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PETRONAS adopts hybrid LNG pricing

Malaysia's state-owned PETRONAS has shown flexibility towards long-term LNG buyers by adopting hybrid price formulae. Some of the recently concluded sales agreements with Chinese buyers are based on China's domestic LNG Truck prices, and a spot cargo from Bintulu, Malaysia was sold under a new ICE NGX index (AECO); our Markets Editor Anja Karl was told.

As of April 2021, PETRONAS has concluded 3.5 million tonnes in LNG sales – both long and short-term contracts as well as spot transactions. Flexibility on pricing proved vital to strike deals: “A harmonious LNG market cannot solely depend on the JKM index to make up for extensive capital investments required. Each project has its own business challenges and economics, hence a viable, diversified and mixed approach to pricing mechanisms is essential,” Shamsairi M. Ibrahim, PETRONAS Vice President for LNG Marketing & Trading told *LNG Journal*.

Platt's Japan Korea Marker (JKM) indexation is widely regarded as the Far East region's benchmark for spot LNG cargoes, despite its high volatility. But things may change, given that PETRONAS and its long term customers have started discussions on hybrid price formulas for new, renegotiated and price renewed LNG offtake agreements. This allows buyers to diversify their exposure against a single-indexed price while preserving sellers' project economics viability.

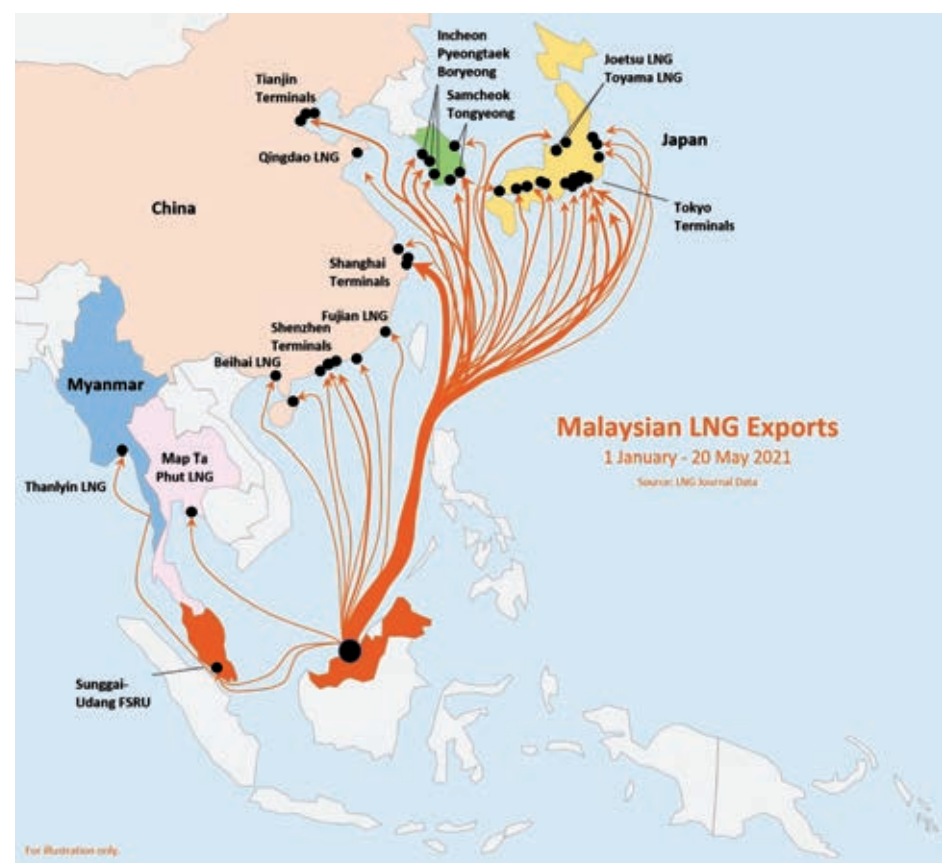
First Canadian-indexed LNG deal

The commodity exchange ICE NGX, headquartered in Calgary, has developed the AB-NIT (AECO) hub into one of the leading price benchmarks for natural gas in Canada since 1994. PETRONAS had introduced the AECO index following the sale of a spot LNG cargo from Bintulu, Malaysia, to an undisclosed end-buyer in the Far East.



Shamsairi Ibrahim,
VP PETRONAS LNG
Marketing &
Trading

The aim is to establish a new, alternative index, Shamsairi said: “With Canada's close proximity and straight-run to Japan, Korea, Taiwan and China markets, buyers



now have a new pricing alternative for Asia-bound LNG. Moreover, AECO is backed by large gas reserves in the LNG Canada venture whereby trades are done at a discount, compared to Henry Hub.”

The LNG Canada export project in British Columbia is currently under construction and scheduled to produce first LNG by middle of the decade. The massive project will supply 14 million tonnes per annum (mtpa) from the first two trains, with the potential to expand to four trains.

Built at an estimated cost of C\$40 billion, or US\$31.4 billion, the LNG Canada venture is 40 percent owned by Shell, while PETRONAS owns a 25 percent stake through its subsidiary North Montney LNG Ltd Partnership. Other shareholders are PetroChina, Mitsubishi and KOGAS.

Deal based on China's LNG Truck prices

First emerged from the pandemic, China re-established its position as a global

LNG growth engine. According to IHS figures, imports in the first quarter of 2021 increased 33 percent to 20 million tonnes compared to the same period in 2020 of 15 million tonnes.

Benefiting from the short shipping distance to China, Malaysia has grown to become the third largest LNG supplier to China. “To date, we have delivered over 850 LNG cargoes to 20 out of the 22 LNG receiving terminals across China, whereby our LNG is consumed at almost every region in China,” said PETRONAS' Vice President for LNG Marketing & Trading.

Innovative pricing formulae were also offered to Chinese buyers. “In addition to the commonly used combination of oil and JKM indexations, we also adopted China's domestic LNG Truck prices into long-term LNG sales accords. This allows China's LNG Truck and natural gas market fundamentals to respond to global LNG price movements,” Shamsairi explained.

“China's rapid growth will complement our endeavours in securing and installing

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First cargo from Petronas' Floating LNG unit DUA, loaded onto the Seri Camar carrier

new capacity," he said. "For example, we worked with Tiger Clean Energy Ltd (TCEL) to deliver Malaysia's maiden large-scale export of LNG in ISO tanks in March 2021. We also have performed multiple offshore break-bulking ship-to-ship transfers to deliver smaller-sized LNG parcels to importing terminals challenged by draft and capacity limitations."

Eager to step up sales, PETRONAS started to export LNG in ISO tanks from its filling station in Pengerang, in the state of Johor in southern Malaysia. The maiden shipment was delivered to Shanghai from Pasir Gudang Port of Johor on April 23. Long-term LNG supply has also been arranged via TCEL's LNG ISO tank filling facility in Bintulu, Sarawak, and the first shipment sailed from Bintulu Port to the Port of Long Kou on March 25.

A novel approach to pricing

Within the industry, term LNG cargoes have been linked to oil prices since the 1960s, while Henry Hub indexation

emerged since the last decade for LNG export projects from the United States. In PETRONAS' view, however, the recent crash of oil and spot LNG prices has raised concerns on the competitiveness, sustainability and the reliability of US Henry Hub-linked LNG, with approximately 200 US LNG cargoes cancelled in 2020. Shamsairi pointed out it is hence, "vital for players in the LNG industry value chain to work in harmony and preserve the viability of their respective project economics, to realize our concerted effort of making the world a healthier and cleaner place."

Changes in buying pattern from Asian players has led to a higher number of spot and short-term string cargoes being priced based on the Japan Korea Marker (JKM) that reflect the short-term dynamics of the markets. "On a Brent slope equivalent basis, average JKM had been traded above the term-LNG prices, with the exception of 2019 and 2020 due to the supply glut and demand depression. But the oversupply market is short lifting after a short cycle, as

reflected by the strong JKM prices seen today," Shamsairi explained.

Demand in Asia Pacific is largely driven by China, India and countries in Southeast Asia, though new buyers are coming forward from India, Thailand, the Philippines and Vietnam.

Striving to boost LNG use for power gen

In these emerging price sensitive markets, PETRONAS seeks to leverage on the competitive price environment to grow the use of LNG for electricity generation as a cleaner form of energy, moving away from the use of coal. Governments' sustainability agenda can help accelerate LNG growth: for example, India's Vision 2030 goal to raise the share of gas in the energy mix to 15 percent by 2030, and more than double the country's existing gas grid.

Looking beyond pricing, the Malaysian national oil company is committed to function as a one-stop-centre to address different types of customer's energy needs. "Our experience, geographical



PETRONAS Virtual Pipeline System Truck

advantage, reliability of our integrated assets and customer-centric solutions for various multi-sized customer needs, are amongst the key value propositions that customers can value and enjoy,” Shamsairi said.

Aspiring for Net Zero emissions by 2050

Guided by sustainability goals, PETRONAS in November 2020 set out steps to achieve Net Zero Carbon Emissions (NZCE) by 2050. As a short-term measure, some industry players pursue Carbon Neutral LNG by purchasing carbon offset credits, whereas the Malaysian oil and gas major has also put in place “real targets” to decarbonise its carbon footprint for longer term sustainability.

“We have set the target to reduce our Scope 1 and 2 GHG emissions from our assets at a cap of 49.5 million tons of CO2 emissions by 2024. This target now forms part of an overall phased approach towards our NZCE 2050 goal,” Shamsairi said, explaining “in realising the cap, we secured 90 MW of renewable power from



LNG bunkering vessel

hydro sources that will be used to replace and power PETRONAS LNG complex in Bintulu, Sarawak, starting from 2024.”

Marine transportation and LNG cargo operations will be decarbonised by applying gas-burning to all vessels, calling and loading at MLNG terminal. “We will have 3 new vessels to be commissioned from 2024 onwards which

are designed to produce lower carbon emissions,” he said, underlining PETRONAS has embraced IMO2020 regulations and introduced Southeast Asia’s first LNG bunkering vessel in November 2020 to serve LNG bunker fuel requirements in the region.

By exporting LNG via ISO tanks, in addition to providing the solution

domestically in Peninsular Malaysia through the Virtual Pipeline System, Shamsairi shared “with this method of delivery, off-grid and remote customers now can receive their choice of cleaner energy supply, delivered to their doorsteps; rewarding our efforts as a progressive energy and solutions partner, enriching lives for a sustainable future.” ■

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Tanzania's need for speed

Negotiations on Tanzanian LNG development have been stuck in limbo for years. Led by a new President, the country reaffirmed its keen interest in LNG 'lift-off'. IOCs pledged collaboration but highlighted the 'need for speed' in a competitive market. Our markets editor Alexander Wilk investigates

Less than a week since Tanzania's new President Samia Suluhu Hassan spoke about the stalled negotiations during her speech to Parliament in late April, the Tanzania Petroleum Development Corporation (TPDC) said talks between the government and international oil companies (IOCs) are to be resumed. In her speech, the President said negotiations had dragged on for too long and needed to be concluded swiftly. Suluhu Hassan subsequently issued a directive to her government that negotiations with IOCs on the proposed US\$30 billion, 2-train TLNG project at Lindi are to be expedited. This has revived hopes the Lindi-based project will finally be implemented. Successive Tanzanian governments have been in intermittent negotiations with IOCs for more than six years. In an op-ed published in Tanzanian newspaper *The Citizen* on 13 April, Shell and Norway's Equinor welcomed the new presidential directive and highlighted the urgency in bringing talks to a successful conclusion as the time to develop and commercialise Tanzania's offshore gas resources was 'limited.' The two IOCs' country managers said it was time for 'critical decisions' on the project.

Sizeable early investments

Equinor and Shell – alongside other international companies such as Ophir Energy and Pavilion Energy – have been keen on developing Tanzania's sizeable offshore gas assets for almost a decade.

Equinor, Norway's oil and gas champion, has been present in Tanzania since 2007 when the company signed a Production Sharing Agreement (PSA) with TPDC. Equinor and ExxonMobil hold the license for Tanzania's Block 2 with Equinor as operator on a 65 percent participating interest, along with ExxonMobil's working interest of 35 percent. TPDC has the right to participate with a 10 percent interest.

Equinor started exploration drilling activities in Tanzania's Offshore Block 2 in 2011. A total of 15 exploration wells have been drilled, resulting in nine discoveries with estimated volumes of more than 20 Tcf of gas in place. Overall, US\$2.1 billion in investments have been

spent between 2010 and 2017, according to Equinor.

Shell states its activities in the country began in the 1930s, supplying fuel and lubricants. The energy giant was able to expand its Tanzanian portfolio following the fusion of its business with that of BG in 2016, becoming operator of offshore Blocks 1 and 4 with estimated reserves of around 16 Tcf of gas. Shell operates the blocks in partnership with Indonesia's MedcoEnergi and Singapore's Pavilion Energy. In 2019, the major stated it also invested c. US\$2.0 billion in working towards first LNG in Tanzania.

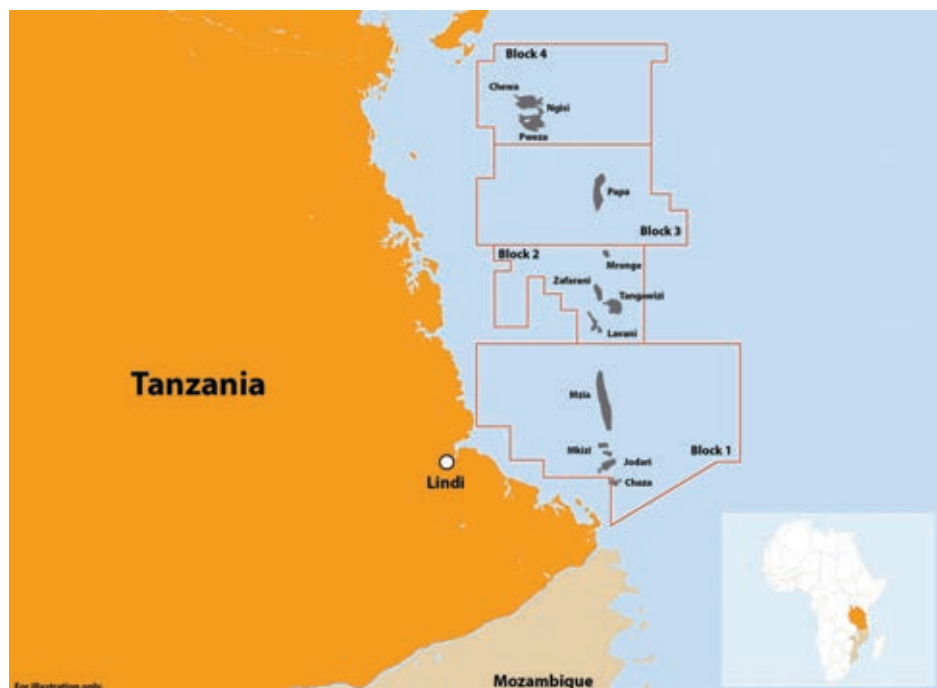
Revenue prospects

Tanzanian hydrocarbon assets are already producing gas for power generation and manufacturing. There are also plans for building a US\$1.9 billion fertiliser plant on the Mtwara coastline, but as with the LNG project the fertiliser plant's fate remained to be determined at the time of writing. In 2019, Tanzania's energy minister Medard Kalemani said construction would start in 2021 with commissioning sometime in 2024. However, gas production – and by extension government revenue – for fertiliser production, power production and industrial use would be dwarfed by output required for a 2-train LNG plant, according to Shell marketing material.

LNG thus holds the promise of substantial revenue for Tanzania. The country's central bank estimates just starting work on the US\$30 billion LNG plant would add another two percentage points to annual economic growth of around seven percent. Shell's Tanzanian subsidiary highlighted in 2019 that the 'government stands to receive more than half of the total project income' once TLNG has become operational. In their op-ed, Equinor and Shell submitted 'Tanzania's LNG in international markets could be worth Shilling 10 trillion (\$4.3 billion) per year based on today's market prices'.

Wary investors and protracted negotiations

Plans for an LNG plant on Tanzania's southern coast connected to several offshore fields by pipeline have been under proposal since 2014. A major initial



sticking point had been Tanzania's hydrocarbon legislation stemming from the 1980s, which the government swiftly updated by drafting and passing a new legislative framework in 2015 to better regulate upstream, midstream, and downstream activities. This new regulatory framework consists of the 2015 Petroleum Act, the 2015 Oil and Gas Revenues Management Act and the 2015 Extractive Industries Transparency and Accountability Act.

The establishment of this new framework notwithstanding, a CMI Brief published in 2016 highlighted a number of remaining regulatory gaps in Tanzania's petroleum resource governance, ranging from limited oversight by the National Assembly (Parliament) over petroleum institutions to 'large discretionary powers' by government and 'few mechanisms in place to prevent political interference and conflicts of interest'.

Tanzania made further legal changes in 2017, but which resulted in investors being 'scared off,' according to energy lawyer and former ambassador Mwanaidi Sinare Maajar speaking during a webinar organised by law firm Herbert Smith Freehills in May.

In 2020, investors were still wary of issues surrounding Tanzania's hydrocarbon governance in practice, according to the Fraser Institute's Annual Survey of Mining Companies. Tanzania fell from 64 of the 104 jurisdictions surveyed in 2016, to last in 2019 and 75th out of 77 jurisdictions in 2020.

Tanzania's negotiations with IOCs have had little progress for more than three years. Construction was originally scheduled to begin in 2022, according to a presentation by Tanzania's energy minister to the Tanzanian Parliament in May 2019, but Tanzania suspended talks in the same year to facilitate a review and the renegotiation of the country's PSA. Then-president John Magufuli had ordered the review of PSA clauses related to repatriation of funds, arbitration issues, revenue sharing and parliamentary power.

