with state-led Alaska Gasline Development Corp (AGDC), have just decided to slash capital spending by \$5.5 billion, or 12.4 percent, lowering the project's price tag from a staggering \$44.2 billion to a more moderate \$38.7 billion. Developers claim these cuts will allow them to ship LNG from Alaska to Asia at competitive prices, but critics still doubt the project's commercial viability. Fresh investment – notably from China – is deemed critical to the success of Alaska LNG, especially because Exxon and BP aim to reach financial close before the start of 2021.

Construction costs for a liquefaction plant are much higher in Alaska than in the U.S. lower-48 states, and transporting North Slope reserves all the way south to Nikiski on the Kenai Peninsula, where Alaska LNG will be located, is not cheap either. Not only do they involve drilling operations in an arctic environment, but also for building an 800-mile pipeline transport the natural gas to Nikiski, situated just south of Anchorage.

AGDC recently said the wellhead price the state of Alaska itself would receive for its royalty share of gas would likely range between \$1.00/MMBtu and \$2/MMBtu. Hence, some analysts projections say LNG exported from Alaska would need to be priced as high as \$9-10 per MMBtu – just to be profitable.

“At this price, LNG cargoes from Alaska will have a hard time to compete with Qatari cargoes or Russian pipeline gas in China – the dominant market in Asia,” traders told *LNG Journal*.

Global markets are awash with natural gas, spot prices have fallen to near three-year lows and the sluggish demand recovery in aftermath of the Covid-19 pandemic have delayed, or derailed several liquefaction projects worldwide.

High hopes for first LNG in 2026

As for the high-cost Alaska LNG venture, state-led AGDC already obtained federal authorization in mid-May to build and operate the 20 mtpa liquefaction and export terminal but is now dragging its feet to take FID. Developers also have



Exxon Mobil's production facilities at Point Thompson



FERC approval for an 807 miles pipeline to transport up to 3.9 billion cubic feet (bcm) of North Slope gas from Prudhoe Bay to Nikiski, just south of Anchorage, as well as a permit from the Department of Energy (DOE) for 20 mtpa to be supplied to nations with or without a Free Trade Agreement (FTA) with the United States.

Obtaining FERC and DOE approval “significantly de-risked the project execution,” analysts noted, considering the project was first proposed nearly a decade ago. ExxonMobil and BP had initially sought to take FID at the start of this year, but the timing has lapsed due to the current market turmoil. Now there is “some hope,” analysts said that first Alaskan LNG will be produced and exported by early 2026.

Provided financial close on Alaska LNG will be reached before the end of this year, construction could get underway in early 2021, allowing for a start

commercial operations by late 2025.

However, the timing could not be worse for taking FID on a high-cost liquefaction project, as markets are still reeling from the Covid-related energy demand destruction in April when JKM spot prices fell to a historic low of less than \$2 per MMBtu. Since then, prices have only partially recovered. The Platts JKM contract for October was last seen at \$4.10 per MMBtu when this publication went to press, while the September contract gained nearly \$1/MMBtu since the start of August.

The steep forward price contango, seen earlier this summer, has now eased as the prices for October and November swap contracts only increased to \$4.665 per MMBtu and \$5.090 per MMBtu, respectively. Traders and shipping companies consequently started to end the practice of slow steaming as they now seek to bring LNG cargoes to premium destinations earlier.



Render of Alaska LNG project

Short shipping route to Asia

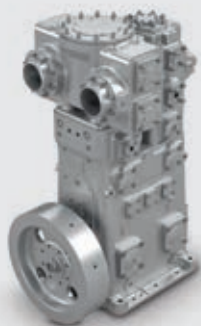
The biggest commercial advantage of adding a major liquefaction facility in Alaska is the shorter shipping route to Japan, China and South Korea than from the U.S. Gulf Coast, where four of the six operational U.S. LNG export facilities are located. Tankers would take just 7 days, assuming an average speed of 19 knots, to cover the 4,200 nautical miles for shipping LNG from Nikiski in Alaska to Japan (*see map on page 8*).

Alternatively, it would take 9 days to ship Alaskan LNG to China, Taiwan and South Korea. That compares favourably with the transit time of 9-10 days for LNG delivered from northwest Australia to China. However, wellhead and liquefaction costs of Australian gas resources are much cheaper in most cases than the ones developers of the Alaska LNG venture are confronted with.

Projects with high wellhead costs do

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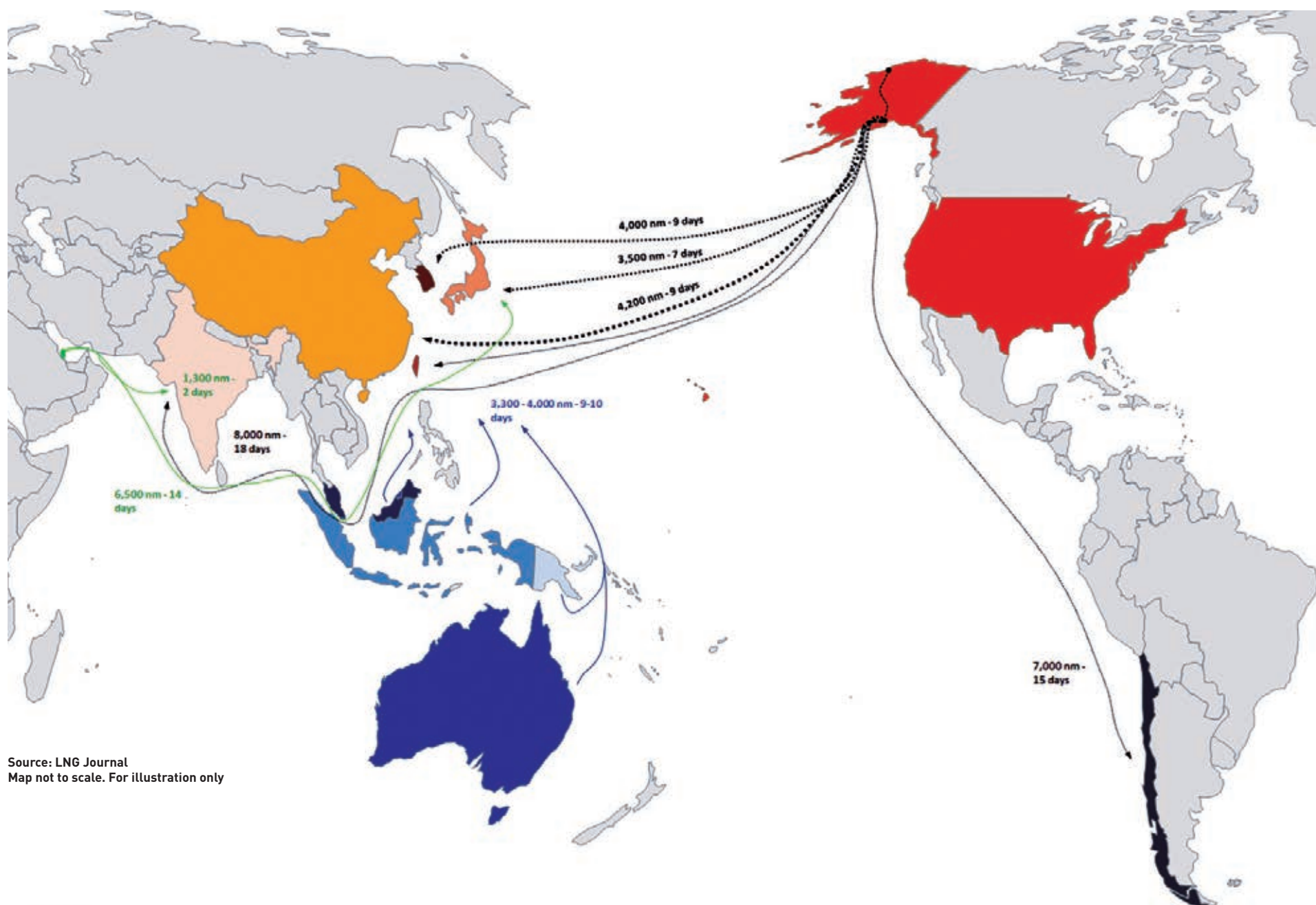


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Map not to scale. For illustration only

not bode well in today's depressed gas market. Though peak summer demand has brought some price recovery in Asia, the glut on global LNG market is here to stay and may build up further during Covid-related lockdowns in the upcoming autumn and in winter 2020/21.

Courting Chinese investors

Staying optimistic, AGDC President Frank Richards said the reduced capital costs for the Alaska LNG venture would "inspire discussions" with potential investors and LNG offtakers. "We are incorporating these results into our discussions with potential partners as we work to transition to a new market-led project team and maximize project benefits for the State of Alaska," he said. "The new [cost] estimate," in his view, "will enhance the competitive price of LNG from the Alaska LNG project versus similar projects vying to serve major Asian markets."

In fact, state-owned AGDC is looking for new investors. The Capex-intensive Alaska LNG venture had already been given a lifeline in mid-2019 when supermajors ExxonMobil and BP committed to spend a

further \$20 million to keep the project afloat. These days, Chinese funding might well turn out to be instrumental to get the project off the ground.

In August, Sinopec said it still wants to conclude definite offtake agreements for LNG shipments from Alaska and become the project's main offtake customer, provided CIC Capital will become an equity investor in alliance with the Bank of China. The reaffirmed commitment of state-controlled Sinopec comes regardless of political tensions between China and the United States.

Sinopec has for long had an eye on Alaska. Already in early October 2018, the Chinese major signed a supplemental agreement with AGDC to reserve 75 percent of production capacity in the 20 mtpa Alaska LNG venture. This offtake accord with Sinopec came shortly after AGDC had arranged feed-gas deals with Exxon and BP, which committed 22.7 trillion cubic feet of natural gas to the Alaska LNG venture. The supply will be sourced mostly from the 32 Tcf of the easily recoverable feed-gas resource in the Prudhoe Bay and Point Thomson

fields on Alaska's prolific North Slope.

To sell the remaining 5 mtpa – not booked by Sinopec – Alaska LNG developers are understood to have intensified talks with Tokyo Gas, Korea Gas and PetroVietnam. In the interim, some smaller Chinese independent buyers may come forward and snap up some volumes. In current depressed oil and gas markets, AGDC is open to almost any form of foreign financing, combined with firm offtake accords, so savvy Chinese investors are in a good negotiating position. ■

FERC to decide on Kenai LNG by year-end

The US Federal Energy Regulatory Commission (FERC) will make a decision by the end of this year on Marathon Petroleum Corp's plan to convert the Alaskan Kenai LNG export plant into an import terminal.

FERC said it planned to issue an environmental assessment by 3rd September and make a final decision by 2nd December 2020. The US federal authorization deadline comes 90 days

after the environmental assessment which had initially been expected by 24th April. But FERC had to wait for the US Department of Transportation's Pipeline and Hazardous Material Safety Administration (PHMSA) to make a decision on the company's plan for a vaporiser.

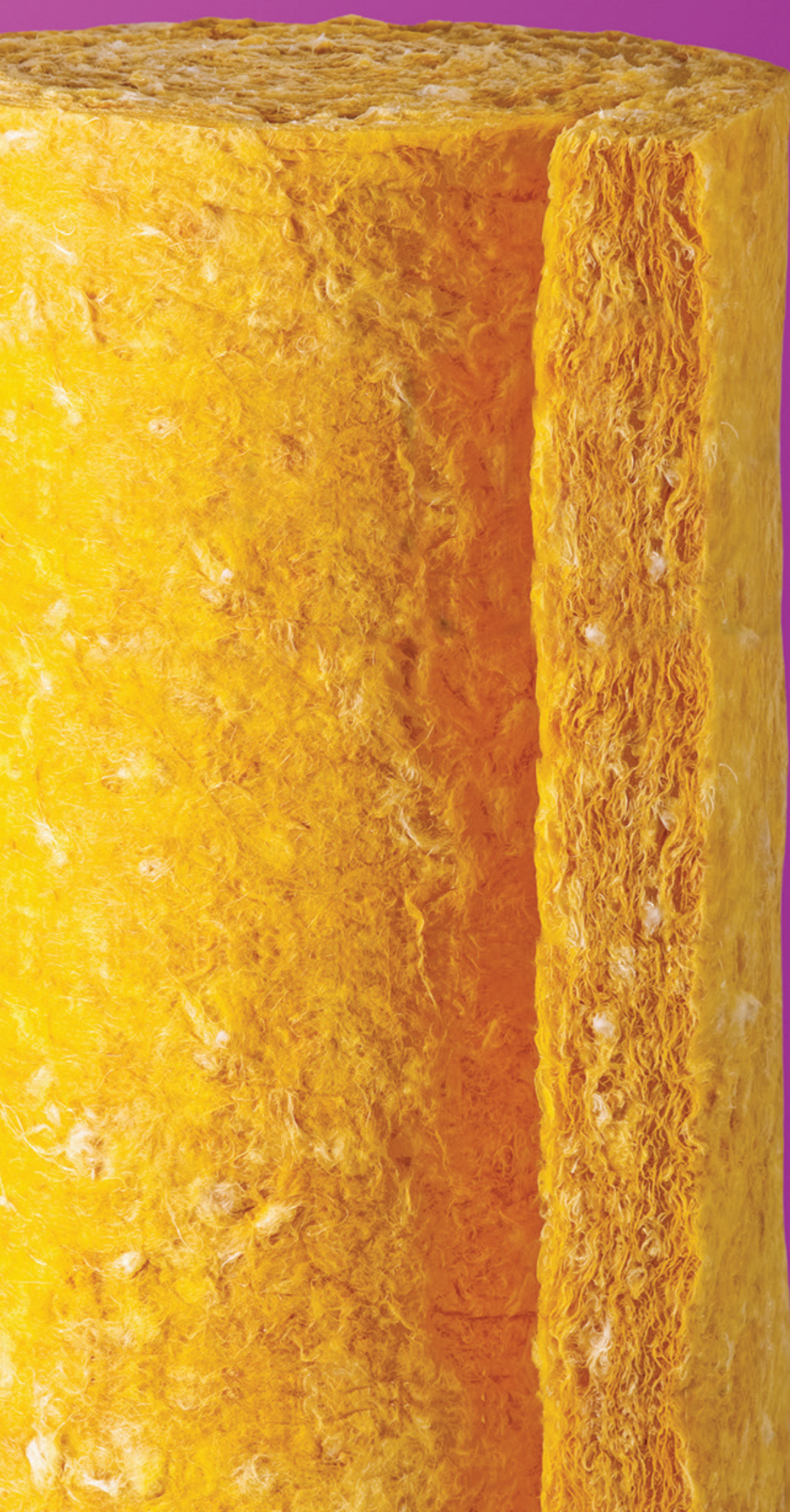
The Kenai LNG facility entered service in 1969 as an export facility. And it remained the only large LNG

export facility in North America until Cheniere Energy's Sabine Pass export terminal in Louisiana entered service in February, 2016.

Nearly all of the Alaskan LNG was shipped to Japan. Kenai's operator, ConocoPhillips mothballed the facility in 2015 before selling it to a subsidiary of Andeavor in February, 2018. Marathon bought it in October of that year. ■

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July LNG trade improves on stronger Asian and European demand

July LNG trade improved marginally on the back of higher Pacific exports to cover additional Asian demand. Meanwhile, US LNG's enduring market retreat weighed on Atlantic performance whilst lower Qatari output hampered Middle Eastern supply performance, our Markets Editor Alexander Wilk reports

Following the protracted decline in global LNG trade between March and June, July trade stabilised at 26.22 million tonnes (mmt) whilst seeing only marginal month-on-month growth of 0.05mmt (0.2 percent). Whilst rising temperatures contributed to elevated demand, the widespread lifting of many public health measures previously targeted at stalling the spread of COVID-19 had the most significant impact in halting the month-on-month decline of previous months. This effect was particularly observable in the Far East, where Japan led a resurgence in demand. Accordingly, Pacific Basin exports grew relatively robustly by 0.45mmt (4.3 percent) in July. However, Atlantic Basin exports still did not manage to escape their downward spiral caused by the market retreat of US LNG, which was helped along by fewer exports to South Korea in July. At the same time, Middle Eastern shipments struggled to move past a significant export reduction by Qatar. Notably, the Middle Eastern LNG powerhouse pivoted from its focus on Argentina in June to capturing market share in South Korea in July. As such, despite the first month of growth since March, overall trade performance in July 2020 still represented a decrease of 4.42mmt compared to 2019, equating to 14.4 percent of negative growth year-on-year.

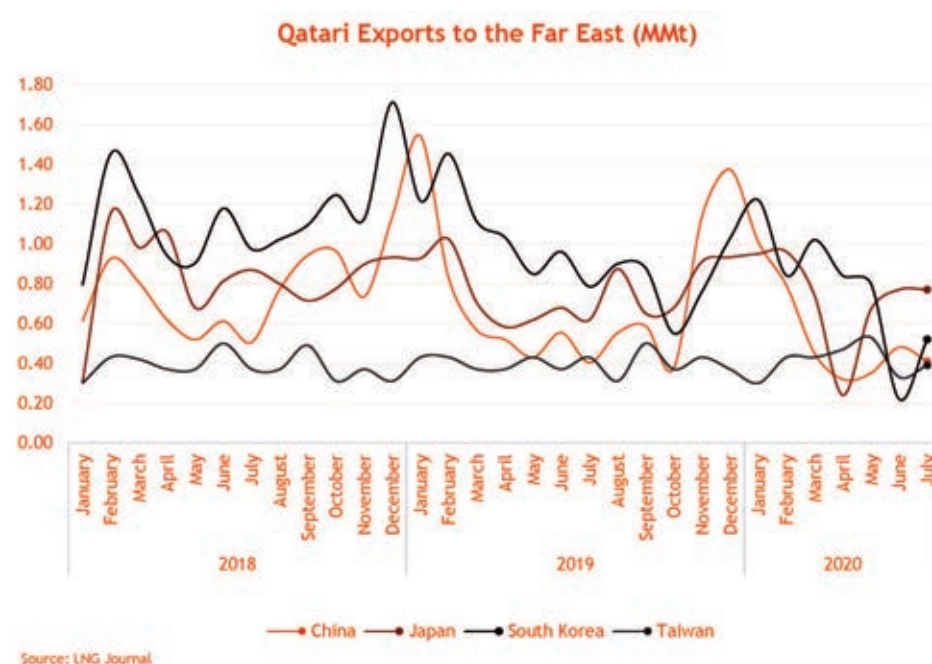
July's month-on-month performance increase in terms of volume was primarily

held back by the Atlantic Basin, where trade was down 0.26mmt (-3.3 percent) to 7.69mmt from the 7.95mmt seen in June. Coming in second by volume drop was the Middle East, where trade decreased by 0.14mmt (-1.8 percent) to 7.65mmt in July from 7.79mmt in June. Middle Eastern trade thus departed from its growth path between May and June. Notably, that growth had already begun to slow in June. We highlight that trade in all three Basins found year-on-year growth to be elusive, with Atlantic trade down by 1.91mmt (-19.9 percent) year-on-year, followed by the Pacific with 1.88mmt (-14.7 percent) and the Middle East with 0.63mmt (-7.6 percent).

Exports

Pacific Basin: The Pacific Basin ended the month of July 0.45mmt (4.3 percent) up in exports compared to June, which increased capacity utilisation by 3pp to 81 percent.

The Basin's biggest exporter – Australia – shipped 0.07mmt (-1.2 percent) less month-on-month, and thereby saw a significantly slower month-on-month decrease than in June when shipments had dropped by 0.55mmt due to maintenance and lower South Korean demand. Australia's improved performance – in relative terms – was supported by Gorgon LNG recovering production levels following extensive maintenance and a considerably better demand picture in Japan. However, Australian plants heavily exposed to South Korean and Chinese demand continued to suffer. Notably, South Korea continued to slash offtakes whilst Chinese demand was only treading water in July. Accordingly, exports out of Queensland were down by 0.20mmt net as Gladstone LNG – primarily supplying South Korea – and Queensland Curtis LNG – focussed on



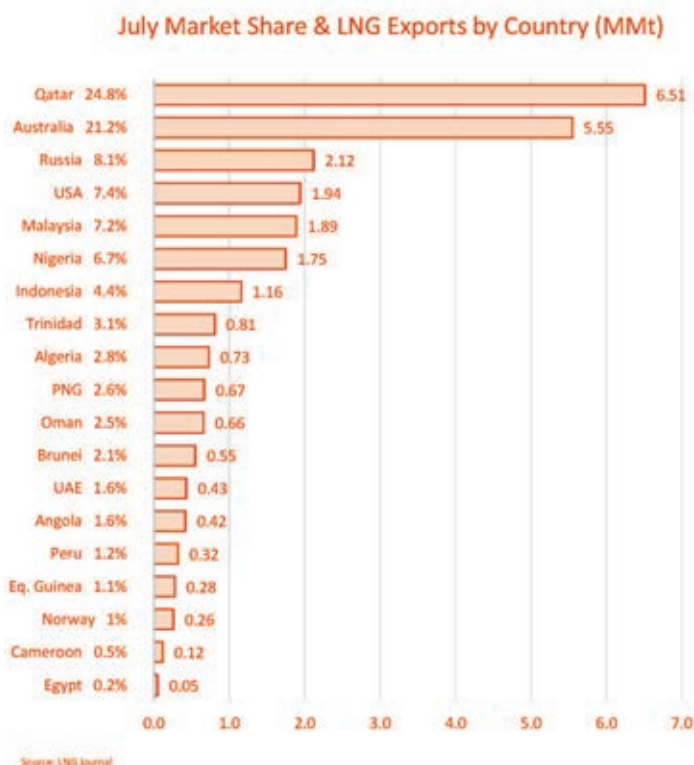
China – had to curtail exports by 0.25mmt in July. These reductions outweighed even robust month-on-month export growth of 0.22mmt (34.9 percent) at Gorgon LNG together with broadly stable exports of 0.65mmt at Australia Pacific LNG, both supplying China on firm contracts.

North of Australia, the effect of lower South Korean demand could be observed in Papua New Guinea, where PNG LNG saw shipments grow only marginally by 0.01mmt (1.5 percent) to 0.67mmt as its market share in that country fell away in July. A similar effect could be observed in neighbouring Indonesia. The country also barely held on to June level production as only a strong resurgence of Japanese demand in particular prevented overall month-on-month decline after offtakes from China and South Korea decreased by 0.23mmt overall. Although Malaysia saw more substantial month-on-month export growth of 0.08mmt (4.6 percent) in July, it equally suffered from significant South Korean demand decline again cushioned only by stronger demand growth in Japan and Taiwan. In contrast, Brunei LNG managed to increase shipments in July by 0.10mmt (22.2 percent) to 0.55mmt: not through higher exports to Northeast Asia's demand centres, but through two shipments amounting to 0.13mmt on Malaysian demand.

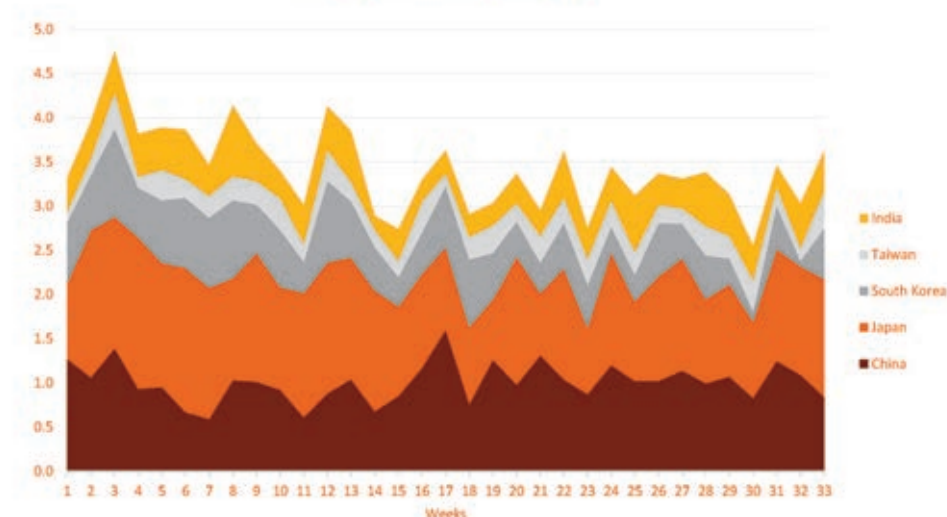
Elsewhere in the Pacific, Russia's Sakhalin-2 LNG saw exports increase by 0.12mmt (19.4 percent) to 0.74mmt in July compared to 0.62mmt in June.

Notably, the bulk of that growth derived from an increase in exports to China by 0.43mmt, which, however, was tempered by lower demand in India, South Korea and Taiwan. Concurrently, Peru's Pampa Melchorita plant also increased exports by 0.13mmt (68.4 percent), helped by higher Japanese demand. However, 0.20mmt of Peruvian LNG were still at sea without confirmed destinations at the time of writing, making an ultimate categorisation of demand for all shipped Peruvian gas in July difficult.

Atlantic Basin: The amount of LNG exported within the eastern part of the Atlantic Basin – comprising Europe, Russia and Africa – saw a considerable net increase of 0.21mmt (4.4 percent) month-on-month in July. The bulk of that growth was facilitated by an increase of 0.15mmt both at Norway's Snøhvit LNG and Russia's Yamal LNG. Whereas Norway benefitted from European demand in France, Greece, Lithuania and Portugal, Yamal LNG's export growth was primarily due to Chinese demand. Taking advantage of warmer summer climate, the plant made use of the Northern Sea Route in the Arctic to ship gas to the Beijing and Shanghai areas. Concurrently, Yamal also conducted three transshipments at France's Montoir-de-Bretagne terminal in July, with cargoes going to Izmir in Turkey, Dubai and Aqaba LNG in Jordan. However, 0.30mmt of Yamal gas also went into the Maasvlakte Gate Terminal in Rotterdam, much of which we suspect was bunkered,



Leading Pacific LNG Imports (MMt)



ready to be re-exported at a later date. Notably, re-exports were slashed globally in July, tumbling from 0.62mmt in June to just 0.18mmt in July (-44 percent), thus pointing to very little scope for arbitrage.

Net African LNG exports were down by 0.13mmt (-3.8 percent) month-on-month in July, led by a drastic reduction of 0.23mmt (-25 percent) at Algeria's Arzew plant. The FLNG vessel Hilli Episayo stationed offshore Kribi in Cameroon also struggled to maintain monthly output,

reducing shipments by 0.01mmt (-8 percent). Meanwhile, however, these decreases were tempered by robust month-on-month export growth at the EG LNG plant on Bioko Island in Equatorial Guinea, which increased shipments by 0.08mmt (40 percent) in July. Angola and Nigeria also increased monthly shipments by 0.01mmt and 0.02mmt, respectively.

In the western half of the Basin, exports continued to tumble by a total of 0.39mmt (-12 percent) from 3.14mmt in June to

2.75mmt on US LNG performance in July. Although the rate of monthly decline thereby more than halved compared to June, US LNG exports continued to suffer heavy net export reductions of 0.28mmt (-12.6 percent). Although Cove Point LNG once again managed to slightly increase its month-on-month exports by shipping 0.11mmt more to Greece and Turkey, alongside a small 0.02mmt (3 percent) increase at Cameron LNG, the remaining active US LNG plants – led by Freeport LNG – saw shipments plummet. Accordingly, Freeport LNG loadings were down 0.15mmt (-68 percent) followed by Corpus Christi LNG with 0.13mmt (-41 percent). Notably, Sabine Pass LNG, which had led the decline in US LNG loadings with 0.77mmt (-55 percent) in June, managed to drastically slow that decline to just 0.03mmt (-5 percent) in July. The plant could even have achieved month-on-month export growth but for a significant demand reduction for its gas of 0.17mmt (-45.9 percent) in South Korea. Elba Island LNG, meanwhile, continued its absence from the conventional LNG market. Market visibility at the time of

writing indicated these volumetric declines were hastened by a loss in Japanese and South Korean market share in particular, which some sporadic demand growth for US LNG in Europe (e.g. Spain) could not compensate for. However, we highlight that roughly 0.21mmt were still en route to the Pacific without confirmed destinations at the time of writing so that the eventual composition for US LNG demand – but not overall volumes – had yet to transpire.

In South America, Atlantic LNG in Trinidad & Tobago continued to see exports decrease, with the month-on-month decline accelerating from 0.03mmt (-3 percent) in June to 0.11mmt (-12 percent) in July as Caribbean demand mostly disappeared. Argentina's Tango FLNG barge, meanwhile, did not load a cargo. Consequently, as the Atlantic Basin's overall shipped LNG decreased by 0.18mmt (-2 percent) month-on-month in July, export utilisation also fell by 2pp to 60 percent.

Middle East: Middle Eastern LNG exporters once more kept activity broadly steady in July, decreasing monthly

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shipments by 0.14mmt (2 percent) to 7.65mmt. The performance was underpinned by a strong decrease in Qatari shipments, but which was tempered by an increase out of the UAE and a rare Egyptian cargo. As such, the Basin’s utilisation of operational export capacity (i.e. excluding Yemen) decreased only slightly to just below nameplate (99 percent) in July.

Owed to the massive size of the Ras Laffan LNG complex, LNG supply from Middle East was determined by changes to Qatar’s exports. The country accounted for most of the Basin’s monthly export reduction in July as its shipments decreased by 0.21mmt (3 percent) month-on-month. However, that growth did not extend to exports to the Pacific Basin, to which Qatari shipments increased by 0.49mmt (14.9 percent), led by destinations in South Korea and Bangladesh. Notably, the leading LNG exporter hoovered up 0.30mmt (13 percent) of available South Korean demand as the exact equivalent disappeared in Argentina. Other Atlantic Basin destinations, with the exception of Spain and the United Kingdom, also saw LNG flows from Qatar decrease by 0.42mmt (-16 percent) overall.