It had previously been hoped that construction of the 10 million tonnes per annum LNG plant would be completed by 2028.

Host Government Agreement (HGA)

At the time writing, the 'host government agreement', which is regarded by both government and IOCs as a crucial step towards a final investment decision (FID) for TLNG, remained to be concluded. An HGA typically establishes the government's rights and obligations, investors' duties, the environmental and other relevant standards, liability, legal framework, arbitration and closure of the project. It thus often paves the way for finalising negotiations on revenue sharing and tax, leading to the necessary prerequisites for an FID.

HGA discussions on the construction of the TLNG project are now expected to resume within the month, according to TPDC managing director James

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Mataragio. President Suluhu Hassan had directed the Ministry of Energy in late April to expedite negotiations by taking onboard investors who are ready to start implementation.

Equinor and Shell wrote in their mid-April op-ed that ‘Tanzania is encouraged to [act] now by demonstrating its commitment and successfully restarting negotiations on the host government agreement and pledging to conclude them in a timely manner.’

‘Natural gas has a key part to play in the global energy transition, but the window in which to act to develop new resources is limited,’ Shell’s country chair Frederik Grootendorst and his counterpart at Equinor, Mette Halvorsen Ottoy, also wrote, urging that 2021 must be the year when action is taken to conclude the negotiations.

The two executives further submitted that whilst the LNG project represented a ‘tremendous opportunity to transform the country’s economy,’ that opportunity ‘may not necessarily exist for very much longer’ with timing being ‘critical’ for success. ‘A mega project like this takes years to plan, design and execute and hence critical decisions are required now,’ they wrote.

Tough six months ahead

Suluhu Hassan now aims to wrap up talks on LNG development within six months. However, the government has its work cut out in (re)securing investor confidence. Speaking during the Herbert Smith Freehills webinar in May, consultant and non-executive director at Tullow Oil Sheila Khama noted that it was easy ‘to change laws [but] harder to change the mindset of investors and this

is where [Tanzania’s] greatest focus should be’. Khama further submitted that jurisdictions seeking to attract investment must focus on ‘narrowing the gap between policies as perceived by the nation state and [how these] policies are perceived by investors’.

Mwanaidi Sinare Maajar highlighted that investors will expect a legal regime that provides certainty and due process, especially with regard to licenses and financial transactions. She further elaborated that apart from financial matters, issues surrounding management of foreign staff also fed into an investor-friendly environment. ‘Companies [will] be looking at approval procedures [...] and how to allow expatriates to go in and out. Can decisions be challenged through an appeal or a judicial process [...] and how quickly can disputes be resolved?’, she said.

Another participant at the webinar, energy consultant Carole Nakhle, expressed concern that although Tanzania has one of the largest gas reserve bases in Africa, it ‘has behaved like a country [...] with very low costs of extraction and production. That is not the case.’

Write-down

Nakhle’s comments echoed Equinor’s decision to write down the book value of its TLNG project by US\$982 million in January this year, citing project economics. Whilst the company acknowledged the progress made in recent years on the commercial framework for TLNG, ‘overall project economics have not yet improved sufficiently to justify keeping it on the balance sheet’, Equinor

said in a statement.

‘The TLNG project has an anticipated breakeven price well above the portfolio average for Equinor and is, at this time, not competitive within this portfolio. Equinor will continue to engage with the Government of Tanzania in negotiations on a commercial, fiscal and legal framework that may provide a viable business case for TLNG in the future,’ Equinor said.

‘Equinor maintains an attractive portfolio of project development opportunities in oil and gas as well as renewables. This portfolio requires strict prioritization, ensuring capital is allocated towards projects yielding the most competitive returns,’ the statement continued.

‘As shown at the Capital Markets Update in February last year, Equinor’s oil and gas projects with expected start-up by 2026 have an average breakeven below US\$35/bbl based on today’s estimates. Similar for non-sanctioned oil and gas projects with expected start-up within this decade, the average breakeven is below US\$40/bbl,’ the company said.

Collaboration to beat competition

In recognition of a tough year of 2020 and a ‘highly competitive global LNG space’, Shell and Equinor announced in their op-ed they had signed a memorandum of understanding (MOU) for formal collaboration on the LNG project in Lindi in January. They expected a ‘swift transition’ to a collaborative approach would create positive synergies and economies of scale while significantly saving development costs and time.

‘Collaboration will not only bring the best outcome for Tanzania and for the project but will also make the project more competitive in the global marketplace, produce and process vast amounts of natural gas to power Tanzania’s industrialization plan, support the country’s ambitions to supply gas to the region, and reduce dependence on imported oil,’ they stated.

‘It’s crucial for the project that all parties play their part in making competitive improvements, and this MOU is a step in the right direction,’ they said, promising that collaboration between ICOs, TPDC and the government would ensure ‘Tanzania LNG can win in the highly competitive global LNG space’.

Tanzania – despite its vast gas resources – has hitherto lagged neighbouring Mozambique, which up until April this year had two LNG export projects under development and a third at the planning stage. In contrast to Tanzania, it was a surge in violence that forced oil major Total to declare force majeure on its Mozambique LNG project. ExxonMobil had already delayed FID on its Rovuma development due to budget constraints, leaving Eni’s Coral Sul FLNG project the only active LNG development with FID in East Africa.

Although LNG progress at Tanzania’s most proximate competitor has thus been hampered, Equinor and Shell warned ‘many regions around the world including Nigeria, Qatar and North America have established LNG export operations with ambitions to expand significantly,’ pressing the point that this competition ‘highlights the need for speed’.

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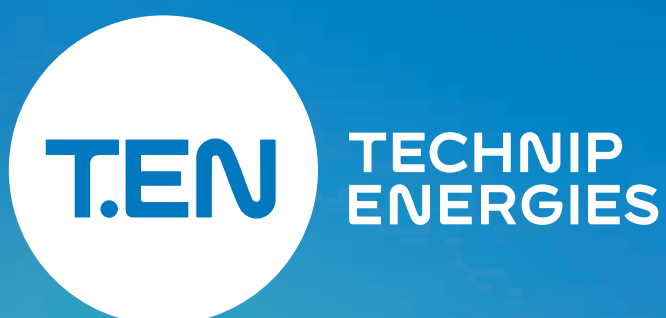
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China tells Tier-2 buyers to shun Australian LNG

Beijing is meddling politics and trade relations with Australia. At least two smaller Chinese LNG importers have been mandated to stay clear from buying any more of the super-chilled gas from Down Under this year and in 2021, but the rhetoric is having limited impact so far; our Markets Editor Anja Karl finds.

Traders disclosed on the condition of anonymity that two, if not three utility buyers were given verbal orders from Chinese government officials not to buy spot cargoes from Australia or enter any new long-term offtake agreements. These second-tier buyers facilitate nearly 12 percent of China's LNG imports.

LNG Journal's ship tracking data shows that imports of Australian LNG by smaller Chinese companies have been trending down since January. But their limited scope cannot tip the scale, given that most Australian LNG headed for China is imported by large, state-controlled enterprises.

The four majors — China National Offshore Oil Corp (CNOOC), China Petroleum & Chemical Corp (Sinopec) and PetroChina — are still free to choose their LNG supply sources based on price and profit margins. This unequal treatment has been dismissed by market economists.

Sinopec and CNOOC hold financial stakes in Australia Pacific LNG and Queensland Curtis LNG, hence Beijing has limited scope to interfere. Many China-bound cargoes from APLNG and QCLNG are shipped on purpose-built vessels and are part of long-term deals.

Tariffs retaliate for pandemic probe

Forcing the hand of China's Tier-2 LNG importers is easier for Beijing and supports tactics of tit-for-tat trade politics with Canberra, the seat of the Australian government. Beijing already imposed tariffs or import restrictions on several commodity imports from Down Under in retaliation for Australia initiating a probe

into the origins of the coronavirus pandemic. Closing the doors on dialogue, the Chinese government in mid-May froze all strategic economic negotiations with the Australian government. Prior to that, it suspended most of the cooking coal imports for Chinese steel makers. Halting LNG imports would be a further escalation.

Replacing Australian imports "impossible"

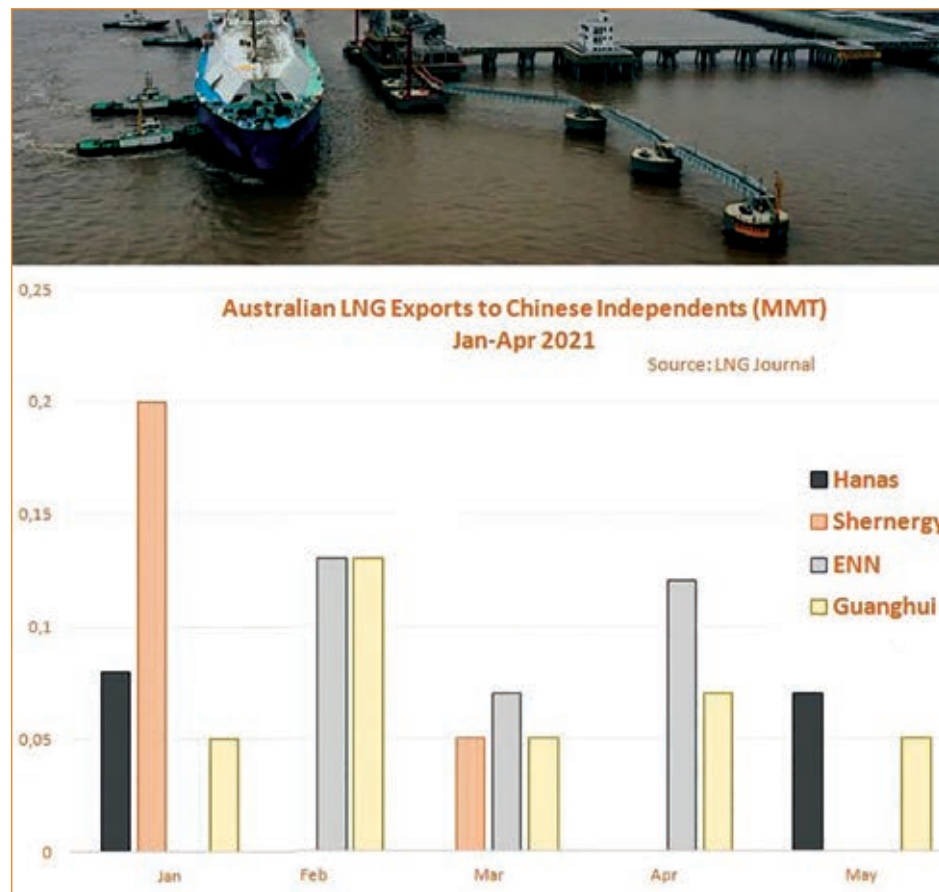
Traders reckon it would be "nearly impossible" for China to suspend LNG imports from Australia entirely and, in fact, Beijing's rhetoric is not having much effect on actual shipments. In 2020, Australian exporters shipped LNG cargoes worth over A\$13 billion (\$10bn) to China — a huge volume which would be challenging to replicate with supplies from elsewhere.

CNOOC has long-term contracts to import 3.6 million tons per year from Shell's 8.5 mtpa Queensland Curtis LNG export plant, Sinopec takes up to 7.6 mtpa of the 9 mtpa capacity at Australia Pacific LNG and PetroChina has a contract for 2.25 mtpa from Chevron's huge 15.6 mtpa Gorgon LNG liquefaction project.

Qatar and Malaysia, the second and third largest suppliers to China, could not compensate for the substantial volume shipped from Australian projects.

LNG Journal's ship tracking data shows a total of 42 cargoes set sail to China from Australia between April 15 and May 16, compared to 18 from Malaysia and just 7 from Qatar (see table on the next page).

The Australian imports in April covered 44.5 percent of China's total LNG



imports in that month. China's customs bureau has not yet published import figures for April, but vessel tracking data indicates China received 2.94 million tons of LNG shipments from Australia in April, up by around 430,000 tons month-on-month, or 17 percent.

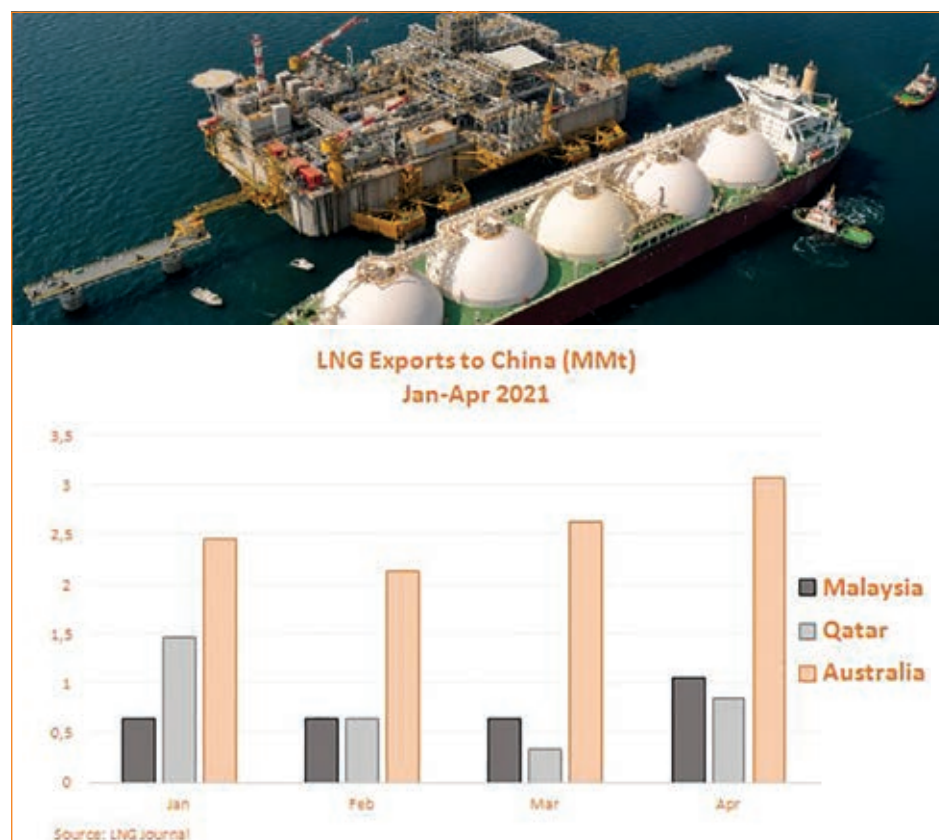
No cargo diversion seen just yet

Should Beijing impose an outright ban on Australian LNG, Chinese buyers could

source alternative cargoes from Qatar, Malaysia and the US or ramp up pipeline gas from Russia.

But ship tracking data does not yet show any indications that contractual LNG deliveries from Australia are being diverted. In the first four months of 2021 Australia maintained the same level of shipments to China as last year when it supplied 77.8 mtpa of LNG, just ahead of Qatar with 77.1 mtpa.

The Department of Industry Resources



China and Japan turn to carbon-neutral LNG

Asia is currently at the forefront of sourcing environmentally friendly LNG. Shell has traded seven carbon-neutral cargoes to Asia since 2019, inter alia with Tokyo Gas, CNOOC Gas & Power and Taiwan's CPC.

Moreover, Singapore's Pavilion Energy imported the country's first carbon neutral LNG cargo on April 11. Pavilion also signed long-term LNG supply contracts with Qatar Petroleum and Chevron that mandate specific

GHG data provision with each cargo. The two deals cover LNG supply of 2.3 mtpa from 2023.

Last year, Singapore imported 4.01 million tons, according to our data and calculations. Roughly 1.21mmt were re-exported with the majority going to China.

From a demand perspective, LNG imported volumes declined from Q4-2020 to China (-1mmt, or -5%) and the rest of Asia (-0.8mmt or -6%), according to McKinsey figures.



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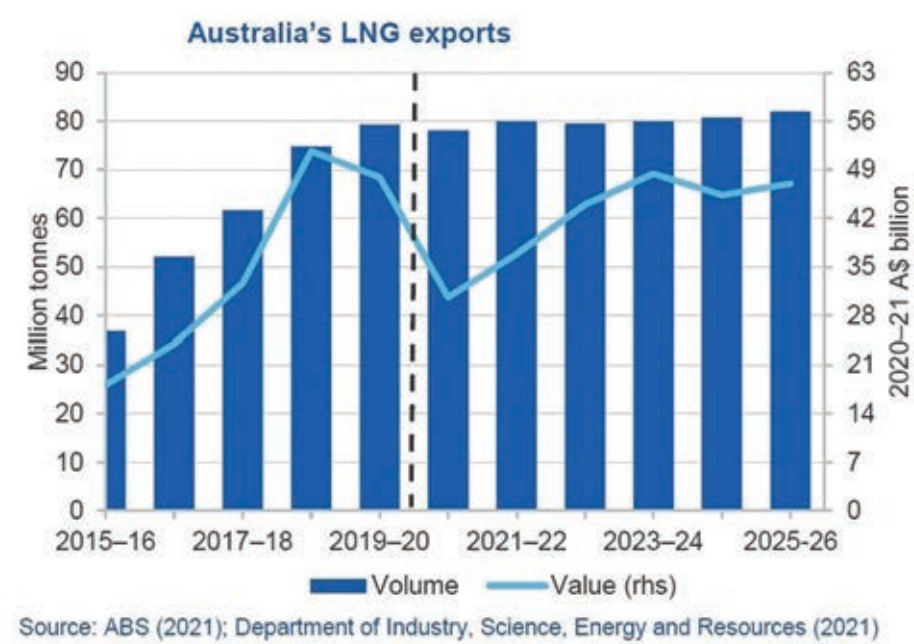
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and Energy’s March forecast finds that this financial year Australia’s LNG exports will be worth \$32.5 billion, behind iron ore at \$114.7 billion and coal at \$37.6 billion (see graph).