The two other active producers in the Persian Gulf – Oman and the UAE – saw

a net export increase slightly by 0.02mmt (2 percent), however, as a 0.03mmt increase at Das Island compensated for a 0.01mmt decrease at Qalhat in Oman. Egypt’s Idku LNG, meanwhile, briefly ended its market absence by exporting a rare cargo in July. The shipment marked Egypt’s first LNG export since March this year. However, our data suggests this export was a one-off with no follow up planned as market fundamentals – bother international and domestic – remain unfavourable for the foreseeable future.

Imports & Domestic Trade

Pacific Basin: Pacific Basin imports returned to growth in July, increasing by 0.87mmt (5 percent) to 18.71mmt from the 17.85mmt seen in June. The commensurate import capacity utilisation thereby also increased by 2pp to 51 percent. Overall Pacific demand continued to be buoyed by Japanese demand growth of 0.70mmt (14.5 percent) whilst demand curtailment within the Basin was led by South Korea, which cut back on LNG offtakes by 0.30mmt (-12.5 percent). Meanwhile, Taiwan increased offtakes by 0.27mmt (20.9 percent) to 1.56mmt.

As a prominent emerging LNG demand centre in the Pacific Basin, India’s demand stood out by showing only slight month-on-month growth of 0.04mmt (2 percent). This

flattish demand profile in July stood in stark contrast to the robust growth seen in May and June, when demand rebounded quickly after a brief interim in April. However, our data point to a possible return to more robust Indian demand growth in August, with deliveries on 11 August ahead by two cargoes compared to the same period in July.

In Southeast Asia, Indonesian demand retreated by 0.17mmt (-54.8 percent) in July after an interim peak in June. Indonesian legislators extended their Large-Scale Social Restrictions until end-

July as infection rates threatened to accelerate. Neighbouring Malaysia also saw domestic demand decrease by 0.02mmt (-10.5 percent) to 0.17mmt. Malaysian LNG demand was covered by one Australian shipments via Gladstone LNG delivered to Pengerang’s petrochemical plants as well as two Brunei LNG shipments totalling 0.12mmt to the Sungai Udang FSRU.

The protracted low-price environment in July enticed the roster of typically price-conscious buyers – including Bangladesh, Thailand, Chile, Mexico, Singapore and Myanmar – to collectively grow imports by 0.33mmt. This was primarily due to Bangladesh, which increased its monthly LNG intake by 60 percent from 0.25mmt to 0.40mmt. Thailand and Chile also boosted imports by 0.10mmt (19.2 percent) and 0.08mmt (28.6 percent), respectively. Although the Pacific’s latest demand-side addition, Myanmar, saw July imports curtailed by 0.01mmt (-58.4 percent), we highlight that this was due to the additional commissioning cargo in June instead of a drop in structural demand. Finally, an increase of 0.04mmt (12.1 percent) in Singapore compensated for a decrease of 0.03mmt (14.3 percent) in Mexico.

The roster’s demand growth – specifically that of Bangladesh – also had a positive impact on FSRU utilisation in the Pacific by importing 0.10mmt more month-on-month through these floating terminals. This pushed FSRU utilisation within the Basin to 43 percent, up 7pp from June. Nevertheless, as highlighted in the Atlantic and Middle East sections below, overall FSRU utilisation across all three basins still decreased by 3 percent in July due to overall demand decreases in FSRU-operating countries in the two Basins.

Atlantic Basin: Atlantic Basin LNG imports also rebounded from a retreat in June as they increased by 0.24mmt (4 percent) to 6.46mmt. The increase was underpinned by strong Spanish and Dutch demand growth, which added to monthly offtakes with 0.75mmt overall. Although growing only relatively moderately in July, Argentina demand also remained strong at 0.61mmt, up 0.05mmt (8.9 percent) month-on-month. Accordingly, the Basin’s overall capacity utilisation increased slightly by 1pp to 28 percent.

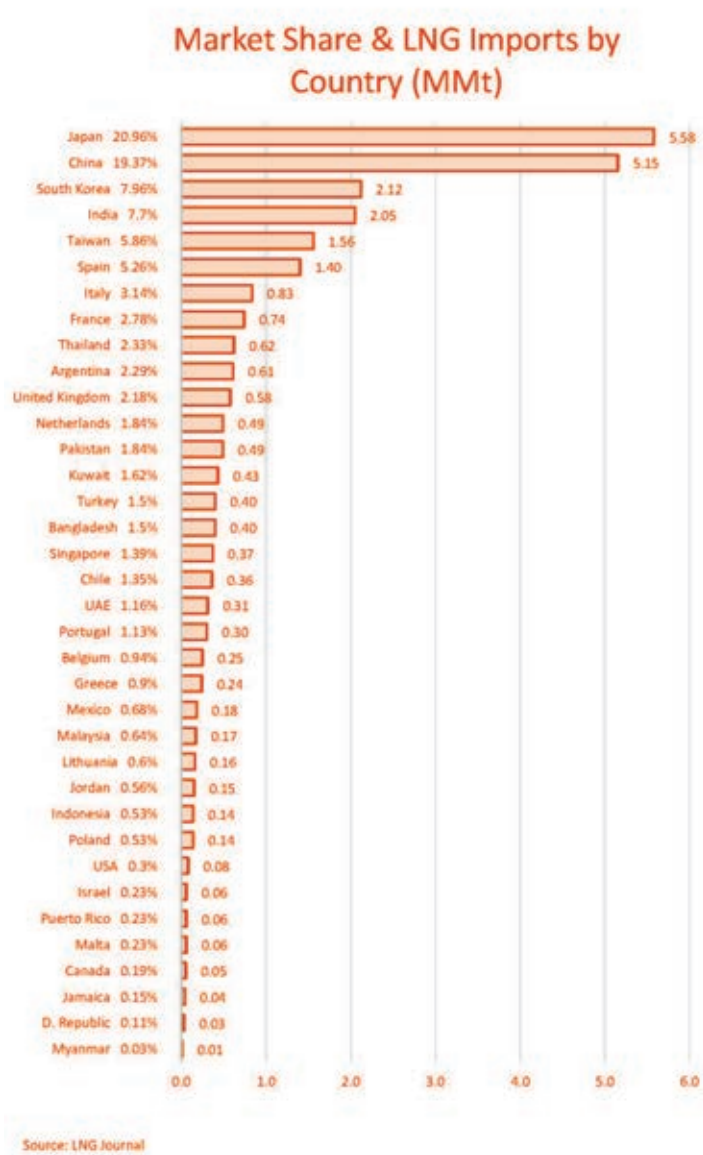
Elsewhere in Europe, however, the United Kingdom and Turkey both curtailed offtakes by 0.37mmt overall, whilst Belgium and Poland cut back on LNG offtakes by 0.13mmt. This left a

roster of smaller European buyers – Greece, Portugal, Lithuania and Malta – as well as France to supply relatively minor month-on-month growth of 0.18mmt in total.

In the western half of the Atlantic, the Caribbean and South America – including Argentina, Brazil, Jamaica, Puerto Rico, the Dominican Republic, Panama and Colombia – saw month-on-month LNG demand decrease slightly by 0.03mmt overall in July and thus did not continue with the strong showing the previous month. Most of that negative growth transpired in the Dominican Republic, which slashed offtakes by 0.09mmt (75 percent), and which could only partially be compensated for by relatively moderate monthly increments in volumetric terms in Argentina (0.05mmt) and Puerto Rico (0.02mmt). Accordingly, the use of FSRU capacity by volume throughout the basin decreased by 3pp to 31 percent as the absence of Turkey’s Iskenderun facility as well as the lack of Turkish LNG demand growth weighed on overall utilisation.

In North America, Canada imported a cargo of 0.05mmt and thus barely compensated for a demand reduction in the United States. US LNG imports decreased significantly by 0.06mmt (-43 percent) in July in line with bi-directional use of the Cove Point LNG facility.

Middle East: Among the three basins, the Middle East stood alone in showing an overall month-on-month demand decrease in July. High summer temperatures notwithstanding, Kuwait in particular reduced offtakes by 0.09mmt (-17 percent) whilst Pakistan’s Port Qasim facility struggled to maintain monthly imports at around the 0.50mmt mark in July. Pakistan reduced offtakes by 0.02mmt (-4 percent). Similarly, Israel kept the number of imported shipments steady at one per month, but with a slightly lower volume of 0.06mmt in July compared to 0.07mmt in June, according to our data and calculations. In contrast, Dubai’s DUSUP continued to seize opportunities in an oversupplied market and grew imports once more by growing offtakes by 0.02mmt (7 percent). In similar vein, Jordan increased its offtakes by 0.02mmt (15 percent) to 0.15mmt in July. Nevertheless, Middle Eastern import capacity utilisation still saw a decrease of 2pp to 49 percent in July. This shift also translated into a commensurate reduction in FSRU capacity utilisation since the region imports all of its LNG through floating terminals. ■





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Courtesy of Anthony Veder

Nakilat surpasses industry's average safety

Nakilat Shipping Qatar Ltd (NSQL), established in 2012, continues to surpass the industry's average safety benchmarks. NSQL achieved a LTI-free year in 2019 for its managed and operated fleet, and recorded a 99.75 percent average reliability for its wholly owned vessels of 29 LNG vessels and 4 LPG vessels

Speaking to *LNG Journal*, Nakilat said it managed to reach these top benchmarks after implementing far-reaching safety measures across its fleet. The Incident and Injury Free (IFF) and shared values InSPIRE campaigns not only empowered individuals to take ownership on safety issues, but also encourages them to embody our core values throughout their daily operations.

Unperturbed by Covid-19 related challenges, Nakilat in May 2020 started the second transition phase of its fleet management from Shell International Trading & Shipping Company to its in-house ship management arm, Nakilat Shipping Qatar Ltd.

Q-Max Al Mayeda, Q-Flex Al Kharaitiyat, Q-Max Bu Samra and Q-Max Al Samriya are the first of the seven LNG carriers to be transitioned to date. During the first phase of transition in 2017, Nakilat successfully saw 10 vessels brought to in-house management. Since then, NSQL has maintained an excellent safety and operational performance above the industry average in the global shipping sector.

Upon completion of the second phase vessel transition from Shell, NSQL's managed fleet will comprise of 25 transferred vessels (21 LNG and 4 LPG carriers) and two newbuild vessels to make a strong 27 vessels managed fleet by the end of the current year.

Growing its ship management capabilities with over a decade of managing gas tankers, Nakilat envisions to become a fully-fledged shipping and maritime company. The management of its vessels centrally from Qatar also allows Nakilat to capitalize on existing synergies with its main charterer to realize greater operational efficiencies and optimize costs.

First ME-GI type LNGC newbuild for Nakilat

Nakilat first announced in 2019 that it will be adding four more LNG carrier newbuilds through a new joint venture with long-term partner Maran Ventures, the LNG ship-owning arm of the Angelicoussis Group. Under the deal for the new joint venture (JV), Global Shipping Co. Ltd. – Nakilat holds a 60 percent stake, while Maran holds the remaining 40 percent.

Set to be delivered between 2020 and 2022, the four newbuilds will be equipped with some of the most advanced technology in the market today, with two of them featuring ME-GI, and the other two X-DF propulsion systems. The vessels will have a cargo carrying capacity of 173,400 - 174,000 cbm respectively. The delivery of all 4 vessels will bring Nakilat's fleet to 74 vessels, which is just under 12 percent of the current global LNG fleet in carrying capacity.



Nakilat in May took delivery of the new LNG carrier 'Global Energy' from Daewoo Shipbuilding & Marine

In May 2020, Nakilat's very first M-type Electronically Controlled Gas Injection (ME-GI) engine LNG carrier newbuild Global Energy was successfully delivered. Global Energy is commercially managed by Nakilat and technically / crew managed in-house by Nakilat Shipping Qatar Limited (NSQL), a ship management subsidiary of Nakilat.

The ME-GI series of LNG vessels such as Global Energy are designed to be significantly larger than the conventional LNG carriers with a lower boil-off rate (BOR), more fuel-efficient, and have lower emission levels than other engines currently being used in LNG shipping. Furthermore, operating a ME-GI class LNG carrier is also said to have

considerable capital expenditure and overall operational cost savings – one of the most competitive LNG carriers on a Unit Transportation cost (UTC) basis.

Driving sustainability across its fleet

Driven by its sustainability focus in the aspect of environmental stewardship, it is worth noting that Nakilat pursued a pilot project for the world's first ME-GI systems onboard the largest type of LNG carrier ever built, a Q-Max. The 266,000 cbm LNGC Q-Max Rasheeda was built in 2010, one of the 45 Q-Max and Q-Flex types and owned by Nakilat. LNGC Q-Max Rasheeda was the world's first low-speed marine diesel engine to be converted to use LNG as fuel back in 2015. It became a pivotal case study for ships of its scale. Learnings from this pilot project continue to pave the way for greater enhancement in green shipping system designs across the industry.

As the European Union (EU) is pursuing a policy to make ship recycling greener and safer, Nakilat has started obtaining Inventory Hazardous Materials (IHM) certification for its vessels according to EU Legislation and has made good progress on this recently implemented legislation, which requires ships to have an inventory of hazardous material on board. Extensive surveys have been completed, with samples taken and analyzed in labs. In addition to all mandatory certifications, the vessels maintain voluntary compliance certification with the Hong Kong International Convention for the Safe & Environmentally Sound Recycling of Ships.



One of Nakilat's double-berth QMax LNG vessels

The Company's fleet of LNG carriers is fitted with modern and sustainable technology in compliance with the highest international operating standards. Nakilat's operated vessels have been conferred the Green Award to certify its 'extra clean and extra safe' operations by the Green Award Foundation. "The addition of new generation LNG vessels to our fleet will strengthen our efforts to operate sustainably. Not only will these vessels be designed to achieve greater thermal efficiency, but they will also be more environmentally-friendly and drivers on cost effective operations," Nakilat said, stressing this is important as it need to respond to an increasingly competitive marketplace that demands operational superiority and sustainability.

Seafarer's development programme

Nakilat aspires not only to be the leading energy transportation and maritime company, but also recognized as a safe, reliable and efficient ship operator. Aligned with the its long-term growth strategic objective, Nakilat has been expanding its in-house crew administration to have greater autonomy in its operations and closer management of its seafarers.

With the new addition of technologically advanced vessels to its fleet, Nakilat remains focused in the development of competencies, enhancing skills, acquiring technical know-how and modernizing its systems to develop a professional maritime workforce with high caliber. The Company also intends to take full vessel management responsibility of the floating storage and regasification unit (FSRU) Exquisite from the current operator in the future. As such, Nakilat's Seafarers' Competence Development Programme is aimed at developing qualified seafarers in accordance with the highest international standards to strengthen the company's positioning as a global leader and provider of choice for energy transportation and maritime services.

Steering forward steadily

Safety enhancement, vessel reliability and cost optimization continue to be Nakilat's main drivers for operational excellence in managing its modern vessels. Demonstrating strong commitment towards providing safe, reliable and efficient shipping and maritime services excellence, Nakilat

strives to meet the essential energy transportation needs in a responsible manner.

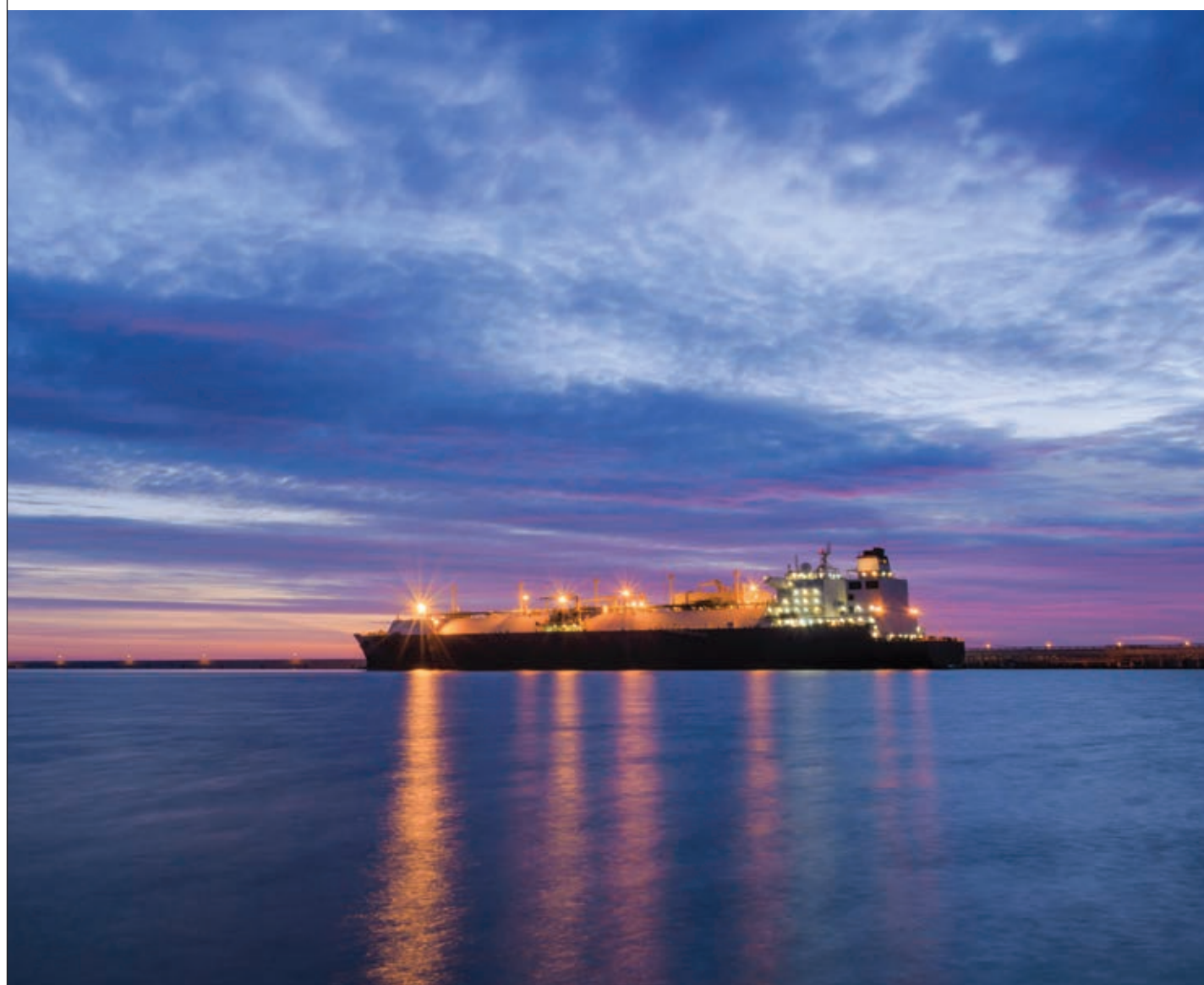
Nakilat's successful long-term growth strategies, business diversification and synergetic alliances with established industry partners have been well reflected through its robust financial

performance. The company confidently steers forward with a continued focus on high standards in safety management and operational efficiency of its fleet management, as it will soon be welcoming several more ships into its fold with the upcoming LNG fleet management transitions and deliveries of LNG carrier

newbuilds in the coming year.

Nakilat continues to explore opportunities to expand its portfolio, diversify its business and grow its global reach in multiple market sectors such as LNG ships, FSRUs, LPG ships, small-scale LNG as well as downstream LNG value chain. ■

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LNG VESSELS							
WHOLLY-OWNED (MANAGED BY NAKILAT SHIPPING QATAR LTD. - NSQL)							
Ship Name	Type	Capacity (m³)	Length (m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
Al Ghashamiya	Q-Flex	217,591	315	Nakilat	NSQL	Samsung Heavy Industries	2009
Sheehaniya	Q-Flex	210,200	315	Nakilat	NSQL	Daewoo Shipbuilding & Marine Engineering	2009
Mesaimeer	Q-Flex	216,312	315	Nakilat	NSQL	Hyundai Heavy Industries	2009
Onaiza	Q-Flex	210,150	315	Nakilat	NSQL	Daewoo Shipbuilding & Marine Engineering	2009
Al Gattara	Q-Flex	216,200	315	Nakilat	NSQL	Samsung Heavy Industries	2007
Al Gharrafa	Q-Flex	216,200	315	Nakilat	NSQL	Samsung Heavy Industries	2008
Al Hamla	Q-Flex	216,200	315	Nakilat	NSQL	Samsung Heavy Industries	2008
Tembek	Q-Flex	216,200	315	Nakilat	NSQL	Samsung Heavy Industries	2007
Al Dafna	Q-Max	266,366	345	Nakilat	NSQL	Samsung Heavy Industries	2009
Al Ghuwairiya	Q-Max	263,300	345	Nakilat	NSQL	Daewoo Shipbuilding & Marine Engineering	2008
Al Mafyar	Q-Max	266,370	345	Nakilat	NSQL	Samsung Heavy Industries	2009
Mekaines	Q-Max	266,476	345	Nakilat	NSQL	Samsung Heavy Industries	2009
Mozah	Q-Max	266,253	345	Nakilat	NSQL	Samsung Heavy Industries	2008
Umm Slal	Q-Max	265,978	345	Nakilat	NSQL	Samsung Heavy Industries	2008
WHOLLY-OWNED (MANAGED BY SHELL INTERNATIONAL TRADING AND SHIPPING COMPANY LTD. - STASCO)							
Ship Name	Type	Capacity (m³)	Length (m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
Al Bahiya	Q-Flex	210,100	315	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Al Karaana	Q-Flex	210,100	315	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Al Kharaitiyat	Q-Flex	216,300	315	Nakilat	STASCO	Hyundai Heavy Industries	2009
Al Khattiya	Q-Flex	210,150	315	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Al Nuaman	Q-Flex	210,100	315	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Al Rekayyat	Q-Flex	216,293	315	Nakilat	STASCO	Hyundai Heavy Industries	2009
Al Sadd	Q-Flex	210,200	315	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Aamira	Q-Max	266,000	345	Nakilat	STASCO	Samsung Heavy Industries	2010
Al Mayeda	Q-Max	266,000	345	Nakilat	STASCO	Samsung Heavy Industries	2009
Al Samriya	Q-Max	263,300	345	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Bu Samra	Q-Max	266,000	345	Nakilat	STASCO	Samsung Heavy Industries	2008
Lijmiliya	Q-Max	263,300	345	Nakilat	STASCO	Daewoo Shipbuilding & Marine Engineering	2009
Rasheeda	Q-Max	266,276	345	Nakilat	STASCO	Samsung Heavy Industries	2010
Shagra	Q-Max	266,000	345	Nakilat	STASCO	Samsung Heavy Industries	2009
Zarga	Q-Max	266,000	345	Nakilat	STASCO	Samsung Heavy Industries	2010
WHOLLY-OWNED (MANAGED BY NAKILAT-SVITZERWIJSMULLER - NSW)							
Ship Name	Type	Capacity (m³)	Length(m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
Hadd Al Theeb	Tug Boat	439	31.5	NSW	NSW	ASL Shipyard Private Limited	2007
Al Melihat	Tug Boat	439	31.5	NSW	NSW	ASL Shipyard Private Limited	2007
Dawi	Tug Boat	490	33.9	NSW	NSW	ASL Shipyard Private Limited	2007
Meliah	Tug Boat	490	33.9	NSW	NSW	ASL Shipyard Private Limited	2007
Onaiza	Tug Boat	490	33.9	NSW	NSW	ASL Shipyard Private Limited	2007
Anbar	Tug Boat	490	33.9	NSW	NSW	ASL Shipyard Private Limited	2007
Umm Al Shubrum	Tug Boat	294	28.67	NSW	NSW	Nakilat Damen Shipyard Qatar	2014
Al Kharsaah	Tug Boat	294	28.67	NSW	NSW	Nakilat Damen Shipyard Qatar	2014
Al Nefayed	Tug Boat	353	30.6	NSW	NSW	Nakilat Damen Shipyard Qatar	2014
Qitat Jarada	Maintenance	479	40.29	NSW	NSW	ASL Shipyard Private Limited	2007
RL-30	Mooring Boat	30	14.5	NSW	NSW	Strategic Marine Private Limited	2007
RL-31	Mooring Boat	30	14.5	NSW	NSW	Damen Alwarby Shipyard	2007
RL-32	Mooring Boat	30	14.5	NSW	NSW	Damen Alwarby Shipyard	2007

continued from previous page

Al Esaiwed	Mooring Boat	46	16.76	NSW	NSW	Nakilat Damen Shipyard Qatar	2014
Ras Al Allaj Qatar	Mooring Boat	46	16.76	NSW	NSW	Nakilat Damen Shipyard Qatar	2014
Svitzer Al Dana	Single Point Mooring / Offshore Lineboat	100	22.25	NSW	NSW	Damen Netherlands	2006
Svitzer Al Maha	Single Point Mooring / Offshore Lineboat	100	22.25	NSW	NSW	Damen Netherlands	2006
Al Wosail	Single Point Mooring / Offshore Lineboat	110	22	NSW	NSW	Albwarby Marine Engineering Limited Liability Company	2008
Al Owainat	Single Point Mooring / Offshore Lineboat	110	22	NSW	NSW	Albwarby Marine Engineering Limited Liability Company	2008
Svitzer Al Safliya	Wellhead Maintenance / Crew Boat	171	31	NSW	NSW	Strategic Marine Private Limited	2006
Svitzer Al Shamal	Wellhead Maintenance / Crew Boat	171	31	NSW	NSW	Strategic Marine Private Limited	2006
Svitzer Al Shaqab	Wellhead Maintenance / Crew Boat	171	31	NSW	NSW	Strategic Marine Private Limited	2006
Ras Laffan PB2	Pilot Boat	57	16.3	NSW	NSW	Cheo Lee Shipyard	2008
Al Ghaf	Pilot Boat	71	21.42	NSW	NSW	Nakilat Damen Shipyard Qatar	2015
Umm Al Rous	Pilot Boat / Crew Boat	97	23.3	NSW	NSW	Grandweld	2007

JOINT VENTURE VESSELS

*("K" Line) - Kawasaki Kisen Kaisha, Ltd | *(NYK Line) - Nippon Yusen Kaisha | *(SCI) - Shipping Corporation of India | *(Teekay) - Teekay Shipping Corporation | *(MOL) - Mitsui O.S.K. Lines
 *(CONV) - Conventional | *(DFDE) - Dual Fuel Diesel Electric | *(TFDE) - Triple Fuel Diesel Electric

Ship Name	Type	Capacity (m³)	Length (m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
Al Oraiq	Q-Flex	210,100	315	Nakilat / "K" Line	"K" Line	Daewoo Shipbuilding & Marine Engineering	2008
Umm Al Amad	Q-Flex	210,100	315	Nakilat / "K" Line	"K" Line	Daewoo Shipbuilding & Marine Engineering	2008
Al Jassasiya	CONV	145,700	285	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2007
Maran Gas Achilles	CONV / TFDE*	174,000	289	Nakilat / Maran Gas	Maran Gas	Hyundai Heavy Industries	2016
Maran Gas Alexandria	CONV / TFDE*	161,870	285	Nakilat / Maran Gas	Maran Gas	Hyundai Heavy Industries	2015
Maran Gas Apollonia	CONV / TFDE*	161,870	289	Nakilat / Maran Gas	Maran Gas	Hyundai Heavy Industries	2014
Maran Gas Asclepius	CONV	145,822	285	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2008
Maran Gas Coronis	CONV / TFDE*	145,700	285	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2012
Maran Gas Delphi	CONV / TFDE*	159,800	249	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2014
Maran Gas Efessos	CONV / TFDE*	159,800	294	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2014
Maran Gas Lindos	CONV / TFDE*	161,870	294	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2015
Maran Gas Posidonia	CONV / TFDE*	161,870	289	Nakilat / Maran Gas	Maran Gas	Hyundai Heavy Industries	2014
Maran Gas Sparta	CONV / TFDE*	159,800	289	Nakilat / Maran Gas	Maran Gas	Hyundai Heavy Industries	2015
Simaisma	CONV	145,889	285	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2006
Umm Bab	CONV	145,000	285	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2005
Woodside Goode	CONV / DFDE*	159,800	294.2	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2013
Woodside Rogers	CONV / DFDE*	159,800	294.2	Nakilat / Maran Gas	Maran Gas	Daewoo Shipbuilding & Marine Engineering	2013
Al Aamriya	Q-Flex	210,168	315	Nakilat / MOL*	MOL*	Daewoo Shipbuilding & Marine Engineering	2008
Fraiha	Q-Flex	210,100	315	Nakilat / MOL*	MOL*	Daewoo Shipbuilding & Marine Engineering	2008
Murwab	Q-Flex	210,100	315	Nakilat / MOL*	MOL*	Daewoo Shipbuilding & Marine Engineering	2008
Al Sahla	Q-Flex	216,200	315	Nakilat / NYK	NYK* Line	Hyundai Heavy Industries	2008
Al Thumama	Q-Flex	216,200	315	Nakilat / NYK	NYK* Line	Hyundai Heavy Industries	2008
Al Utouriya	Q-Flex	215,000	315	Nakilat / NYK	NYK* Line	Hyundai Heavy Industries	2008
Ejnan	CONV	145,000	283	Nakilat / NYK	NYK* Line	Samsung Heavy Industries	2007
Al Ghariya	Q-Flex	210,150	315	Nakilat / Pronav	Pronav	Daewoo Shipbuilding & Marine Engineering	2008
Al Ruwais	Q-Flex	210,150	315	Nakilat / Pronav	Pronav	Daewoo Shipbuilding & Marine Engineering	2007
Al Safliya	Q-Flex	210,150	315	Nakilat / Pronav	Pronav	Daewoo Shipbuilding & Marine Engineering	2007
Duhail	Q-Flex	210,150	315	Nakilat / Pronav	Pronav	Daewoo Shipbuilding & Marine Engineering	2008
Aseem	CONV / DFDE*	155,003	285	Nakilat / SCI*	SCI*	Samsung Heavy Industries	2009
Al Marrouna	CONV	149,539	288	Nakilat / Teekay*	Teekay*	Daewoo Shipbuilding & Marine Engineering	2006
Al Areesh	CONV	148,786	288	Nakilat / Teekay*	Teekay*	Daewoo Shipbuilding & Marine Engineering	2007
Al Daayen	CONV	148,853	288	Nakilat / Teekay*	Teekay*	Samsung Heavy Industries	2008
Al Huwaila	Q-Flex	217,000	315	Nakilat / Teekay*	Teekay*	Samsung Heavy Industries	2008
Al Kharsaah	Q-Flex	217,000	315	Nakilat / Teekay*	Teekay*	Samsung Heavy Industries	2008
Al Khuwair	Q-Flex	217,000	315	Nakilat / Teekay*	Teekay*	Daewoo Shipbuilding & Marine Engineering	2006
Al Shamal	Q-Flex	217,000	315	Nakilat / Teekay*	Teekay*	Samsung Heavy Industries	2008

LPG VESSELS

Ship Name	Type	Capacity (m³)	Length (m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
Al Wukir	VLGC	82,491	225	Nakilat / Milaha	NSQL	Hyundai Heavy Industries	2008
Bu Sidra	VLGC	82,419	225	Nakilat / Milaha	NSQL	Hyundai Heavy Industries	2008
Lubara	VLGC	82,452	225	Nakilat / Milaha	NSQL	Hyundai Heavy Industries	2009
Umm Laqhab	VLGC	82,408	225	Nakilat / Milaha	NSQL	Hyundai Heavy Industries	2008

FSRU VESSEL

Ship Name	Type	Capacity (m³)	Length (m)	Ship Owner	Ship Manager	Shipbuilder	Delivered
EXQUISITE	FSRU	150,900	291	Nakilat / Excelsior	Exmar	Daewoo Shipbuilding & Marine Engineering	2009

Accurate as of October 2019

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For the Record

AKER Solutions and Kvaerner, Norway's two largest offshore energy contracting and supply companies, have decided to re-merge as an engineering and subsea supply company for the 21st century just nine years after they were split up. The move is being arranged by Norwegian industrialist Kjelle Inge Røkke, who controls both companies and is aiming to make the merged entity more active in alternative energy projects in addition to oil and natural gas for the transition to the lower-carbon future. Aker Solutions, which will absorb Kvaerner assets under the re-merger, has been involved in a number of LNG projects around the world, including liquefaction ventures in the US and a floating facility in West Africa as well as subsea projects for LNG feed-gas worldwide. The company is also a leader in subsea equipment provision and production as well as the processing and transportation of gas.

Kvaerner's most significant recent contract was awarded at the end of June 2020 to dismantle and recycle three large topsides and platform equipment from the Valhalla and Hod fields in the southern Norwegian North Sea, operated by Aker-BP and which since 1982 had produced more than one billion barrels of oil equivalents. Aker Kvaerner was the leading Norwegian oil and gas contractor before it was split into two separate companies in 2011. "Kvaerner and Aker Solutions have for many years been successful suppliers to customers operating energy production facilities, especially to oil and gas companies," said the re-merger statement. "Customers in this market are increasingly asking for solutions with reduced environmental footprint, and new customers ask for renewable energy solutions," it added. Reuniting the two large companies is officially aimed at making them better able "to deliver a more complete offer" to the energy sector globally. The re-merger was welcomed by investors, with share values in both companies surging. Aker Solutions shares listed on the Oslo stock exchange jumped more than 34 percent to 13.70 Norwegian crowns (\$1.47) per share, while Kvaerner's shares jumped 8 percent to 9.8 crowns per share. "Combining Aker

Solutions and Kvaerner in one company will bring together expertise and innovative spirit of two strong and compatible cultures," said Kvaerner President and Chief Executive Karl-Petter Løken. The combined company will have about 15,000 employees in more than 50 locations around the world. Combined revenues for the companies amounted to 38 billion crowns (\$4.1Bn) in 2019. In the planned re-merger process, a new organisation model will be established.

Kvaerner's CEO Løken will be a member of the new company's Executive Management Team, and will assume responsibility for the Renewables segment. Idar Eikrem will take on the role as of Chief Financial Officer in Aker Solutions from 1 August 2020. "Other key management positions will be concluded during the coming weeks," the statement added. "The consolidation will take the form of a statutory merger whereby Aker Solutions ASA will absorb Kvaerner ASA, in accordance with the Norwegian Public Limited Liability Companies Act," it explained. The statement added that the larger Aker Solutions would be the dominant force of the merged entity. The new company would become a dedicated supplier, adding value in early front-end customer engagement. Analysts said companies also stand to gain from large investments by the Norwegian government in carbon capture and storage projects as well as renewable energy. "The combined entity will be a dedicated execution partner for delivery of complete projects for new energy production facilities, for example oil and gas production platforms or subsea systems, or offshore wind power installations," said Kjetil Digre, the Aker Solutions CEO and also the proposed CEO for the combined company. "We will continue to fine tune and improve our internal capacities, to ensure that we always have a sound capacity utilisation. In addition to our own capabilities, we will continue to collaborate closely with partners," stated Digre.

Aker Solutions had at the start of 2020 around 16,000 of its own employees and Kvaerner had about 2,800. In response to changing markets, both companies had prior to the re-merger commenced adjustments of capacities, costs and jobs. "Most of the staff reductions will be completed before the merger is implemented and combined cost-cutting initiatives aim to reduce the fixed cost-level by about 1.5Bn crowns (\$162M) on an annualized basis through 2021," they said.

ARGENTINA purchased 28 liquefied natural gas cargoes for the Southern Hemisphere winter at average prices of \$2.87 million British thermal units as natural gas production fell in the first half of 2020 amid long-term plans to start its own LNG exports from the Vaca Muerta Shale. Argentina's state-owned Integración Energética Argentina (Ieasa) purchased the LNG shipments to cover around 25 percent of the country's natural gas needs during the winter season. The Argentine Energy Institute (IAE) said in its latest report that natural gas production dropped by 9.2 percent year-on-year, or 4.39 billion cubic feet per day, to 124.4 million cubic metres per day. Analysts said that movement restrictions in place because of Covid-19 led to the fall in output.

The IAE report said conventional gas production, which accounted for 57 percent of the overall fall, decreased by 10.6 percent in May while unconventional output from the Vaca Muerta Shale in the western Neuquén province fell by 7.2 percent. Argentine natural gas output has been falling since March 2020 and in April was down by 11.3 percent from the same month in 2019 to 116.7 million cubic metres per day. Oil and gas services companies say that since the start of June there has been an increase in activity, particularly in the Vaca Muerta. There were 196 hydraulic fracturing stages completed in the Vaca Muerta in June, still less than one-third of 2019 peak activity, compared with just 28 in May and none recorded in April, according to data compiled by Houston-based services company NCS Multistage. The Argentine natural gas market is also going through a transition, specifically with regards to price formation. While productivity had improved before the Covid-19 lockdown as a result of increased fracking stages and longer laterals, production costs at the Vaca Muerta are still too high for international markets.

The Argentine government has also been taking measure to stimulate the oil and gas industry, now considered vital for the South American nation's economic future, by bringing in a \$45 per barrel oil price floor for producers to encourage exploration and production. Energy market reforms include a natural gas pricing structure with a benchmark start being considered of around \$3.50 per MMBtu. The IAE report added that the state-run Argentine Electricity Market Management Company (Cammesa), which purchases natural gas and ensures

power supplies, paid subsidies in June amounting to about \$2 billion. The Vaca Muerta has attracted investment partners such as international majors ExxonMobil Corp., Chevron Corp. and Royal Dutch Shell as well as Total, Norwegian company Equinor and Qatar Petroleum. They are being supported by Argentina's state-owned energy company Yacimientos Petrolíferos Fiscales (YPF) as a full participant in properties. Equinor, for example, is partnered with Shell and at the start of 2020 they expanded their acreage. They completed the joint acquisition of the 49 percent interest held by Schlumberger in the Bandurria Sur onshore block, with each paying \$177.5M for their 24.5 percent stakes in 56,000 gross acres in the central area of the Vaca Muerta. YPF is the operator of this project with a 51 percent interest and the block was in the late pilot phase of development before the March lockdown and has production estimates of around 10,000 barrels of oil equivalent per day. The Argentine company said in a recent presentation that shale oil and gas production would soon account for 20 percent of its overall output. YPF added that its average first-quarter 2020 natural gas price realizations were \$2.80 per MMBtu, down from \$3.70 per MMBtu in the same quarter of 2019 and from \$4.80 per MMBtu in the first three months of 2018.

CHEVRON Corp., the US major and operator of two world-class LNG export plants in Western Australia, has agreed to acquire Houston-based Noble Energy and its assets in US shale basins and the East Mediterranean, including the Leviathan and Tamar gas fields offshore Israel. The all-stock takeover values Noble at \$10.38 per share or 0.1191 per Chevron share. Noble is an independent oil and gas producer with widespread operations. Buying the company expands Chevron's presence in the US DJ Basin of Colorado and the Permian Basin, which spans West Texas and New Mexico. Chevron said its purchase would also include an integrated midstream business and an established position in the Eagle Ford Share in South Texas.

It would additionally give San Ramon, California-based Chevron, which has a market value of \$163 billion, assets in Israeli waters in the East Med and an LNG-related gas field offshore Equatorial Guinea in West Africa. Noble's main partner in the East Med is the Delek Group of Israel and their joint venture

Tamar and Leviathan natural gas fields have long-term supply deals with Israel, Jordan and Egypt. The takeover of Noble is Chevron's first big strategic move after it walked away from a high-profile bidding war for Anadarko Petroleum Corp. in 2019. The Anadarko deal included the Mozambique LNG project for Area 1 resources in the Rovuma Basin offshore the southeast African nation. Chevron lost out in the Anadarko bidding to Occidental Petroleum, which sold on its Mozambique LNG stake to European oil and gas major Total.

Analysts note that Occidental has since been languishing under a \$40 billion debt load since buying Anadarko and has not been helped by the oil market crash in mid-March 2020. The Noble operations will complement Chevron's operatorships of Gorgon LNG and Wheatstone LNG in Western Australia and the Angola LNG plant in southwest Africa, which was the world's first liquefaction facility supplied by associated gas as a by-product of oil output. "Our strong balance sheet and financial discipline gives us the flexibility to be a buyer of quality assets during these challenging times," said Chevron Chairman and Chief Executive Michael K. Wirth. "This is a cost-effective opportunity for Chevron to acquire additional proved reserves and resources," added the CEO. "Noble Energy's multi-asset, high-quality portfolio will enhance geographic diversity, increase capital flexibility and improve our ability to generate strong cash flow," explained Wirth.

The transaction has been unanimously approved by the Boards of both companies and is expected to close in the fourth quarter of 2020. However, it is still subject to Noble shareholder and regulatory approvals. Following closing of the transaction, Noble shareholders will own about 3 percent of the combined company. The financial advisor to Chevron in the transaction was Credit Suisse Securities and Paul, Weiss, Rifkind, Wharton & Garrison LLP were legal advisors. J.P. Morgan Securities acted as financial advisor to Noble and Vinson & Elkins LLP was Noble's legal advisor.

COOPER ENERGY of Australia and Japanese trading house and LNG buyer, the Mitsui Group, said they planned to invest in buying and upgrading the idle Minerva Gas Plant in the state of Victoria to boost offshore natural gas supplies in southeast Australia. Copper said both companies would make a joint commitment of A\$55 million (US\$384Mlb)

to support increased and new domestic gas supply for the region. The companies said A\$37M would be spent on upgrading the plant, A\$17.8M on purchasing it and on engineering and maintenance. "This investment decision represents an important milestone in Cooper Energy's continuing growth as a safe, competitive, efficient and reliable developer and marketer of new gas supplies for homes and businesses in southeast Australia," said Cooper Energy Managing Director David Maxwell.

The infrastructure works at the Minerva Gas Plant will enable the supply of 16 petajoules of currently undeveloped gas. Maxwell said this was an important commitment to infrastructure investment, local jobs and increased domestic gas supply. "This is a 'shovel-ready project' which will see Cooper Energy and Mitsui Group upgrade the idle Minerva Gas Plant to be a processing hub for local production and discoveries in the offshore Otway Basin in Victoria," explained Maxwell. The Minerva Gas Plant is located near Port Campbell in Victoria and will be renamed the Athena Gas Plant in recognition of the expansion of its role in processing new supplies from the Otway gas fields. "It means local jobs for local contractors which will help deliver reliable gas supplies into the East Coast market," he stated. "The investment follows the successful exploration program by Cooper Energy and Mitsui Group resulting in the Annie-1 gas discovery, in the Otway Basin, the first offshore discovery in southeast Australia over seven years," added Maxwell.

The Cooper-Mitsui investment comes as two LNG import projects advance in southeast Australia to alleviate natural gas shortages. Australian utility AGL Energy is progressing with its LNG import terminal project at Crib Point on Westernport Bay, south of the Victoria state capital Melbourne. AGL said recently its environmental statement would be open for public comment until 26th of August 2020. Subject to clearance, AGL hopes to make a final investment decision on the Crib Point project around the end of 2020. A second LNG project aimed at ending gas shortages is being developed by Australian Industrial Energy (AIE) in the state of New South Wales at Port Kembla, south of Sydney. That project is backed by the world's largest LNG purchaser, JERA Co. Inc. of Japan, the Japanese trading house Marubeni Corp and Australian mining billionaire Andrew Forrest's Squadron

Energy. The Minerva Gas plant project proposes to draw gas from four offshore wells (Casino-4, Casino-5, Henry-2, and Netherby-1) into the onshore plant via a pipeline tie-in and minor modifications. "This will improve recovery enabled by lower plant inlet pressure and provide the ability to offer customers firm supply," Cooper Energy explained. "Following the completion and performance testing, first gas is expected to be delivered to the Minerva plant within the September quarter 202. This expectation incorporates allowances for uncertainty from Covid-19 as it is presently understood," the company statement concluded.

COSCO Shipping Energy Transportation, the Chinese shipping line with more than 30 liquefied natural gas carriers in its fleet, has approved an order for three more LNG newbuilds and French storage technology company GTT will supply the tank designs. The three vessels will have 174,000 cubic metres capacity and the order has been placed with China's Hudong-Zhonghua Shipbuilding Co. Cosco, abased in Shanghai, said the vessel order would be under a joint venture with China National Petroleum Corp., the Chinese energy major. CNPC is a shareholder in the Yamal LNG plant at Sabetta in northern Siberia and operated by Russian natural gas company Novatek. It is also taking a stake in Novatek's proposed second venture in the region, Arctic LNG II, on the Gydan Peninsula.

Cosco plans to set up a joint venture with an affiliate of CNPC's Hong Kong-listed arm PetroChina, to operate the three new ships. GTT said each of the Chinese newbuilds will be fitted with the No. 96 L03-plus membrane containment system, a technology developed by GTT. The delivery of the vessels is planned between the fourth quarter of 2022 and the second quarter of 2023. "We are pleased to continue our long-term partnership with Hudong-Zhonghua and COSCO Shipping through this new LNGC order," said Philippe Berterottière, Chairman and Chief Executive of GTT. Cosco said the price for each vessel is \$185 million and Cosco would invest \$600M in total for the vessels, including financing costs. Cosco's LNG order book had been set to close in 2020 with the delivery of three final vessels for the Yamal LNG project from the Hudong-Zhonghua yard.

The shipowner has a fleet of 36 LNG carriers, 30 of which are owned under joint ventures. A total of 15 vessels in the

fleet are jointly-owned Arc7 ice-class carriers, with Cosco owning 50 percent equity in six of the ships and minority stakes in the remaining eight. The Hudong-Zhonghua group is a wholly owned subsidiary of China State Shipbuilding Corp. and in April 2020 received a \$3-billion preliminary order from Qatar Petroleum that would reserve building berths. The order if confirmed would be for least 16 ships to deliver cargoes from Qatar's LNG expansion at the Ras Laffan export complex.

CYPRUS has held a foundation stone-laying ceremony at the site of the Mediterranean Island's first LNG import terminal being built at Vasilikos port near Limassol by a Chinese company and partly financed by the European Union. Cypriot President Nicos Anastasiades led the event at the Vasilikos Energy Park on the south of Cyprus and said the facility puts Cyprus on the track of a new energy era. "I would say that this is a really historic landmark, since it officially marks the materialization of an ambitious project of strategic importance and of national dimensions," said Anastasiades. "With the laying of the foundation stone, a lengthy effort to bring natural gas to Cyprus has finally come to an end," noted Anastasiades. "It was an effort marred by a multitude of problems, sometimes due to expediciencies or red tape," he stated.

The project will comprise a floating storage and regasification unit (FSRU), a jetty, mooring facilities, a pipeline on the jetty and other onshore and offshore related infrastructure. The Cypriots are also currently in the process of inviting expressions of interest for the supply of LNG. Around 25 companies have expressed an initial interest and the supply contracts are expected to have a duration of between three to five years. The terminal will cost €289 million (\$326M) to construct and the contract is in the hands of a joint venture comprising China Petroleum Pipeline Engineering, a subsidiary of China National Petroleum Corp., and Greece's Metron SA. Another Chinese company, Hudong-Zhonghua Shipbuilding was awarded the management of the project, in association with Wilhelmsen Ship Management of Norway. The Natural Gas Public Company of Cyprus (DEFA) is also involved in the overall development process for the terminal.

The ceremony at Vasilikos was attended by local and foreign officials, including the Chinese Ambassador Huang

Xingyuan. Anastasiades said that the LNG project had received support from the European Commission in the form of €101M in grants under its “Connecting Europe Facility” programme and through lending by EU financial institutions. The President said that he would follow the progress of the project closely as he would like to inaugurate the facility before the end of his second and last five-year presidential term in 2023. He said that the operation of the LNG terminal for the gas-fired power plant that is replacing heavy fuel oil would reduce environmental emissions by 30 percent and result in savings in electricity generating costs of between 15 percent and 25 percent. “Leaving the past behind us, we are able to implement a government decision to import natural gas first taken in February 2003,” the President concluded.

DENMARK has opened the way for the completion of the Russian-led Nord Stream II pipeline natural gas project for Western Europe to compete with LNG after previous delays caused by threats of US sanctions. Construction of the 1,230-kilometres pipeline is almost complete, apart for a final stretch of around 120 kilometres in length in Danish waters. The Danish Energy Agency said it would allow the Gazprom-led project to use pipe-laying vessels with anchors instead of the more advanced ships using self-positioning technology and which are affected by US sanctions imposed in December 2019. The US considers the Nord Stream II project a security risk to Europe, though both Russia and most European Union members have condemned Washington’s sanctions.

Germany is the main EU supporter of Nord Stream II and has been accused by several EU members, including Poland, of encouraging the EU energy security policy of building LNG import terminals to reduce dependence on Russian pipeline gas while encouraging the new Gazprom pipeline project to supply Western Europe. Nord Stream II also bypasses EU LNG importers Poland and Lithuania, as well as the traditional pipeline transit nation Ukraine, on its route under the Baltic Sea from the Russian port of Ust-Luga, near St Petersburg, to Greifswald in northeast Germany. The Swiss-Dutch subsea company Allseas, which was laying the dual pipelines using two vessels, the “Pioneering Spirit” and the “Solitaire”, halted its work to avoid US sanctions. With Allseas leaving the project, the Russians have taken over and

President Vladimir Putin assured the Russian public that the pipeline would be completed without international assistance. The Nord Stream II project's two parallel pipelines will be able to transport 55 billion cubic metres per annum of natural gas from Russia to Germany. After starting in Russian waters, the pipelines pass through Finnish, Swedish, Danish and German marine areas before making their landfall on the German coast. Still, even if Gazprom completes the project, the company will have to face legal obstacles related to its operation within the EU internal market.

The EU extended its internal gas market regulations in 2019 to pipelines to and from non-EU countries. Under the amended law, Nord Stream II must adhere to third-party access (TPA) and tariff regulations for pipelines entering EU member territory as well as to the principle of unbundling, whereby the transmission and ownership of natural gas need to be separate from each other. Analysts say this is a problem for Gazprom because of its vertically integrated structure. The Russian company could, however, avoid the new EU rules if it is awarded an exemption by the national energy market regulator of the EU member state where the pipeline enters the EU - Germany’s Federal Network Agency.

In the decision to let the Russians lay the pipes, the Danish Energy Agency emphasized, among other things, that the remaining part of the pipelines must avoid certain areas of the sea bottom where deep trawling, anchoring and seabed interventions are discouraged due to the risk posed by “dumped chemical warfare agents”. “The decision is made in accordance with the Continental Shelf Act and on the basis of Denmark's obligations under the UN Convention on the Law of the Sea,” said the Danish statement. “Here, Denmark is obliged to allow the construction of transit pipelines with respect for safety and resources rules and the environment,” stated the Danes.

ELIXIR Energy, the Australian exploration and production company with plans for a small-scale liquefaction plant using coal-seam gas to provide clean fuel for trucks in Mongolia, is making progress in assessing resources in the South Gobi desert region. Elixir, listed on the Australian Securities Exchange, has an accord with Mongolian fuel retail company MT Group on studying an LNG

fuel plant. The proposed liquefaction facility would supply LNG made from CSG to a large coal trucking fleet operating from mines in the South Gobi region and delivering to China.

Elixir said in an ASX statement that it is currently focusing on assessing resources in its 100 percent-owned Nomgon IX CSG production sharing contract (PSC) located in the South of Mongolia, not far from the Chinese border. The 30,000 square kilometres PSC was executed by Adelaide-based Elixir in September 2018 and has a 10-plus years exploration period. Elixir said its seismic contractor has commenced work on the acquisition of 2D seismic in the North-West part of the licence area. “The total 106 kilometre acquisition program should be finished by early August 2020 and subsequent processing will take around another month after that,” explained the company. “Recent field work, data collection and analysis have identified new areas of coal outcropping in various parts of the PSC,” said Elixir. “The location of these are consistent with Elixir’s prospective resource estimates,” it added. “They support the view that the very large licence area is likely to host numerous coal bearing sub-basins that are prospective for coal seam gas,” stated Elixir.

The company has signed a non-binding memorandum of understanding with MT Group to help develop the small-scale LNG plant that could initially provide fuel for the Tavan Tolgoi mine trucks which deliver 15 million tonnes of coal per annum to China. “Our appraisal and exploration program has now started in line with our plans,” said Elixir’s Managing Director Neil Young. “We look forward to receiving the results therefrom to integrate with the results of Nomgon-1 over the rest of this year,” he added. Elixir believes that supplying gas to a small-scale LNG plant in the South Gobi region was be a great initial offtake project for the company to investigate. Elixir and MT Group believes there is clearly an existing market in terms of the very large local coal trucking fleet which could operate on clean gas rather than diesel. Mongolia’s MT Group was established in 1994 and its core operations comprise fuel retailing facilities across the country, including filling stations on the Tavan Tolgoi-to-China road. It currently sources diesel and gasoline products for the likes of Russia’s Rosneft and Gazpromneft.

GASLOG Ltd, the LNG fleet owner with 35 carriers split with its US affiliate

GasLog Partners, said the group had signed three new loan agreements amounting to \$1.1 billion arranged by 12 banks as it confirmed jobs cuts, reductions in expenses and the delivery of a new vessel. The group said GasLog Ltd arranged a \$577M facility and GasLog Partners signed up for two loans for \$260M and \$200M and these substantially refinanced all debt maturities due in 2021. Debt on 12 LNG carrier was refinanced for a total of around \$1Bln while about \$30M of incremental liquidity was provided for the group. “The three new credit facilities are signed and are expected to close by the end of July 2020,” said GasLog. GasLog decided in November 2019 to move its headquarters from Monaco to the Greek port of Piraeus, home of its operational platform to improve efficiency and to reduce overheads. The company said that consequently, the headcount in its London office had been reduced to nine from 27, materially concluding the organizational changes. GasLog said the plan was expected to generate annualized savings of about \$6M beginning in 2021.

The company also reported taking delivery on July 15 of the “GasLog Westminster”, a 180,000 cubic metres capacity carrier with X-DF propulsion and a Mark III Flex containment system. The vessel was delivered on time and on budget and will immediately commence a seven-year charter with a wholly owned subsidiary of the UK utility Centrica plc. GasLog said the “GasLog Westminster” is the third of seven vessels scheduled to be delivered during 2020-2021, all of which are fully funded and together are expected to generate about \$145M of gross earnings per annum. “I am very pleased to announce the continued delivery of our in-built growth, refinancing of our 2021 debt maturities a year ahead of schedule and further reductions in our cost base, all strategic priorities heading into 2020,” said GasLog Chairman Peter G. Livanos. “The ‘GasLog Westminster’ provides industry-leading shipping economics and emissions reductions while expanding our relationship with Centrica and enhancing our revenue and cash flow visibility,” added the Chairman. “Signing our largest refinancing during unprecedented uncertainty in credit and bank markets underscores the strength and scale of our platform to attract new capital providers,” stated Livanos.

Regarding the arrangement of the three loans, the global co-ordinators and book-runners of the three loans were the

US Citibank, Dutch bank ABN Amro and Finland-based Nordea Bank AB. UK-based HSBC plc acted as the mandated lead arranger, France's Credit Agricole Corporate and Investment Bank acted as lead arranger, while UniCredit Bank of Italy and National Australia Bank acted as arrangers for the syndicate for Gaslog Ltd's \$577M facility. France's BNP Paribas and Credit Suisse AG acted as co-coordinators and bookrunners and Greece's Alpha Bank S.A. acted as arranger in the syndicate for the \$260M loan. Norway's DNB ASA, London Branch and the Dutch ING Bank N.V., London Branch acted as co-coordinators and bookrunners for the \$200M loan. Gaslog in June 2020 also held a private share placement with the participation the Tung family of China, the Onassis Foundation and the Greek Livanos family. Clarksons Platou Securities AS acted as financial advisor to GasLog during the placement. In the placement, GasLog sold 14.40 million common shares at a price of \$2.50 per share for total gross proceeds of \$36.0M. The net proceeds of the placement were to be used for general

corporate purposes. GasLog had posted a first-quarter 2020 loss as LNG demand faced multiple headwinds. The company had reported a quarterly net loss of \$39.43M versus a profit of \$5.89M in the same three months of 2019.

GAZTRANSPORT and Technigaz (GTT), the French technology firm for designs of systems for the maritime transportation and storage of liquefied natural gas, has renewed and expanded a global Technical Services Agreement (TSA) with the Norwegian shipowner Knutsen OAS Shipping and its growing LNG fleet. This new agreement covers Knutsen's larger fleet which is expanding to 17 LNG vessels in 2022 with five newbuilds joining the 12 ships currently on the water. GTT said all the Knutsen LNG carriers are equipped with Mark III Flex or No. 96 technologies developed by the Paris-based company. The agreement gives a support role to GTT for the maintenance and operation of the LNG carriers.

Services offered by GTT include on-site technical assistance for inspection, maintenance, repairs, operations and

engineering. GTT said Knutsen would also benefit from access to the HEARS emergency hotline, which enables shipowners and their crews to contact GTT's experts 24/7 to respond to operational issues. "We are pleased to renew and expand this agreement with a long-term partner like Knutsen OAS Shipping, which owns and operates a growing fleet of vessels," said Philippe Berterrothière, Chairman and Chief Executive of GTT. "Thanks to our tailor-made support services, adapted to the needs of our customers, we guarantee maximum efficiency and safety for vessels in operation," added the CEO. GTT concluded a similar accord in March 2020 with Excelerate Energy of the US, a leading floating LNG terminal project company. That agreement was signed by GTT subsidiary GTT North America for a period of five years with the US owner of floating storage and regasification units.

Under the agreement, GTT will support Excelerate Technical Management (ETM) with the maintenance and operation of nine FSRUs equipped with GTT's No. 96 storage tank system. It includes GTT on-

site technical assistance for inspection, maintenance, repairs, operations and engineering, as well as access to the HEARS hotline. GTT notes that it has gradually been enlarging its range of services to support the operations of LNG carriers, floating LNG production hulls, FSRUs and other LNG-related structures to shorten dry-dock time, assist crews and ensure operational safety and efficiency. Excelerate's operations have included setting up FLNG import terminals offshore the US, Argentina, Brazil and other nations in Asia and elsewhere such as the Middle East.

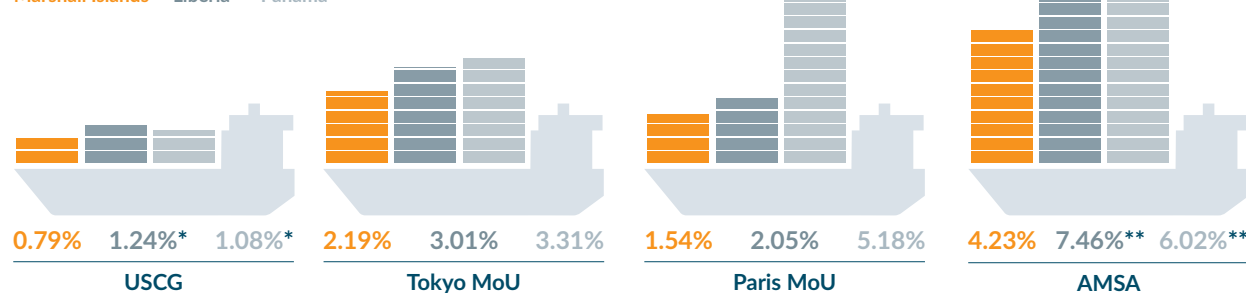
INDONESIA has said through its energy regulator that Royal Dutch Shell was considering selling its 35 percent stake in the offshore Abadi natural gas field in the Masela block that will underpin an onshore LNG export joint venture proposed for Yamdena Island with Inpex Corp of Japan. "It's becoming a wait and see situation and, maybe, there will be a recalculation," said Indonesia's Upstream Oil and Gas Special Regulatory Taskforce (SKK Migas) operations deputy,



THE MARSHALL ISLANDS REGISTRY

Port State Control Detention Trends (%)

Marshall Islands Liberia Panama



* Liberia and Panama are targeted for additional PSC examinations by the USCG for having a detention ratio up to two times the overall detention average.

Sources: 2019 Port State Control Annual Reports.