Come 2021-22, revenue from LNG exports is seen rise to \$43.7 billion, exceeding coal with \$42.5 billion. However, LNG export earnings are forecast to fall sharply in 2020-21, plunging to \$33 billion, down from \$48 billion in the pre-year period. The decline is driven by weak contract prices and, to a lesser extent, by lower export volumes, government analysts noted. From 2023, however, earnings will recover thanks to a

rise in contract and spot prices and government analysts project LNG export earnings will vary between \$44 billion and \$47 billion in the years through to 2026.

Australian exporters had “weathered the pandemic well,” Graeme Bethune, CEO of the consultancy Energy Quest commented. The Platts JKM Asian LNG spot price has hit US\$10 per MMBtu, which pushes up LNG netback prices for east coast gas.

Beijing’s trade politics is unlikely to have much of an impact in the wider picture. “Lack of gas for LNG projects is a bigger threat to LNG exports than

anything China might do,” he noted. In particular, production from the North West Shelf is set to start declining “soon” and will be followed by falling output from some of the Queensland projects later this decade.

Déjà-vu from 2018 politics

Put in perspective, Beijing’s latest verbal orders to Tier-2 LNG buyers mirror a 2020 directive to Chinese power plant operators and steel mills not to import Australian coal.

LNG has already been subject to sanctions in 2018, when tit-for-tat import tariffs escalated between China and the United States. Former US President Trump imposed tariffs on goods imported from China, prompting Beijing to retaliate by placing tariffs on US products, including LNG. These tariffs on American LNG imports were hiked from 10 percent to 25 percent in 2019, as the trade war intensified.

Observers doubt things will go that far this time. “An import tariff similar to the 25 per cent slapped on US LNG exports in 2018 would likely be too painful for Chinese buyers and consumers,” said Wood Mackenzie Asia Pacific vice-chair Gavin Thompson, „but Beijing might consider moves to deter Chinese buyers from signing new long-term contracts

with Australian projects.”

Such a move could be “politically expedient”, he noted, as it allows Beijing to show its readiness to take punitive actions on Australian exports while minimizing the consequences for China’s LNG supply options.

Hard-nosed Chinese buyers have for long invested in Australian upstream and liquefaction projects as they seek to get a firmer grip on the gas value chain. The escalating trade tensions between Beijing and Canberra, however, risks to render further investment impossible.

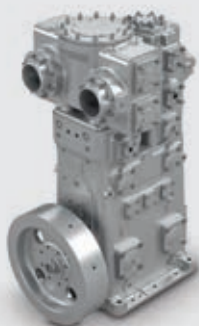
Staying positive, Australia’s largest LNG shipper Woodside Petroleum expects its strong relationships with Chinese counterparts to prevail now and into the future. “We see China as a key strategic partner for the development of Australia’s – and Woodside’s – resources and firmly believe such partnerships deliver value for all,” the company said.

Pragmatism is expected to prevail, toning down Beijing’s anger over the coronavirus probe; hence the latest stand-off with Canberra should not escalate into an open trade war. LNG and iron ore imports are unlikely to be halted, simply due to China’s far-reaching dependency on Australian suppliers. An outright ban would otherwise risk unravelling the trade balance in Asia Pacific. ■

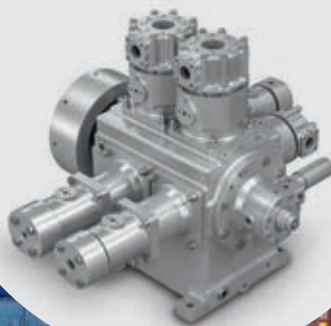
LNG exports to China from Australia, Malaysia and Qatar									
Cargo ID	Country	Export Facility	Vessel Name	Imo Number	Sailed Date	Import Facility	Arrival Date	Original Cargo MMt	Buyer
SVDI544332	Australia	Pluto LNG	Woodside Charles Allen	9859753	16-May-21	Guangdong Dapeng LNG	29-May-21	0.08	CNOOC
ZCEJ844331	Australia	NWS LNG	GasLog Sydney	9626273	15-May-21	Guangdong Dapeng LNG	22-May-21	0.06	CNOOC
C6UU944331	Australia	Australia Pacific LNG	Grace Acacia	9315707	15-May-21	Qidong LNG	26-May-21	0.05	Guanghui
C6BH244330	Australia	Wheatstone LNG	Seishu Maru	9666558	14-May-21	Caofeidian LNG	28-May-21	0.05	CNPC
VRPI544329	Australia	Australia Pacific LNG	CESI Tianjin	9694749	13-May-21	Qingdao LNG	24-May-21	0.07	Sinopec
C6BC944327	Australia	Wheatstone LNG	Asia Venture	9680190	11-May-21	Jiangsu LNG	21-May-21	0.06	CNPC
V7HJ744327	Australia	Australia Pacific LNG	Flex Rainbow	9709037	11-May-21	Tianjin - Nangang LNG	22-May-21	0.07	CNOOC
ZCEB244326	Australia	Queensland Curtis LNG	Methane Julia Louise	9412880	10-May-21	Zhejiang LNG	22-May-21	0.07	CNOOC
9V533544326	Malaysia	Malaysia LNG	Saga Dawn	9769855	10-May-21	Dongguan LNG	15-May-21	0.02	Jiufeng Group
VRDJ344325	Australia	NWS LNG	Dapeng Sun	9308479	09-May-21	Guangdong Dapeng LNG	16-May-21	0.06	CNOOC
C6XQ544325	Australia	Gorgon LNG	LNG Jupiter	9341689	09-May-21	Beihai LNG	21-May-21	0.07	Sinopec
VRID244324	Malaysia	Malaysia LNG	Shen Hai	9583677	08-May-21	Shanghai (Yangshan) LNG	13-May-21	0.06	Shermergy
V7PW344324	Qatar	Ras Laffan	Umm Slal	9372731	08-May-21	Dalian LNG	24-May-21	0.12	PetroChina
C6AX344323	Australia	Wheatstone LNG	Asia Vision	9606948	07-May-21	Jiangsu LNG	16-May-21	0.06	CNPC
VRPI644323	Australia	Australia Pacific LNG	CESI Wenzhou	9694751	07-May-21	Jieyang LNG	17-May-21	0.08	CNOOC
C6WL544323	Malaysia	Malaysia LNG	Arctic Spirit	9001784	07-May-21	Shanghai Peak-Shaving	12-May-21	0.04	Hua'an
ZCDU344322	Qatar	Ras Laffan	Methane Shirley Elisabeth	9321756	06-May-21	Jieyang LNG	31-May-21	0.06	CNOOC
VRFT744321	Australia	NWS LNG	Dapeng Star	9369473	05-May-21	Guangdong Dapeng LNG	12-May-21	0.06	CNOOC
SVBW644321	Australia	Queensland Curtis LNG	Maran Gas Efessos	9627497	05-May-21	Hainan LNG	17-May-21	0.06	CNOOC
9HA535444321	Australia	Gorgon LNG	Minerva Kalymnos	9869942	05-May-21	Jiangsu LNG	16-May-21	0.08	CNPC
EARD44320	Australia	Wheatstone LNG	La Mancha Knutsen	9721724	04-May-21	Fujian LNG	17-May-21	0.07	Hanas
HOTC44320	Malaysia	Malaysia LNG	Lucia Ambition	9016492	04-May-21	Hainan Transfer Station	09-May-21	0.01	PetroChina
9MGQ944320	Malaysia	Malaysia LNG	Seri Amanah	9293844	04-May-21	Qidong LNG	13-May-21	0.06	Guanghui
9MVR844320	Malaysia	PFLNG 2	Seri Camellia	9714276	04-May-21	Shenzhen Diefu LNG	12-May-2	0.07	CNOOC

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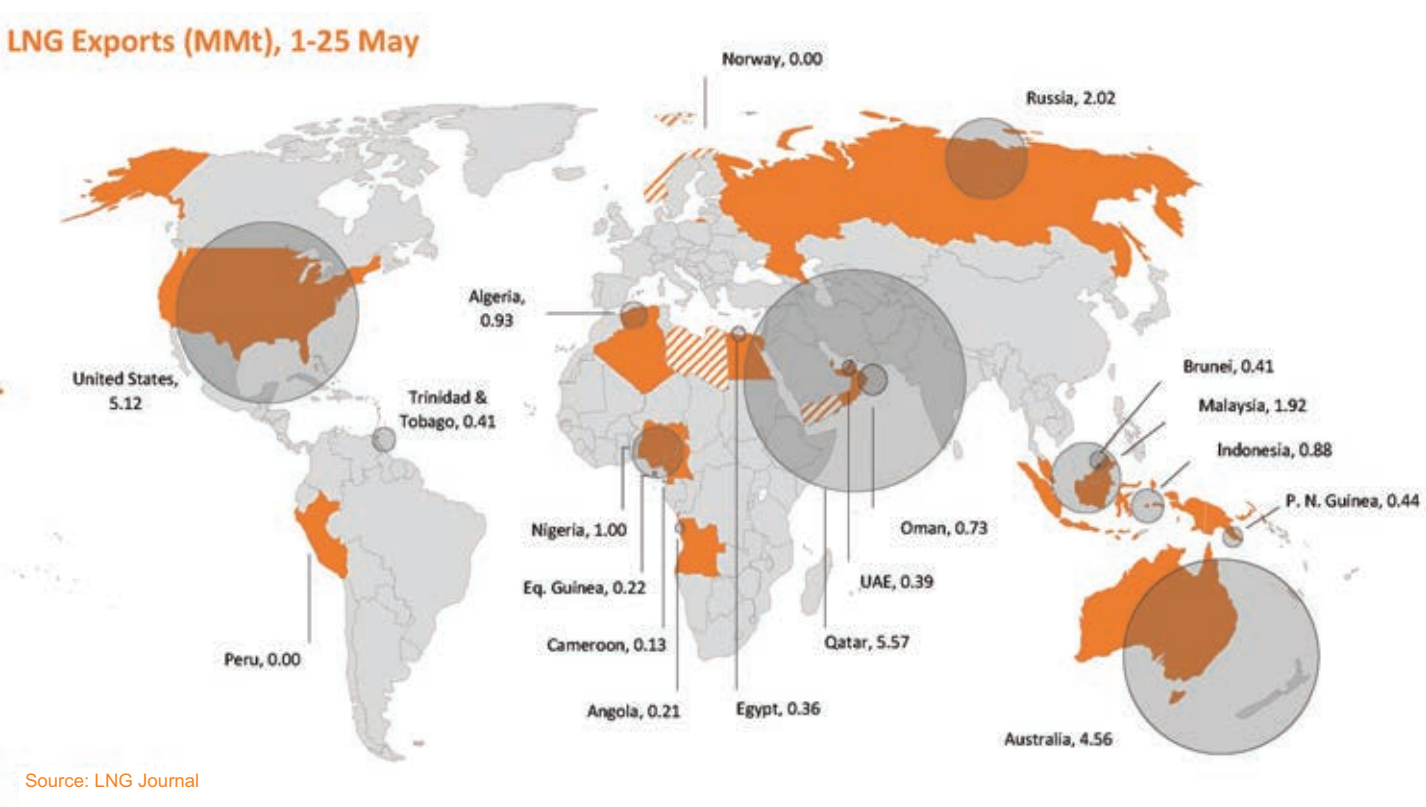
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Weaker Pacific LNG flows likely cushioned by higher US, Qatari exports in May

Weaker Pacific LNG flows were cushioned by higher US and Qatari exports whilst demand saw robust seasonal increases outside Europe up to 25 May, our Markets Editor Alexander Wilk reports.

Our Market Tracker data pointed to global LNG trade likely to have seen a full-month decrease of 0.96mmt (-4 percent) in May at the time of writing. Notably, Pacific exports were trailing their month-on-month equivalent by 1.57mmt (-15 percent) so that overall exports were down by around 1.02mmt (-4 percent) month-on-month on 25 May. In the Atlantic Basin, fewer shipments out of West Africa and Russia negated higher Algerian exports up until 25 May. However, we are seeing a firm silver lining in likely strong month-on-month export growth in the United States. Similarly, we are expecting robust export growth in the Middle East based on higher Qatari exports, which were essential in compensating for retreating Egyptian exports. Meanwhile, global LNG demand as of 25 May was determined by the Pacific Basin, where month-on-month imports had already increased by 1.73mmt (11 percent) as China and South Korea had seen demand growth of



1.50mmt at the time of writing. Our market visibility also indicated potential Atlantic and Middle Eastern full-month

demand growth based on cargoes en route to these regions.

Exports

As of 25 May, our preliminary data suggests month-on-month export performance will come in below that of April, with shipments down by around 0.96mmt (-4 percent) month-on-month on 25 May. Exports by volume were led by the Atlantic Basin at the time of writing, where shipments were trailing their equivalent April levels by a relatively small margin of 0.10mmt (-1 percent). In contrast, the Pacific had more substantial catching up to do, trailing its month-on-month equivalent by 1.57mmt (-15 percent) at the time of writing. This had left month-on-month export growth up to 25 May to the Middle East, where shipments had increased robustly by 0.65mmt (10 percent).

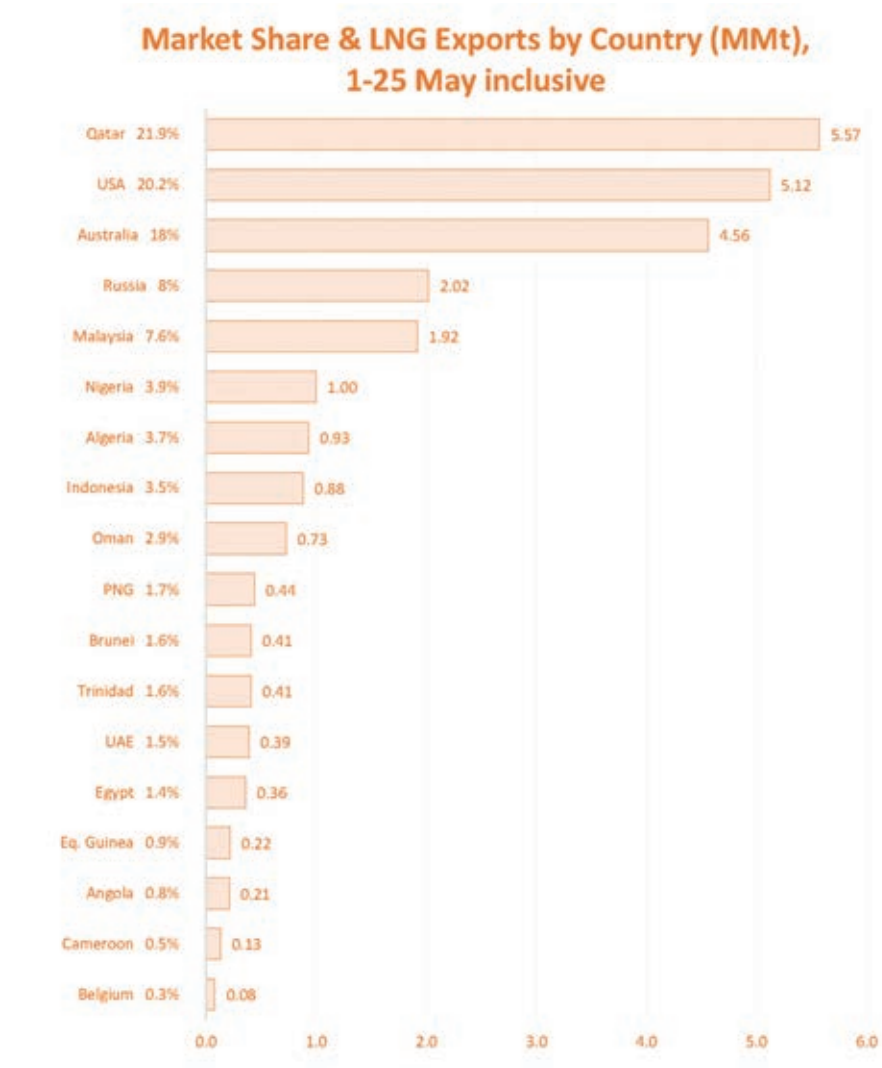
Pacific Basin

Pacific exports stood at 8.95mmt on 25 May, trailing their month-on-month equivalent of 10.52mmt in April by 1.57mmt (-15 percent). Consequently, pro rata capacity utilisation stood at 80 percent.

The Basin's biggest exporter – Australia – had shipped 1.18mmt

(-21 percent) less month-on-month at the time of writing with exports down across most Australian plants. Although nominally there remained sufficient time in the month of May to close that difference by the time of full month-on-month results, the trend in May to date did not suggest that this will be the case. Preliminary figures suggested exports from Gorgon LNG in particular were at risk to show a full-month decrease by the end of May as they were down by 0.34mmt (-37 percent) from the 0.93mmt recorded on 25 April. This was followed by Wheatstone LNG, where shipments were trailing their month-on-month equivalent of 0.83mmt by 0.20mmt (-24 percent). Darwin, Ichthys and Gladstone LNG saw exports decrease by 0.50mmt overall. We were not expecting another shipment from either Darwin or Ichthys LNG before the end of May, based on our shipping data, meaning that at the time of writing it seemed likely the two plants would not see month-on-month export growth. Other Australian plants, namely Pluto LNG and Queensland Curtis LNG, were each facing a gap of 0.14mmt to their April results, leaving sufficient time remaining to finish the month with at least stable exports.