** Liberia and Panama have exceeded the overall AMSA average detention rate over the three years from 2017-2019 and Liberia is listed among the top five worst detention rates by flag State.

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Julius Wiratno. Wiratno said that Shell's decision to sell was based on the current low crude oil prices and development delays caused by the Covid-19 pandemic. Inpex controls the remaining 65 percent stake of the Masela block located in the southeast Arafura Sea and with at least 10.7 trillion cubic feet of proven gas reserves. Wiratno noted that the Indonesian government and two companies had already signed agreements on the block's development plans, including deciding on its location on Yamdena Island, the largest of the Tanimbar chain.

Neither Shell nor Inpex have commented on the Indonesian statement. The liquefaction and export plant was scheduled to come on stream on Yamdena Island by around 2027 with Inpex already completing preliminary front-end engineering design for a facility with an annual initial capacity of 9.5 million tonnes. Regulator SKK Migas had also obtained the approval for the project from the Maluku provincial administration responsible for the island. The Indonesians had earlier proposed that a

370-mile pipeline should be built to connect Abadi gas field resources to a liquefaction plant on Indonesia's Aru Island, while Inpex had preferred a location in the southeast Asian nation's Tanimbar chain. The original Inpex plan for the Abadi project with partner Shell was to produce LNG from a floating production hull, similar to the Prelude FLNG project offshore northwest Australia that shipped its first LNG cargo in June 2019.

The Indonesians approved the application for a seven-year additional time allocation earlier in 2019 and a 20-year extension to the Production Sharing Contract (PSC) for the Masela block, extending the term of the PSC until 2055. Inpex and SKK Migas initially planned to finish development of the block by 2018 but disagreements related to the block's development plan, including whether the LNG plant should be built onshore or offshore, pushed back the project. Inpex and Shell were expected to be finalizing a marketing plan in 2020 and a supply accord had been lined up with the Indonesian state-run domestic natural gas

and electricity companies, Perusahaan Gas Negara and Perusahaan Listrik Negara.

JAPANESE liquefied natural gas imports rebounded from 2020 declines as they rose last month, though the overall trend was down as half-year imports dropped 5.7 percent, with only US shipments increasing in the first six months. Japan imported 5.26 million tonnes of LNG in June, an increase of 1.2 percent on the 5.20MT received in June 2019. The nation had imported 4.5MT in May, a fall of 18.9 percent on the corresponding month of 2019 as the government implemented restrictions for the Covid-19 pandemic. The June volumes amounted to 76 cargoes compared with 65 in May and versus January 2020 when over 100 cargoes were received and 7.5MT of LNG.

The latest monthly shipments cost 246.81 billion yen (\$2.29Bln), 10.6 percent less than the June 2019 import bill of \$275.95Bln yen (\$2.57Bln), according to the preliminary monthly trade figures from the Japanese Finance Ministry. While June imports rose the overall

outlook was for a drop in LNG imports during 2020. The six-month figures for January through June 2020 saw LNG imports decline by 5.7 percent to 36.40MT compared with 38.58MT in the first half of 2019. One of the main competitor fuels to LNG for power generation, thermal coal, rose by a bigger margin of 2.0 percent to 8.21MT compared with June 2019. Nuclear power usage in Japan is still much reduced from the 50 units on line in 2011 to a handful now. The number of nuclear reactors in operation in mid-2020 is falling from nine to four or five as Japan tightens safety restrictions and several plants close for upgrades, though it cannot rely on more nuclear power for the rest of the year. Asian LNG cargo deliveries in June from nations such as Malaysia and Indonesia, Papua New Guinea and Brunei amounted to 1.48MT, a rise of 10.8 percent from the same month a year ago.

Middle East deliveries from countries like Qatar, the United Arab Emirates and Oman were up by 12.6 percent to 1.07MT. Shipments from Russia, mostly from the Sakhalin Island plant in the Far East, were down 34.2 percent from a year ago.

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to 266,000 tonnes. US cargo deliveries to Japan in June were also down to 207,000 tonnes, a drop of 24.4 percent. The balance of imports in June 2020 came from Australia, African nations and the spot market and these were slightly lower at 2.23MT compared with 2.24MT in June 2019. Japan's main suppliers are Australia, Qatar, Malaysia and Indonesia as well as the US, while a variety of other countries deliver spot cargoes such as Nigeria, Equatorial Guinea, Algeria and Peru. The Ministry's figures for the imports of LNG for the first six months of 36.40MT showed overall regional declines apart from in cargoes from the US. Shipments from Asia fell 10.1 percent to 8.88MT and Middle East deliveries dropped 15.7 percent to 5.93MT. Half-year imports from Russia were down 14.3 percent to 2.64MT, while US imports were up by almost 67 percent to 2.23MT. The volumes of cargoes in the half year from Australia, other nations and the spot market was 16.72MT. The cost of the January-June shipments was around 17 percent lower at 1.89 trillion yen (\$17.6Bln) versus 2.27 trillion yen (\$21.23Bln) in the first half of 2019, according to the Ministry figures.

KBR of the US and Japanese companies JGC Corp. and Chiyoda Corp. who built the onshore Ichthys liquefaction and export plant at Bladin Point near Darwin in Australia, have lost a Court of Appeal case for a US\$1.9 billion claim against a power station sub-contractor. The ruling against the JKC consortium was handed down by the Western Australia Court of Appeal in Perth. JKC Australia LNG was contracted by Japanese energy company Inpex Corp. to build the \$US34Bln Ichthys project and an adjoining power plant was sub-contracted to a group including Australian company UGL, owned by the CIMIC group, and the companies CH2M Hill and General Electric of the US. The UGL-CH2M Hill consortium had terminated its contract with JKC in January 2017 and immediately pulled its workers off the site at Bladin Point, near Darwin in the Northern Territory. This was because the new UGL construction company parent CIMIC had completed a hostile takeover of UGL in December 2016 and one of its first steps was the cancellation of the Ichthys power contract for its new subsidiary.

The Western Australian Supreme Court had in May 2019 dismissed an application by JKC Australia for the court to declare that the parent company guarantees for

the power plant construction were instruments that it could require payment immediately. Now the higher Court of Appeal has rejected all claims lodged by the JKC consortium and issued a very detailed judgment. "In written submissions JKC contended that the primary judge did not follow an established approach to construction and adopted an unconventional approach," said one part of the ruling by the Appeal Court. "We do not accept that submission. His Honour referred to the leading High Court authorities on the general principles that apply in relation to the construction of commercial contracts," it added. "In our view, read fairly and as a whole, the primary judge approached the task of construing the Parent Company Guarantees in accordance with those authorities. In any case nothing is gained by analysing, as JKC seeks to do from time to time, the validity of particular aspects of the primary judge's reasoning in coming to a conclusion on the constructional questions before him," the judges stated.

At the time of the power-plant walk out, the JKC project contractors had said they were disappointed by the action of the CH2M Hill-UGL joint venture when the power plant was about 90 percent complete. It was understood that the termination could trigger a disproportionate delay to the overall LNG project because the last 10 percent of the power station work was particularly complex. In late June 2020, Houston-based KBR announced it would no longer be taking part in fixed-priced LNG or energy project building contracts, though the decision had nothing to do with the Australia legal dispute but rather was part of a change in corporate strategy.

NEXTDECADE Corp., the Houston-based developer of the Rio Grande LNG export plant in the Texan port of Brownsville, will have five liquefaction Trains instead of six while maintaining annual output of 27 million tonnes per annum. NextDecade, listed on the Nasdaq global exchange, said that its activities before taking a final investment decision have focused on engineering and reducing the facility's environmental footprint. This has been especially relevant as the Rio Grande plant will be close to two other facilities on the Brownsville Ship Channel area. These are Texas LNG, owned by New York-based Glenfarne Group and Annova LNG whose backers include Exelon Corp, the utility headquartered in Chicago.

The original front-end engineering and

design for Rio Grande LNG was based on six LNG Trains, each capable of producing 4.5 MTPA. "The technologies that were selected and filed with the Federal Energy Regulatory Commission (FERC) in 2015 and 2016 have evolved over the five-year permitting period," explained NextDecade. "The LNG trains are now more efficient and will produce more LNG with lower total carbon-dioxide equivalent (CO₂e) emissions," it added. "Multiple optimizations have been identified that will lead to the delivery of a world-class LNG project capable of producing 27 MTPA with just five LNG Trains instead of six," stated NextDecade.

Implementation of these optimizations will result in several benefits when compared with NextDecade's original six-Train project including approximately 21 percent lower CO₂e emissions, a shortened construction timeline for full completion and an expected reduction in traffic on roadways. "This is an extremely positive development for all of our stakeholders, as the environmental benefits from these optimizations are significant," said Matt Schatzman, NextDecade's Chairman and Chief Executive. "In addition to the emissions reductions we will achieve, these optimizations will reduce the project's footprint, traffic and construction schedule, and demonstrate our ongoing commitments to the community in the Rio Grande Valley," Schatzman declared.

On account of these changes, NextDecade expects to eventually vacate Train 6 on its FERC permit. Future development of Train 6 will require NextDecade to secure another authorization from FERC, the US Department of Energy and any other relevant federal or state agency. NextDecade's five-Train plant will be underpinned by economical feed-gas supplies from the Permian Basin and the Eagle Ford Shale in Texas.

OIL SEARCH, the Australian-listed Papua New Guinea LNG shareholder with a stake in the expansion project, plans to write off up to \$US400 million, mostly on exploration assets and a gas-to-power project in PNG due to the outlook for oil and gas prices. The PNG-focused oil and gas company will record a non-cash, pre-tax charge of between \$US360M (\$A518 million) and \$US400M (\$A576M) in its half-year results that would not impact its cash earnings, according to a statement to the Australian Securities Exchange. Oil Search said that a strategic

review found that a number of assets in PNG were now of low priority either due to lower prospectivity or less than optimum project economics and as a result, would not be currently pursued.

The LNG plant, located northwest of the capital Port Moresby, produced at an annualised rate of 8.7 million tonnes per annum in the first three months of 2020, Oil Search noted in its first quarter earnings. "Oil Search has assessed the carrying value of the company's assets for impairment as at 30 June 2020, in accordance with the relevant accounting standards and after taking into account the potential longer-term impact of prevailing economic conditions and the outlook for oil and gas prices," said the company. "The impairments that are expected to be recognised largely relate to PNG exploration licences," explained the PNG-based company whose other main assets are in Alaska. "As part of the Strategic Review currently underway and in line with the company's commitment to prioritising capital allocation, a number of exploration and evaluation assets in PNG have been identified as being of reduced priority due to lower prospectivity or sub-optimal economics," explained the report signed by Oil Search Managing Director Keiran Wulff. "As there is no current intention to pursue activities on these assets, the full value of these exploration assets is expected to be written down," he stated. "An immaterial impairment relating to exploration leases in Alaska, which are scheduled to be relinquished, also is anticipated," he explained.

Oil Search has previously said it was well placed to withstand a prolonged period of oil price weakness and advance its growth projects when market conditions improve. The company noted in its previous earnings that formal negotiations had been suspended in January 2020 on the LNG expansion between ExxonMobil, on behalf of the P'nyang co-venturers, of which it is part, and the PNG Government. "Given the ongoing gas supply uncertainties resulting from the recent suspension of mining activities at the Porgera Project (gold mine), the carrying value of the Hides Gas-to-Electricity Project is also expected to be fully impaired," said Wulff. "The expected impairment expense is a non-cash item and will not impact cash earnings or cashflow," he added.

"The final impairment expense to be recognised is subject to the finalisation of the half-year accounts and completion of the half-year review by the company's

auditor,” stated Wulff.

The two existing LNG Trains at the PNG plant have a nameplate capacity of 6.9 MTPA, though have consistently produced more and will be the site of any future expansion. Three new liquefaction Trains are proposed in the delayed expansion plan. The five Trains when operational would have capacity of nearly 20 MTPA and would give PNG a more substantial role as a regional producer. The P’nyang gas field licence, controlled by PNG LNG plant operator ExxonMobil, also includes Australian-listed Santos as well as Oil Search. The separate Papua Gas Agreement for other feed-gas resources has already been approved and signed. This comprises holders of the onshore PNG Elk-Antelope gas field licence, led by Total and also including shareholders in the P’nyang field lease, ExxonMobil as well as Oil Search. Elk-Antelope onshore gas fields are covered by petroleum retention licence PRL15 and by the Papua Gas Agreement and the P’nyang onshore gas fields are in the PRL3 licence area of PNG.

OIL SEARCH posted a drop in second-quarter revenues and plans to reduce the global workforce by about one third by year-end to traverse the current industry challenges. Revenues for the three months amounted to US\$266.2M compared with US\$378.9M in the same quarter of 2019. The company added that there was a continued strong production performance at the PNG LNG plant, located northwest of Port Moresby, with the annualised output rate coming in at 8.8 million tonnes per annum compared with 8.7 MTPA in the first quarter. Oil Search additionally reported a drop in its realized LNG prices to US\$7.34 per million British thermal units in the second quarter from US\$9.08 in the first three months of 2020, down 19 percent.

The average oil and condensate price realised during the second quarter was US\$23.05 per barrel, down 53 percent on the first quarter of 2020. “A systematic and detailed organisational review was completed and focused on supporting sustainable cost reductions and achieving operational efficiencies without compromising safety or reliability. It will result in a reduction in Oil Search’s global workforce of approximately 34 percent by year-end,” said the company. Oil Search noted that it raised US\$700 million in extra capital through a rights issue to existing shareholders to strengthen the balance sheet and give total liquidity of

US\$1.67 billion. “During the 2020 second quarter, Oil Search made material steps to enhance the company’s resilience to prolonged lower oil prices without compromising its ability to progress growth projects when conditions allow,” said Managing Director Keiran Wulff. “Combined with continued strong production from the ExxonMobil-operated PNG LNG Project, Oil Search is on track to achieve its production targets in 2020, despite the shut-in of the Hides Gas-to-Electricity (GTE) project during the quarter due to the suspension of operations at the Porgera gold mine,” he stated.

The Hides facilities supply gas to the mine, which suspended operations earlier in 2020 amid a dispute with the PNG government. Oil Search has other oil assets in Alaska and said the results of the Alaskan winter programme were very positive, with oil discovered in the Nanushuk and Alpine reservoirs at Mitquq, near existing and proposed infrastructure, and in the Nanushuk reservoir at Stirrup in the Horseshoe area. “These results have materially upgraded the ultimate prospectivity and optionality of our Alaskan portfolio and are being integrated into asset appraisal and development plans,” said Oil Search.

OKRA ENERGY Alabama, a small-scale US liquefied natural gas supply and technology company, said it was awarded a renewable five-year contract to deliver LNG in ISO containers to Enestas Energy and Gas, a distributor in Mexico for transport, industrial users and local power generation. Okra Energy will fulfil the contract from a liquefaction plant with production capacity of 100,000 gallons per day it is constructing at the town McIntosh in Alabama.

“We’re proud to bring new technologies and enhanced energy sector jobs to Washington County through our supply contract with Enestas Energy & Gas, who share our belief that access to natural gas is a basic asset for the development of any country,” said Chief Executive Mark Clark. “Natural gas is an excellent, stable and low-cost alternative fuel to reduce greenhouse gas emissions and combat global warming,” Clark added. Okra Energy supplies both LNG and liquefaction technology to various markets throughout the Americas.

The company said it most recently installed the first small-scale LNG facility in Peru, bringing containerized LNG to the country’s northern gas suppliers and manufacturing facilities. Okra Energy’s

new customer, Enestas Energy completed the first dual LNG and liquid ethane port terminal in Mexico in 2019. The Enestas Gulf of Mexico facility is located at the port of Coatzacoalcas in Veracruz state. The Mexican terminal features an automated storage and unloading system and is able to unload directly from vessels of up to 22,000 cubic metres capacity in size. When Enestas receives its US shipments from Okra Energy in containers it will transport the fuel to the end-users by truck. “This supply contract with Okra Energy Alabama will allow us to continue and improve our distribution capabilities in Mexico,” said Enestas Chief Executive Caio Zapata.

ORIGIN ENERGY, the Australian utility and shareholder with China’s Sinopec and ConocoPhillips in the Australia-Pacific LNG plant in Queensland, will log asset impairments of about US\$840 million, including on a US contract with Cameron LNG in Louisiana. Origin, the nation’s leading electricity and gas supplier, said in a statement to the Australian Securities Exchange that it expected to post non-cash charges of between A\$1.16Bln and A\$1.24Bln in its full-year accounts.

The bulk of the charges of more than A\$700 million relate to write-downs of its equity investment in the APLNG joint venture. The APLNG plant on Curtis Island near the port of Gladstone produces almost 9 million tonnes per annum from two Trains and 7.6 MTPA has been contracted to Sinopec since the plant came on stream in 2016. Sinopec holds a 25 percent stake in APLNG while Origin and ConocoPhillips each hold 37.5 percent of the shares.

However, Origin also made a provision for the Cameron LNG supply contract and the impairment will total between A\$440M and A\$460M of the total. Origin said that it had a contract to buy a small number of cargoes from the Cameron facility, operated by Sempra Energy, and due to the slump in global LNG prices, cargoes from the US that were potentially profitable into Asia are now loss-making. Origin’s agreement is for the purchase of 250,000 tonnes per annum, about three of four cargoes, from the Cameron plant on a free-on-board basis for 20 years. The first cargo was recently delivered in June 2020. Origin buys the LNG at a Henry Hub-linked price plus a fixed tolling fee and will then market the volumes at a Japan-Korea Marker (JKM) spot price in Asia. “Origin has responded quickly to Covid-19

and the decline in commodity prices, reducing operating costs and capital expenditure, and these actions have improved resilience and helped to mitigate some of the impacts on our business,” said Origin Chief Executive Frank Calabria. “These factors, and the broader macroeconomic environment, have contributed to our revised medium and long-term outlook for commodity prices,” he added. “Origin is well positioned over the long-term with a business spanning energy retailing, power generation and natural gas which generates strong cash flow, along with exposure to future growth opportunities in renewable energy and new technologies,” stated the CEO.

PETROBRAS, the Brazilian state-controlled energy company, has pre-qualified nine bidders, including European-based majors Royal Dutch Shell, BP of the UK and Total of France, for the long-term lease of one of its liquefied natural gas import terminals in the northeast of the country. The bidding is for a lease on the Bahia LNG terminal site and its associated pipeline in the northeast state of Bahia as well as access to the Brazilian gas market network. The move by the company, known as Petrobras, is in line with an agreement made with the nation’s antitrust regulator in July 2019 to open up the Brazilian natural gas market to more competition. “The lease bidding process is in line with the strategy of improving and building a favourable environment for new investors to enter the natural gas sector, while improving capital allocation,” Petrobras said in a statement.

The facility is located at Baía de Todos os Santos in the port city of Salvador and has regasification capacity of 14 million cubic metres per day of natural gas. Analysts say there was still tremendous scope for increasing natural gas use in Brazil for the energy transition. Currently natural gas is in third place in the country’s use of primary energy behind oil (46 percent) and hydropower (29 percent). These three are followed by a growing renewables sector made up mostly of wind and bio-fuels at 8 percent. Coal use is reducing annually and is now down to about 5 percent. Petrobras did not issue a schedule for the next stages of the bidding process for the Salvador LNG terminal.

Other companies included in the short list to lease the terminal are Spanish major Repsol, floating import terminal pioneer, Excelerate Energy of the US, and Golar Power, a joint venture project of

Golar LNG and US equity fund, Stonepeak Infrastructure Partners. Spanish utility Naturgy also pre-qualified along with the local Brazilian utilities, Bahiagas and Compass Gas and Energy. Any final lease agreement will not include the 173,400 cubic metres capacity floating storage and regasification unit “Excelerate Experience”, which is currently deployed at Salvador. However, other infrastructure included in any deal will be the 45-kilometre associated pipeline. It originates at the LNG terminal landfall and has two gas exit points at Sao Francisco do Conde and Sao Sebastiao do Passe.

The Bahia terminal in Salvador is one of three controlled by Petrobras in Brazil. The two others at Pecem in the northeast state of Ceara and at Guanabara in the state of Rio de Janeiro, which has been idle since 2018. While Brazil’s three terminals have been significantly under-utilized, Petrobras and the government are just now making efforts to allow third-party access. In March 2020, the 170,000 cubic metres capacity FSRU “Golar Nanook” became the first independent terminal to begin operating in Brazil for

Golar Power in a private project. The FSRU is deployed in the small northeast Brazilian state of Sergipe as part of gas-fired power plant venture that will enable Brazil to increase its energy security and natural gas use while continuing to expand its development of renewables.

PILOT LNG, a US infrastructure company, said it had filed with regulators for the first dedicated liquefied natural gas bunkering facility to serve the Texas Gulf Coast ports of Galveston, Houston and Texas City. The bunker terminal will be located on Pelican Island in the Gulf with a final investment decision scheduled for the second half of 2021 and operations starting in 2024. “Pilot LNG has filed regulatory applications with relevant government agencies, including the US Army Corps of Engineers (USACE) as the lead permitting agency,” said the company. The facility infrastructure will be designed around floating liquefaction (FLNG) technology to be engineered, and constructed by Wison Offshore & Marine of Nantong in China.

The Chinese yard is best known for

constructing the FLNG barge “Tango FLNG” built in 2017 and currently deployed at the port of Bahai Blanca in Argentina. “Wison is pleased to be part of this breakthrough US project by designing and building the liquefaction unit, that will supply LNG to the end-user market in the Galveston, Houston and Texas City port complex,” stated Vivian Li, head of Wison Offshore & Marine in North America. “Since delivering the world’s first FLNG facility currently operating in Argentina, Wison has developed numerous floating solutions across the LNG value chain, with a focus on promoting a cleaner energy infrastructure alternative to the global market,” she added

As international regulators tighten emissions standards, the maritime industry is increasingly turning towards LNG as the marine fuel of choice due to its significantly lower emissions profile and cost competitiveness. “Pilot LNG’s Galveston LNG Bunker Port will provide clean-burning LNG to one of the US’s largest Port complexes,” said Pilot LNG Chief Executive Jonathan Cook. “The proposed Galveston LNG Bunker Port

would provide the necessary infrastructure to supply the growing market for LNG marine fuel, substantially reducing marine emissions and cutting shippers’ fuel costs at the same time,” Cook added. He explained that the Galveston Bay area, which encompasses the industrial Ports of Houston, Texas City and Galveston, is an ideal location to add LNG bunkering infrastructure. It had more than 10,500 deep-water vessel visits in 2019 and over 133,000 tug/tow movements on the Houston Ship Channel and is the nation’s fourth busiest cruise terminal.

The company pointed out that Emission Control Areas (ECAs), including US coastal waters and the Galveston Bay area, and the 2020 International Maritime Organization sulfur cap on fuel make it more difficult for traditional marine fuels to comply with regulations and more expensive for shipping companies to operate their vessels. The company noted that LNG when used as a marine fuel significantly reduces vessel emissions, including eliminating virtually all sulfur oxide emissions without the

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PTTEP of Thailand, the oil and natural gas producer, has reduced its spending plans for the rest of 2020, though would remain on track with key investments in projects such as Mozambique LNG and development of the company's largest ever southeast Asian natural gas discovery in the Lang Lebah field offshore Sarawak. PTTEP, whose official name is Exploration and Production Public Company Ltd, noted in its latest newsletter to shareholders that it had adjusted investment plans to cope with the impact from the Covid-19 pandemic that suppressed domestic energy demand. PTTEP said its 2020 expenditure has been reduced by 15-20 percent with some exploration activities deferred, while maintaining reasonable capital expenditure levels to ensure the continuity of the energy supply of the country.

In the LNG sector, PTTEP has an 8.5 percent stake in the Area 1 licence of the Rovuma Basin offshore Mozambique in southeast Africa. Part of the overall stake, about 26 percent, was transferred to French major Total from Anadarko Petroleum of the US as a side-deal to the Occidental Petroleum takeover in 2019 of Anadarko. PTTEP in 2019 also made a Malaysian acquisition from Murphy Oil of the US, including a large stake in the Rotan natural gas discovery offshore Malaysia, which is subject to a floating LNG joint venture. "PTTEP will continue with investment in development projects such as Mozambique Area 1 and additional drilling activity in the Malaysian Lang Lebah gas field in Block Sarawak SK410B, to ensure the first production of these projects in the next four years as planned," stated the Thai company.

PTTEP's Lang Lebah gas field is the largest commercial discovery of petroleum resources it has ever made in what was its first exploration well at the Sarawak SK410B Project just over a year ago. The natural gas discovery at Lang Lebah-1RDR2 encountered 252 metres of net gas pay and has an estimated several trillion cubic feet of gas in place. The SK410B project is located in shallow waters about 90 kilometres offshore Sarawak in PTTEP acreage of around 1,870 square kilometres. PTTEP in its post Covid-19 and oil crisis review revised downwards its overall estimated sales volume in 2020 to 362,000 barrels of oil equivalent per day, a decrease of 7 percent overall from the previous target.

However, the company said it was staying on track with its current investments and was also ready to spend on expansion. "After the oil price crisis, PTTEP is ready for investment opportunities as we follow our strategic expansion plans that emphasize Southeast Asia where we have built expertise and experience and in the Middle East," said the company. PTTEP said it had expanded investment in Thailand, Malaysia, the United Arab Emirates and Oman for short and long-term gains as well as acquired

projects that immediately generate income. The company was also prepared for digital transformation through investment in new businesses that will enhance technical performance. "Through these strategies, we aim to achieve solid growth and maintain Thailand's energy security in the long term," said the company. The PTTEP update also included a mention of the company's celebration of its 35th anniversary.

A ceremony was held at PTTEP headquarters in Bangkok to mark its

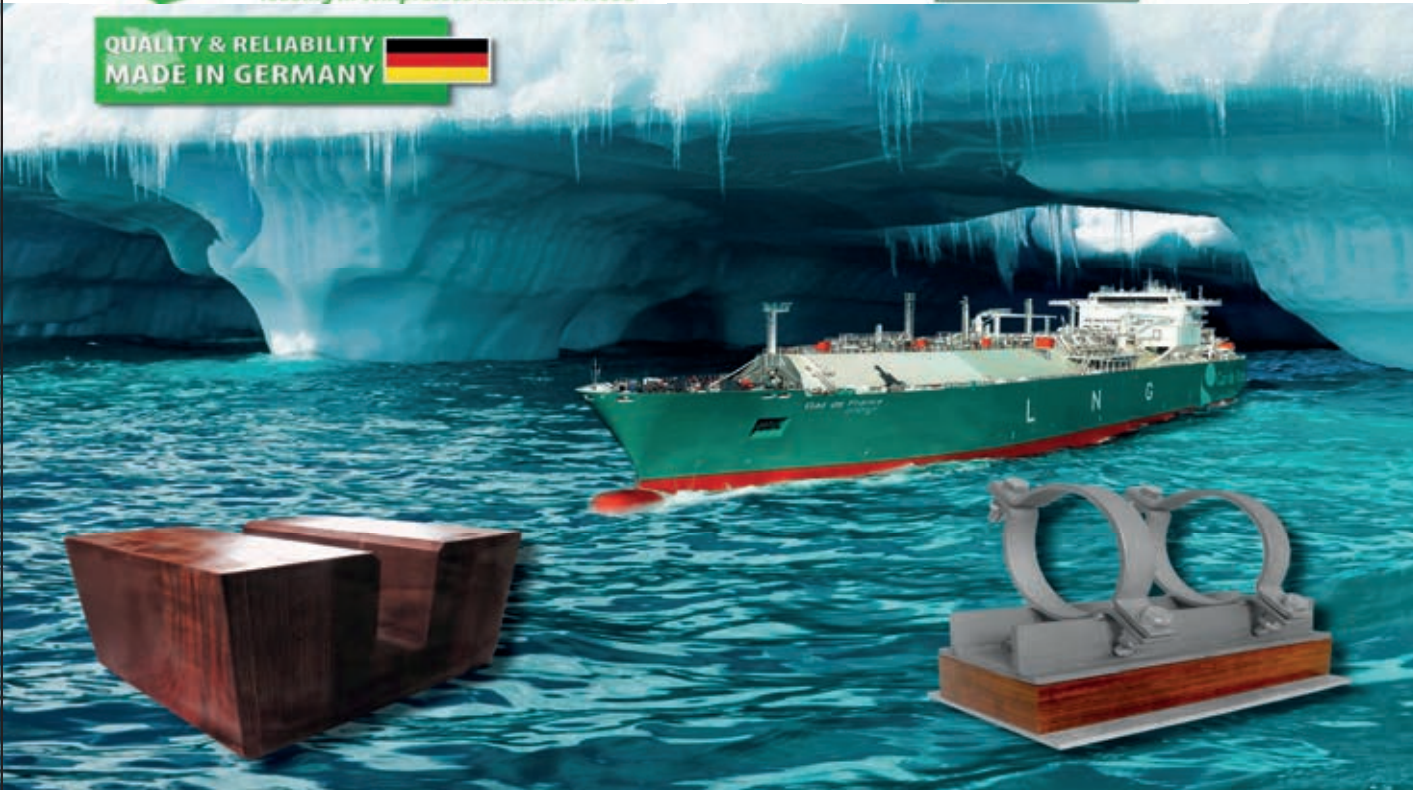
founding in 1985 with the mission as a state-owned petroleum exploration and production enterprise to strengthen national energy security. The event was attended by senior board members and executives. They were led by Prajya Phinyawat, Chairman and Head of the Independent Directors Committee of PTTEP, Tongchat Hongladaromp, Advisor to the Board and former PTTEP President, as well as Phongsthorn Thavisin, the current President and Chief Executive.

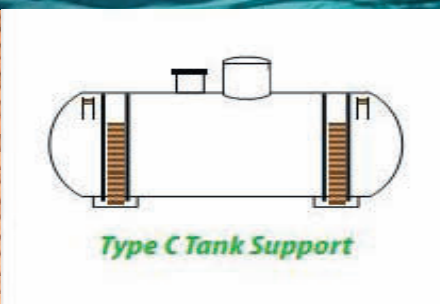


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RENERGEN, the emerging South African domestic natural gas and helium producer, said it planned to hold an auction for LNG volumes to be produced at a small-scale liquefaction plant in Free State province from onshore resources. The company's Virginia Gas Project, sited about 250 kilometres southwest of Johannesburg, holds the only onshore petroleum production right in South Africa. Renergen is listed on both the Johannesburg Stock Exchange and the Australian Securities Exchange. Its LNG auction will be for volumes in excess of those destined for a domestic LNG fuel distribution venture with European major Total. "With an average of greater than 95 percent methane and almost zero higher alkanes, Renergen will produce LNG of outstanding purity, placing the company's product as the ideal substitute for liquid fuels, which will burn cleaner and release fewer emissions," said a statement to the ASX. "All interested parties will be required to sign a mutual confidentiality agreement, while all details relating to the auction will be kept confidential," said Renergen. "Information relating to successful bids will also be kept confidential, including the identities of successful bidders, and will only be made public by mutual agreement," it added.

Renergen said it would be the first South African-based company to supply LNG and from domestic supply as opposed to imported sources. "The company will complete its Phase 1 plans for the Virginia Gas Project and will be producing LNG and helium," its statement added. It said it would thus become the first distributor of LNG at filling stations in partnership with the Total station network in South Africa, as well as being the country's only producer of helium. Renergen anticipates that Phase 2 of the Virginia Gas Project will be completed by 2023. The company gave no details on volumes nor of timetables for its proposed LNG auction. The company expects demand for LNG to increase significantly across South Africa. Renergen's Phase 2 production at the Virginia Gas Project will boost availability of LNG across all major highways in South Africa, with surplus volumes to be made available to the market.

The Virginia Gas facilities will tap exploration and production rights in 187,000 hectares of onshore gas fields across the municipalities of Welkom, Virginia and Theunissen in the Free State. "The source of the Virginia Gas Project's natural gas is primarily

microbial. It originates from deep within the Witwatersrand Supergroup, via groundwater circulating through large faults," the company explained. The natural gas was first discovered in the Virginia gold mine in 1947 and the mine has been emitting combustible gas ever since. This gas, with affiliated helium, comes to the surface via drillholes, faults and cracks in all the mines of the goldfield. Renergen maintains that the natural gas contains one of the richest helium concentrations recorded globally. In its LNG fuel distribution agreement with Total, Renergen said its customers would be predominantly logistics companies operating trucks along the main highway routes of South Africa. The first route targeted under the Renergen-Total LNG fuel agreement will be the N3 between Johannesburg, the nation's largest city in Gauteng province, and the Indian Ocean coastal city of Durban. Renergen's fuel distribution deal is with the Total subsidiary, Total South Africa Proprietary Ltd.

RUSSIAN shipments of LNG continued unabated during the Northern Hemisphere summer on a small fleet of Arc-7 ice-class carriers from the Yamal export plant in Siberia along the Northern Sea Route to North Asian destinations such as China and Taiwan. The carriers delivering to Asia included vessels such as the 172,000 cubic metres capacity "Georgiy Brusilov" which discharged a July cargo at the Yung-An import terminal in Taiwan. The Yamal plant has three liquefaction Trains on stream, each with nameplate capacity of 5.5 million tonnes per annum. A smaller fourth Train at Yamal is currently being completed and will produce 900,000 tonnes per annum, taking overall production to 17.4 MTPA.

All the LNG vessels of around 172,000 cubic metres capacity are part of a fleet of 15 Arc7 carriers that shuttle to and from Sabetta for natural gas company Novatek and its Yamal joint venture partners, including French major Total and China National Petroleum Corp. LNG shipments from the Yamal port make up most of the energy shipping traffic along the NSR and numbers have been rising since the summer season's first eastbound voyage by the carrier, the "Christophe de Margerie". The vessel left Sabetta on the May 19 and arrived on June 9 at the Chinese port of Jiangsu. It was the earliest eastbound shipment on the NSR ever for this kind of vessel.

The "Christophe de Margerie" was

followed by the "Vladimir Voronin", an LNG carrier that sailed across parts of the route without icebreaker escorts. In late June, the "Georgiy Ushakov" and "Vladimir Rusanov" also crossed the Arctic route carrying Asian cargoes. The "Christophe de Margerie" headed back to Sabetta from the Chinese port of Yangkou to lift another cargo at the Yamal loading facilities. The "Georgiy Brusilov" was also in action delivering to Asia escorted by the Russian nuclear-powered icebreaker "Yamal", shipping data showed. The "Vladimir Voronin" was scheduled to lift an August cargo at Sabetta after it discharged a shipment at the Chinese Tianjin port, located east of Beijing.

SANTOS, the Adelaide-based Australian LNG plant operator, expects to recognise a non-cash impairment charge in the range of US\$700-US\$800 million before tax, most of it attached to LNG, due to the revised oil price and the effects of Covid-19 and energy market demand fundamentals. As a result of changed oil price assumptions, Santos said it would recognise non-cash impairments on Gladstone LNG in Queensland of US\$640-US\$700 million and on exploration assets, primarily in the Cooper and Amadeus Basins, of US\$60-US\$100 million in the half-year results. The partners of Santos in the GLNG plant on Curtis Island, near the port of Gladstone, are Malaysian energy company Petronas, European major Total and Korea Gas Corp.

Santos has also assumed control in 2020 of the Darwin LNG plant in the Northern Territory after an assets purchase deal with US major ConocoPhillips. The Adelaide-based company additionally has a stake in Papua New Guinea LNG and its expansion project, though only GLNG is part of the assets write-down. Santos explained that it sets its long-term oil price assumptions by referencing, as a guide, the average oil price assumptions of a number of independent energy analysts. Using this approach, Santos said it had reduced its long-term price assumption by over 10 percent while also forecasting a slower recovery in the short to medium term. The impairment charge is forecast to increase Santos's borrowing by around 1.5 percent. Santos stated that its debt covenants had "sufficient headroom" and are not under threat at current oil prices for a number of years. "Since 2016, Santos has implemented a disciplined operating model that is focussed on generating free cash flow through the oil price cycle," said

Santos Chief Executive Kevin Gallagher. "In response to Covid-19 and the lower oil price environment, Santos announced in March financial measures including reductions in capital and operating expenditure, and a target 2020 free cash flow breakeven oil price of US\$25 per barrel," he explained. "Our disciplined operating model combined with the proactive measures taken to reduce expenditure saw Santos generate more than US\$430 million in free cash flow in the first half of 2020 despite significantly lower oil prices," he added. The CEO said that Santos was well positioned to take growth opportunities when business conditions improved. The impairment charge is a non-cash item with no impact on gross earnings or cash flow.

SEMBCORP Marine posted a net loss of S\$192 million (US\$138.3M) for the six months to June 2020, following the "severe deterioration" of activities at all its Singapore yards as a result of the Covid-19 pandemic and amid a planned de-merger from parent Sembcorp Industries. Sembcorp Marine's results in the same six months of 2019 had amounted to a loss of S\$7M. The first-half 2020 earnings showed group revenues were S\$906M and the net order book had S\$1.91Bln of work outstanding, including liquefied natural gas sector ships such as LNG-powered vessels, bunkering ships and floating LNG storage. A total of 74 vessels were repaired or upgraded at Sembcorp Marine yards in the 2020 first half, less the half the total of 153 vessels in the first six months of 2019. The Sembcorp construction and conversion work for LNG mainly affects projects involving joint ventures of Japanese shipping company Mitsui OSK Lines. Since April, when the Singapore government imposed its Covid-19 "circuit breaker" measures, in particular movement restrictions that disallowed migrant workers from leaving their dormitories for work, there was a substantial reduction in the group's operating yard workforce (including sub-contractors) from about 20,000 to 850 persons.

Sembcorp Marine's Singapore yards had to stand down and discontinue production activities, resulting in significant delays to project executions. As a consequence, all divisions posted losses for the six months period, with the exception of Repairs & Upgrades which reported higher profits. The company said Specialised Shipbuilding revenue was S\$35M, up from S\$7M in the year-ago

period on higher earnings for Roll-On-Roll-Off passenger (Ropax) ferries as well as the LNG bunker vessel projects. Revenue from Repairs & Upgrades totalled S\$258M, which was 5 percent higher than the \$245M in the 2019 first half. This was due to higher revenue per vessel at S\$3.49M from several upgrade projects for floating storage and regasification units (FSRU) and cruise ships.

Revenue for the Rigs & Floaters segment was S\$459M, well down on the S\$1.22Bn recorded in the 2019 first half. Offshore Platforms revenue was S\$130M. This included platforms successfully delivered for the Tangguh gas modules project in June 2020 from Sembcorp Marine's Batam yard in Indonesia. Singapore's state wealth fund Temasek recently stepped in to support a S\$2.1Bn rights issue by Sembcorp Marine to help its finances and as it also demerges from its parent company Sembcorp Industries. Temasek in 2019 had offered to buy control of another Singaporean conglomerate Keppel Corp, whose businesses includes the hard-hit rig-building sector. Sembcorp Industries owns 61 percent of Sembcorp Marine.

President and Chief Executive Wong Weng Sun said during an earnings call on July 15 that the company had been positioned for recovery in 2020 before being hit by the double crises. "Given the delays in executing our existing projects, and with new orders likely to remain depressed in 2020, the group now foresees that recovery will be pushed out to 2021 and beyond," explained Wong. "While we have yet to announce significant new orders this year, we have resumed discussions on several project opportunities," added the CEO. He has also brought in pay cuts across the board in all divisions of the company. Wong said he had volunteered to take a 50 percent pay cut, senior management will take 15 percent salary reductions and middle management will be paid 10 percent less. All other employees in Singapore and overseas will take a 5 percent pay cuts, except for those earning under S\$1,800 a month.

SHELL has joined Western Australian LNG operator Woodside Petroleum and Petronas of Malaysia in making a minority investment in the online liquefied natural gas trading platform GLX. GLX was launched in the Australian city of Perth in 2016 and began trading LNG cargoes in 2017. GLX is among

several companies with Web-based trading and was set up to trade in the physical commodity as a way of deepening market liquidity. The company's name comes from Global LNG Exchange (GLX) and its full name is now GLX Digital. It is also expanding into the area of helping other firms set up their own trading infrastructure. The platform was developed in Australia by LNG industry professionals who saw the opportunity for trading to undergo a technological transformation.

Its first online cargo auctions started in 2017 and were timed for participation by buyers and sellers in Singapore and London time. Damien Criddle, a Perth-based executive and former Shell lawyer, launched the GLX platform with other energy executives, including Rob Cole, an ex-Woodside director. Woodside became a foundation member of GLX in July 2017 and then decided to invest in the company as did Petronas, which has a stake in the Gladstone LNG plant in Queensland. Now, Shell has followed their lead and also taken a stake in GLX. "This digital platform is a natural step in the continued evolution of the global LNG market and as a leading LNG player, we are keen to be part of this," said Steve Hill, an Executive Vice President for Shell. "The sophistication of the GLX software in combination with the high calibre and quality of the management team gives GLX a strong base for the future," stated Hill.

GLX now has 75 company members signed up compared with 55 members in mid-2019, and they trade under a clearly defined framework. The income of GLX comes from subscriptions and is said to have increased over the past year, though the firm has yet to make a profit. Analysts said that the advantage of having investors like Shell, Woodside and Petronas is that you also have some trading business from three of the biggest LNG players in the Asia-Pacific region. Accompanying the Shell investment statement, GLX Chief Executive Criddle said the company now had 23 employees and was expanding to 40 in the next year. The CEO added that the firm was moving away from controlling its own online LNG marketplace and towards helping companies build their own. Recently appointed GLX Chairman Mark Barnaba, who is also a current board member of the Reserve Bank of Australia, believes the new Shell investment validates the emergence of digitalisation across global commodity markets. "This development is

not just significant for the LNG sector, but the digitalisation of commodity markets globally," said Barnaba. "We are delighted to welcome Shell Ventures as a shareholder, joining a growing registry of respected equity investors," he added.

SINGAPORE Energy Market Authority is seeking to appoint two new official liquefied natural gas importers for the Asian city state as future natural gas use is set to expand along with its activities as a regional LNG Hub. The EMA has issued a Request for Proposal (RFP) to begin the process of finding the two companies. "Having more LNG term importers in the market will enhance competition and provide more options for gas buyers," said a statement. The current LNG term importers are the local company Pavilion Energy, a unit of the Singaporean wealth fund Temasek, and Shell Eastern Trading, a subsidiary of Royal Dutch Shell.

Both companies were appointed during a similar process in 2017. "Natural gas is one of four switches in Singapore's energy story towards a more reliable, affordable and cleaner energy future," added the EMA. "It is expected to be the dominant fuel for Singapore in the near future as we scale up our renewable energy options," it explained. The regulator invited interested parties to submit proposals which will be evaluated based on their ability to provide reliable, secure and competitive supply of LNG to Singapore. The EMA noted that proposals had to be submitted by the 9th of November 2020, 3.00pm Singapore time. The move comes as Singapore moves ahead with its plans to increase capacity handled and to start LNG bunkering services in the port as it strives to be a regional LNG Hub.

The EMA is also leading the plans to develop a second regasification and storage terminal. The terminal would be a floating facility for break-bulk cargoes whereby shipments would be broken up into smaller parcels in delivered to southeast Asian customers such as Thailand, Vietnam and the Philippines. Analysts said that Asian emerging economies would become more reliant on LNG, with China and India already major buyers and other southeast Asian nations becoming importers. Singapore LNG Corp. owns and operates the current single onshore terminal at Jurong Island with peak regasification capacity of 11 million tonnes per annum. The terminal was built in 2013 and then expanded capacity. In 2018, the country introduced a spot LNG

import policy that allowed buyers to respond to changing market demand.

As far as being a centre of LNG trading, the government has confirmed that this has already been achieved with almost 50 LNG trading and shipping firms having offices in Singapore. Additionally, the first Singapore LNG bunkering vessel, owned by Shell Eastern Petroleum and Keppel Offshore and Marine, was launched in June 2020 at the Keppel Nantong Shipyard in China. A joint venture between Shell and Keppel called FueLNG initially ordered the ship to provide LNG bunkering to a wide variety of vessels through truck-to-ship or ship-to-ship bunkering in the port. The newbuild has 7,500 cubic metres capacity and was expected to be completed in the fourth quarter of 2020. The Shell-led venture would enable FueLNG to be the first in Singapore to provide regular ship-to-ship LNG bunkering services within the port.

SNAM RETE GAS, the Italian natural gas network operator, has decided to recommission storage at the nation's oldest LNG import terminal near Genoa while also completing a \$10 billion deal for a minority stake in gas pipelines in the United Arab Emirates. Snam Rete joined a consortium with four equity funds based in North America and Asia to complete the acquisition of 49 percent of Abu Dhabi National Oil Company (ADNOC) Gas Pipelines. At the same time, Snam Rete said it would recommission storage at the Italian LNG import terminal at Panigaglia in northwest Italy, which has been in operation since 1969. The company said it would bring back on line an existing 50,000 cubic metres storage tank that was taken offline five years ago. "Total storage capacity at the terminal once work is completed will then be around 100,000cbm," said the company.

Italy has three LNG import terminals and the other two are the floating storage and regasification unit, the "FSRU Toscana" with 137,500 cubic metres capacity deployed off Livorno on the west coast, and the offshore gravity-based facility, Adriatic LNG, on the northeast coast with 250,000 cubic metres of capacity. The network company whose full name is Societa Nazionale Metanodotti (SNAM) Rete Gas, in October 2019 agreed to acquire a controlling stake in the OLT Offshore LNG Toscana company which operates the "FSRU Toscana". Regasification capacity at the Panigaglia terminal will remain the same at 2.5 million tonnes per annum, compared with

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2.8 MTPA capacity at the “FSRU Toscana” and 6 MTPA at Adriatic LNG. Sam Rete has estimated the cost of bringing the Panigaglia terminal storage back into operation at about €20 million (\$22.7M). In its completed minority stake deal for ADNOC Gas Pipelines in the UAE, Snam Rete had a variety of partners who hold other energy infrastructure investments.

The transaction values the minority stake in ADNOC Gas Pipelines, with 20-year management rights for 38 pipelines in the UAE, at just over \$10.1 billion. “For Snam, which is the consortium’s only industrial operator, this is an important investment opportunity in strategic infrastructure, with the potential for future collaborations in the energy transition in the Gulf area,” said the Italian company. The consortium partners were the investment funds Global Infrastructure Partners, Brookfield Asset Management of Canada, the Ontario Teachers’ Pension Fund of Canada and GIC, the Singapore sovereign wealth fund.

TECHNIPFMC, the company that has put on hold its de-merger into two separate entities for subsea and LNG projects because of Covid-19 and the oil slump, has launched with services firm Halliburton Company a new technology product for subsea wells. TechnipFMC and Halliburton introduced their trade-marked OdaSea system, which they described as the first distributed acoustic sensing solution for subsea wells. “The technology platform enables operators to execute intervention-less seismic imaging and reservoir diagnostics to reduce total cost of ownership while improving reservoir knowledge,” they explained. “The OdaSea service integrates hardware and digital systems to strengthen digital capabilities in subsea reservoir monitoring and production optimization,” their statement added.

Halliburton provides the fiber optic sensing technology, completions and analysis for reservoir diagnostics while TechnipFMC provides the optical connectivity from the topside to the completions. “Through the collaboration, operators can accelerate full field subsea fiber optic sensing, design and execution,” they stated. TechnipFMC has two main offices in both Houston and Paris and said in March 2020 it was delaying plans to separate into two companies because of volatile market conditions created by the coronavirus outbreak. The company had first announced the proposal in August 2019 and planning was well advanced

when the pandemic and oil price slump impacted markets in mid-March. TechnipFMC then said on March 16, 2020 that the global pandemic, a sharp drop in oil prices and heightened volatility in global financial markets had “created a market environment that is not currently conducive to the company’s separation” plans.

On the latest joint venture, TechnipFMC and Halliburton said they were delivering solutions with the technology to multiple subsea projects at all stages from conceptual design to execution and installation. “This project enables an enhanced level of reservoir understanding for our customers and expands our unique integrated subsea solution,” said Christina Johansen, Vice President of TechnipFMC Subsea Product Manufacturing. “We are proving that we can leverage the competencies and know-how to drive the change our industry needs for a higher level of sustainability,” she stated. With the de-merger on hold TechnipFMC has still overhauled its divisions with Onshore-Offshore having been renamed Technip Energies, in-line with the new scope of the business. The company said in its most recent earnings that despite the challenges and a softening of near-term LNG markets, the long-term fundamentals for natural gas, and LNG in particular, remained strong. The two other TechnipFMC divisions are Subsea and Surface Technologies.

THE American Gas Association, the industry group representing over 200 utility companies delivering natural gas throughout the US, said its members had recently invested \$3.8 million per day on energy efficiency programs. The AGA noted that there were more than 75 million residential, commercial and industrial natural gas customers in the country who benefit from the shale-gas boom that also enabled the creation of an LNG export industry on the Gulf Coast and elsewhere. The domestic natural gas market formed by utilities and industries such as chemicals competes for resources against pipeline exporters and LNG liquefaction plants.

A new report from the AGA showed the high level of spending monitored in a survey carried out in 2018. “Energy efficiency is a key component of AGA’s Climate Change Position Statement released earlier this year,” said the AGA. It noted that the use of natural gas, in combination with renewable energy and efficiency, has contributed to US energy-

related carbon dioxide emissions declining to the lowest levels in nearly 25 years. “The programs and investments made every year by America’s natural gas utilities provide another example of how local natural gas companies work with their customers to help them save money and protect the environment,” said AGA President and Chief Executive Karen Harbert. “AGA members also make significant investments in reducing the energy burdens for our most vulnerable customers through weatherization assistance,” she added. The report explained that in 2018, natural gas utilities funded 132 natural gas efficiency programs in the US and Canada for a total of \$1.47 billion, an 8 percent jump from 2016 and a 20 percent rise since 2012.

These programs help customers install tighter-fitting windows and doors, better insulation and purchase increasingly more efficient natural gas appliances. Natural gas utilities spent one-quarter of their budget (\$365.34 million) on low-income efficiency programs, assisting over 214,581 participants in 2018. Additionally, more than 66,000 commercial customers, and upwards of 72,000 industrial program customers were enrolled in natural gas efficiency programs in 2018. The report said that with these significant investments, natural gas utilities helped their customers save 259 trillion Btus of energy and offset over 13.5 million metric tons of carbon dioxide emissions from 2012 to 2018, the equivalent to removing 2.9 million cars off the road for a year. US customers saved 425 million therms, or 42.5 trillion Btu, through natural gas efficiency programs, offsetting 2.25 million metric tons of avoided CO2 emissions in 2018 alone. “Natural gas utilities are working with their customers to be part of the solution to climate change, helping them lower their

emissions while also saving money,” Harbert said. “Our industry encourages and supports energy efficiency in pursuit of a significantly lower-carbon energy economy,” she stated.

The AGA said that these investments in natural gas efficiency are yielding big results. The report said that while the total number of residential natural gas customers in the US has grown by 86 percent in the past 40 years, overall residential natural gas demand has remained steady. It noted that residential customers today use half of the volume of natural gas that they used in 1970 despite consistent growth in the average size of homes. In that time, CO2 emissions from the average natural gas home have declined 1.2 percent per year. The AGA, founded in 1918, said more than 100 years later in 2019 natural gas met more than 30 percent of energy needs in the US.

TOTAL SA has changed its name to Total SE on global stock markets to identify as a European rather than a French oil and gas company just after it confirmed that project financing was in place for the Mozambique LNG project using Area 1 feed-gas in the Rovuma Basin. “Total has registered with the Trade and Companies Register of Nanterre (near Paris) as a European Company,” said Total. The new SE addition means “Societas Europaea (SE)”, Latin for European company. The Total name was previously followed by the French term “Société anonyme (SA)”, meaning a public limited company, the equivalent of Plc in English. “This follows negotiations with employees’ representatives in 25 countries of the European Economic Area,” added Total, which has a global workforce of around 100,000 people. It noted that members of the Special Negotiating Body for management and unions had approved

Diary of events

September 2020
Gastech Virtual Conference
 7 -11 September 2020
<https://www.gastechevent.com/>

November 2020
Abu Dhabi International Petroleum Exhibition & Conference 2020 (ADIPEC)
 Nov 9-12 2020
 Abu Dhabi National Exhibition Centre (ADNEC), Abu Dhabi, UAE
<https://www.adipec.com>

December 2020
23rd World Petroleum Congress
 6 - 10 December 2020
 George R. Brown Convention Center
 1001 Avenida De Las Americas,
 Houston, Texas, USA
<https://www.wpc2020.com/>

February 2021
2nd American LNG Forum
 09-10 February 2021
 Hotel Marriott Marquis Houston
 1777 Walker St, Houston, Texas,
 77010 USA
<https://americanlngforum.com>

and signed an agreement relating to the procedures for the involvement of employees in this new European Company. “The Company will now be listed as Total SE on stock markets trading its shares and American Depositary Shares,” explained Total.

However, its identifying ticker on the Paris Euronext exchange (FP) and New York Stock Exchange (TOT) will remain unchanged. The shares were last trading at €33.83 per share, down 1.75 percent, and valuing the company at around €88.45 billion (\$101Bln). The change to Total's name was announced as the European energy major's Chief Financial Officer Jean-Pierre Sbraire said that he was pleased with the signing of the \$14.9-billion senior debt financing agreement for Mozambique LNG. The joint venture includes the development of the Golfinho and Atum natural gas fields located in Offshore Area 1 concession and the construction of a two-Train liquefaction plant with a total capacity of 13.1 million tonnes per annum. “The signing of this large-scale project financing, less than one year after Total assumed the role of operator of Mozambique LNG, represents a significant achievement and a major milestone for the project,” declared CFO Sbraire. “It demonstrates the confidence placed by the financial institutions in the long-term future of LNG in Mozambique,” he added. “This key milestone has been reached thanks to the dedication of the Mozambique authorities and the financial partners of the project,” stated the CFO.

Total said that the African venture represented a total post-financial investment decision outlay of \$20Bln. “The project financing amounts to \$14.9Bln, the biggest ever in Africa, and includes direct and covered loans from eight Export Credit Agencies (ECAs), 19 commercial bank facilities and a loan from the African Development Bank,” Total explained. The ECAs that participated in the financing included Export Import Bank of the United-States (US-Exim), Japan Bank for International Corporation (JBIC), Nippon Export and Investment Insurance (NEXI), UK Export Finance (UKEF), Servizi Assicurativi del Commercio Estero of Italy (SACE), Export Credit Insurance Corp. of South Africa (ECIC), Atradius Dutch State Business (Atradius) and Export-Import Bank of Thailand (EXIM Thailand). The Area 1 shareholding has Total as operator with a 26.5 percent participating interest alongside Mozambican state energy company ENH (15 percent). Japan’s

Mitsui & Co. owns 20 percent, India’s ONGC Videsh, Bharat PetroResources and Beas Rovuma Energy each hold 10 percent and Thailand’s PTTEP 8.5 percent.

VIETNAM is making progress on several liquefied natural gas import projects to support associated power plants and one such venture in Bac Lieu Province in the southern Mekong Delta has been highlighted in a half-yearly Vietnamese report on the economy. Ian Nguyen, Director of Origination and Government Relations in Hanoi for the Bac Lieu LNG venture being developed by Delta Offshore Energy, appeared on Vietnamese television to give more details on the project. Delta Offshore is a Singapore-based consultancy and project firm and has lined up equipment from the French power plant manufacturing and technology centre in Belfort, northeast France, of US company General Electric.

The Bac Lieu project had a memorandum of understanding with the US Magnolia LNG export project planned for near Lake Charles in Louisiana. However, the developer, Australia-based LNG Ltd, was purchased from the administrators after it ran out of cash by the US Glenfarne Group. “The MOU expired before Glenfarne closed the deal with LNGL,” explained Nguyen. “There is no shortage of LNG suppliers interested in the Bac Lieu project and Vietnam as a long-term customer,” he added. “Our preference is US LNG. We will be releasing a Request for Proposals (RFP) for a long-term LNG SPA to the wider market to qualify suppliers for the offtake concession with the Vietnam government,” stated Nguyen. “The Vietnamese power market will more than double. Industrial gas demand potential is significant, given the growing manufacturing base,” he noted.

Following on from last year's celebration of the 30th anniversary of the start of Foreign Direct Investment (FDI) hosted by the Ministry of Planning and Investment, the Bac Lieu LNG and power project was highlighted by Vietnam's leading national broadcaster VTV1. “In particular, Bac Lieu Province has leap-frogged its peers as an example of increasingly empowered localities due to recent policy trends,” Nguyen said in an interview. “This emerging province has an ambitious vision to develop a globally competitive modern aquaculture industry value-chain that will need clean, reliable and affordable energy from LNG,”

explained the Delta Offshore executive. “The clean electricity generated from this project along with the supporting grid infrastructure will also enable the entire Mekong Delta's participation in the clean and renewable energy transition,” stated Nguyen. “Undoubtedly, the improved clean energy access will attract even more FDI and industrial development in the ‘rice bowl’ of Vietnam to further underpin sustainable socio-economic growth,” he explained. Power plant designs for the Delta Offshore-led venture envisage capacity of 3,200 megawatts with four gas turbine units with a capacity of 750 MW each and one unit with a capacity of 200 MW.

The first phase of the project will see investments of around \$1 billion in Vietnam’s power sector with construction expected in four distinct phases through to 2026. The Bac Lieu project investment model will be the nation’s predominant investment template going forward. The government has mentioned three other LNG-for-Power projects with import facilities, including a 4,000MW plant in the northern port city of Haiphong. A third LNG terminal is envisaged adjacent to a gas-fired power station in Ninh Thuan province, south of Cam Ranh Bay. A fourth project is at Long An, also on the Mekong Delta, and this will see the development of yet another 3,000MW power plant.

WOODSIDE Petroleum posted overall second-quarter sales revenues of US\$768 million, a drop of 28.2 percent as its realised LNG price dropped by US\$3.10 per million British thermal units from the first quarter. Woodside said its realised LNG prices in the quarter came to US\$5.00 per MMBtu compared with US\$8.10 MMBtu in the first quarter of 2020 and US\$7.10 per MMBtu in the year-ago quarter. Realised oil prices came to US\$31 per barrel compared with US\$52 per barrel in the first quarter and US\$69 per barrel in the 2019 second quarter. The company had registered first quarter 2020 sales of US\$1.07 billion versus second quarter 2019 revenue of US\$838M for LNG, oil, condensate and domestic gas.

LNG sales amounted to US\$608M in the second quarter versus US\$854M in the first quarter and US\$648M in the year-ago quarter. Woodside’s earnings report also gave updates on its main overseas developments, the Sangomar oil project offshore Senegal and the Myanmar natural gas venture, as well as

on its delayed Australian West Coast gas hub. The company said it submitted applications for production licences and retention lease renewals for the Burrup Hub project in Western Australia. Woodside’s second-quarter, one-sixth share of sales from the North West Shelf plant fell to 679,198 tonnes from 715,284 tonnes in the same three months of 2019, though were up from 606,577 tonnes in the first quarter of 2020.

The company’s sales from Pluto LNG fell to 1.09 million tonnes from 1.16MT in the previous quarter. “I am proud of the way the Woodside team has responded to unprecedented challenges in this half: managing the impact of Tropical Cyclone Damien; ensuring the safety of our people and business integrity as the Covid-19 pandemic unfolded; and adapting to the lower commodity price environment,” said Woodside Chief Executive Peter Coleman. “We have implemented the cost-saving measures announced at the end of the last quarter and are preparing our future growth projects to proceed when market conditions improve,” added Coleman. “Woodside’s commitment to the Burrup Hub is unwavering and work is continuing to finalise commercial agreements and regulatory approvals for the Scarborough, Pluto Train 2 and Browse developments,” explained the CEO. “We are positioning to take advantage of a forecast global LNG supply shortfall later this decade,” he stated.