The only Australian plants with



accelerated month-on-month production were NWS LNG and Australia Pacific LNG. NWS LNG had already shipped 0.18mmt (22 percent) more month-on-month on 25 May whilst Australia Pacific LNG showed a narrow month-on-month lead of 0.01mmt (1 percent).

As to unconventional LNG production, Shell's Prelude FLNG barge continued to show market presence in May but had not loaded a second cargo at the time of writing. Initially there were indications of a second cargo loading via the GasLog Gladstone before month-end – which would have likely meant month-on-month export growth for Prelude – but the vessel was diverted ahead of time, our data indicates.

North of Australia, Papua New Guinea's PNG LNG saw month-on-month shipments decrease by 0.19mmt (-30 percent) to 0.44mmt compared to 0.63mmt at the time in April. Although our market visibility indicated two cargo liftings via the LNG Venus and the Maran Gas Leto before the end of the month, these two additional shipments would only mean PNG LNG kept month-on-month exports broadly steady, provided also the vessels would leave the plant fully laden.

In neighbouring Indonesia, the amount of LNG shipped had also decreased month-on-month, down by 0.08mmt (-8 percent) to 0.88mmt from 0.96mmt recorded during the first 25 days in April. Malaysia saw broadly steady exports of 1.92mmt at the time of writing. Concurrently, Brunei had made considerable headway, with month-on-month exports up 0.07mmt (21 percent)

to 0.41mmt.

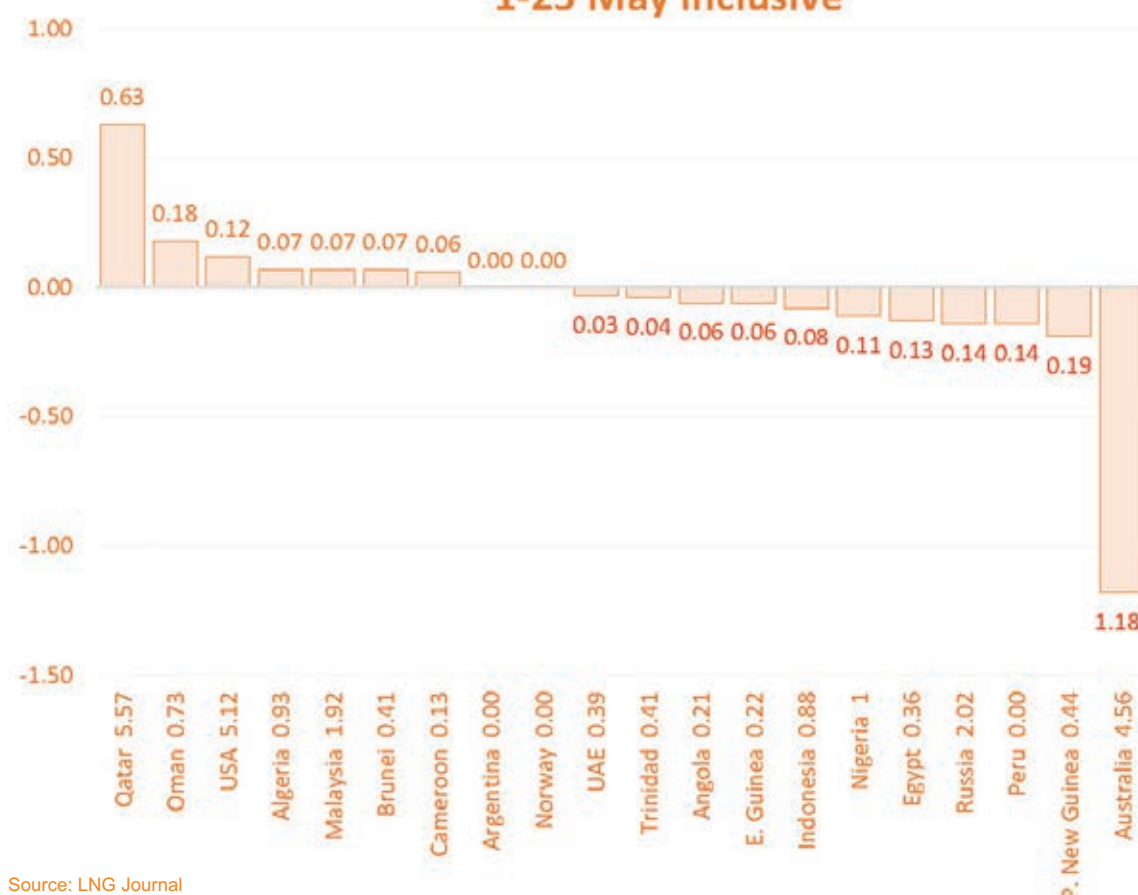
Elsewhere in the Pacific, Russia's Sakhalin-2 LNG had seen exports decrease month-on-month on 25 May. The plant's shipments had decreased by 0.06mmt (-8 percent) to 0.74mmt as of 25 May from 0.80mmt in the equivalent period in April. However, we did not expect that this negative difference would carry through to the end of the month. In contrast, Peru's Pampa Melchorita plant had not been seen in the market by 25 May with no indication of a cargo loading before the end of the month.

Atlantic Basin

The Atlantic Basin's overall shipped LNG had decreased slightly by 0.10mmt (-1 percent) month-on-month to 9.30mmt on 25 May. This translated into export capacity utilisation of 75 percent.

The overall amount of LNG exported within the eastern part of the Atlantic Basin – comprising Europe, Russia and Africa (and not including re-exports) – had seen a net decrease of 0.18mmt

Incremental LNG Exports (MMt) by Country 1-25 May inclusive



Source: LNG Journal

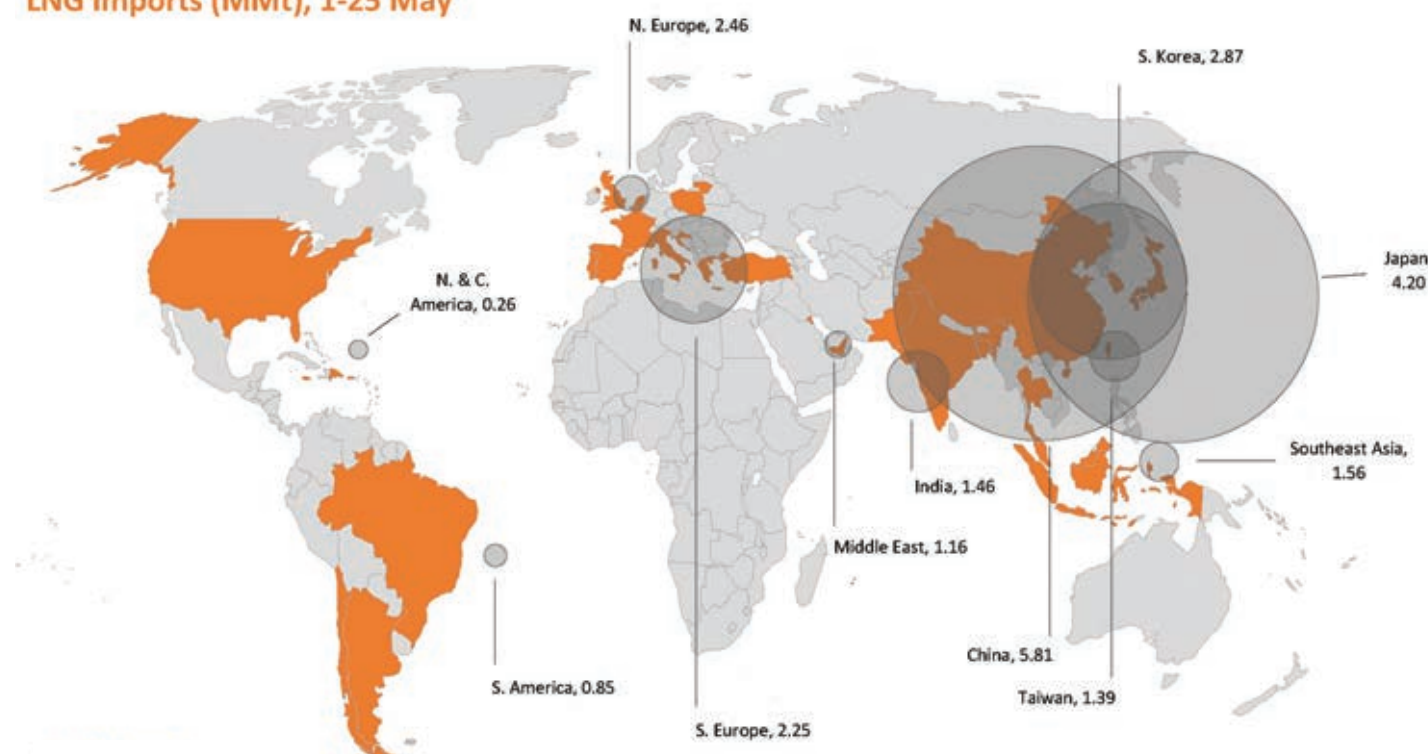
(-4 percent) month-on-month on 25 May. The ongoing outage at Snøhvit LNG in Norway still weighed on the eastern Atlantic's overall exports, as did a significant month-on-month reduction of 0.11mmt (-10 percent) at Nigeria's Bonny Island LNG. Shipments from other West African exporters were also down for the month to date as Angola and Equatorial Guinea had reduced exports by 0.12mmt overall (-22 percent) in addition to a reduction of 0.08mmt (-6 percent) at Russia's Yamal LNG. Even a firm increase

in exports by 0.11mmt (19 percent) from Algeria's Arzew plant had not compensated at the time of writing. Whilst in theory there was enough time until the end of May for these differences to be balanced overall, we were not optimistic that smaller plants such as EG LNG and Angola LNG would see positive month-on-month growth by the end of May considering visible scheduled vessel calls.

Accordingly, the Atlantic's main source for LNG export growth in May was set to be the United States. Overall US shipments had increased moderately by 0.12mmt (2 percent) to 5.12mmt on 25 May compared to the 5.00mmt recorded for the same period in April. Market visibility at the time of writing indicated export growth was underpinned by growth in Atlantic Basin demand for US LNG, where South America stood out. Month-on-month exports broadly destined for the Atlantic region had expanded from 2.30mmt this time in April to 2.56mmt in May. Whilst we highlight that there remains potential for these numbers to change (e.g. due to diversions), we expect the overall growth trend to have held by the end of the month.

In South America, Atlantic LNG in Trinidad & Tobago had seen monthly exports decrease noticeably, reaching 0.41mmt on 25 May compared to the 0.45mmt recorded on 25 April. Atlantic

LNG Imports (MMt), 1-25 May



Source: LNG Journal

LNG shipments pivoted from the Caribbean and North America to Europe, where demand was set to have seen a significant demand upswing over April. However, there had not been a shipment to the Pacific and the Far East in May at the time of writing.

Middle East

In contrast to the lower month-on-month Pacific and Atlantic Basin exports on 25 May, shipments from Middle Eastern plants had increased by 0.65mmt (10 percent) to 7.05mmt from 6.40mmt for the equivalent period in April. The increase was underpinned by a boost in Qatari shipments by 0.63mmt (13 percent) to 5.57mmt. Meanwhile, the country’s fellow Persian Gulf producers in Oman and the UAE also kept month-on-month growth apace, increasing exports by 0.15mmt (15 percent) on higher Omani exports. Egypt struggled with a lack in export growth on 25 May as the newly restarted Damietta plant, which had ramped up shipments since March, had slashed exports by 0.06mmt (-35 percent) to 0.11mmt. Neighbouring Idku LNG had similarly reduced shipments at the time of writing, which were down 0.07mmt (-22 percent) to 0.25mmt.

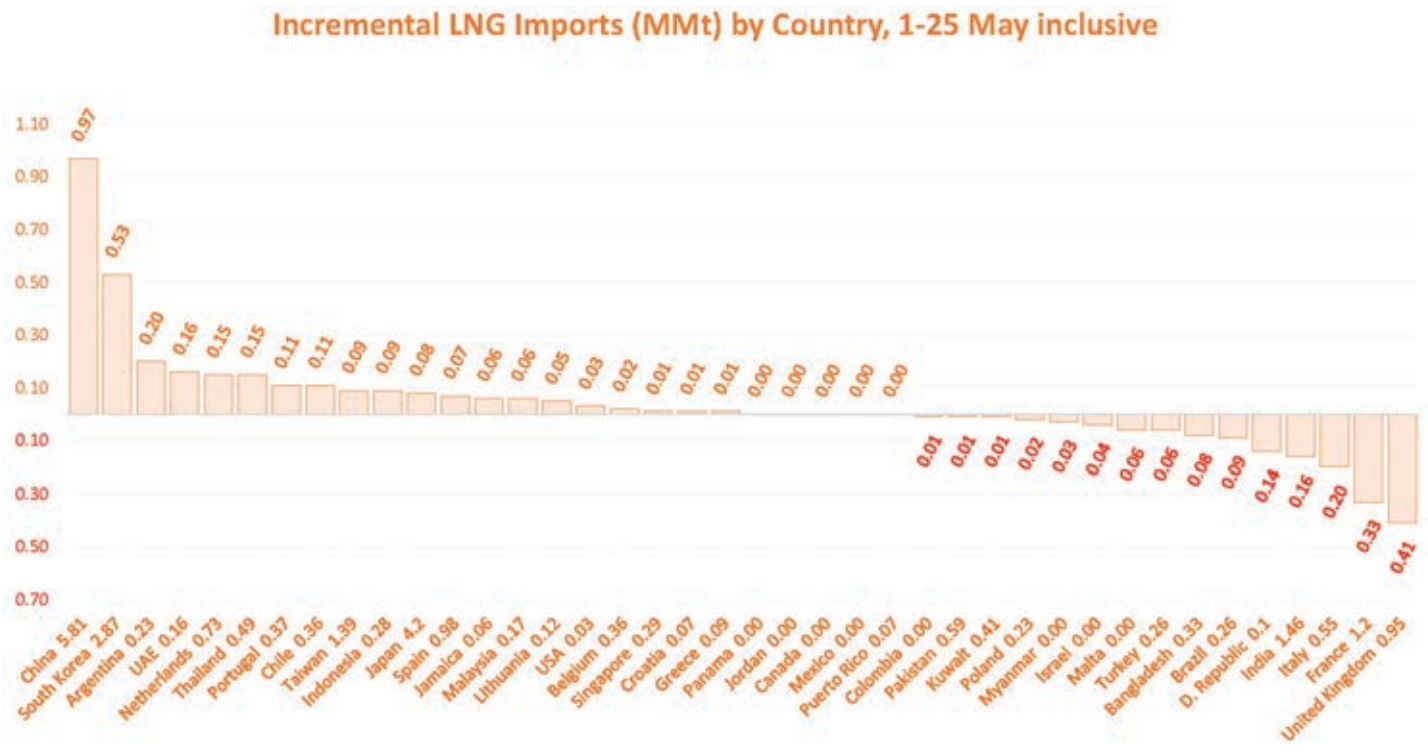
Nevertheless, our data showed the Basin’s overall utilisation of operational export capacity (i.e., excluding Yemen) to stand at 109 percent on 25 May, pushed by Qatar.

Imports & Domestic Trade

Global LNG demand as of 25 May was determined by the Pacific Basin, where month-on-month imports had already grown by 1.73mmt. This was contrasted by a notable demand decrease of 0.61mmt (-8 percent) in the Atlantic Basin and indications of continued, albeit moderate, seasonal demand growth in the Middle East, where offtakes were up 0.03mmt (3 percent) month-on-month. However, our market visibility indicated both the Atlantic Basin and the Middle East would still have seen full-month growth by the end of May.

Pacific Basin

Month-on-month Pacific Basin imports had already increased by 1.73mmt as China and South Korea had seen demand growth of 1.50mmt to date on 25 May. At the time of writing, we were still expecting more than 70 additional cargoes to arrive throughout the Basin, indicating potential full-month growth in the Pacific of around 1.98mmt according

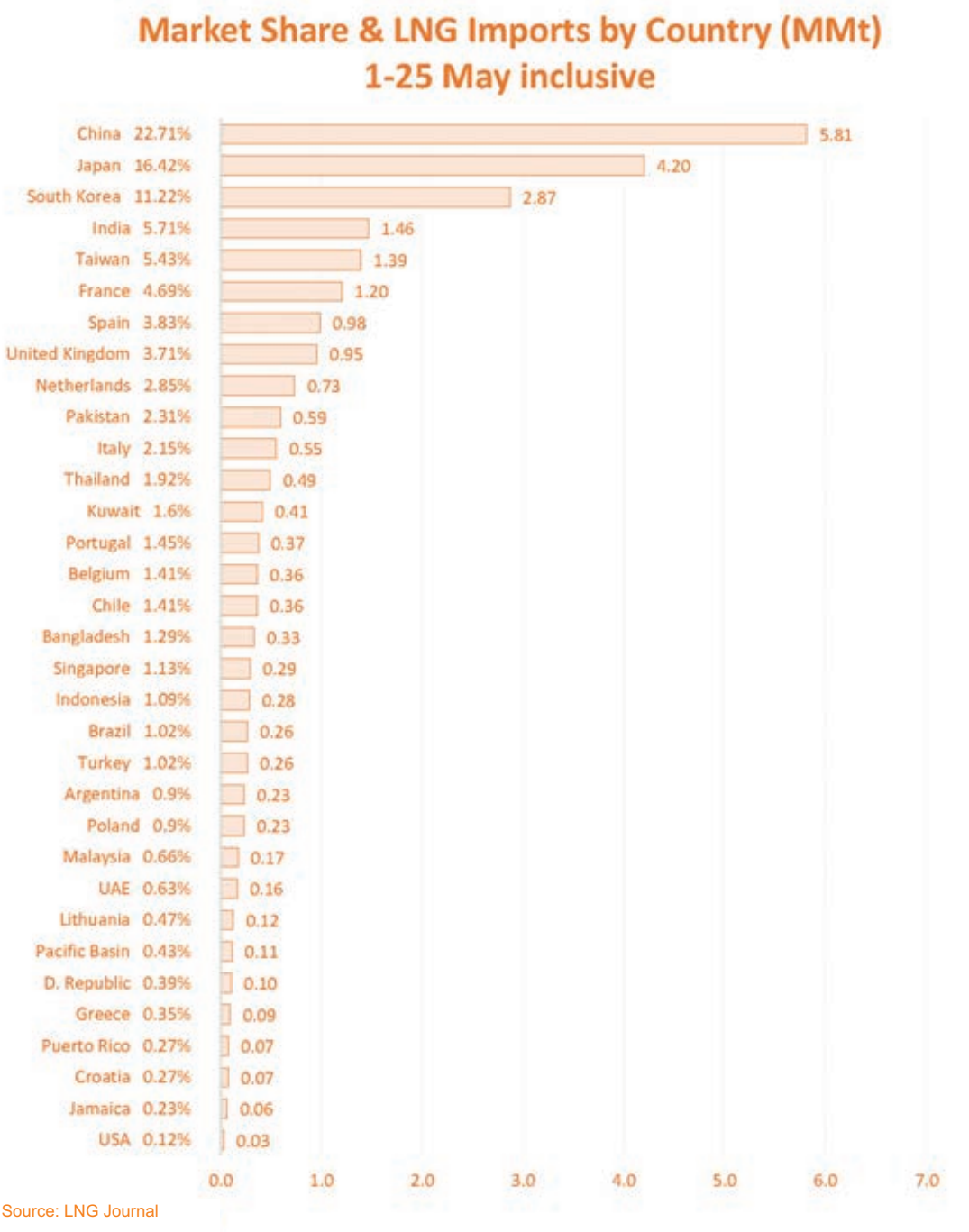


Source: LNG Journal

to market visibility.