Woodside said its Rufisque, Sangomar and Sangomar Deep Offshore joint venture continues to progress with execution of the Sangomar Field Development Phase 1 offshore Senegal. “Woodside is progressing contracting and procurement activities and working with contractors on detailed design work for the FPSO and commencement of fabrication of subsea equipment,” said the company. “Woodside is actively preparing for the 23 well development drilling campaign targeted to commence in mid-2021,” it added. “Phase 1 subsea infrastructure and overall project planning remains on track for delivery of first oil targeted in 2023,” said Woodside. In the Myanmar A-6 natural gas project located in the Rakhine Basin of the Bay of Bengal, Woodside said pre-front-end engineering design activities were continuing across the technical, commercial and marketing work streams. However, the planned Myanmar exploration drilling programme was being revised in response to Covid-19 impacts. ■

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New reliquefaction unit gains orders

Babcock LGE has recently claimed significant success with its patented LNG reliquefaction technology - ecoSMRT. Technical Editor Ian Cochran investigates

For example, a few months ago, the company announced that an ecoSMRT had completed cargo operations on board a recently delivered LNGC.

This operation was undertaken after the first cargo loading of Sovcomflot's 174,000 cu m LNGC 'SCF La Perouse' in Houston, Texas, following her delivery from Hyundai Heavy Industries (HHI) in February of this year.

Babcock claimed that by trialling the ecoSMRT solution on board, this confirmed that the single mixed refrigerant design can operate in real-time conditions at complete capacity.

This operation also marked an important milestone in the roll-out of the system and confirmed the gas trial's positive results concluded at the end of last year, Babcock said.

After the operation, a post-loading performance test was carried out, including a performance test with a capacity of 1,500 kg/h for over 12 hrs.

The system also underwent a performance test on the full capacity of 1,850 kg/h for 25 hrs and in addition, in the complete range of operating modes, such as ramp-up or ramp-down and accelerated warming. A system shutdown and restart was also carried out.

Babcock LGE said that shipowner was satisfied with the tests and the 'SCF La Perouse' thus became completely operational.

Managing Director, Neale Campbell, said following the tests: "Our LNG reliquefaction technology ecoSMRT is an important solution for LNG shipowners and we are pleased that the first vessel

using this market-leading technology has now completed live cargo operations for Sovcomflot's 'SCF La Perouse'.

"With three ecoSMRT gas trials now successfully complete and a fourth due for completion before the end of this month (May), ecoSMRT is paving the way as a world-leading LNG reliquefaction system, delivering significant performance and efficiency benefits to the market," he said.

The company added that it will commission 39 ecoSMRT systems over the next few years.

Back in 2018, Babcock said it had won contracts to supply its ecoSMRT LNG reliquefaction technology to four LNGCs ordered at HHI's Ulsan and Samho shipyards in South Korea.

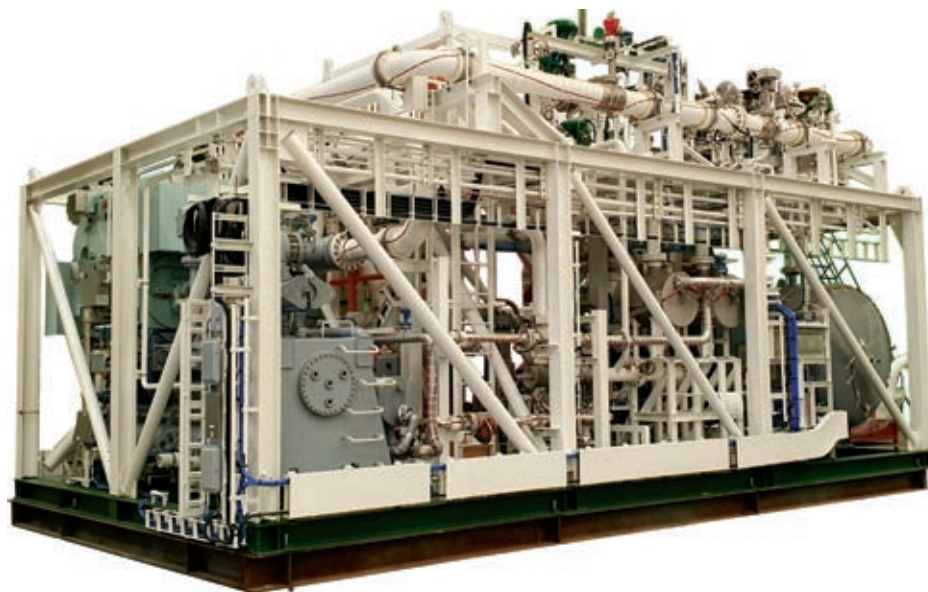
Offering efficiency, cost and footprint savings, ecoSMRT enables LNGCs to operate with greater reliquefaction capacity and significantly reduced power consumption – at a lower cost – than other mixed refrigerant or nitrogen expansion systems.

Requiring only one compressor, ecoSMRT benefits from a significantly lower power consumption, meaning reduced maintenance requirements and lower operating costs (OPEX). The technology also minimises emissions, the company claimed.

ecoSMRT's introduction was the result of a joint-venture project between HHI and Babcock.

Large orderbook

Speaking exclusively with *LNG Journal*, the company said that there were five ecoSMRTs currently operating on board



Babcock LGE's ecoSMRT reliquefaction system

LNGCs and another 34 on order.

EcoSMRT is claimed to be compatible with both MAN (ME-GI) and WinGD (X-DF) dual-fuel propulsion systems and the company explained that it works closely with the shipyard and shipowner ordering a system to select the configuration and design parameters for the Boil-Off Gas (BOG) reliquefaction unit.

The company explained that basically, the LNGC's fuel gas compressor supplies pressurised BOG to the ecoSMRT plant. This BOG is compressed further using an oil injected screw compressor, then passes to the reliquefaction exchanger, in which the cold temperature required to reliquefy the BOG is provided by the ecoSMRT single mixed refrigerant (SMR) circuit.

The BOG then condenses in the reliquefaction exchanger, leaving the system as condensate liquid, and is returned to the cargo tanks.

ecoSMRT is claimed to be innovative on several fronts:

- ♦ Babcock has designed out the need for a secondary refrigeration loop by using integrated pre-cooling in the heat exchanger.
- ♦ External mixing of streams to eliminate the risk of oil contamination in the cryogenic section of the heat exchanger during low turndown and shutdown.
- ♦ Requires less space on board the ship than similar systems, while still offering improved efficiency, reduced fuel consumption and lower power requirements for higher reliquefaction capacity.

When combined together, all of the cooling and condensation operations now occur in a single system, which is able to internally pre-cool the SMR stream before its final phase separation, reducing rotating equipment by 50% – specifically requiring only a single compressor.

This means that fewer plant items require maintenance, which is of significant benefit to shipowners. The removal of the external refrigerant system also provides a significant reduction in the space required for the LNG reliquefaction plant – around a 40% reduction – and lower installation costs for the shipyard.

Babcock claimed that ecoSMRT is much more efficient than competing solutions, offering a higher reliquefaction capacity – tonnes/per hour for lower power consumption, typically up to 35% more efficient, which is a direct OPEX saving throughout the life of the ship. ■



The LNGC 'SCF La Perouse' underwent system trials recently

LNGC crew training - a vital management component

Last July, Bernhard Schulte Shipmanagement (BSM) announced that it had installed a new liquid cargo simulator (LCS) at its Cyprus Maritime Training Centre (MTS)

This initiative, combined with a structured career progression model, was aimed at ensuring BSM's LNGC crews were highly trained and competent to support the company's growing global LNG shipping operations.

LNG Journal's Technical Editor, Ian Cochran, spoke with Andrew Hall and other key BSM personnel about LNGC crew training today.

Hall explained that the new LCS suite covers all functionalities of other/previous liquefied cargo operation simulators (LICOS) systems. In addition, it supports induced gas flotation (IGF) related training programmes.

"The suite is a stand-alone solution and is not directly connected to the bridge and/or engine room systems. From our experience, however, this does not derogate from creating a realistic training environment but rather it opens the possibility to create scenarios including other common tools on board, such as two-way radio communication," he explained.

He also said that it was possible to structure the simulator stations to form a cargo control room environment, as the LCS has been specifically designed to provide a highly realistic simulation of operations.

The simulator software comes with Moss and Membrane cargo containment system models and boil-off fuelled propulsion systems, plus steam boiler/turbine, DFDE, ME-GI, and X-DF engine configurations. The containment systems and gas handling systems, were developed by GTT Training.

Interim approval for BSM's STCW-related programmes was given by the Cyprus Flag SDM, while the SIGTTO LICOS course received interim approval by DNV GL. "We are very pleased with having received the approval from such reputable and internationally accepted institutions, testifying to our high-quality standards," Hall said.

He explained that all crew joining LNGCs, including Cadets, are expected to undergo liquefied gas tanker training. BSM is an avid supporter of SIGTTO, which has a strong focus on crew training and has developed a number of best practice guidance documents.

LNG Journal was told that BSM strongly believed in its comprehensive cadet recruitment and training programme to support all vessel types. The programme dates from 2010 when it was introduced for the Bernhard Schulte owned fleet and was then expanded to all BSM vessels under the Schulte Group Cadet Programme.

Between 2015 and 2019, cadet intake totalled 1,828 of various nationalities. In 2019 alone, BSM took in 301 cadets and there is a current retention rate of 97%. The LNGCs are included in this programme and it is acknowledged that it plays a vital role in securing the quality and quantity of well-trained officers that will be required to man the increasing number of LNGCs being delivered in the coming years.

BSM tends to send the more experienced and outstanding cadets to LNGCs, but not exclusively. The shipmanagement company also has a structured career progression plan for other ranks in place that has been developed to provide opportunities for all high performing seafarers to join LNGCs from all vessel types.

The Schulte Group as a whole, including BSM, has specifically developed a crewing strategy for its third party clients' and own gas tonnage to address the anticipated shortage of qualified LNG officers. The strategy is based on recruitment, training and retention measures.

"Our specialised gas training hub at MTC Cyprus with its new LCS will play a significant role in this, as it trains seafarers beyond industry requirements. It offers realistic training in an immersive



An instructor teaches a Cadet on an LCS

environment while using latest technology.

"BSM has access to a pool of 18,000 seafarers, of which over 1,700 alone are qualified and experienced gas officers (LNG and LPG). We are therefore confident we have the right tools in place to ensure successful recruitment of qualified LNG officers.

"What we presently see as problematic are the travel restrictions imposed in many countries as a result of the COVID-19 pandemic that create tremendous efforts, not only for shipmanagers, to ensure our seafarers can be safely repatriated and their relievers sent to the vessels.

"If the situation continues, then it will become problematic to recruit qualified seafarers for any type of ship, as many might hesitate to re-join any time soon, provided they can afford financially, or look for a career ashore," Hall said.

Co-ordination Centre

BSM has been managing LNGCs for 30 years. In addition, to co-ordinating the LNG activities across the Schulte Group and to develop and implement strategies to improve LNG capabilities further, an 'LNG Co-ordination Centre' (LCC) was set up in 2018.

LCC is a business development unit and its sole function is to provide a centre of excellence addressing LNG shipping, small scale LNG, LBV, FSRU/LNG FSU and IGF related matters and to act, if required, as a central, single point of contact for shipowning and shipmanagement clients in the initial stages of enquiry.

Hamburg-based Pronav became part of the Schulte Group in 2018 and this has had the affect of increasing the Schulte

Group's pool of highly qualified LNG officers. Pronav has a very high retention rate, particularly among senior officers.

Since 1998, Pronav has been operating up to 14 LNGCs simultaneously; including steam vessels fitted with Moss and membrane cargo tanks. Today, Pronav still operates two steam ships. The company has access to a significant number of steam-experienced LNG officers and is thus able to take further steam driven LNGCs into management.

During the more than 20 years of Pronav's involvement in steam LNGCs, comprehensive training programmes were developed. Situations, such as the lack of steam engineers on the market, were overcome by careful monitoring of the fleet and timely training based on departures/retirements.

Instead of creating a problem for engineer training and retention, having access to steam turbine powered LNGCs is an advantage to BSM over other shipmanagers. BSM claimed that it is one of the few third party shipmanagers, if not the only one, to have both experience in managing these ships, as well as access to officers experienced on steam turbine powered LNGCs.

Currently, BSM manages a fleet of 40 LNGCs, 16 of which are under full management and 24 under crew management. Other newbuilding LNGCs will be taken under full and/or crew management in the coming years.

BSM manages LNGCs from offices in Hamburg (Germany), Newcastle (UK) and Athens (Greece) and is currently developing the same capabilities in Singapore. ■

BSM Cyprus MTS Courses include:

- Advanced Liquefied Gas Tanker Operations (STCW).
- Basic Liquefied Gas Tanker Operations (STCW).
- Advanced Training for Service on Ships subject to the IGF Code (STCW).
- Basic Training for Service on Ships subject to the IGF Code (STCW).
- LNG Tanker Operations Management Level (SIGTTO).
- Liquefied Cargo Operations (non-SIGTTO).
- A range of additional BSM and client specific training.

Air Products' patented technology enables the world's largest LNG trains

News that Air Products had supplied Qatargas' Ras Laffan trains with its patented AP-X® LNG process, prompted Technical Editor, Ian Cochran to ask the company for a description of the technology

AP-X® LNG process achieves not only high capacity in a single train, but can also incorporate high LPG recovery, lower LNG heating value for new markets, and maximum efficiency, the company explained.

This range of applications demonstrates that the process brings significant economies of scale to the industry, reducing capital cost while maintaining the efficiency, flexibility, and reliability of the proprietary AP-C3MR™ (propane pre-cooled, mixed refrigerant) process.

Air Products' AP-X® liquefaction process cycle, as depicted in Figure 1 below, employs the C3MR cycle using propane for pre-cooling and a mixed refrigerant for liquefying natural gas and then adds a reverse Brayton nitrogen cycle to shift the entire sub-cooling duty to a separate nitrogen refrigeration loop.

The LNG enters the nitrogen expander cycle at around -115 deg C, where it is sub-cooled to a final temperature of about -150 deg C. By using a separate cycle for LNG sub-cooling, the mixed refrigerant system is de-bottlenecked, reducing the mixed refrigerant flow by 40% per unit LNG produced.

The first six AP-X® trains were commissioned over a decade ago in Qatar, each with a design capacity of 7.8 mill tonnes per annum.

Four additional AP-X® trains will be delivered to Qatar for the first phase of Qatar Petroleum's North Field East (NFE) project. Each of the four new LNG

process units, will also have a design capacity of 7.8 mill tonnes.

These trains will become operational in 2025, liquefying natural gas from Qatar's North Field, claimed to be the largest offshore non-associated natural gas field in the world. The production capacity from each of these AP-X® trains is significantly larger than any other LNG train in operation, the company said.

Air Products' equipment provided with the AP-X® liquefaction technology includes main cryogenic heat exchangers (MCHEs), sub-cooling heat exchangers (SCHEs), nitrogen economiser cold boxes and Rotoflow® turbo-machinery companders. Rotoflow® is an equipment division of Air Products and works closely with the LNG equipment and cycle experts to develop a highly efficient, optimised liquefaction process.

Air Products will build the AP-X® LNG heat exchangers at its Port Manatee, Florida manufacturing facility. Typically, an LNG heat exchanger can be as large as over 5 m in diameter and 55 m long. A completed unit can weigh as much as 500 tonnes.

Technological advancements

Combining the AP-X® cycle with currently available CWHE (coil wound heat exchangers) and machinery advancements enable LNG trains with production capacities of over 10 mill tonnes per annum.

Frame 9E gas turbines were first used



Air Products' AP-C3MR™ and AP-X® process technologies are in operation at the 14 existing LNG trains located in Ras Laffan, Qatar

for mechanical drive service for the original six AP-X® trains in Qatar. Since then, additional driver options have become available for the mechanical drive service.

One of the technology developments to become available since the commissioning of the original AP-X® trains is the use of multi-shaft gas turbine configurations for heavy duty frames in mechanical drive service. The multi-shaft options offer several advantages, such as:

- 1) Large helper motors are usually not required.
- 2) Compared to single shaft gas turbines, multi-shaft gas turbines can be started under load, reducing or eliminating the need for flaring, and loss or recovering of refrigerant components upon restart.
- 3) Multi-shaft gas turbines offer the option of using a wide speed control range for additional process control and turndown capability.

In scaling up the liquefaction process, refrigerant compressor aerodynamic and mechanical design considerations can become limiting. Specifically, compressor flow coefficients and Mach numbers may be beyond proven or feasible ranges.

One solution to this problem is to use parallel compressor strings to reduce the aerodynamic constraints on the refrigerant compressor design. With parallel compressor strings, the propane and mixed refrigerant compression can be arranged on the same shaft (eg, two compression strings, each with 50% propane and 50%

mixed refrigerant compression). This allows the power split between propane for pre-cooling and mixed refrigerant for liquefaction to automatically adjust with changing process conditions, such as ambient temperature, ensuring the driver power can be fully utilised. This is particularly useful in colder climates where the seasonal variation of ambient air temperature is large.

Another area of development to consider in refrigeration compression driver technology is the installation and commissioning of large electric motor drives for baseload LNG facilities. The largest electric motor drives in the LNG industry have recently been commissioned at the Freeport LNG facility with three liquefaction trains producing around 15 mill tonnes per annum.

In summary, the company explained that the AP-X® LNG process is a hybrid of two proven refrigeration processes, a C3MR process for pre-cooling and liquefaction followed by a reverse Brayton cycle for LNG sub-cooling.

The process is very flexible and can be implemented using single shaft gas turbines, multi-shaft gas turbines or electric motors as main drivers for the refrigeration compressors to achieve capacities in excess of 10 mill tonnes. It can also be configured for LPG recovery using a variety of approaches depending on the feed, the desired recovery, and owner preference.

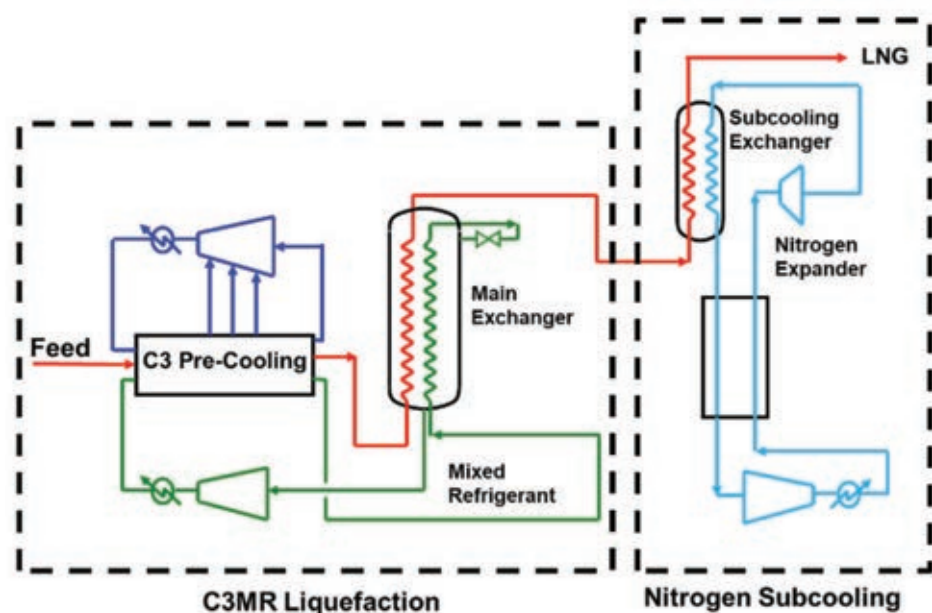


Figure 1: AP-X® Process. Source: Air Products

PPA Progresses LNG bunkering plans

Preparations for extensive LNG bunkering infrastructure in Western Australia are progressing with planning underway to support more dual-fuel vessels, Pilbara Ports Authority (PPA) tells LNG Journal's fuelling editor Malcolm Ramsay

The authority introduced the country's first ship-to-ship LNG bunkering services license earlier this year and announced the intention to turn the Pilbara into a 'LNG bunkering hub', building on the region's existing infrastructure to create a ship refuelling nexus.

"It's very early stages at the moment so we are still agnostic on the technology to be used but our main focus has been working towards getting planning approvals in place... This region already has extensive LNG export infrastructure in place, with several truck loading facilities and LNG is widely used for remote power stations so we have plenty of LNG capacity," Lyle Banks, General Manager Development & Trade at PPA, told *LNG Journal*.

'Very significant' number of vessels

As planning progresses, the PPA aims to firm up commitments to switch to LNG from some of the region's biggest commodity firms, such as mining giant BHP which operates a fleet of iron ore tankers exporting cargoes from its processing hubs at Newman, Yandi, Mining Area C and Jimblebar.

"In terms of numbers it is hard to say but last year BHP released the world's first bulk carrier tender for LNG-fuelled transport to carry up to 27 million tonnes of its iron ore from the Pilbara. This would equate to a fleet of 13 to 14 vessels. Recent reports indicate that BHP is planning 5 LNG-fuelled vessels initially but if we look at all iron ore volumes in the

region 10% of the total volume equates to about 80 million tonnes, so there could be a very significant number of vessels in the future," Lyle Banks, General Manager Development & Trade at PPA, said.

Despite being a major LNG producing region, the Pilbara still relies heavily on imported diesel fuel and marine gas oil to power shipping and industry across the region. The forward-looking plans of the PPA now enable the billions of litres of imported fuel to be replaced with LNG.

Formed in 2014, the PPA operates as a Western Australian Government Trading Enterprise, and manages the former port authorities of Dampier and Port Hedland, two of the three major iron ore export ports in the region and Ashburton, where the Wheatstone project exports from.

Western Australia is home to some of the largest LNG projects in the world, including the North West Shelf Joint Venture project, Woodside's Pluto project, the Gorgon Gas project, and the Wheatstone project. Between them these export projects have total capacity of close to 50 million tonnes per annum (mtpa). The government of Western Australia has introduced a gas policy that aims to ensure that gas equivalent to 15 per cent of exports is available for consumers in the region.

Bunker license interest

PPA issued its first truck-to-ship LNG bunkering licence in January 2017, and LNG fuelling of offshore supply vessels have occurred regularly at the Port of



Aerial of Port Hedland

Dampier ever since.

Following the award of the first ship-to-ship bunker licence to Woodside Energy in May, the area has seen a growing interest, despite global headwinds caused by Covid-19 lockdowns, and a bulk vessel bunkering discount has further added to momentum with operators discussing additional services.

"The bulk vessel bunkering discount that we introduced on July 1 has been very well received and conversations with operators have already raised interest in potential other services," Banks explains.

The move to encourage greater uptake of LNG as a transport fuel for the region has also been welcomed by the LNG Marine Fuel Institute which predicts that Australia can meet and exceed new IMO 2020 regulations through the roll-out of new LNG bunkering infrastructure.

"While shipping remains a hugely

efficient means of transporting goods across the world, ships can emit levels of sulphur oxides (SOx), nitrogen oxides (NOx) and particulate matter (PM) pollution that impacts people living near ports and in coastal areas. Which is why alternative fuels need to play a significant role in the shipping industry achieving the IMO 2050 50% net emission target. LNG will be a large part of the marine fuel mix beyond 2050," Margot Matthews, CEO of LNG MFI, commented.

New pathways

The move to promote gas as the fuel of choice for heavy transport in the region is also driving efforts to research a range of new alternatives as Woodside launched a partnership with a consortium of Japanese companies earlier this year.

"Woodside and its partners in Japan have forged new energy pathways before and we can do so again, as we expect by 2030 to see large-scale hydrogen production around the world and we intend to be part of that," Peter Coleman, CEO of Woodside, commented.

The agreement with JERA Inc, Marubeni Corporation and IHI Corporation will explore the use of ammonia as a fuel stock and a potential energy carrier for hydrogen export. Woodside aims to initially produce hydrogen through steam methane reforming of natural gas and investigate large-scale combination with nitrogen to form ammonia to enable it to be shipped as a liquid.

Pilbara is also home to one of the largest ammonia production sites in the world, operated by Yara, near the port of Dampier. ■

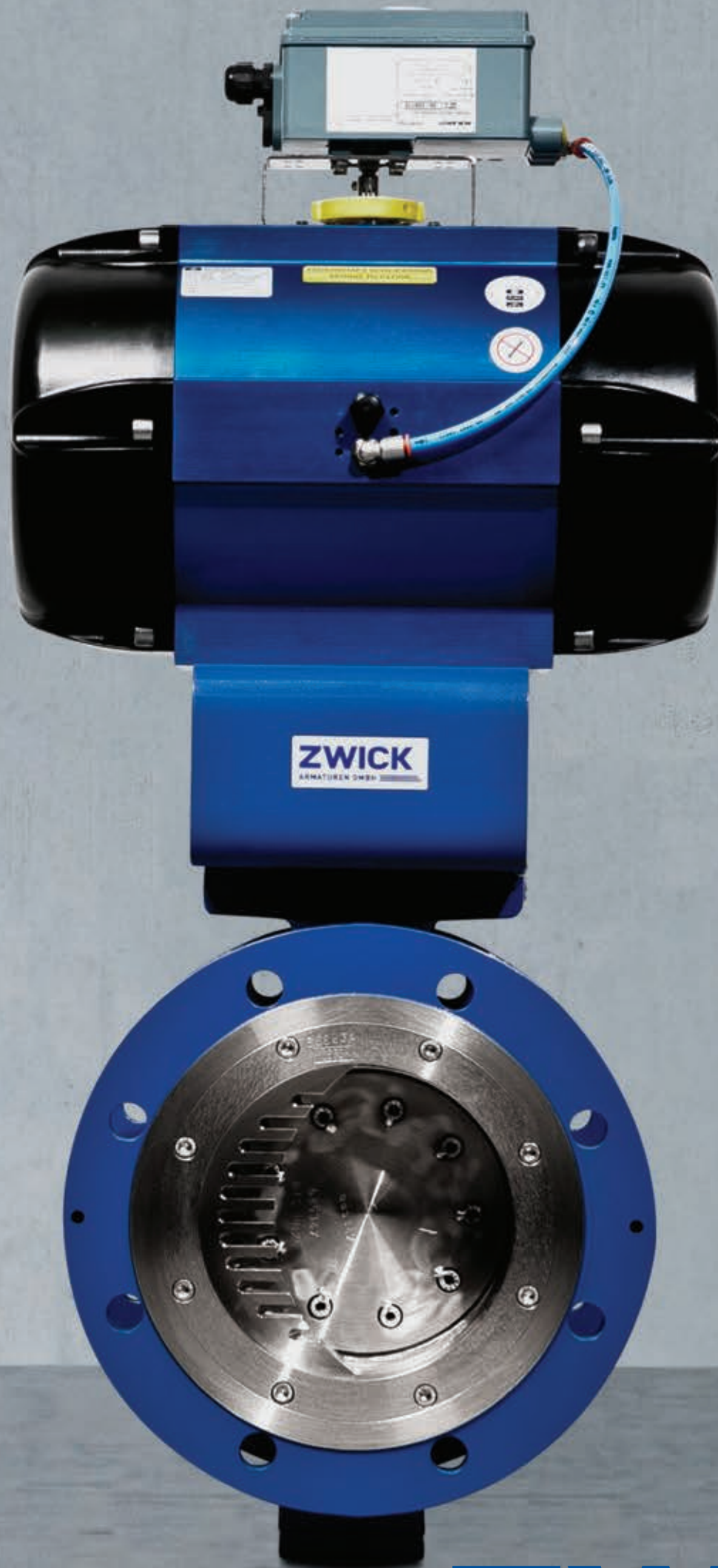


Port of Dampier

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METAL SEATED CONTROL VALVE

ZERO LEAKAGE

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World LNG Carrier Fleet

LNG carrier	Capacity m ³	Owned or Ordered by	Builder	Delivery Date	Flag	Power Plant	Cargo System	No. of tanks	Ship built for Export plant
Aamira	266,000	QGTC	Samsung	Dec-10	Liberia	DRL	GTT	5	Qatargas IV
Abadi	135,000	Brunei Gas Carriers	Mitsubishi Nagasaki	Jun-02	Brunei	S	Moss	5	Brunei LNG
Abalamabie	174,900	Bonny Gas	Samsung	June-16	Bermuda	DFDE	GTT	4	Nigeria LNG
Adam LNG	162,000	Oman LNG	Hyundai	Dec-14	Marshall Is.	DFDE	GTT	4	Oman LNG
Adriano Knutsen	180,000	Knutsen	Hyundai	Jul-19	Spain	MEGI-DF	GTT	4	charter
Al Aamriya	210,100	J5 Consortium	Daewoo	Feb-08	Marshall Is.	DRL	GTT	4	Qatargas
Al Areesh	151,700	Teekay LNG	Daewoo	Jan-07	Qatar	S	GTT	4	Ras Gas II
Al Bahiya	210,185	QGTC	Samsung	Oct-09	Liberia	DRL	GTT	5	Qatar-Atlantic
Al Biddah	135,275	J4 Consortium	Kawasaki Sakaide	Nov-99	Japan	S	Moss	5	Qatargas
Al Daayen	151,700	Teekay LNG	Daewoo	Apr-07	Qatar	S	GTT	4	RasGas II
Al Dafna	266,000	QGTC	Samsung	Oct-09	Marshall Is.	LR DRL	GTT	4	Qatar-Atlantic
Al Deebel	145,000	Peninsular LNG	Samsung	Dec-05	Bahamas	S	GTT	4	Qatargas
Al Gattara	216,200	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	GTT	4	Qatargas II
Al Ghariya	210,100	ProNav	Daewoo	Feb-08	Bahamas	DRL	GTT	4	Qatargas
Al Gharaffa	216,200	OSG/Nakilat	Hyundai	Jan-08	Marshall Is.	DRL	GTT	4	Various
Al Ghashamiya	216,000	QGTC	Samsung	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Ghuwairiya	261,700	QGTC	Daewoo	Aug-08	Marshall Is.	DRL	GTT	5	Qatar-Atl'c Basin
Al Hamla	216,000	OSG	Samsung	Feb-08	Marshall Is.	DRL	GTT	4	QatarGas
Al Hamra	137,000	National Gas Shipping	Kvaerner-Masa	Jan-97	Liberia	S	Moss	4	ADGAS
Al Huwaila	217,000	Teekay	Samsung	May-08	Bahamas	DRL	GTT	4	RasGas III
Al Jasra	137,100	J4 Consortium	Mitsubishi Nagasaki	Jul-00	Japan	S	Moss	5	Qatargas
Al Jassasiya	145,700	Maran-Nakilat	Daewoo	May-07	Greece	S	GTT	4	RasGas
Al Kharaitiyat	216,200	QGTC	Hyundai	May-09	Liberia	DRL	GTT	4	Qatargas III
Al Kharaana	210,000	QGTC	Daewoo	Oct-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Kharsaah	217,000	Teekay	Samsung	May-08	Bahamas	DRL	GTT	4	RasGas III
Al Khatiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	GTT	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	GTT	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GTT		Ras Gas I
Al Mayeda	266,000	QGTC	Samsung	Jan-09	Liberia	DRL	GTT	5	Qatar-US/Var.
Al Nuaman	210,000	QGTC	DSME	Dec-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Oraiq	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GTT	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	GTT	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GTT	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GTT	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	GTT	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GTT	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	GTT	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	GTT	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	GTT	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	GTT	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	GTT	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GTT	4	Brunei LNG
Amanl	154,800	Brunei-Shell	Hyundai	Nov-14	Brunei	DFDE	GTT	4	Brunei LNG
Aman Bintulu	18,928	Perbadanan / NYK Line	NKK Tsu	Oct-93	Malaysia	S	GTT	3	Petronas
Aman Hakata	18,800	Perbadanan / NYK Line	NKK Tsu	Nov-98	Malaysia	S	GTT	3	Petronas
Aman Sendai	18,928	Perbadanan / NYK Line	NKK Tsu	May-97	Malaysia	S	GTT	3	Petronas
Arctic Aurora	160,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	GTT	4	Various
Arctic Discoverer	140,000	K Line	Mitsui Chiba	Jan-06	Bahamas	S	Moss	4	Various
Arctic Lady	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Apr-86	Norway	S	Moss	4	Various
Arctic Princess	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Jan-06	Norway	S	Moss	4	Various
Arctic Sun	89,880	Arctic LNG Shipping	IHI Chita	Dec-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Arctic Voyager	140,000	K Line	Kawasaki	Jul-06	Bahamas	S	Moss	4	Statoil
Arkat	148,000	Brunei-Shell	DSME	Feb-11	Brunei	DFDE	GTT	4	Brunei LNG
Arwa Spirit	165,000	Teekay LNG	Samsung	Sep-08	Marshall Is.	DFDE	GTT	4	Various



Aseem	154,850	K Line-Petronet	Samsung	Nov-09	Malta	S	GTT	4	Qatar-India
Asia Endeavour	160,000	Chevron	Samsung	Dec-14	Bahamas	DFDE	GTT	4	Various
Asia Energy	160,000	Chevron	Samsung	Sept-14	Bahamas	DFDE	GTT	4	Various
Asia Excellence	160,000	Chevron	Samsung	Sept-13	Bahamas	DFDE	GTT	4	Various
Asia Venture	160,000	Chevron	Samsung	Sept-17	Bahamas	DFDE	GTT	4	Various
Asia Vision	160,000	Chevron	Samsung	June-14	Bahamas	DFDE	GTT	4	Various
Bahrain Spirit	173,000	Teekay	Daewoo	Sept-18	Bahamas	DFDE	GTT	4	Various
Barcelona Knutsen	173,400	Knutsen	Daewoo	May-10	N.I.S.	DFDE	GTT	4	Various
Bebatic	75,060	Brunei Shell Tankers	Atlantique	Oct-72	Brunei	S	GTT	6	Brunei LNG
Beidou Star	172,000	MOL	Hudong	Oct-15	Hong Kong	DRL	GTT	4	Various
Berge Arzew	138,088	BW Gas	Daewoo	Jul-04	Norway	S	GTT	4	Sonatrach
Bilbao Knutsen	138,000	Knutsen / Marpetrol	IZAR Sestao	Jan-04	Spain	S	GTT	4	Atlantic LNG
Bilis	77,730	Brunei Shell Tankers	La Seyne	Mar-75	Brunei	S	GTT	5	Brunei LNG
Bishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-15	Panama	S	Moss	4	Australia-Japan
Boris Davydov	172,600	Dynagas	Daewoo	Sept-18	Cyprus	DFDE	GTT	4	Yamal LNG
Boris Vilkitsky	172,600	Dynagas	Daewoo	Jan-17	Cyprus	DFDE	GTT	4	Yamal LNG
British Achiever	173,644	BP Shipping	Daewoo	June-18	Isle of Man	MEGI-DF	GTT	4	Various
British Contributor	173,644	BP Shipping	Daewoo	Oct-18	Isle of Man	MEGI-DF	GTT	4	Various
British Diamond	155,000	BP Shipping	Hyundai	Sep-08	Isle of Man	DFDE	GTT	4	Indonesia-Various
British Emerald	155,000	BP Shipping	Hyundai	Jun-07	UK	DFDE	GTT	4	Tangguh LNG
British Innovator	138,200	BP Shipping	Samsung	Jul-03	Isle of Man	S	GTT	4	Various
British Listener	173,644	BP Shipping	Daewoo	June-19	Isle of Man	MEGI-DF	GTT	4	Various
British Mentor	173,644	BP Shipping	Daewoo	July-19	Isle of Man	MEGI-DF	GTT	4	Various
British Merchant	138,000	BP Shipping	Samsung	Apr-03	Isle of Man	S	GTT	4	Various
British Partner	173,644	BP Shipping	Daewoo	Mar-18	Isle of Man	MEGI-DF	GTT	4	Various
British Ruby	155,000	BP Shipping	Hyundai	Jan-08	U.K.	DFDE	GTT	4	Various
British Sapphire	155,000	BP Shipping	Hyundai	Sep-08	Isle of Man	DFDE	GTT	4	Tangguh
British Sponsor	173,644	BP Shipping	Daewoo	Sept-19	Isle of Man	MEGI-DF	GTT	4	Various
British Trader	138,000	BP Shipping	Samsung	Dec-02	Isle of Man	S	GTT	4	Engas
Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	GTT	5	Qatargas
BW GDF Suez Boston	138,059	BW Gas	Daewoo	Jan-03	Norway	S	GTT	4	Suez LN
BW GDF Suez Everett	138,028	BW Gas	Daewoo	Jun-03	Norway	S	GTT	4	Suez LNG
BW Integrity	170,000	BW Gas	Samsung	May-17	Singapore	DFDE	GTT	4	FSRU
BW Lilac	173,400	BW Gas	Daewoo	Mar-18	Malta	MEGI-DF	GTT	4	various
BW Magna	173,400	BW Gas-Acu Brazil	Daewoo	Mar-19	Singapore	DFDE	GTT	4	FSRU-Brazil
BW Pavilion Aranda	173,400	BW Gas	Daewoo	Oct-19	Singapore	MEGI-DF	GTT	4	Various
BW Pavilion Leeara	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	GTT	4	Various
BW Pavilion Vanda	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	GTT	4	Various
BW Singapore	170,000	BW Gas	Samsung	May-15	Singapore	DFDE	GTT	4	FSRU
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GTT	4	Yemen-Atlantic
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GTT	4	Yemen-Atlantic
BW Tulip	173,400	BW Gas	Daewoo	Jan-18	Malta	MEGI-DF	GTT	4	various
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GTT	4	Engas
Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	GTT	4	Various
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GTT		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GTT	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GTT	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
Cesi Beihai	174,100	MOL-China LNG	Hudong	June-17	Hong Kong	S	GTT	4	Australia-China
Cesi Gladstone	174,100	MOL-China LNG	Hudong	Oct-16	Hong Kong	S	GTT	4	Australia-China
Cesi Lianyungang	174,100	MOL-China LNG	Hudong	June-18	Hong Kong	S	GTT	4	Australia-China
Cesi Qingdao	174,100	MOL-China LNG	Hudong	Nov-16	Hong Kong	S	GTT	4	Australia-China
Cesi Tianjin	174,100	MOL-China LNG	Hudong	Sept-17	Hong Kong	S	GTT	4	Australia-China
Challenger FSRU	263,000	MOL LNG	Daewoo	Oct-17	St Kitts	DFDE	GTT	4	Various
Cheikh Bouamama	75,500	Skikda LNG Transport	USC	Jul-08	Bahamas	S	GTT	4	Sonatrach
Cheikh El Mokrani	75,500	Med LNG Corp	USC	Jun-07	Bahamas	S	GTT	4	Sonatrach
Christophe de Margerie	172,600	SCF	Daewoo	Nov-16	Cyprus	DFDE	GTT	4	Various
Clean Energy	150,000	Dynagas	Hyundai	Mar-07	Marshall Is.	S	GTT	4	Various
Clean Force	150,000	Dynagas	Hyundai	Jan-08	Marshall Is.	S	GTT	4	Various
Clean Ocean	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	GTT	4	Various
Clean Planet	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	GTT	4	Various
Clean Vision	160,000	Dynagas	Hyundai	Jun-15	Marshall Is.	DFDE	GTT	4	Various
Cool Explorer	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Cool Runner	160,000	Thenamaris	Samsung	May-14	Bermuda	DFDE	GTT	4	Various
Cool Voyager	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Corcovado LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Creole Spirit	174,000	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	GTT	4	Cheniere



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Cubal	160,400	Mitsui/NYK/Teekay	Samsung	Jan-12	Bahamas	DFDE	GTT	4	Various
Cygnus Passage	145,400	Cygnus LNG	Mitsubishi	Feb-09	Panama	S	Moss	4	Various
Dapeng Moon	147,000	China Ships	Hudong	Jul-09	China	S	GTT	4	Various
Dapeng Star	147,000	China Ships	Hudong	Nov-09	China	S	GTT	4	Various
Dapeng Sun	147,000	China Ships	Hudong	Jul-07	China	S	GTT	4	Woodside Energy
Diamond Gas Orchid	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
Diamond Gas Rose	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
Disha	136,000	Petronet LNG Ltd.	Daewoo	Jan-04	Malta	S	GTT	4	Qatargas
Doha	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-99	Japan	S	Moss	5	Qatargas
Duhail	210,100	ProNav	Daewoo	Jan-08	Germany	DRL	GTT	4	Various
Dukhan	135,000	J4 Consortium	Mitsui Chiba	Oct-04	Japan	S	Moss	4	Qatargas
Dwiputra	127,385	Humpuss Consortium	Mitsubishi Nagasaki	Mar-94	Bahamas	S	Moss	4	Pertamina
Ebisu	147,547	Golar LNG	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
Eduard Toll	172,000	Teekay-CLNG	Daewoo	Dec-17	Bahamas	MEGI-DF	GTT	4	Various
Ejnan	145,000	4J	Samsung	Jan-07	Bahamas	S	GTT		RasGas
Ekaputra	136,400	Humpuss Consortium	Mitsubishi Nagasaki	Jan-90	Liberia	S	Moss	5	Pertamina
Energy Advance	145,000	Tokyo LNG Tankers	Kawasaki Sakaide	Mar-05	Japan	S	Moss	4	Darwin
Energy Atlantic	159,924	Alpha	STX Jinhae	Sep-15	Malta	DFDE	GTT	4	Various
Energy Confidence	155,000	Tokyo LNG Tankers	Kawasaki	Apr-09	Panama	S	Moss	4	Various
Energy Frontier	147,600	Tokyo LNG Tankers	Kawasaki Sakaide	Sep-03	Japan	S	Moss	4	Darwin
Energy Glory	165,000	Tokyo LNG Tankers	JMU	Sept-18	Japan	S	Moss	4	Various
Energy Horizon	177,000	Tokyo LNG Tankers	Kawasaki	Jul-11	Japan	S	Moss	4	Pluto LNG
Energy Innovator	165 000	MOL-Tokyo gas	JMU Tsu	April-19	Japan	TFDE	IHI-SPB	4	Cove Point-Japan
Energy Liberty	165 000	MOL	JMU Tsu	Oct-18	Japan	TFDE	IHI-SPB	4	Various
Energy Navigator	147,000	Tokyo LNG Tankers	Kawasaki Sakaide	May-08	Japan	S	Moss	4	Various
Energy Progress	145,000	MOL	Kawasaki	Nov-06	Japan	S	Moss	4	Bayu Undan LNG
Energy Universe	165,000	MOL-Tokyo Gas	JMU Tsu	Sept-19	Japan	TFDE	IHI-SPB	4	Cove Point-Japan
Enshu Maru	165,257	K Line	Kawasaki	June-18	Japan	S	Moss	4	Various
Esshu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-14	Panama	S	Moss	4	Australia-Japan
Excalibur	138,200	Exmar/ Excelerate	Daewoo	Oct-02	Belgium	S	GTT	4	Various
Excel	138,106	Exmar/ MOL	Daewoo	Sep-03	Belgium	S	GTT	4	Various
Excelerate	138,000	Exmar/Excelerate	Daewoo	Oct-06	Belgium	S	GTT	4	Various
Excellence	138,000	GKFF Ltd.	Daewoo	May-05	Belgium	S	GTT	4	Excelerate Energy
Excelsior	138,000	Exmar	Daewoo	Jan-05	Belgium	S	GTT	4	Various
Exemplar	150,900	Excelerate	Daewoo	Jun-10	Belgium	S	GTT	4	Various
Expedient	151,000	Excelerate	Daewoo	Nov-09	Belgium	S	GTT	4	Various
Experience RV	174,000	Exmar/Excelerate	Daewoo	Jul-14	Marshall Is.	DFDE	GTT		Various
Explorer	150,900	Exmar/Excelerate	Daewoo	Mar-08	Belgium	S	GTT	4	Excelerate
Express	151,000	Exmar/Excelerate	Daewoo	May-09	Belgium	S	GTT	4	Various
Exquisite	150,900	Excelerate	Daewoo	Sep-09	Belgium	S	GTT	4	Various
Fedor Litke	172,636	Dynagas	Daewoo	Nov-17	Cyprus	DFDE	GTT	4	Various
Flex Endeavour	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Enterprise	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Rainbow	174,000	Flex LNG	Samsung	July-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Ranger	174,000	Flex LNG	Samsung	April-18	Marshall Is.	MEGI-DF	GTT	4	Various
Fraiha	210,100	J5 Consortium	Daewoo	Sep-08	Marshall Is.	DRL	GTT	4	Qatargas
FSRU Independence	170,000	Hoegh	Hyundai	Feb-14	NIS	DFDE	GTT	4	Various
FSRU Lampung	170,000	Hoegh	Hyundai	May-14	Indonesia	DFDE	GTT	4	Various
Fuji LNG	147,895	TMSC Gas	Kawasaki	Jun-04	Malta	S	Moss	4	Various
Fuwairit	138,000	Peninsular LNG	Samsung	Jan-04	Bahamas	S	GTT	4	RasGas II
Galea	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
Galicia Spirit	140,620	Teekay LNG Partners	Daewoo	Jul-04	Liberia	S	GTT	4	Engas
Gaselys	153,500	GdF/NYK	Atlantique	Mar-07	France	DFDE	CS 1	4	Engas
Gallina	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
GasLog Chelsea	153,000	GasLog	Hanjin Korea	Dec-09	Panama	TFDE	GTT	4	Various
Gaslog Geneva	174,000	GasLog	Samsung	Sept-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Genoa	174,000	GasLog	Samsung	Jun-18	Bermuda	TFDE	XDF	4	Various
Gaslog Gibraltar	174,000	GasLog	Samsung	Oct-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Glasgow	174,000	GasLog	Samsung	Jun-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Gladstone	174,000	GasLog	Samsung	May-19	Bermuda	XDF	GTT	4	Various
Gaslog Greece	174,000	GasLog	Samsung	Mar-16	Bermuda	TFDE	GTT	4	Shell charter
GasLog Hongkong	174,000	GasLog	Hyundai	Jun-18	Bermuda	XDF	GTT	4	Various
GasLog Houston	174,000	GasLog	Hyundai	Jan-18	Bermuda	XDF	GTT	4	Various
GasLog Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	GTT	4	Various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	GTT	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	GTT	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	GTT	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	GTT	4	Various



GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	GTT	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	GTT	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	GTT	4	Various
Gaslog Warsaw	174,000	GasLog	Samsung	May-19	Bermuda	TFDE	GTT	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	GTT	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell
Georgiy Brusilov	172,000	Dynagas	Daewoo	Jun-18	Cyprus	DFDE	GTT	4	Yamal LNG
Georgiy Ushakov	172,600	Teekay-China	JV Daewoo	Oct-19	Bahamas	MEGI-DF	GTT	4	Various
Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Gigira Laitebo	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	GTT	4	Various
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GTT	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	TFDE	GTT	4	Various
Golar Celsius	160,000	Golar LNG	Samsung	Sep-13	Bermuda	DFDE	GTT	4	Various
Golar Crystal	160,000	Golar LNG	Samsung	Oct-13	Bermuda	TFDE	GTT	4	Various
Golar Eskimo (FSRU)	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	GTT	4	Various
Golar Freeze	125,850	Golar LNG	HDW	Feb-77	UK	S	Moss	5	Various
Golar Glacier	162,000	Golar LNG	Hyundai	Sep-14	Marshall Is.	TFDE	GTT	4	Various
Golar Grand	145,880	Golar LNG	Daewoo	2006	IoM	S	GTT	4	Various
Golar Ice	160,000	Golar LNG	Samsung	Feb-15	Bermuda	DFDE	GTT	4	Various
Golar Igloo (FSRU)	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Golar Kelvin	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	GTT	4	Various
Golar Maria	145,950	Golar LNG	Daewoo	2006	Marshall Is.	S	GTT	4	Various
Golar Mazo	135,225	Golar LNG/PPP	Mitsubishi	Jan-00	Liberia	S	Moss	5	Pertamina
Golar Penguin	160,000	Golar LNG	Samsung	Mar-14	Marshall Is.	TFDE	GTT	4	Various
Golar Seal	160,000	Golar LNG	Samsung	Aug-13	Bermuda	TFDE	GTT	4	Various
Golar Singapore (FSRU)	160,000	Golar LNG	Samsung	June-15	Bermuda	TFDE	GTT	4	Various
Golar Snow	160,000	Golar LNG	Samsung	Jan-15	Bermuda	TFDE	GTT	4	Various
Golar Tundra (FSRU)	160,000	Golar LNG	Samsung	Dec-15	Bermuda	TFDE	GTT	4	Various
Golar Viking	140,000	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	Moss	4	Various
Golar Winter	138,250	Golar LNG	Daewoo	Apr-04	Marshall Is.	S	GTT	4	Petrobras
Grace Acacia	150,000	Algaet Shipping	Hyundai	Jan-07	Japan	S	GTT	4	Various
Grace Barleria	150,000	Swallowtail Ship	Hyundai	Oct-07	Japan	S	GTT	4	Various
Grace Cosmos	150,000	AGH Shipping	Hyundai	Mar-08	Japan	S	GTT	4	Various
Grace Dahlia	177,000	Tokyo Gas	Kawasaki	Oct-13	Japan	S	Moss	4	Various
Gracilis	138,830	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	GTT	4	Shell BG
Granatina	140,645	Shell Shipping	Daewoo	Dec-03	Singapore	S	GTT	4	Shell
Grand Aniva	147,200	Sovcomflot/NYK	Mitsubishi	Jan-08	Japan	S	Moss	4	Various
Grand Elena	147,200	Sovcomflot/NYK	Mitsubishi	Oct-07	Japan	S	Moss	4	Various
Grand Mereya	147,200	Primorsk/MOL/K Line	Chiba	May-08	Japan	S	Moss	4	Sakhalin II
Hanjin Muscat	138,200	Hanjin Shipping	Hanjin	Jul-99	Panama	S	GTT	4	Oman Gas
Hanjin Pyeong Taek	130,600	Hanjin Shipping	Hanjin	Sep-95	Panama	S	GTT	4	Pertamina
Hanjin Ras Laffan	138,214	Hanjin Shipping	Hanjin	Jul-00	Panama	S	GTT	4	QatarGas
Hanjin Sur	138,333	Hanjin Shipping	Hanjin	Jan-00	Panama	S	GTT	4	Oman Gas
Hispania Spirit	140,500	Teekay LNG Partners	Daewoo	Sep-02	Spain	S	GTT	4	Atlantic LNG
Hoegh Esperanza FSRU	170,000	Hoegh	Hyundai	April-18	Norway	DFDE	GTT	4	Various
Hoegh Gallant FSRU	170,050	Hoegh LNG	Hyundai	May-14	Marshall Is.	DFDE	GTT	4	chartered
Hoegh Giant FSRU	170,050	Hoegh LNG	Hyundai	Jan-18	Marshall Is.	DFDE	GTT	4	various
Hoegh Grace FSRU	170,050	Hoegh LNG	Hyundai	May-15	Marshall Is.	DFDE	GTT	4	various
Hyundai Aquapia	135,000	Hyundai MM	Hyundai	Mar-00	Panama	S	Moss	4	Oman Gas
Hyundai	135,000	Hyundai MM	Hyundai	Jan-00	Panama	S	Moss	4	RasGas
Hyundai Ecopia	145,000	Hyundai	Hyundai	Nov-08	Panama	S	GTT	4	Various
Hyundai Greenpia	125,000	Hyundai MM	Hyundai	Nov-96	Panama	S	Moss	4	Pertamina
Hyundai Oceanpia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	Oman Gas
Hyundai Technopia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	RasGas
Hyundai Utopia	125,182	Hyundai MM	Hyundai	Jun-94	Panama	S	Moss	4	Pertamina
Iberica Knutsen	138,000	Knutsen OAS	Daewoo	Aug-06	Norway	S	GT 96	4	Gas Natural
Ibra LNG	147,100	Oman Gas	Samsung	Jun-06	Panama	S	GTT	4	Oman LNG
Ibri LNG	145,000	Oman Gas	Mitsubishi	Jul-06	Panama	S	GTT	4	Oman LNG
Ish	137,540	National Gas Shipping	Mitsubishi Nagasaki	Nov-95	Liberia	S	Moss	5	ADGAS
K Acacia	138,017	Korea Line	Daewoo	Jan-00	Panama	S	GTT	4	Oman Gas
K Freesia	135,256	Korea Line	Daewoo	Jun-00	Panama	S	GTT	4	RasGas
Kinisis	173,400	K-Line	Daewoo	Jan-18	Liberia	MEGI-DF	GTT	4	Various
K Jasmine	145,700	Korea Line	Daewoo	Mar-08	Panama	S	GTT	4	Kogas offtake
K Mugungwha	152,000	K Line	Daewoo	Nov-08	Panama	S	GTT	4	Various
Kita LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Kotawaka Maru	125,200	J3 Consortium	Kawasaki Sakaide	Jan-84	Japan	S	Moss	5	Darwin



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Kumul	172,000	MOL	Hudong	May-16	Hong Kong	DRL	GTT	4	PNG-Asia
Lalla Fatma N'Soumer	145,000	Algeria Nippon Gas	Kawasaki Sakaide	Dec-04	Bahamas	S	Moss	4	Various
Lijmilya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GTT	5	Various
LNG Abalamabie	174,900	Bonny Gas	Samsung	Nov-16	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Abuja	126,530	Bonny Gas Transport	GD Quincy	Sep-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Abuja II	174,900	Bonny Gas	Samsung	Oct 16	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Adamawa	141,000	Bonny Gas Transport	Hyundai	Jun-05	Bermuda	S	Moss	4	Various
LNG Akwa Ibom	141,000	Bonny Gas Transport	Hyundai	Nov-04	Bermuda	S	Moss	4	Various
LNG Aquarius	126,300	MOL/LNG Japan	GD Quincy	Jun-77	Marshall Is.	S	Moss	5	Various
LNG Barka	153,000	NYK	Kawasaki	Jan-09	Bahamas	S	Moss	4	Various
LNG Bayelsa	137,500	Bonny Gas Transport	Hyundai	Feb-03	Bermuda	S	Moss	4	Nigeria LNG
LNG Benue	145,700	BW Gas	Daewoo	Mar-06	Bermuda	S	GTT	4	Nigeria LNG
LNG Bonny	177,000	Bonny Gas Transport	Hyundai	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Borno	149,600	NYK Line	Samsung	Aug-07	Japan	S	GTT	4	Nigeria LNG
LNG Capricorn	126,300	MOL/LNG Japan	GD Quincy	Jun-78	Marshall Is.	S	Moss	5	Pertamina
LNG Cross River	141,000	Bonny Gas Transport	Hyundai	Sep-05	Bermuda	S	Moss	4	Various
LNG Dream	145,000	Osaka Gas	Kawasaki	Sep-06	Japan	S	Moss	4	Woodside Energy
LNG Dubhe	174,000	MOL-Cosco	Hudong	Sept-19	China	S	GTT	4	Russia-Asia
LNG Ebisu	147,500	MOL	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
LNG Edo	126,530	Bonny Gas Transport	GD Quincy	May-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Enugu	145,000	BW Gas	Daewoo	Oct-05	Bermuda	S	GTT	4	Nigeria LNG
LNG Fimina	175,000	Bonny Gas Transport	Samsung	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Flora	127,700	J3 Consortium	Kawasaki Sakaide	Mar-93	Japan	S	Moss	4	Pertamina
LNG Fukurokuju	165,000	MOL	Kawasaki	June-15	Japan	S	Moss	4	Various
LNG Gemini	126,300	MOL/LNG Japan	GD Quincy	Sep-78	Marshall Is.	S	Moss	5	Pertamina
LNG Imo	148,300	BW Gas	Daewoo	Jun-08	Bermuda	S	GTT	4	Nigeria LNG
LNG Jamal	135,330	Osaka Gas/J3 Consortium	Mitsubishi Nagasaki	Oct-00	Japan	S	Moss	5	Oman Gas
LNG Juno	177,300	MOL-Osaka	Mitsubishi	Oct-18	Marshall Is.	DFDE	Moss	4	Freeport LNG/Various
LNG Jupiter	145,000	NYK Line	Kawasaki	Jul-09	Bahamas	S	Moss	4	Various
LNG Jurojin	155,300	MOL	MHI Nagasaki	Nov-15	Japan	S	KM	4	Various
LNG Kano	148,471	BW Gas	Daewoo	Jan-07	Bermuda	S	GTT	4	NLNG
LNG Lagos	177,000	Bonny Gas	Hyundai	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Leo	126,400	MOL/LNG Japan	GD Quincy	Dec-78	Marshall Is.	S	Moss	5	Pertamina
LNG Lerici	65,000	Exmar	Italcantieri Sestri	Mar-98	Italy	S	GTT	4	Sonatrach
LNG Libra	126,400	Hoegh LNG	GD Quincy	Apr-79	Marshall Is.	S	Moss	5	Various
LNG Lokoja	148,300	BW Gas	Daewoo	Dec-06	Bermuda	S	GTT	4	Nigeria LNG
LNG Mars	155,000	MOL/Osaka Gas	Mitsubishi	Oct-16	Marshall Is.	S	Moss	5	Various
LNG Merak	174,000	MOL-Cosco	Hudong	Nov-19	China	S	GTT	4	Russia-Asia
LNG Ogun	148,300	NYK Line	Samsung	Aug-07	Japan	S	GTT	4	Nigeria LNG
LNG Ondo	148,300	BW Gas	Daewoo	Sep-07	Bermuda	S	GTT	4	Nigeria LNG
LNG Oyo	140,500	BW Gas	Daewoo	Dec-05	Bermuda	S	GTT	4	Nigeria LNG
LNG Pioneer	138,000	MOL	Daewoo	Jul-05	Bahamas	S	GTT	4	Idku
LNG Port Harcourt	175,000	Bonny Gas	Samsung	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Portovenere	65,000	Exmar	Italcantieri Sestri	Jun-96	Italy	S	GTT	4	Sonatrach
LNG River Niger	141,000	Bonny Gas Transport	Hyundai	May-06	Bermuda	S	Moss	4	Various
LNG River Orashi	145,910	BW Gas	Daewoo	Nov-04	Bermuda	S	GTT	4	Nigeria LNG
LNG Rivers	137,231	Bonny Gas Transport	Hyundai	Jun-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Sakura	177,000	NYK-Kepco	Kawasaki	Mar-18	Bahamas	DFDE	GTT	4	Various
LNG Saturn	153,000	MOL	MHI	Nov-15	Japan	S	Moss	4	Various
LNG Schneeweisschen	180,000	MOL-Itochu	Daewoo	Aug-18	Panama	XDF	GTT	4	Various
LNG Sokoto	137,231	Bonny Gas Transport	Hyundai	Aug-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Taurus	126,300	MOL/LNG Japan	GD Quincy	Aug-79	Marshall Is.	S	Moss	5	Various
LNG Venus	155,000	Osaka/MOL	MHI	Oct-14	Japan	S	Moss	4	Various
LNG Vesta	127,547	Tokyo Gas Consortium	Mitsubishi Nagasaki	Jun-94	Japan	S	Moss	4	Pertamina
LNG Virgo	126,400	MOL/LNG Japan	GD Quincy	Dec-79	Marshall Is.	S	Moss	5	Pertamina
Lobito	160,400	Mitsui/NYK/Teekay	Samsung	Oct-11	Bahamas	DFDE	GTT	4	Various
Lusail	138,000	Peninsular LNG	Samsung	May-05	Bahamas	S	GTT	4	Qatar
Macoma	173,400	Teekay	Daewoo	Oct-17	Bahamas	DFDE	GTT	4	Various
Madrid Spirit	138,000	Teekay LNG Partners	IZAR Puerto Real	Jan-05	Spain	S	GTT	4	Engas
Magdala	173,400	Teekay	Daewoo	Feb-18	Bahamas	DFDE	GTT	4	Various
Magellan Spirit	165,500	Teekay LNG Partners	Samsung	Sep-08	Denmark	DFDE	GTT	4	Various
Malanje	160,400	Mitsui/NYK/Teekay	Samsung	Jul-11	Bahamas	DFDE	GTT	4	Various
Maran Gas Achilles	174,000	Maran	Hyundai Samho	Feb-16	Greece	DFDE	GTT	4	Various
Maran Gas Agamemnon	174,000	Maran	Hyundai Samho	May-16	Greece	DFDE	GTT	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	GTT	4	Various
Maran Gas Amphipolis	173,400	Maran	Daewoo	Aug-16	Greece	DFDE	GTT	4	Various
Maran Gas Apollonia	161,870	Maran	Daewoo	Jan-14	Greece	DFDE	GTT	4	Various
Maran Gas Asclepius	145,000	Kristen Navigation	Daewoo	Jul-05	Bermuda	S	GTT	4	Qatar