Pacific offtakes for May are likely to be led by China, which had seen month-on-month demand growth of 0.97mmt (20 percent) to 5.81mmt on 25 May and was potentially going to import another 1.23mmt by the end of the month according to visible vessel schedules. Consequently, at the time of writing and barring vessel delays or diversions, we were expecting strong full-month LNG demand growth to around 7.10mmt in China in May. This outlook was followed by South Korea with a possible full-month demand increase of roughly 0.47mmt (17 percent) to 3.21mmt in May. In contrast, India had seen a notable drop in month-on-month demand by 0.24mmt (-18 percent) to 1.12mmt by the middle of May, but which had begun to recover to 1.46mmt, meaning the negative gap had narrowed to 0.16mmt (-10 percent) at the time of writing. According to our market visibility, there were another 0.46mmt due in the country before the end of the month. In the absence of delays or diversions, this indicated on 25 May that India would see

full-month demand of 1.92mmt, up likely to see demand increase by 0.09mmt marginally from 1.90mmt in April. (36 percent) to 0.34mmt, whilst In Southeast Asia, Indonesia was neighbouring Malaysia was also likely to



Source: LNG Journal

see domestic offtakes grow by 0.04mmt (22 percent) month-on-month.

Moreover, the roster of typically price-conscious Pacific buyers – including Bangladesh, Thailand, Chile, Mexico, Singapore and Myanmar – were collectively likely to see imports increase by 0.23mmt (14 percent) in May, our data of visible cargoes indicated on 25 May. This was primarily due to Thailand, Chile and Singapore having already imported 0.27mmt more by 25 May. This outlook was mainly tempered by Bangladesh, where visible scheduled vessel calls indicated 0.13mmt (-25 percent) offtake decrease by the end of the month. Mexico did not enter the market in May. Myanmar was equally not seen in the market, having imported 0.03mmt in April.

Atlantic Basin

LNG imports in the Atlantic Basin had decreased notably by 0.61mmt (-8 percent) month-on-month to 6.66mmt, pegging pro rata utilisation at 36 percent on 25 May. However, our market visibility indicated potential Atlantic full-month demand growth of around 0.25mmt (3 percent) to 8.87mmt from 8.62mm in April, which would peg overall capacity utilisation at 35 percent.

European demand growth up to 25 May was underpinned by the Netherlands, Portugal, Spain and Lithuania, which together had increased imports by 0.38mmt (21 percent). Belgium, Croatia and Greece showed more modest increments of 0.03mmt (6 percent) overall at the time of writing. However, our data also showed a combined month-on-month decrease of 1.08mmt in Poland, Malta, Turkey, Italy, France and the United Kingdom at the time of writing. Our market visibility as of 25 May suggested European imports were on course for a net demand reduction of around 0.72mmt for the full month after taking into account visible cargoes en route to European terminals. However, we highlight that there also were 1.14mmt broadly en route to Europe with their final destination still to be declared. At least a portion of these may cushion the Europe's likely net demand reduction in May.

As to demand in the western Atlantic, importers in the Caribbean and South America – including Brazil, Jamaica, Puerto Rico, the Dominican Republic, the United States and Canada – were set to have seen a robust monthly net LNG demand increase by around 0.38mmt

(52 percent) overall in May and are thus likely to contrast the month-on-month demand decrease of 0.13mmt (-15 percent) seen in April. This month-on-month growth is likely carried by Argentina, which at 0.23mmt of imports had already shown 0.20mmt growth by 25 May over its equivalent period in April.

Middle East

We were also expecting Middle Eastern offtakes to have increased significantly

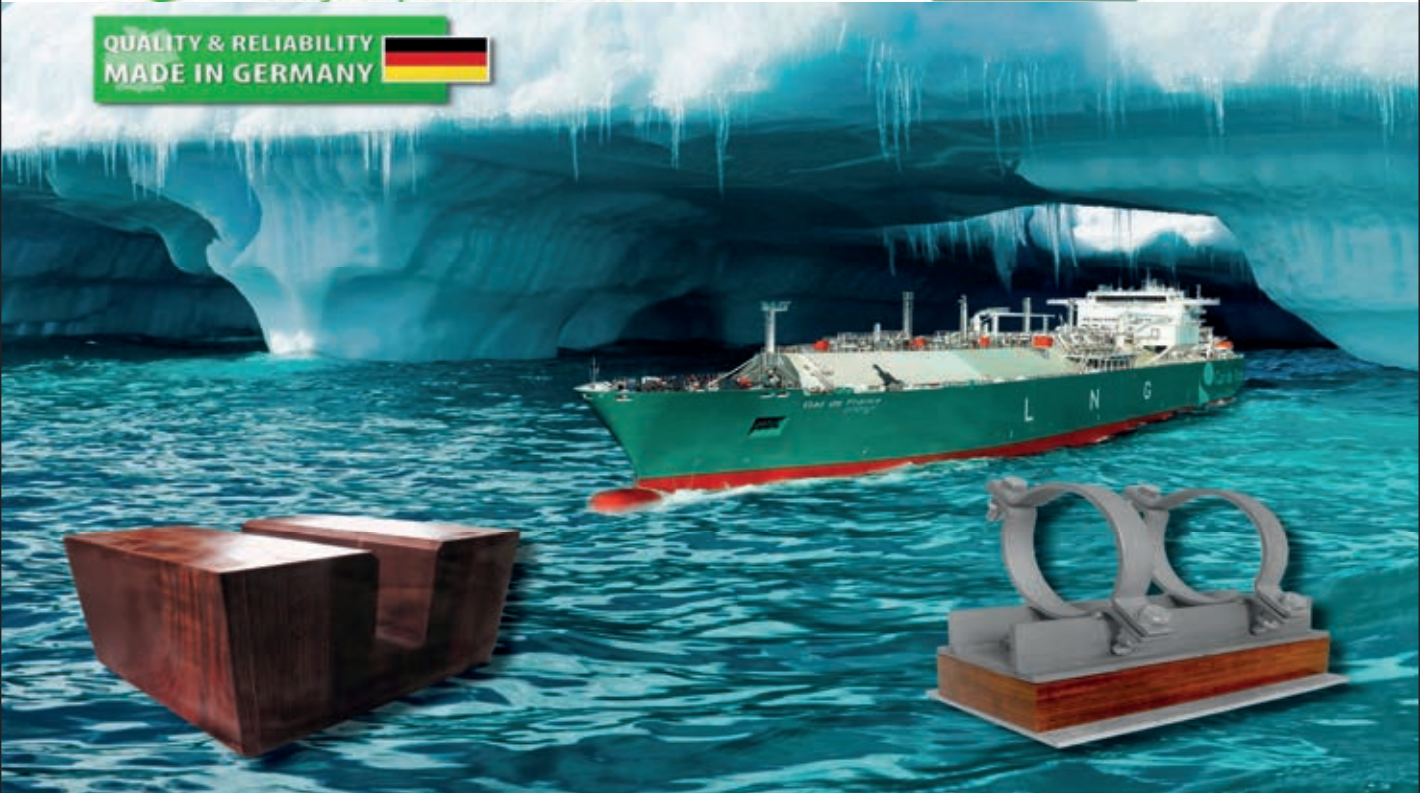
by the end of May. Our market visibility at the time of writing indicated regional offtakes to have grown by at least 0.06mmt (15 percent) to 1.37mmt by 31 May, tempered only by an expected 0.06mmt (8 percent) reduction in Pakistan. The majority of that growth was likely to be limited to the Persian Gulf region, where the UAE's Dubai FSRU had already seen growth of 0.16mmt in the first 25 days of May. Kuwaiti demand growth in May was more uncertain, however. We were

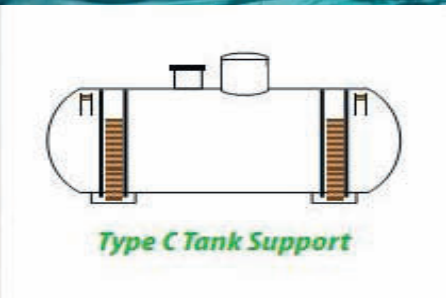
still expecting the Yari LNG to sail for the Mina al Ahmadi terminal, but the vessel had yet to declare its destination at the time of writing. We were also tracking the Atlantic LNG-derived KMarin Emerald, which also still had to declare its destination, but may arrive at Israel's Hadera FSRU facility on 29 May. If these two vessels unload their cargoes within the Basin before the end of the month, Middle Eastern demand growth could climb to around 0.20mmt (15 percent). ■



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For the Record

AIR PRODUCTS, the leading provider of LNG equipment, reported a 3 percent decline in fiscal second-quarter net profits as it continued as the main LNG processing technology provider while building up a global industrial gases business with projects progressing in nations such as Malaysia, China, Saudi Arabia and South Korea.

The company reported net income of \$477 million, slightly lower than the same three months of 2020 and the results included an estimated \$0.10 to \$0.15 per share negative impact from the effects of Covid-19.

The LeHigh Valley, Pennsylvania-based company highlighted its continued safe operations at more than 750 facilities around the world as it continued in the past year to receive orders for its proprietary LNG technology, equipment and related process licenses.

These LNG orders were for Qatar's LNG production expansion, Sempra Energy's Costa Azul LNG export terminal project in Mexico and the currently delayed Mozambique onshore project in Cabo Delgado province.

The company said second-quarter sales rose 13 percent to \$2.5 billion, due to 7 percent higher energy cost pass-through, a 4 percent favourable currency and 2 percent higher pricing.

"Volumes were flat, as new plants, acquisitions and increased sale-of-equipment activities were offset by reduced contributions from the Lu'An (China) gasification project, lower merchant demand from Covid-19, and the severe Winter Storm Uri that affected the US Gulf Coast," explained Air Products.

In its US operations Air Products noted in its highlights that it brought onstream a sixth air separation unit in Chandler in Arizona and the first cryogenic nitrogen plant in the Bayan Lepas Free Industrial Zone at Penang in Northern Malaysia to increase capacity to serve fast-growing electronics and other end-market demand.

The company additionally extended its gasification leadership by acquiring the 50 percent equity stake it didn't already own in a gasification technology joint

venture from China Shenhua Coal, Liquids and Chemical Co.

Air Products also opened a hydrogen fueling station in Ulsan City in South Korea, one of the three pilot projects in the Asian nation.

In major project updates, Air Products said the Lu'An synthesis gas \$1.3-billion joint venture in Changzhi City in China's Shanxi Province requested start-up of the facility and commissioning is underway.

In Saudi Arabia, Air Products is in a joint venture with Saudi Aramco and Acwa Power to acquire the gasification, power and industrial gas assets at the Jazan Economic City, representing a total investment value of about \$11.5 billion.

The Jazan project is in the final stages of project financing and the company said that barring unforeseen circumstances the transaction was expected to close during this fiscal year.

"Despite ongoing challenges from Covid-19 globally and the severe winter storm in the US Gulf Coast during the quarter, our talented, committed and dedicated team continued to work tirelessly, supporting our customers and successfully executing our mega-projects," said the Chairman, President and Chief Executive of Air Products, Seifi Ghasemi.

"Adjusted earnings per share improved over the prior year, we continued to improve pricing, and we again generated strong cash flow," he added.

"Meanwhile, Air Products continues to lead with world-scale energy transition projects in gasification, carbon capture and carbon-free hydrogen," stated Ghasemi.

AGL ENERGY confirmed the development of the proposed Crib Point LNG import project in the southern Australian state of Victoria has been cancelled as the utility also pursues a corporate overhaul by spinning off infrastructure assets.

The LNG project was dropped after the Independent Advisory Committee (IAC) findings and the Victorian Planning Minister's determination that the project would have "unacceptable environmental" effects.

AGL's LNG regasification terminal would have been sited at Westernport Bay, south of Melbourne, and had previously been described by the company as one of the vital tools in the cleaner energy transition.

AGL's venture was one of about half a

dozen LNG regasification projects under development in southeast Australian states.

"AGL takes its environmental obligations seriously and works cooperatively with all regulatory agencies to ensure we meet all regulatory requirements and engage with the communities where we operate, so as to respond to their concerns," said AGL on deciding to end the LNG project.

"From the outset, AGL recognised both the opportunity of the site at Crib Point and the environmental standards we needed to meet in a location of this kind," it added. "AGL presented a scientifically sound case, backed by experts, which demonstrated that the potential environmental effects were manageable," it explained.

AGL said it still has a "highly flexible gas portfolio and a supply strategy" which will enable customer demand to be met from existing and new domestic supply sources and proposed third-party regasification projects in southern Australia.

AGL is also in the midst of a corporate overhaul after deciding to spin off its infrastructure arm. AGL's Interim Managing Director and Chief Executive Graeme Hunt, made a presentation at the 22nd Macquarie Securities Conference on May 5, which went ahead on a virtual basis. Hunt's speech confirmed that AGL was progressing with its considerations on the "structural separation" and intended to provide more details by the 30th of June 2021.

"Our outlook continues to reflect the challenging market and operating conditions," said Interim CEO Hunt. "And as we announced yesterday, we are ceasing development of the Crib Point gas project and expect to recognise pre-tax expenses of up to \$108 million as a significant item," he told the Macquarie Securities conference.

CALCASIEU PASS LNG, the Louisiana export project has begun pre-commissioning activities and moved closer to being the nation's seventh large-scale LNG exporter by the fourth quarter of 2021.

The plant developer, Venture Global LNG, was given permission by the US Federal Energy Regulatory Commission on May 10 to commission a gas turbine at the Calcasieu Pass plant, a move usually made several months before full commissioning for production and start-up.

Once the seventh plant starts, the US is heading for the position of the World's No. 1 exporter by mid-2022, moving ahead of Australia and Qatar, with both producing just under 80 MTPA.

The Calcasieu Pass plant will have total output of 10 million tonnes per annum and its completion is ahead of schedule because it is being built using modular liquefaction Trains.

The Trains are being constructed in Italy and delivered for installation and set up at the Louisiana site.

About half of the 18 processing Trains to be used at the facility have now been installed.

At the end of April 2021, Venture Global issued a tender for at least 12 cargoes from Calcasieu Pass for delivery starting at the end of the third quarter of 2021.

With full production from Calcasieu Pass, the US would move to total nameplate capacity at the seven plants of 81.5 million tonnes per annum. This would rise to 86 MTPA once the sixth Train at Cheniere Energy's Sabine Pass plant in Louisiana comes on stream in 2022.

Venture Global plans a phased operational start-up with commissioning cargoes being lifted in the fourth quarter and full operations at Calcasieu Pass expected in mid-2022.

Calcasieu Pass is also being constructed with its associated TransCameron Pipeline.

The FERC letter just received by Venture Global gives the company permission to introduce hazardous fluids to an LM2500 gas turbine at Calcasieu Pass after its formal request.

The company also listed other pre-commissioning works that can be started in the weeks ahead.

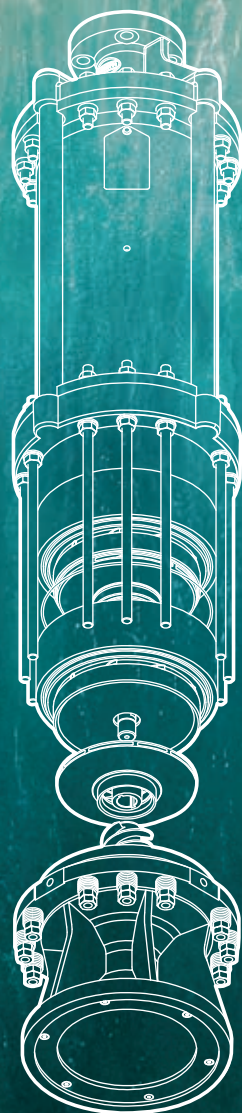
"Calcasieu Pass has now fulfilled the environmental conditions listed which were necessary prior to commencing the introduction of temporary Aqueous Ammonia to the Terminal's LM2500 gas turbine," said the notice.

"Calcasieu Pass hereby requests written authorization from the Director of the Office of Energy Projects (OEP) and a Notice to Proceed with the scope of work described no later than May 10, 2021," it added.

"Prior to introduction of hazardous fluids, Calcasieu Pass shall complete and document for all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed Control System and the

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Safety Instrumented System that demonstrates full functionality and operability of the system,” explained Venture Global.

“Liquefaction Train 1 will be commissioned and run to produce LNG, which will be sent to the South LNG Tank and the South Jetty using the associated loading equipment,” said the company in its formal description of plans given to FERC.

Venture Global told FERC that prior to full commissioning, Calcasieu Pass shall file a detailed schedule for equipment start-ups.

“The schedule shall include milestones for all procedures and tests to be completed, prior to introduction of hazardous fluids, and during commissioning and start-up,” said Venture Global.

Prior to commissioning, Calcasieu Pass told the regulator it would also file results of the LNG storage tank hydrostatic tests and foundation settlement results along with those on adjacent piping.

The area of Calcasieu Pass in Cameron Parish in Louisiana already plays host to the existing Cameron LNG plant, operated by Semptra Energy.

In addition to the Calcasieu Pass plant, Arlington, Virginia-based Venture Global has received all authorizations to build a second plant, the Plaquemines export facility at river mile-marker 55 on the west side of the Mississippi River, about 30 miles south of New Orleans.

Both Calcasieu Pass and Plaquemines are being constructed with liquefaction and export capacity of 10 MTPA and with the same number of modular Trains.

The Calcasieu Pass plant has Omaha, Nebraska-based company Kiewit Corp. as the engineering, procurement and construction contractor.

EQUINOR, the Norwegian oil and gas company, has concluded internal investigations following two fires last year at its facilities in Norway, one at the Hammerfest LNG export plant and a second at the Tjeldbergodden methanol facility, and has submitted the results to the nation’s Petroleum Safety Authority.

The fire at Hammerfest LNG on Melkoya island occurred on September 28 in 2020, while the fire at the Tjeldbergodden plant at an industrial complex in Nordmøre happened just over two months later on December 2.

“Both fires at the onshore facilities in 2020 were very serious,” stated Irene Rummelhoff, an Equinor Executive

Vice President in presenting the reports.

“These incidents have made a deep impression on everyone who was involved or affected. The emergency response effort helped ensure that no one was injured,” she added.

“I want to commend the efforts and commitment exhibited by our employees, suppliers and the local communities to return the facilities to safe operation,” stated Rummelhoff.

She declared that the incidents in 2020 had triggered a comprehensive improvement effort within safety at Equinor’s onshore facilities.

“We didn’t waste any time in taking steps to ensure that incidents like this never occur again,” said the Equinor executive.

“The findings in both investigation reports will be followed up with measures designed to reinforce and enhance the safety work at the onshore facilities and in Equinor in general,” she said.

In the Hammerfest LNG report, Equinor concluded that during a start-up of the facility, a fire occurred in the filter housing of a gas turbine generator.

The investigation group noted that the cause of the fire was spontaneous ignition in the filters in the turbine’s air inlets, caused by excessively high temperatures over a long period of time.

“The anti-icing heat exchanger in the air inlet was used outside of its intended area of application, thus causing the high temperature that triggered the fire,” said the report.

“The investigation group does not believe that the maintenance interval for exchanging the filters that self-ignited is a contributing cause,” said Equinor.

“No one was injured in the incident. Both the PSA report and our own investigation confirm that the fire was unlikely to spread to other parts of the facility. The extinguishing efforts undertaken based on the precautionary principle, and in line with the applicable emergency preparedness principles, entailed extensive damage to parts of the facility,” the report added.

Equinor also recently reported that the Hammerfest LNG facility, which supplies European import terminals, would remain closed until March 2022 due to the scope of the repairs needed to restore the facility to safe production.

Equinor has initiated modifications to the air intakes in the turbines to prevent similar incidents from occurring.

“The incident was not caused by a single technical or human error, but was

the result of several direct and underlying factors,” said the Equinor Hammerfest report.

“The findings will be followed up in a dedicated improvement initiative in Equinor,” said the company.

FLUXYS of Belgium plans to install four additional LNG truck-loading bays at the Zeebrugge import terminal as LNG demand continues to grow as a fuel replacement for diesel in northwest Europe and all around the European Union.

Zeebrugge has been in operation since 1987 and has five tanks with 566,000 cubic metres capacity of storage and a nominal 6.6 million tonnes per annum of unloading.

“With demand for LNG as a low-emission fuel soaring, the existing truck-loading bays at the Zeebrugge LNG terminal are gradually being used at their maximum capacity,” said Fluxys.

“While the number of truck-loadings in 2017 was still around 1,450, the utilization rate for this year is estimated to rise towards 6,000 loadings, approaching the maximum capacity of 8,000,” added the company.

The Fluxys operations at Zeebrugge have also grown in importance since the start of the long-term trans-shipment contract in 2019 for Yamal LNG in Russia. The Yamal cargoes pushed shipping traffic at the Zeebrugge terminal to new heights in 2020.

A total of 172 vessels docked at the terminal, smashing the previous record of 130 in 2019.

Fluxys said that March 2020 was the busiest ever month for ship traffic at the terminal, with a total of 30 vessels docking, more than double the previous record in May 2019.

At the same time, LNG truck traffic increased by over 20 percent.

“A market interest inquiry into truck-loading slots at the Zeebrugge terminal held in mid-2020 showed strong demand for booking substantially more slots in the future,” explained Fluxys.

“With the additional truck loading bays, the market will continue to be able to count on sufficient loading capacity to meet increasing demand. The four new truck-loading bays are scheduled to become available in 2024,” stated Fluxys.

LNG trailers mainly load LNG at the Zeebrugge terminal to supply fuelling stations servicing LNG-powered trucks.

The trailers loaded at the terminal also supply LNG-powered ships and remote industrial users without connection to the gas grid.

Another option is loading LNG containers for onward intermodal transport by train or ship.

“The key demand driver for substantially more truck-loading slots at Zeebrugge is the fast-growing fleet of LNG-powered trucks and the equally strong rise in fuelling stations to service them,” noted Fluxys.

On the shipping side, Fluxys in February 2021 reached a final investment decision to build 6 MTPA of additional regasification capacity at Zeebrugge.

A total of 4.7 MTPA will be completed by early 2024 and the remainder by 2026, adding to the 6 MTPA capacity available.

GOLAR LNG Ltd, which still has around 25 owned or operated vessels in its fleet, reported a profit in a hectic first quarter that saw the departure of its Chief Executive Iain Ross, the sale of US unit Golar LNG Partners to New Fortress Energy, along with Golar’s half share in the Hygo Energy Transition business in Brazil.

First-quarter net income for Golar LNG Ltd came to \$25.4 million compared with a loss of \$104.2M in the same three months of 2020.

The average daily Time Charter Equivalent (TCE) in the first three months of 2021 came to \$61,700, in line with both expectations and the TCE achieved in the first quarter of 2020.

Among Golar LNG Ltd’s remaining vessels comprising conventional carriers, FSRUs and floating production vessels, one ship was highlighted in the earnings report.

Golar said that the “FLNG Hilli Episeyo”, which produces LNG offshore Cameroon in West Africa, was offloading its 56th cargo, with 100 percent commercial uptime maintained.

The company said that the “FLNG Gimi” conversion project at Keppel Shipyard in Singapore, and destined to be deployed for the Mauritania-Senegal project offshore West Africa, was 69 percent technically complete and on track and on budget.

The vessel will produce LNG under a 20-year charter deal over the Greater Tortue Ahmeyim gas fields in the offshore area licensed to BP of the UK and Kosmos Energy of the US.

“With the announcement of the sale of

Golar LNG Partners LP and Hygo Energy Transition to New Fortress Energy on January 13, and closing of the transactions on April 15, Golar has made significant progress simplifying its business,” said the company.

“We are encouraged by the strength of shipping rates during what is normally a seasonally weak period,” the statement noted.

“The few shipyards capable of building LNG carriers are filling with container newbuild orders and we do not see potential for significant new LNG carrier orders before 2024,” said Golar.

“Current and forward energy prices are also strengthening, increasing the attractiveness of LNG upstream investments and our FLNG technology,” it added.

Golar said it was continuing to pursue FLNG growth projects including both tolling arrangements and opportunities to develop hydrocarbon exposure through ownership of gas suitable for production by the company’s FLNG technology.

In its shipping market outlook, Golar said things were improving

on underlying LNG demand and higher prices.

“Ton miles are increasing, the likelihood of any summer 2021 cargo cancellations has been reduced, charterers seeking spot tonnage are facing competition from those looking for term charters, all of which are improving the rate outlook,” said Golar.

“Tighter emissions regulations expected from 2023 may also require slower steaming for a substantial portion of the existing fleet. The market strength can be illustrated by our recent fixture of a one-year time charter at a level of return not seen in the LNG market since 2010-2011,” stated Golar.

The company added that it was pleased to have appointed Karl Fredrik Staubo as the new CEO in succession to Iain Ross, while Eduardo Maranhao was named as Chief Financial Officer.

“With their GMLP and Hygo backgrounds both have been intimately involved with the business for some time and will be familiar faces to Golar stakeholders, allowing for a seamless transition,” said the company.

GTT, the French maritime storage technology company, has been chosen to design the fuel tanks of 12 new liquefied natural gas-powered container vessels ordered from China by the global CMA CGM shipping group based in the French port of Marseille.

GTT said that CMA CGM aims to have a fleet of 44 LNG-fuelled container ships by 2024.

The LNG fuel tanks will be the GTT Mark III membrane containment system and will be able to load 14,000 cubic metres of LNG

The 12 vessels will be delivered between the last quarter of 2023 and the third quarter of 2024.

The construction contracts for the CMA CGM newbuilds has been given to the Chinese shipyards, Hudong-Zhonghua Shipbuilding and Jiangnan Shipyard Co.

Each of the Chinese yards will build six vessels able to carry between 13,000 and 15,000 twenty-foot equivalent units of containers.

The order for the six 15,000 TEU vessels completes the order of five similar

container vessels signed in June 2019 with the Jiangnan Shipyard.

“After nine container vessels ordered in 2017 and five in 2019, the choice of GTT technology is confirmed by CMA CGM for the liquefied natural gas propulsion of its vessels,” explained Philippe Berterottière, Chairman and Chief Executive of GTT.

“Participating in the decarbonisation of maritime transport alongside the CMA CGM Group and our partners Hudong-Zhonghua Shipbuilding and the Jiangnan Shipyard is a source of great pride for GTT and its teams,” added Berterottière.

The French-flagged CMA CGM containership line is the market leader in LNG-powered vessels.

The first delivered vessel was the 23,000 TEU “CMA CGM Jacques Saadé”, named after the late Lebanon-born founder of the shipping line and father of current Chairman Rodolphe Saadé.

The next deliveries of the first nine newbuilds were named after Parisian landmarks, monuments or institutions such as the “CMA CGM Champs Elysees”, the “Palais Royal”, the “Louvre”, the

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“Rivoli”, the “Montmartre”, the “Concorde”, the “Trocadéro” and the “Sorbonne”.

CMA CGM has chosen French energy major Total as its LNG bunkering supplier at ports around the French coast and in Rotterdam.

JAPAN PETROLEUM Exploration Co (Japex), the oil and gas operator with liquefied natural gas import terminal and Japanese pipelines assets, has agreed to cut losses and sell its stake to Malaysia’s Petronas in the Canadian North Montney shale-gas joint venture.

The Petronas Canadian subsidiary is the operator of the North Montney project in British Columbia that was purchased as part of the Malaysian company’s LNG project ambitions, now focused on the Royal Dutch Shell-led LNG Canada project at Kitimat.

“Japex had participated in the North Montney project and had proceeded with a feasibility study of the LNG project in addition to the shale-gas development and production,” explained the Tokyo-based company.

“Even after the decision not to proceed with the LNG project in July 2017, due to changes in the business environment, Japex had been working with Petronas and its partners to maximize the value of the North Montney project,” it added.

However, Japex noted that it had embarked on a medium-term business plan to improve the profitability of its exploration and production unit.

“The environment surrounding the E&P business is expected to become even more severe due to the prolonged effects of Covid-19 since early last year, including the structural changes and the accelerating global decarbonization,” it explained.

Therefore, Japex decided to sell its 10 percent interest in the North Montney project to Petronas for an undisclosed sum.

As a result of this transaction, Japex stated that it expected to record an extraordinary loss of around C\$493 million (\$407M) for exiting the Canadian venture.

Japex E&P projects continue in nations like Indonesia and in the UK sector of the North Sea, where it is involved in oil.

Japex additionally owns a network of 800 kilometre of high-pressure gas pipeline in Japan to supply local gas distributors companies, power plants and industrial customers.

The Japex supplies come from its domestic gas fields and regasified LNG from import terminals.

The company’s own Soma LNG import terminal in Fukushima Prefecture started commercial operations in March 2018.

The Soma facility comprises 230,000 cubic metres capacity of storage as well as loading facilities for trucks and two jetties for LNG carriers and domestic coastal vessels.

This terminal receives LNG cargoes and feeds the regasified LNG into the Soma-Iwanuma Gas Pipeline.

Volumes are also shipping to the Yufutsu LNG receiving terminal at Tomakomai-city on Hokkaido island by small-scale carriers.

Japex says the stability of natural gas supply along its pipelines is further improved by connecting the Japan Sea side and the Pacific Ocean side via the Niigata-Sendai Gas Pipeline, which is the Japex gas main line.

Through its Fukushima natural gas power plant, Japex added that it was also promoting the power generation business as one of its new earnings bases.

JGC Holdings Corp., the Japanese energy and LNG engineering group whose current work includes the LNG Canada project and the Coral South floating LNG venture offshore Mozambique, posted lower net sales in the past fiscal year, though adjusted profits increased as it forecast a sector upsurge.

During JGC’s fiscal year from April 2020 until the end of March 2021 net sales amounted to 433.9 billion yen (\$3.99Bln), lower than the forecast 480.0Bln yen (\$4.41Bln), though ordinary (adjusted net) income was higher at 25.5 billion yen (\$234.5M) compared with income of 22.3Bln yen (\$205.7M) reported in the previous fiscal year.

Because of the impact of Covid-19 over the past year, earnings per share dropped to 20.37 yen (US\$0.19) from a forecast 31.70 yen (\$0.29) per share.

“We had assumed that our business environment impacted by Covid-19 would have returned to normal during the period concerned, but the situation has been unclear and different from our assumption,” said JGC.

“In these circumstances, the net sales were affected by the fact that construction progress could not get a sharp recovery towards the end of the fiscal year to reach our forecast,” added JGC.

“The operating income and ordinary income exceeded the forecasts because of margin improvements in domestic and overseas projects and a reduction in general and administrative expenses,” stated the company.

JGC expected business to grow in the LNG sector in the coming years.

“LNG is a cleaner, lower-carbon fossil fuel for the energy transition and is expected to keep growing steadily amid higher demand in emerging economies,” stated the Japanese company.

JGC said it would also seek to strengthen its contract portfolio to secure some of the many projects anticipated for LNG production and receiving terminals and gas-fired thermal power plants.

Additionally, JGC said projects would also likely increase in the already “traditional” renewable energy business such as in solar power, energy storage and biomass power generation, as well as in the new and experimental fields of hydrogen and ammonia fuel.

JGC said its outstanding contracts in the LNG sector amounted to 509.8Bln yen (\$4.6Bln) compared with 617.4Bln (\$5.6Bln) at the end of the previous fiscal year.

Petroleum refining engineering contracts, including in nations like Iraq, amounted to around 444.1Bln (\$4.0Bln).

JGC’s corporate structure has JGC Holdings as the parent company and JGC Corp. operating the overseas engineering, procurement and construction (EPC) business of the JGC Group.

JGC Corp. was chosen by Iraq to upgrade the oil refinery at Basrah, located 525 kilometres southeast of the capital Baghdad.

That Iraqi lump-sum EPC contract is valued at more than \$3Bln and the completion date is 2025.

Outstanding contracts increased in JGC’s overall engineering sector backlog amounting to 1.24 trillion yen (\$11.4Bln), also including some power generation and chemical projects, versus 951.3Bln yen (\$8.74Bln) at the end of the previous fiscal year.

As part of the medium-term business plan, JGC said it would also be investing around 200Bln yen (\$1.8Bln) in key corporate activities such as digital transformation and research and development.

Its financial targets for the 2025 fiscal year include net sales of 800Bln (\$7.35Bln), operating income of 60Bln yen (\$500M) and net profit of 45Bln yen (\$413M).

JGC also explained its aims to promoting clean energy as well as, and not instead of, human welfare.

“We remain committed to our traditional mission of creating a more prosperous future, which has been redefined to reflect our purpose of improving the intertwined health of humans and the Earth,” stated JGC.

KOSMOS ENERGY, the US shareholder in the floating liquefied natural gas joint venture offshore the West African nations of Mauritania and Senegal, halved its losses in the first quarter and said material progress was made across all the major workstreams of the LNG project centred on the Greater Tortue-Ahmeyim gas fields.

Kosmos stated that the project was 58 percent complete after advances made on the floating LNG vessel, the hub terminal with a concrete breakwater, the Floating Production Storage Offloading (FPSO) unit and on the subsea infrastructure.

Kosmos, the specialized Atlantic Margin exploration and production company whose projects are centred offshore West African nations as well the US Gulf of Mexico, is developing FLNG production in the waters of Mauritania and Senegal with UK major BP.