CARRIER FLEET



Maran Gas Chios	173,548	Maran	Daewoo	March-19	Greece	DFDE	GTT	4	Various
Maran Gas Coronis	145,700	Maran	Daewoo	Sep-07	Greece	S	GTT	4	Rasgas II
Maran Gas Delphi	159,800	Maran	Daewoo	Feb-14	Greece	DFDE	GTT	4	Various
Maran Gas Efessos	159,800	Maran	Daewoo	Jun-14	Greece	DFDE	GTT	4	Various
Maran Gas Hector	174,000	Maran	Hyundai Samho	Nov-16	Greece	DFDE	GTT	4	Various
Maran Gas Hydra	173,617	Maran	Daewoo	Feb-19	Greece	DFDE	GTT	4	Various
Maran Gas Lindos	159,800	Maran	Daewoo	Jun-15	Greece	DFDE	GTT	4	Various
Maran Gas Mystras	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GTT	4	Various
Maran Gas Olympias	174,500	Maran	DSME	Feb-17	Greece	DFDE	GTT	4	Various
Maran Gas Pericles	174,000	Maran	Hyundai Samho	June-16	Greece	DFDE	GTT	4	Various
Maran Gas Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GTT	4	Various
Maran Gas Roxana	173,400	Maran	Daewoo	Jan-17	Greece	DFDE	GTT	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	GTT	4	Various
Maran Gas Spetses	174,000	Maran	Daewoo	Feb-18	Greece	DFDE	GTT	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GTT	4	various
Maran Gas Ulysses	174,000	Maran	Hyundai Samho	Jan-17	Greece	DFDE	GTT	4	Various
Maran Gas Vergina	173,605	Maran	Daewoo	Dec-2016	Greece	DFDE	GTT	4	Various
Maria Energy	174,000	Tsakos	Hyundai	Mar-15	Marshall Is.	TFDE	GTT	4	Various
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	GTT	4	Various
Marshal Vasilevskiy	174,000	Gazprom	Hyundai	Russia	Jan-2019	DFDE	GTT	4	Russia-FSRU
Marvel Crane	177,000	NYK-Mitsui	Mitsubishi	Mar-19	Singapore	S	Moss	4	US/Various
Marvel Eagle	155,000	MOL-Osaka	Kawasaki	Sept-18	Marshall Is.	S	Moss	4	Cameron LNG/Various
Marvel Falcon	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Cameron LNG/Various
Marvel Hawk	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Cameron LNG/Various
Marvel Kite	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Various
Marvel Pelican	155,000	MOL-Mitsui	Kawasaki	Dec-19	Marshall Is.	DFD	Moss	4	Cameron LNG-Various
Matthew	126,540	Suez LNG Shipping	Newport News	Jun-79	Bahamas	S	GTT	6	Atlantic LNG
Megara	173,000	Teekay	Daewoo	Oct-18	Bahama	MEGI-DF	GTT	4	Various
Mekaines	266,000	Naklilat	Samsung	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Meridian Spirit	165,500	Teekay LNG	Samsung	Jan-10	Denmark	DFDE	GTT	4	Various
Mesaimeer	210,100	Naklilat	Hyundai	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Methane Alison Victoria	145,000	GasLog	Samsung	Aug-07	Bermuda	S	GTT	4	Eq.Guinea LNG
Methane Becki Anne	170,000	GasLog	Samsung	Sep-10	Bermuda	TFDE	GTT	4	Various
Methane Heather Sally	145,000	GasLog	Samsung	Jul-07	Bermuda	S	GTT	4	Eq.Guinea LNG
Methane Jane Elizabeth	145,000	GasLog	Samsung	Jun-06	Bermuda	TFDE	GTT	4	Engas
Methane Julia Louise	170,000	GasLog	Samsung	Dec-09	Bermuda	TFDE	GTT	4	Various
Methane Kari Elin	138,200	Shell	Samsung	Jun-04	Bermuda	S	GTT	4	Various
Methane Lake Charles	145,000	Shell	Samsung	Feb-07	Bermuda	S	GTT	4	Marathon Oil
Methane Lydon Volney	145,000	Shell	Samsung	Aug-06	Bermuda	S	GTT	4	Engas
Methane Mickie Harper	170,000	Shell-GasLog	Samsung	Nov-10	Bermuda	TFDE	GTT	4	Various
Methane Nile Eagle	145,000	Shell-GasLog	Samsung	Dec-07	Bermuda	S	GTT	4	Engas
Methane Patricia Camila	170,000	Shell-GasLog	Samsung	Oct-10	Bermuda	TFDE	GTT	4	Various
Methane Princess	138,159	Golar LNG	Daewoo	2003	UK	S	GTT	4	Spot BG
Methane Rita Andre	145,000	GasLog	Samsung	Mar-06	Bermuda	S	GTT	4	Engas
Methane Shirley Elizabeth	145,000	GasLog	Samsung	Apr-07	Bermuda	S	GTT	4	Marathon Oil
Methane Sprit	165,000	Teekay LNG	Samsung	Mar-08	Singapore	DFDE	GTT	4	Various
Milaha Qatar	145,000	Milaha	Samsung	Apr-06	Denmark	S	GTT	4	Qatar
Milaha Ras Laffan	138,270	Milaha	Samsung	Mar-04	Denmark	S	GTT	4	RasGas II
Min Lu	147,000	China Ships	Hudong	Aug-09	China	S	GTT	4	Various
Min Rong	147,000	China LNG Ships	Hudong	Feb-09	Hong Kong	S	GTT	4	Australia-China
Mourad Didouche	126,130	Hyproc Shipping	Atlantique	Jul-80	Algeria	S	GTT	5	Sonatrach
Mozah	266,000	QGTC	Samsung	Aug-08	Qatar	DRL	GTT	5	Qatargas II
Mraweh	137,000	National Gas Shipping	Kvaerner-Masa	Jun-96	Liberia	S	Moss	4	ADGAS
Mubaraz	137,000	National Gas Shipping	Kvaerner-Masa	Jan-96	Liberia	S	Moss	4	Various
Muraq	210,100	J5-K Line	Daewoo	May-08	Marshall Is.	DRL	GTT	4	Qatar-Atlantic Basin
Murex	173,400	Teekay	Daewoo	Oct-17	Bahamas	DFDE	GTT	4	Various
Murwab	210,100	J5 Consortium	Daewoo	May-08	Marshall Is.	DRL	GTT	4	Qatargas
Muscat LNG	149,170	Oman Gas/MOL	Kawasaki Sakaide	Mar-04	Japan	S	Moss	4	Oman Gas
Myrina	173,000	Teekay	Daewoo	Sept-18	Bahamas	MEGI-DF	GTT	4	Various
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT	4	Various
Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	GTT	4	Various
Nikolay Urvantsev	172,000	MOL-China Ships	Daewoo	Nov-19	Hong Kong	DFDE	GTT	4	Yamal
Nikolay Yevgenov	172,600	Teekay	Daewoo	Oct-18	Bahamas	MEGI-DF	GTT	4	Various
Nikolay Zubkov	172,600	Dynagas	Daewoo	Nov-18	Cyprus	DFDE	GTT	4	Yamal LNG
Nizwah LNG	145,000	Oryx LNG Carriers	Kawasaki Sakaide	Dec-05	Japan	S	Moss	4	Oman Gas
Northwest Sanderling	127,525	Australia LNG	Mitsubishi Nagasaki	Jun-89	Australia	S	Moss	4	NWS
Northwest Sandpiper	127,500	Australia LNG	Mitsui Chiba	Feb-93	Australia	S	Moss	4	NWS
Northwest Seaeagle	127,450	Australia LNG	Mitsubishi Nagasaki	Nov-92	Bermuda	S	Moss	4	NWS



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Northwest Shearwater	127,500	Australia LNG	Kawasaki Sakaide	Sep-91	Bermuda	S	Moss	4	NWS
Northwest Snipe	127,747	Australia LNG	Mitsui Chiba	Sep-90	Australia	S	Moss	4	NWS
Northwest Stormpetrel	127,600	Australia LNG	Mitsubishi Nagasaki	Dec-94	Australia	S	Moss	4	NWS
Northwest Swallow	127,708	J3 Consortium	Mitsui Chiba	Nov-89	Japan	S	Moss	4	NWS
Northwest Swan	138,000	Australia LNG	Daewoo	Mar-04	Australia	S	GTT	4	NWS
Northwest Swift	127,590	J3 Consortium	Mitsubishi Nagasaki	Sep-89	Japan	S	Moss	4	NWS
Noshu Maru	180,000	MOL-Jera	MHI-Nagasaki	Feb-19	Japan	S-gas	Moss	4	US-Japan
Oak Spirit	173,400	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	GTT	4	Cheniere
Ob River	150,000	Lance Shipping	Hyundai	Oct-07	Marshall Is.	S	GTT	4	Various
Oceanic Breeze	155,300	K-Line	Mitsubishi-Nagasaki	June-18	Japan	S	Moss	4	Darwin-Japan
Onaiza	210,100	Nakilat	Daewoo	Apr-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Ougarta	171,866	Hyproc Shipping	Hyundai	Mar-17	Algeria	DFDE	GTT	4	Sonatrach
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM	4	Various
Pacific Breeze	182,000	K Line	Kawasaki	Mar-18	Marshall Is.	DFDE	Moss	4	Ichthys LNG
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific Eurys	137,000	LNG Marine Transport	Mitsubishi Nagasaki	Mar-06	Bahamas	S	Moss	4	Darwin
Pacific Mimosa	155,300	NYK Line	MHI	Nov-17	Bahamas	S	Moss	4	Australia-Japan
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi Nagasaki	Sep-03	Bahamas	S	Moss	5	Darwin
Palu LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Pan Americas	174,000	Teekay	Hudong	Mar-18	Hong Kong	TFDE	GTT	4	US-Asia
Pan Asia	174,000	Teekay	Hudong-Zhonghua	July-17	Bahamas	TFDE	GTT	4	Cheniere
Pan Europe	174,000	Teekay	Hudong	Sept-18	Hong Kong	TFDE	GTT	4	US-global
Papua	171,800	MOL-China	Hudong	Jan-15	Hong Kong	DFDE	SSD	4	PNG LNG
Patris	173,400	K-Line	Daewoo	Feb-18	Liberia	MEGI-DF	GTT	4	Various
Polar Eagle	89,880	Polar LNG	IHI Chita	Jun-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Prachi	173,000	NYK-SCI	Hyundai	Nov-16	Singapore	TFDE	GTT	4	Petronet
Prism Agility	180,024	SK Shipping	Hyundai	April-19	Panama	DFDE	GTT	5	Various
Prism Brilliance	180,016	SK Shipping	Hyundai	March-19	Panama	DFDE	GTT	5	Various
Provalys	153,500	Gaz de France	Chantiers	Nov-06	France	DFDE	CS1	4	ELNG
Pskov	170,200	SovComFlot	STX	Mar-14	Liberia	DFDE	GTT	4	Various
Puteri Delima	130,400	MISC	Atlantique	Jan-95	Malaysia	S	GTT	4	Petronas
Puteri Delima Satu	137,100	MISC	Mitsui Chiba	Apr-02	Malaysia	S	GTT	4	Petronas
Puteri Firuz	130,400	MISC	Atlantique	May-97	Malaysia	S	GTT	4	Petronas
Puteri Firuz Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-04	Malaysia	S	GTT	4	Petronas
Puteri Intan	130,400	MISC	Atlantique	Aug-94	Malaysia	S	GTT	4	Petronas
Puteri Intan Satu	137,100	MISC	Mitsubishi Nagasaki	Dec-01	Malaysia	S	GTT	4	Petronas
Puteri Mutiera Satu	137,100	MISC	Mitsui Chiba	Apr-05	Malaysia	S	GTT	4	Petronas
Puteri Nilam	130,400	MISC	Atlantique	Jun-95	Malaysia	S	GTT	4	Petronas
Puteri Nilam Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-03	Malaysia	S	GTT	4	Petronas
Puteri Zamrud	130,400	MISC	Atlantique	May-96	Malaysia	S	GTT	4	Petronas
Puteri Zamrud Satu	137,100	MISC	Mitsui Chiba	Apr-87	Malaysia	S	GTT	4	Atlantic LNG
Raahi	136,000	Petronet LNG Ltd	Daewoo	Dec-04	Malta	S	GTT	4	Qatargas
Ramdane Abane	126,130	Hyproc Shipping	Atlantique	Jul-81	Algeria	S	GTT	5	Sonatrach
Rasheeda	266,000	QGTC	Samsung	Jun-10	Liberia	DRL	GTT		Various
Rias Baixas Knutsen	180,000	Knutsen	Hyundai	Aug-19	Spain	MEGI-DF	GTT	4	Various
Ribera del Duero Knutsen	173,400	Knutsen	Daewoo	Nov-10	Nor-NIS	DFDE	GTT	4	Various
Rioja Knutsen	176,300	Knutsen	Daewoo	Dec-16	Nor-NIS	DFDE	GTT	4	Various
Rudolf Samoylovich	172,652	Teekay-CLNG	Daewoo	Oct-18	Bahamas	MEGI-DF	GTT	4	Various
Salalah LNG	147,000	Oman Gas/MOL	Samsung	Dec-05	Japan	S	GTT	4	Oman
SCF Polar	71,500	Sovcomflot	Kockums	Aug-69	Liberia	S	GTT	6	Sonatrach
Sean Spirit	174,000	Teekay	Hyundai Samho	Feb-19	Bahama	MEGI-DF	GTT	4	Various
Seishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Jan-15	Panama	S	Moss	4	Australia-Japan
Seri Alam	138,000	MISC	Samsung	Oct-05	Malaysia	S	GTT	4	Yemen LNG
Seri Amanah	145,000	MISC	Samsung	Mar-06	Malaysia	S	GTT	4	Yemen LNG
Seri Anggun	145,000	MISC	Samsung	Nov-06	Malaysia	S	GTT	4	Yemen LNG
Seri Angkasa	145,000	MISC	Samsung	Feb-07	Malaysia	S	GTT	4	Petronas
Seri Ayu	145,000	MISC	Samsung	Oct-07	Malaysia	S	GTT	4	Various
Seri Bakti	152,300	MISC	Mitsubishi	Mar-07	Malaysia	S	GTT	4	Petronas
Seri Balhaf	152,000	MISC	Mitsubishi	Sep-08	Malaysia	S	GTT	4	Various
Seri Balquis	152,000	MISC	Mitsubishi	Dec-08	Malaysia	S	GTT	4	Various
Seri Begawan	152,300	MISC	Mitsubishi	Dec-07	Malaysia	S	GTT	4	Various
Seri Bijaksana	152,300	MISC	Mitsubishi	Feb-08	Malaysia	S	GTT	4	Petronas
Seri Camar	150,200	MISC	Hyundai	Feb-18	Malaysia	S	Moss	4	Petronas
Seri Camellia	150,000	MISC	Hyundai	Nov-16	Malaysia	S	Moss	4	Petronas
Seri Cemara	150,200	MISC	Hyundai	Apr-18	Malaysia	S	Moss	4	Petronas
Seri Cempak	150,200	MISC	Hyundai	Feb-18	Malaysia	S	Moss	4	Petronas
Seri Cenderawasih	150,000	MISC	Hyundai	Jan-17	Malaysia	S	Moss	4	Petronas
Sestao Knutsen	138,000	Knutsen	IZAR Sestao	Jan-07	Spain	S	GTT	4	Atlantic LNG

CARRIER FLEET



Sevilla Knutsen	173,400	Knutsen	Daewoo	Jun-10	N.I.S.	DFDE	GTT	4	Various
Shahamah	135,500	National Gas Shipping	Kawasaki Sakaide	Oct-94	Liberia	S	Moss	5	ADGAS
Shangra	266,000	QGTC	Samsung	Nov-09	Liberia	DRL	GTT	5	Qatargas IV
Shen Hai	147,100	China LNG	Hudong Zhonghua	Sep-12	China	AB/CC Steam	GTT	4	Various
Simaisma	147,700	Maran Gas Maritime	Daewoo	Jul-06	Greece	S	GTT	4	Qatar
SK Audace	180,000	SK-Marubeni	Samsung	Jul-17	Panama	XDF	GTT	4	Various
SK Resolute	180,000	SK-Marubeni	Samsung	Jun-18	Panama	XDF	GTT	4	Various
SK Splendor	138,375	SK Shipping	Samsung	Mar-00	Panama	S	GTT	4	Oman Gas
SK Stellar	138,375	SK Shipping	Samsung	Dec-00	Panama	S	GTT	4	RasGas
SK Summit	138,000	SK Shipping	Daewoo	Aug-99	Panama	S	GTT	4	RasGas
SK Sunrise	138,306	I. S. Carriers	Samsung	Sep-03	Panama	S	GTT	4	RasGas
SK Supreme	138,200	SK Shipping	Samsung	Jan-00	Panama	S	GTT	4	RasGas
Sohar LNG	137,250	Oman Gas/ MOL	Mitsubishi Nagasaki	Oct-01	Malta	S	Moss	5	Oman Gas
Sohshu Maru	180,000	MOL	Kawasaki HI	Nov-19	Japan	S-gas	Moss	4	Various-Japan
Solaris	155,000	GasLog	Samsung	Jul-14	Bermuda	TFDE	GTT	4	Various
Sonangol Benguela	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Sonangol Etosha	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Sonangol Sambizanga	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Southern Cross	172,000	MOL	Hudong	May-15	Hong Kong	DRL	GTT	4	Various
Soyo	160,400	Mitsui/NYK/Teekay	Samsung	May-11	Bahamas	DFDE	GTT	4	Various
Spirit of Hela	177,000	MOL	Hyundai	Oct-09	Panama	DFDE	GTT	4	Various
Stena Blue Sky	145,700	Stena	Daewoo	Jan-06	Panama	S	GTT	4	Various
Stena Clear Sky	171,800	Stena	Daewoo	Sep-10	Panama	DFDE	GTT	4	Various
Stena Crystal Sky	171,800	Stena	Daewoo	Jul-10	Panama	DFDE	GTT	4	Various
STX Kolt	145,700	STX Panocean	Korea Hanjin	Nov-08	Panama	DFDE	GTT	4	Various
Suez Point Fortin	154,200	Trinity LNG	Koyo Japan	Nov-09	Panama	S	GTT	4	Yemen LNG
Symphonic Breeze	147,608	K-Line	Mitsubishi Nagasaki	Oct-07	Bahamas	DFDE	Moss	4	Australia-Japan
Taitar No. 1	145,000	NYK Line	Mitsubishi	Oct-09	Liberia	S	Moss	4	Various
Taitar No. 3	145,000	NYK Line	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Taitar No. 4	145,000	NYK	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Tangguh Batur	145,700	Sovcomflot/NYK	Daewoo	Dec-08	Cyprus	S	GTT		Tangguh
Tangguh Foja	155,000	K Line	Samsung	Jul-08	Panama	DFDE	GTT	4	Tangguh LNG
Tangguh Hiri	155,000	Teekay LNG	Hyundai	Nov-08	Isle of Man	DFDE	GTT	4	Tangguh
Tangguh Jaya	145,700	K Line	Samsung	Nov-08	Panama	DFDE	GTT	4	Tangguh
Tangguh Palung	155,000	K Line	Samsung	Mar-09	Panama	DFDE	GTT	4	Tangguh
Tangguh Sago	155,000	Teekay LNG	Hyundai	Mar-09	Isle of Man	DFDE	GTT	4	Tangguh LNG
Tangguh Towuti	145,700	Sovcomflot/NYK	Daewoo	Oct-08	Cyprus	S	GTT	4	Tangguh
Tembek	216,200	OSG/Nakilat	Samsung	Sep-07	Marshall Is.	DRL	GTT	4	Qatargas II
Tenaga Satu	130,000	MISC	Dunkerque	Sep-82	Malaysia	S	GTT	5	Petronas
Tessala	171,866	Hyproc Shipping	Hyundai	Dec-16	Algeria	DFDE	GTT	4	Sonatrach
Torben Spirit	173,000	Teekay	Daewoo	Feb-17	Bahama	MEGI-DF	GTT	4	Various
Trinity Arrow	154,900	K Line	Imabari Shipbuilding	Mar-08	Panama	S	GTT	4	Various
Umm Al Amad	210,100	J5	Daewoo	Aug-08	Marshall Is.	DRL	GTT	4	Ras Gas III
Umm Al Ashtan	137,000	National Gas Shipping	Kvaerner- Masa	May-97	Liberia	S	Moss	4	ADGAS
Umm Bab	145,000	Kristen Navigation	Daewoo	Nov-05	Bermuda	S	GTT	4	Qatargas
Umm Slaal	266,000	QGTC	Samsung	Nov-08	Qatar	DRL	GTT	5	Qatargas
Valencia Knutsen	173,400	Knutsen	Daewoo	Sep-10	Nor-NIS	DFDE	GTT	4	Various
Velikiy Novgorod	170,200	SovComFlot	STX	Feb-14	Liberia	DFDE	GTT	4	Various
Vladimir Rusanov	172,000	MOL-China Shipping	Daewoo	Mar-18	Hong Kong	DFDE	GTT	4	Yamal
Vladimir Viz	172,000	MOL-China Shipping	Daewoo	Sept-18	Hong Kong	DFDE	GTT	4	Yamal
Vladimir Voronin	172,600	Teekay	Daewoo	Jun-19	Bahamas	MEGI-DF	GTT	4	Various
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GTT	4	Various
WilPride	156,000	Teekay	Daewoo	June-13	NIS	DFDE	GTT	4	Various
Woodside Cheney	174,000	Maran	Hyundai Samho	Mar-16	Greece	DFDE	GTT	4	Various
Woodside Donaldson	165,500	Teekay LNG	Samsung	Dec-09	Singapore	DFDE	GTT	4	Various
Woodside Goode	159,800	Maran	Daewoo	Jul-14	Greece	DFDE	GTT	4	Various
Woodside Reeswithers	173,400	Maran	Daewoo	Nov-16	Greece	DFDE	GTT	4	Various
Woodside Rogers	155,900	Maran Gas	DSME	Jul-13	Greece	DFDE	GTT	4	Various
Yakov Gakkal	172,600	Teekay-China JV	Daewoo	Nov-19	Bahamas	MEGI-DF	GTT	4	Various
Yamal Spirit	174,000	Teekay	Hyundai Samho	Jan-19	Bahama	MEGI-DF	GTT	4	Various
Yari LNG	159,983	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Yenisei River	155,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	GTT	4	Various
YK Sovereign	127,125	SK Shipping	Hyundai	Dec-94	Panama	S	Moss	4	Pertamina
Zarga	266,000	QGTC	Samsung	Dec-09	Liberia	DRL	GTT	5	Qatar-Atlantic
Zekreet	135,420	J4 Consortium	Mitsui Chiba	Dec-98	Japan	S	Moss	5	Qatargas

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

LNG Import Terminals

Explanatory Notes

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

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

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
Belgium	Zeebrugge	Fluxys	1987	4	380,000
Canada	Canaport Saint John	Irving Oil, Repsol	2009	3	480,000
Chile	Quintero	ENAP, Metrogas, Enagas	2009	3	334,000
	Mejillones	Engie, Ameris Capital AGF	2010	1	175,000
China	Beihai LNG, Guangxi	Sinopec	2015	4	640,000
	Dalian	PetroChina	2011	3	480,000
	Dapeng ND Guangdong	CNOOC	2018	4	640,000
	Dongguan, Guangdong	Jovo Group	2013	2	160 000
	Fujian LNG (Xiuyu)	CNOOC, Fujian I&D Corp.	2008	2	640,000
	Guangdong	CNOOC,BP	2006	3	480,000
	Haikou, Hainan LNG	CNOOC	2014	3	480,000
	Ningbo, Zhejiang	CNOOC, Zhejiang Energy	2012	3	480,000
	Qidong, Jiangsu	Guanghui Energy	2018	1	60,000
	Qingdao, Shandong	Sinopec	2014	3	480,000
	Rudong	PetroChina	2011	3	530,000
	Shanghai	CNOOC, Shenergy Group	2009	3	495,000
	Shanghai, Mengtougou	Shanghai Gas	2008	3	120 000
	Shenzen, Diefu	CNOOC	2016	2	320,000
	Tangshan, Hebei	PetroChina	2013	3	480,000
	Tianjin North	Sinopec	2017	2	320,000
	Yuedong, Guangdong	CNOOC	2016	2	320,000
	Zhoushan Zhejiang	Enn Group	2018	2	320,000
	Zhuhai, Gaolan	CNOOC	2013	3	480,000
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160 000
Finland	Pori	Gasum Skangas	2016	1	30,000
	Tornio	Gasum Skangas	2018	1	30,000
France	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
	Dunkirk LNG	EDF, Fluxys, Total	2016	3	570,000
Gibraltar	Gasnor	Shell	2018	1	5,000
Greece	Revithoussa	DEPA	2000	3	225,000
India	Dabhol	GAIL, NTPC (Ratnagiri Gas & Power)	2009	3	480,000
	Dahej	Petronet LNG	2004	4	592,000
	Hazira	Shell India, Total	2005	2	320,000
	Kochi, Kerala	Petronet LNG	2013	2	320,000
	Mundra	Gujarat State Petroleum, Adani Group	2018	2	320,000
	Kamarajar (Ennore), Tamil Nadu	Indian Oil, DFC, ICICI Bank	2019	2	360,000
Indonesia	Arun	Pertamina	2015	5	507,000
Italy	Panigaglia	Snam	1969	2	100,000
	Porto Levante (offshore GBS)	ExxonMobil, Qatar Petroleum, Edison Gas	2009	2	250,000
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	2019	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	Bahia Blanca GasPort	Excelerate/YPF Repsol	2008
	Escobar GasPort	Excelerate/Enarsa	2011
Bangladesh	Moheshkhali	Excelerate, PetroBangla	2018
	Cox's Bazar	Summit Power International, Excelerate Energy	2019
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
China	Tianjin FSRU	CNOOC, Hoegh, various	2013
Colombia	Cartagena FSRU	Promigas, Sociedad Portuaria El Cayao	2016
Egypt	Ain Sokhna, Suez	EGAS, Hoegh	2015
	Ain Sokhna, Suez	EGAS, BW Gas	2015
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertamina	2012
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jamaica	Old Harbour	Golar FSRU, New Fortress	2019
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterranea	ElectroGas	2016
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Turkey	Aliaga FSRU, Turquoise FLNG	Etiki LNG	2016
	Dortyol FSRU Challenger	Botas	2018
UAE	Ruwais, Abu Dhabi	Gasco (UAE)	2016
	Jebel Ali Port, Dubai	DSA (UAE)	2010

LNG Export Projects

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

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 1994	2 1	3.2 2.5	3	240,000
ALGERIA	Arzew	Sonatrach GL4Z	1964	3	1.1	3	35,000
	Arzew	Sonatrach GL1Z	1978	6	7.8	3	300,000
	Arzew	Sonatrach GL2Z	1980	6	8.0	3	300,000
	Arzew	Sonatrach	2014	1	4.7		
	Skikda	Sonatrach GL1K II	1980	3	3.0	5	308,000
	Skikda	Sonatrach (rebuild)	2013	1	4.5		
ANGOLA	Soyo	Sonangol, Chevron, BP, ENI, Total	2012	1	5.2	2	370,000
ARGENTINA	FLNG Tango	Bahia Blanca	2019	1	0.5	1	16,100
AUSTRALIA	Karratha	NWS Woodside, Shell, BHP	1989	2	5.0	4	260,000
		(BP, Chevron	1992	1	2.5	1	130,000
		(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
NORWAY	Snøhvit/Melkoya	Equinor, Total, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
PAPUA NEW GUINEA	PNG LNG	Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
		ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-T1	QP, Shell	2010	1	7.8		
	RasGas I- T1&2	QP, ExxonMobil, Kogas, Itochu, LNG Japan	1999	2	6.6		
	RasGas II- T3	QP, ExxonMobil	2004	1	4.7		
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7	6	840,000
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
	Yamal LNG Siberia	Novatek, Total, CNPC, Silk Fund	2017	3	16.5	4	640,000
TRINIDAD & TOBAGO	Point Fortin Train 1	BP, Shell, CIC, NGC	1999	1	3.0	2	204,000
	Train 2	BP, Shell	2002	1	3.3	1	160,000
	Train 3	BP, Shell	2003	1	3.3	1	160,000
	Train 4	BP, Shell, NGC	2005	1	5.2	1	160,000
USA	Cheniere Sabine Pass	Cheniere Energy	2016	5	22.5	5	800,000
	Cove Point LNG	Dominion Energy	2017	1	5.3	7	695,000
	Cheniere Corpus Christi	Texas Cheniere	2018	2	9.0	3	480,000
	Cameron Hackberry	Sempra, Total, Mitsui, Mitsubishi	2019	2	9.8	3	480,000
	Elba Island Georgia	Kinder Morgan, EIG Energy	2019	10	2.5	5	535,000
	Freeport LNG, Texas	Freeport LNG	2019	2	10.2	3	483,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000

A young boy with dark hair, wearing a blue and white 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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