The Dallas, Texas-based company added that the first phase of the Tortue-Ahmeyim LNG project would be 80 percent complete by the end of 2021 and remained on track for first gas in the first half of 2023.

Kosmos halved its net losses in the first quarter to \$90.7 million from \$182.7M in the same three months of 2020.

The earnings statement showed revenues of \$176M, or \$53.66 per barrel of oil equivalent.

Net capital expenditures related to Mauritania and Senegal LNG in the first quarter were \$73M.

Kosmos said it exited the first quarter with approximately \$2.2 billion of net debt and available liquidity of around \$800M.

In March 2021, Kosmos successfully closed a \$450M offering of senior notes due in 2028.

“This month marks the 10th anniversary of the listing of Kosmos on the New York Stock Exchange,” said Chief Executive Andrew G. Inglis.

“In those 10 years, Kosmos has evolved from a frontier explorer to a full-cycle E&P with a diverse reserve base that has increased nearly seven-fold, building the

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platform for continued success over the next 10 years,” stated Inglis.

The CEO said 2021 was off to a strong start with momentum building across the business.

“We have begun infill drilling activities in Ghana and the Gulf of Mexico, will soon begin drilling in Equatorial Guinea, and are on track to deliver our production and cash flow targets for the year,” explained Inglis.

In its other operations in Africa, Kosmos said production in Ghana averaged around 22,400 barrels of oil per day and Kosmos lifted one cargo in the first quarter.

Natural gas offtake to the government of Ghana was around 110 million standard cubic feet per day in the quarter, almost double the level seen in 2019.

Kosmos said production in Equatorial Guinea averaged 10,200 barrels of oil per day net in the quarter and the company lifted a half cargo of oil.

MAMMOET, the Dutch-based heavy-lifting, transportation and installation services provider, has won a contract for Saudi Aramco’s natural gas storage and gas resources management project, the Aramco Hawiyah Unayzah Gas Reservoir Storage venture, located 260 kilometres (160 miles) east of Saudi Arabia’s capital Riyadh.

Samsung Engineering of South Korea has awarded the heavy-lifting and transport work to the experienced Dutch company, which has been operating in Saudi Arabia for over 40 years.

The Aramco Hawiyah Unayzah project comprises a gas injection facility with a capacity of 1,500 million standard cubic

feet per day (mmscf/d) as well as a withdrawal facility which is capable of processing up to 2,000 mmscf per day of gas.

The project includes the construction of gas injection with boosters and compressors, a gas reproduction facility with compressors and slug catchers, as well as various utilities and offsite facilities.

The facility is expected to be completed in 2023 and will enable Saudi Aramco to efficiently manage surplus natural gas volumes to meet seasonal demand.

The value of the Mammoet contract was not disclosed. Korea’s Samsung Engineering was awarded the engineering, procurement and construction (EPC) contract and has in turn given the heavy-lifting, transportation and installation work to Mammoet’s Saudi branch.

Mammoet said more than 60 components would be received either at King Fahad Industrial Port in Jubail or at a fabrication facility in Dammam and transported to the site for further installation.

The heaviest components include four slug catchers, each weighing over 400 tons. “The scope includes associated port handling and customs clearance activities, obtaining of required permits from the Royal Commission and the Ministry of Transport, along with a close collaboration with Saudi Traffic Police to smoothly facilitate the project’s transport phase,” explained Mammoet.

“Over 200 lifts are expected to take place throughout the 17-month long project,” it added. Kevin O’Sullivan, General Manager of Mammoet in Saudi Arabia, said the gas project contract award followed on from the successful delivery of other projects for Samsung Engineering in Saudi Arabia, such as the Shaybah petrochemical plant construction and the Jubail United Petrochemical Company’s Ethylene Oxide-Ethylene Glycol (EO-EG) plant.

“It was secured primarily on the back of the client’s confidence in Mammoet’s technical expertise, quality and safety standards and we are confident in the success of this project,” stated O’Sullivan.

“Having been present in Saudi Arabia for over 45 years, we have a proven track record of executing projects of such scale in the Kingdom,” he said.

“Our local operation hub with extensive local fleet and a dedicated local workforce in line with our commitment to

Aramco’s In-Kingdom Total Value Add program (IKTVA) demonstrates this,” O’Sullivan added.

NIGERIA says its Department of Petroleum Resources (DPR) has awarded a licence for a project to establish the West African nation’s first floating liquefied natural gas production plant and run by a Nigerian oil and gas company rather than an international energy major.

Sarki Auwalu, the Director of the DPR, signed a contract at an online ceremony with Nigerian company UTM Offshore Ltd to support the first Nigerian FLNG venture.

The contract was signed by DPR and UTM Offshore’s Chief Executive Julius Rone who received the License to Establish (LTE) permit for an offshore LNG production plant.

Nigeria has lagged behind other West African nations such as Cameroon and newcomers like Mauritania and Senegal in establishing FLNG facilities for its extensive natural gas resources.

The country operates the onshore Nigeria LNG plant at Bonny Island in the Niger Delta where output in 2020 amounted to just under 21 million tonnes, a fall of 1.4 percent on the previous year as the company also develops its long-awaited Train 7 project.

The Nigeria LNG onshore plant with six liquefaction Trains is owned by four shareholders, Royal Dutch Shell, the French and Italian majors Total and Eni as well as Nigeria National Petroleum Corp. (NNPC), which owns 49 percent of the venture.

The onshore Train 7 contract was signed with an engineering consortium comprising Italy’s Saipem, South Korea’s Daewoo Engineering and Japan’s Chiyoda Corp.

The contract along with a debottlenecking programme would add around 8 MTPA of capacity to the Bonny Island facility, taking the total to around 30 MTPA by 2025.

On the FLNG contract UTM said it had agreed a pre-front-end engineering and design contract with experienced Japanese liquefaction plant builder JGC Corp.

The DPR’s Auwalu said the FLNG project being pursued by UTM was in line with the vision of the Nigerian Federal Government’s efforts to transform Nigeria into more of a natural gas-based economy rather than relying solely on oil.

“The DPR will continue to provide opportunities and enable the businesses of promoters and investors in the oil and gas industry for the economic growth, stability and sustainability of Nigeria and for the mutual benefit of all investors and industry participants,” said Auwalu after the signing.

UTM Offshore’s CEO Rone thanked President Muhammadu Buhari’s administration for creating “an enabling environment” for indigenous oil and gas companies to progress.

Rone expressed optimism that the project would be completed in the next four years.

UTM Offshore gave no details of likely production totals, though the initial plan was to process around 176 million cubic feet per day of natural gas and condensate.

PAPUA LNG, the export plant expansion proposed for Papua New Guinea by French oil and gas major Total and the Government as well as other shareholders, is now proceeding with feed gas coming mainly from the Elk-Antelope resources, among the largest onshore gas fields in Asia.

Total said the decision followed a meeting between Patrick Pouyanné, Chairman and Chief Executive of Total, and a PNG government delegation, led by Deputy Prime Minister Samuel Basil, with the objective of reviewing the next steps for the development of the joint venture.

“After a year of delay because of Covid-19, the Government of PNG and Total as operator are pleased to announce the remobilization of the project teams and of other required resources,” said Total.

The French company said that the objective now was to launch the front-end engineering and design in early 2022 and to prepare for a final investment decision in 2023.

“This positive development follows the signature and the reconfirmation of the Papua LNG Gas Agreement in 2019, the signature of the Fiscal Stability Agreement and the award of the licence extension in February 2021,” explained Total.

Total is the main shareholder in the Petroleum Retention Licence 15 that will underpin most of the production increase. The PNG LNG plant, located at Caution Bay northwest of Port Moresby and operated by ExxonMobil Corp., already produces around 8.8 million tonnes per

Diary of events

June

7th China LNG & Gas International Exhibition

23 - 25 June, 2021

National Exhibition & Convention Centre (NECC), Shanghai, China
<https://www.dmgevents.com/events/>

August

Canada Gas & LNG Exhibition and Conference

23 - 25 August, 2021

JW Marriott Parq Vancouver, Canada
<https://www.canadagaslng.com/>

September

Gastech Exhibition and Conference

13 - 16 September, 2021

Singapore Expo, Singapore
<https://www.gastechevent.com/>

annum of LNG, about 28 percent above nameplate capacity.

Previous studies on Papua LNG supported new capacity comprising three liquefaction Trains each with 2.8 MTPA of output and the feed gas flowing from the Elk-Antelope fields.

The Papua LNG project has the PNG Government and local landowners owning 22.5 percent of the project with Total holding 31.1 percent, ExxonMobil 28.7 percent and PNG-based and Australian-listed Oil Search owning 17.7 percent.

In the process to move the project forward the PNG delegation was invited to Total's headquarters in Paris. "This is indeed a very strong signal of the dedication of the PNG Government to the success of this key project," stated Pouyanné after the meetings.

"I confirm that this project is ranking very high in Total's portfolio given its proximity to growing Asian LNG markets and we will dedicate all necessary resources," declared the Total CEO.

PNG Deputy Prime Minister Basil said it was very important for the Government to meet Total and the French authorities to stress the importance to PNG of the Papua project. "I am pleased with the outcome of this meeting with clear implementation plans," added Basil. Total explained that Papua LNG would target the production of the two main discoveries of the Block PRL-15, the Elk-Antelope fields. It is expected that the gas produced by these fields will be transported by a 320-kilometre onshore-offshore pipeline to the Caution Bay site to be liquefied in two LNG Trains to be built with a total capacity of 5.6 MTPA.

The new Trains will be integrated into the existing PNG LNG facilities in Caution Bay. "Total and the PNG Government aim to cooperate to create significant in-country value and to implement the Papua LNG project in an exemplary manner and taking into highest consideration the bio-diversity and environmental stakes as well as the rights of local communities," said the joint statement.

Total is the world's second-largest non-state run LNG company, with a global portfolio previously expected to reach 50 MTPA by 2025, though the Mozambique LNG export plant volumes will be delayed coming on stream because of the current insecurity in the southeast African nation.

However, the French company still has a diverse mix of volumes with stakes in

liquefaction plants in Qatar, Nigeria, Russia, Norway, Oman, Egypt, the United Arab Emirates, the US, Australia and Angola.

One of the other Papua LNG shareholders, Oil Search, noted that Total had already said that considering the Mozambique LNG project situation, the main priorities now for the French major were Papua LNG and Sempra Energy-run Cameron LNG expansion on the US Gulf Coast. Oil Search said it believed Papua LNG had three main advantages.

"It is ideally positioned with proximity to markets, and is away from pinch-points while at the same time Asian buyers continue to seek high heating-value LNG," said the company listed on the Australian Securities Exchange.

PASSER MARINE of Norway has been granted an initial approval from the European classification society DNV for its development of a new LNG fuel tank insulation system suitable for Type-B fuel tanks.

The new Passer Marine concept is designed for prismatic Type-B LNG tanks, which according to International Maritime Organisation rules require a partial secondary barrier.

The Passer Marine equipment includes a leakage detection system capable of safely managing and containing fuel leaks.

"The system we have developed is cost-effective and production-friendly," said Svein Konradsen, Chief Operating officer of Passer Marine. "The pandemic has been challenging for many companies and for the development of this particular design," explained Konradsen.

"The required testing has been difficult to finalize due to interruptions and limited possibilities to travel, but finally we have been able to submit the necessary documentation which I am very pleased to say was accepted by DNV," he stated.

Konradsen said the Approval In Principle (AiP) from DNV was a boost for the company in the storage tanks equipment market. As LNG-fueled vessels are increasingly being deployed for deep-sea shipping, fuel tank sizes need to increase from 300-1,000 cubic metres of fuel capacity to up to 10,000-20,000 cubic metre, which leaves less room for cargo.

"As such, there is increased industry interest in alternative fuel tanks, known as Type-B, which are prismatic in shape and more volume efficient than

traditional cylindrical Type-C tanks," explained Passer Marine, which has offices in Norway, Lithuania and China.

"Between 95 and 99 percent of LNG-fueled ships contain Type-C fuel tanks, but many newbuilds on order contain Type-B specifications," the company added.

Monika Johannessen, a Head of Department at Hamburg, Germany-based DNV Maritime, explained the thinking behind the initial approval of the Passer Marine tanks insulation.

"There are several insulation concepts under development that provide an integrated secondary barrier and leakage detection system, but there are few proven systems available on the market," said Johannessen.

"We are pleased that Passer Marine has chosen DNV to pursue verification for this innovative concept and look forward to receiving the documentation for full approval," she stated.

An AiP is widely recognized in the industry as an early phase verification level for new design concepts or for existing designs in new applications.

The approval issued by DNV is an independent assessment of a concept according to an agreed requirement framework within DNV rules, notations and regulations.

PETROCHINA, the Chinese oil and gas major listed in Hong Kong and with LNG stakes in Canada and Mozambique, reported an 8.4 percent rise in first-quarter revenues and a return to profits after losses in the same three months of 2020, as it also completed the hand-over of control of the Dalian LNG terminal to the new state-owned energy infrastructure company. PetroChina posted quarterly revenues to the end of March 2021 of 551.9 billion Chinese yuan (\$85.0Bln) compared with 509.0Bln (\$78.4Bln) in the same three months of 2020. First-quarter net profits amounted to 27.7Bln yuan (\$4.2Bln) compared with losses of 16.2Bln yuan (\$2.5Bln) in the same quarter of 2020. The company said earnings were helped by the increasing demand for natural gas across the country. "The demand in the domestic natural gas market increased significantly as compared with the same period of last year," said PetroChina.

PetroChina's parent company, Beijing-based China National Petroleum Corp., imports pipeline natural gas from Central Asian countries and Russia as well LNG from projects such as Yamal LNG and

from PetroChina LNG agreements. PetroChina is additionally part of Royal Dutch Shell's LNG Canada project and has a stake in the Area 4 reserves in the Rovuma Basin offshore Mozambique with Italian company Eni and ExxonMobil of the US. Onshore LNG projects have now been delayed in the southeast African nation because of an Islamist-led insurgency. "In the first quarter of 2021, with the effective control of the Covid-19 epidemic, the world economy showed a good tendency of recovery, and China's economy continued to maintain a stable recovery momentum with signs of steady reinforcement and improvement," said PetroChina. "The GDP of China increased by 18.3 percent as compared with the same period of last year," stated the energy major. "The average spot price of North Sea Brent crude oil was US\$61.12 per barrel, representing an increase of 21.9 percent as compared with the same period of last year and the average spot price of the West Texas Intermediate crude oil was US\$58.13 per barrel, representing an increase of 27.7 percent compared with the same period of last year," noted PetroChina.

PetroChina said its first-quarter average realised price for natural gas was US\$6.56 per thousand cubic feet, representing an increase of 28.6 percent compared with the same quarter in 2020. "We also continued to optimize the structure of gas sources to ensure production and sales of domestic gas, and endeavoured to reduce costs of imported natural gas and LNG," explained PetroChina. "In the first quarter, the Group's domestic natural gas sales volume reached 54.65 billion cubic metres, representing an increase of 14.6 percent over the same period last year," said the company. PetroChina explained that its natural gas and pipeline segment achieved an operating profit of 18.5Bln yuan (\$2.85Bln) in the quarter. This represented an increase of 63 percent from 11.3Bln (\$1.75Bln) in the same period last year, mainly due to the combined effects increased sales, a rise in prices and a decrease in procurement costs.

PetroChina added that among other events its subsidiary company, PetroChina Kunlun Energy, has completed the transfer of assets to China Oil & Gas Pipeline Network Corp. (PipeChina), which was set up as part of state energy reforms to separate oil and gas companies from key infrastructure to allow more third-party access. PetroChina

has transferred to PipeChina its 60 percent equity interest in PetroChina Beijing Gas Pipeline Co. and its 75 percent stake in PetroChina Dalian LNG Co. previously held by Kunlun Energy.

The Dalian LNG terminal is located in the northeast province of Liaoning and has been operational since 2011, with 480,000 cubic metres of LNG storage in three tanks as well as truck-loading bays.

PIVOTAL LNG and joint venture partner NorthStar Midstream are increasing their liquefaction capabilities to 360,000 gallons per day and doubling storage capacity to 4 million gallons using the growing expertise of construction services companies in the US small-scale LNG sector.

The existing liquefaction plant in the port of Jacksonville in Florida, called JAX LNG, started operations in 2018 and is the largest of three US fuel plants owned by Pivotal and NorthStar.

This Florida project is supported by the growing expertise of American companies in the small-scale liquefaction, storage and shipping construction services sectors.

JAX LNG is located along the St. John's River in Jacksonville and the expansion is expected to be placed in service by early 2022 to support a new long-term LNG supply agreement for shipping.

Following completion of the JAX LNG expansion, Pivotal's network of LNG assets will reach a total production capacity of more than 470,000 gallons per day and a storage capacity of 9 million gallons at its three facilities in Florida, Alabama and Pennsylvania.

"We are thrilled to have the opportunity to meet our customers' LNG needs and the growing LNG demands in the eastern US," said Tim Delay, Vice President of Pivotal LNG.

"The expansion at JAX LNG with our partner NorthStar further demonstrates our commitment to investing in the future of clean energy," added Delay.

Construction of the liquefaction plant expansion is underway and led by the Salof Ltd company of Texas.

"Our approach to natural gas facilities ensures the highest attention to the safety and well-being of the facility operators and the local community, while also ensuring we protect our customers' investment," said Robert Luhrs, President of Salof.

"We specify equipment and systems that meet the latest environmental

standards and reliability," he added.

"We are extremely proud to be leading the delivery of the JAX LNG expansion. Many of our modular units are already installed at the site, and we look forward to successfully commissioning the Phase 2 facility," stated Luhrs.

The Pivotal-NorthStar joint venture's Alabama plant at Trussville can produce 60,000 gallons and has 4.8 million gallons of storage, while the Towanda facility in Wyalusing in Pennsylvania has production of 50,000 gallons per day and storage of 80,000 gallons.

For the storage expansion, JAX LNG is working with subsidiaries of Matrix Service Company, a leading contractor to the energy and industrial markets and a leader in small-scale to mid-size LNG liquefaction and storage terminals.

Matrix completed the roof lift of the new 2 million gallon storage tank in December 2020, fulfilling a major construction milestone in the project.

"We are pleased to help JAX LNG bring this critical infrastructure to life, providing cleaner alternative fuel," said Matrix Service Company President and Chief Executive John R. Hewitt.

"Beginning with the engineering and construction of the first LNG storage tank for this facility, we value our ongoing relationship and appreciate the opportunity to continue providing safe, high-quality work to help JAX LNG achieve its current and future business objectives," stated Hewitt.

In 2019, NorthStar formed Polaris New Energy (Polaris), an LNG marine transportation company.

Polaris is having a new 5,400 cubic metres capacity LNG bunkering barge constructed at Fincantieri Bay Shipbuilding of Wisconsin and an integrated tug with the Master Boat Builders company.

When complete, this new articulated tug and barge (ATB) unit will deliver LNG maritime fuel along the US East Coast.

"The shipyards building our tug and barge are making solid progress. The ATB 'Clean Canaveral' will be in operation by the end of 2021," said Tim Casey, Senior Vice President of LNG at NorthStar.

He added that the "Clean Canaveral" will not only serve customers in the Jacksonville area, but will also have the ability to transit up and down the East Coast to serve customers in other ports.

He noted that the ATB's ocean-going capability will provide great flexibility in helping Polaris build out its business.

PUGET LNG, the terminal operator in the port of Tacoma in the US northwest state of Washington, and GAC Bunker Fuels have signed an accord to cooperate on the supply and sale of LNG marine fuel in the Pacific Northwest.

GAC and Puget LNG have signed a memorandum of understanding ahead of the start of operations at the new Tacoma LNG terminal before the end of the second quarter of 2021.

It will be the first such terminal on the US West Coast providing direct shoreside loading access for a bunkering barge.

"A study commissioned by Puget LNG from European classification society DNV on the feasibility of a bunker barge to supply LNG as fuel to ships in the Puget Sound area concluded that the availability and cost of natural gas, especially in North America, has made the use of LNG an attractive solution for ship operators to comply with air emissions regulations," said Puget LNG.

DNV noted in its report that there was a growing order book for LNG-powered vessels, underlining the need to develop LNG supply infrastructure in all major shipping ports and regions, including the Pacific Northwest.

"Partnering with GAC Bunker Fuels is another way Puget LNG is working to create a clean energy future," said Blake Littauer, a director of Puget LNG. GAC Bunker Fuels, a division of the Dubai-based Gulf Agency Company (GAC) Group, will issue a Request for Proposal for a Jones Act-compliant LNG bunker barge to be constructed, owned, and operated by a third party.

"The barge would have the flexibility in size and design to serve multiple shipping customers and is expected to be operational in 2023," said the statement.

"Loading from Puget LNG's terminal in Tacoma, the barge will be able to bunker vessels in port," it explained. "GAC will extend credit terms to shipping companies that purchase fuel on both contract and spot basis," it stated.

Nicholas Browne, Global Director of GAC Bunker Fuels, said the company was pleased to proceed with its US partner. "This exciting foray into the Pacific Northwest with Puget LNG is the latest expansion of our footprint in the US, adding to GAC's growing LNG fuel portfolio," added Browne.

"GAC Bunker Fuels secured a deal to supply LNG as a marine fuel last year, having provided brokerage and ship agency services to the 'Fure Ven' which was the first non-US flagged

vessel to receive LNG in a US port," noted Browne.

The company also entered into a Heads of Agreement with Houston-based Pilot LNG for LNG marine fuel to be delivered ex-ship for its customers in the ports of Houston, Texas City, Galveston and the Galveston Offshore Lightering Area.

RELIANCE Industries of India and BP of the UK said a second natural gas field had come on stream ahead of the mid-2021 schedule in the Krishna Godavari Basin offshore the Indian East Coast, adding to the nation's gas supply in addition to LNG shipments.

Reliance and BP have been developing three deep-water gas developments in block KG D6 of the principal Indian gas basin. The fields are called R Cluster, Satellite Cluster and MJ and together they are expected to produce around 30 million standard cubic metres per day, or 1 billion cubic feet of gas a day, by 2023 to meet up to 15 percent of India's gas demand.

The fields in the project are able to utilise the existing hub infrastructure in KG D6 block, in which Reliance is the operator with a 66.67 percent stake and BP holds 33.33 percent.

The Satellite Cluster field is the second of the three to come onstream following the start-up of the R Cluster field in December 2020. The field is located in water depths of up to 1,850 metres about 60 kilometres from the existing onshore terminal near the city of Kakinada in the state of Andhra Pradesh.

"The field will produce gas from four reservoirs utilizing a total of five wells and is expected to reach gas production of up to 6 million standard cubic metres per day," said the companies. "Together, the R Cluster and Satellite Cluster are expected to produce about 20 percent of India's current gas production," they added.

The third KG D6 development, the MJ field, is expected to come onstream towards the latter half of 2022.

India's LNG imports of more than 350 cargoes a year are currently on a par with its domestic natural gas output. India's calendar-year LNG imports for 2020 moved above the 25MT mark to 26.63MT, according to data from the International Group of Liquefied Natural Gas Importers (GIIGNL).

This was a rise of 11 percent. The volume of deliveries in 2019 came to 23.98MT, after rising 7.1 percent from the 22.42MT received in 2018.

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The three new KG D6 fields will support the country's policy to improve clean energy resources in the future mix.

Reliance is India's largest private sector company and its energy division is just one in a conglomerate with turnover of 659,205 crore rupees (\$87.1 billion) in the past year and net profits of 39,880 crore rupees (\$5.3Bln).

RENERGEN, the emerging South African natural gas and helium company with liquefied natural gas and liquefied helium production plans, said its renewed drilling programme had progressed well as part of the Virginia Gas project at the base of the Karoo formation.

The main geological Karoo Basin underlies about three-fifths of South Africa, covering about 600,000 square kilometres, including the Renergen drilling area in the Free State.

Renergen is conducting drilling starting with well R2D2, reaching the first (pre-fracture system) target.

"We are pleased to advise that the drilling has progressed as anticipated, and the well has been drilled to the base of the Karoo formation, interpreted to be proximal to the target gas-bearing fracture system," said the company in a statement to both the Johannesburg Stock Exchange and the Australian Securities Exchange where it is listed.

The company said logging operations were underway in preparation for casing the well and applying for the requisite approvals to continue drilling in the WITS (Witwatersrand) formation.

Renergen said the approval process was expected to take several weeks to complete, and the company has now chosen to relocate the drilling rig to a new site, C3PO, where it will also drill to the Karoo base pending the approvals to drill to a final depth at the R2D2 well.

"We further advise shareholders that encouragingly, gaseous odours were detected in the deeper section of R2D2, consistent with the experience of the drilling of the successful well MDR1," stated Renergen Chief Executive Stefano Marani.

"We are through the most challenging part of the drilling on R2D2, with more precision than in our previous wells, so the learnings have not been in vain, and we expect our ability to hit targets will only improve as we go forward," added Marani.

"While we are waiting on getting the casing set and completing the lengthy approval process to deepen the well, we

have taken the opportunity to drill through the Karoo on the new site C3PO, which should deliver significant time savings on the overall drilling campaign," stated the CEO.

In the previous campaign the successful MDR1 well returned a helium concentration of 3.15 percent and the P007 well a concentration of 4.38 percent.

The company added that since the previous natural gas discovery statement the flow rate at MDR1 had increased by almost 90 percent to around 164,000 standard cubic feet per day, consistent with expectations.

The Virginia Gas Project is located about 250 kilometres southwest of Johannesburg, South Africa's largest city, and holds the nation's only onshore petroleum production rights.

All of the Virginia Gas Project comprises exploration and production rights of 187,000 hectares of gas fields across the areas and towns of Welkom, Virginia, and Theunissen in the Free State.

The fields contain one of the richest helium concentrations logged internationally.

The liquid helium when produced will be exported while the LNG will be used in South Africa, providing a competitive and cleaner energy source to the country for transportation as well as remote small-scale power plants.

Renergen in January 2021 awarded the front-end engineering and design work to Italian energy contractor Saipem for the downstream development of the Virginia Gas Project.

Saipem will design the natural gas purification section, the gas liquefaction facility using its proprietary technology Liqueflex™-N2, the products storages and off-loading and the associated utilities.

Most of the LNG from the project will be used for vehicle fuel in a joint venture with European energy major Total.

The company anticipates that the project awarded to Saipem would be completed by around 2023.

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 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 area.

SANTOS, the Australian LNG plant operator, and Italian oil and gas company Eni have signed an accord to cooperate on liquefied natural gas and other opportunities in northern Australia and in and around the former Portuguese colony of East Timor, now known as Timor-Leste.

"The areas of cooperation include assessing the synergies of sharing possible infrastructures associated with gas field developments around Barossa and Evans Shoal, the pipeline to Darwin and onshore associated gas processing leading to LNG expansion developments," said a joint statement.

Other areas of Eni-Santos cooperation include the possible development of the Petrel and Tern gas fields through Blacktip-Yelcherr gas plant facilities.

"As I said when I was in Darwin to announce our FID decision for Barossa, we have approval for two more Trains at Darwin LNG and we are open to third-party gas opportunities," said Santos Chief Executive Kevin Gallagher.

Their memorandum of understanding (MOU) includes investigating options to re-purpose the Bayu-Undan gas field facilities in the Timor Sea to extend the life of the project, including a carbon-capture and storage venture, subject to the agreement of the Timor-Leste government.

Gallagher said the MOU built on the momentum for the development plans for northern Australia following the final investment decision taken by Santos on the Barossa gas and condensate project to give a life extension to the Darwin LNG for the next 20 years.

Santos now operates the Darwin plant, as well as the Gladstone LNG facility in Queensland, after acquiring the North Australian assets of US major ConocoPhillips.

"Eni are already a highly valued partner in the Bayu-Undan project and this MOU strengthens our collaboration and cooperation," added Gallagher.

"CCS opportunities at Bayu-Undan are extremely exciting for Santos and Eni and today we are saying, we would like to be open for business to take your CO2," declared the Santos CEO.

"In 2019 the London Convention was amended to allow CO2 to be transported across jurisdictions to enable the

establishment of storage hubs," Gallagher explained.

"The CCS project at Bayu-Undan could provide a new job-creating and revenue-generating industry for Timor-Leste with quality carbon credits increasing in both demand and value internationally," added the statement.

The CCS facility could capture and store CO2 from industries in Australia's Northern Territory and help it meet its net-zero emissions by the 2050 target date. "That's good for the environment, good for local jobs, good for local investment and good for regional development," stated Gallagher.

SASOL, the South African petrochemicals, energy and fuels company, has agreed to sell a 30 percent in the natural gas pipeline running from future LNG exporter Mozambique into South Africa.

Sasol will retain a 20 percent holding and continue to operate and maintain the 865-kilometres Republic of Mozambique Pipeline Company (ROMCO) link currently transporting natural gas from the Pande and Temane fields in Mozambique to Sasol's operations in South Africa.

Both the Pande and Temane gas fields are onshore and are located around 600 kilometres north of the Mozambican capital Maputo and have been in production since 2004 and 2010 respectively.

However, Mozambique has other more lucrative natural gas fields in the Rovuma Basin offshore the northeast province of Cabo Delgado, though the main onshore LNG export project being developed there by France's Total has been suspended for now because of insecurity in the region.

Sasol, the world's leading producer of motor fuel made from coal, is attempting to cash in assets to pay off some of its huge debts.

Sasol said the sale would net around 5.14 billion South African rand (\$363M) when completed by the end of the first half of 2021.

The purchasers are South African interests, including a subsidiary of the nation's largest pension fund firm and insurer, Old Mutual.

"Sasol will retain a 20 percent shareholding in ROMPCO and will continue to operate and maintain the pipeline in terms of the commercial agreement between Sasol and ROMPCO, which is independent of the proposed

transaction,” explained the South African energy company.

“Sasol’s agreements with ROMPCO to transport gas to the Secunda plant are unaffected by the proposed transaction and the tariffs remain as per the said agreements, which were approved by the National Energy Regulator of South Africa (NERSA),” it added.

Secunda CTL is a synthetic fuel plant and petrochemicals and power complex owned by Sasol at Secunda in Mpumalanga province, about 130 kilometres (80 miles) southeast of Johannesburg.

The plant uses coal liquefaction to produce petroleum-like synthetic crude oil from coal.

The Sasol name itself comes from the acronym for South African Synthetic Oil.

The CTL project had its roots in the Apartheid era in South Africa as one way of firstly partly circumventing the global oil supply crisis of the 1970s and then international sanctions.

The first synthetic oil plant in South Africa was opened about 50 years ago at Sasolburg, an industrial site in the north of Free State province chosen for its adjacent coalfields and abundant water supplies from the Vaal River.

SEMPRA ENERGY, operator of the Cameron LNG export plant in Louisiana and developer the Costa Azul venture in Mexico, has again delayed the final investment decision until 2022 on its third proposed export plant, the Port Arthur LNG project in Texas.

Sempra decided to delay the FID on the Port Arthur facility after originally scheduling the decision for around May 2020 until the market downturn pushed back the timetable and the signing of new customers.

“A final investment decision on Port Arthur LNG will likely move into next year, as we work with partners and customers to further reduce the greenhouse-gas emission profile of the project and evaluate the ongoing impacts of the Covid-19 pandemic on the global economy,” said Sempra.

“We remain confident in our view that the market will need additional supplies of LNG in the coming years and believe Sempra LNG projects are the leading candidates to supply this need,” added the San Diego, California-based company.

The project at Port Arthur in Jefferson County was authorized by the Federal Energy Regulatory Commission in April

2019 and involves the construction of two liquefaction Trains, each with capacity of 6.73 million tonnes per annum, the largest processing Trains among all the projects on the Gulf Coast.

Engineering and planning within the regulatory permitting process are continuing for the project.

Other Port Arthur facilities include two marine berths for LNG carriers with two LNG loading arms and two hybrid arms, condensate loading and truck facilities.

It additionally has permits for a construction and materials loading and unloading dock and three full-containment LNG storage tanks.

The Port Arthur LNG also has an expansion planned to include two additional Trains, each with its own gas treatment facilities and each capable of producing 6.73 MTPA, along with associated utilities and infrastructure.

All four Port Arthur Trains are expected to include one propane and one mixed refrigerant refrigeration GE Frame 7EA compressor turbine.

The Port Arthur project signed a fixed-price engineering, procurement and construction contract in March 2020 with US engineers Bechtel.

Sempra had also previously proposed to sell 5 MTPA of Port Arthur LNG to a unit of Saudi Aramco and take a 25 percent investment from the Saudis, while 2 MTPA has also been sold to the Polish Oil & Gas Company.

SOUTH KOREA, the world’s third-largest liquefied natural gas importer, is expected to see domestic demand for natural gas increase by 15 percent through the next 12 years led by gas-fired power and industrial needs.

The country’s annual demand for natural gas is expected to reach 47.9 million tonnes in 2034 compared with 41.7 million tonnes estimated for 2021, according to a report from South Korean Ministry of Trade, Industry and Energy.

The LNG and gas-to-power focus is based on reducing coal-fired power plants and nuclear reactors under its long-term policy for the energy transition.

South Korea’s imports of LNG last year amounted to 40.81MT versus fourth-placed India’s 26.62MT. The biggest supplier to South Korea is Qatar with just short of 10MT of cargoes, followed by Australia with 8.10MT.

The United States last year overtook Malaysia as an LNG supplier to South Korea with 5.83MT of cargoes, versus

5.00MT from Malaysian. The next largest suppliers are Oman with 4.01MT and Indonesia with 2.77MT. “Of the demand volume, the industrial segment is especially anticipated to grow sharply to 27MT in 2034 from this year’s estimate of 21.7MT,” said the Ministry’s report translated from Korean.

It added that demand from the power sector was expected to reach 20.8MT by 2034 from this year’s 20MT. The South Korean plan envisages closing or converting 30 coal-fired power plants, or half of its 60 coal-fired power stations currently in operation by 2034 to help reduce air pollution.

The air pollution problem in South Korea is exacerbated by coal and other emissions floating across the border from North Korea, having also come in from China.

Of the 30 coal-based power stations coming offline, 24 of the facilities with a combined capacity of 12.7 GW will be converted to be powered by regasified LNG.

The report added that power plants using regasified LNG would have a capacity of 43.3 GW in 2022 but that would increase to 59.3 GW by 2034. South Korea also plans to expand its natural gas and LNG storage to 18.4 million cubic metres capacity, up from the current 13.7M cubic metres.

Almost 11 million cubic metres of storage is in the form of LNG tanks at the nation’s six import terminals at Boryeong (200,000), Incheon (2,880,000) Kwangyang (560,000), Pyeong-Taek (3,360,000) Samcheok (630,000) and Tong-Yeong (2,620,000).

“It is important that we maintain a stable supply of natural gas as the resource serves as the bridge fuel in the era of carbon neutrality,” said the Ministry.

STENA Power and LNG Solutions was awarded the contract by Singapore-based Delta Offshore Energy to provide front-end engineering and design for using Stena’s jetty-less LNG transfer and regasification system for an import and power project planned for Bac Lieu province in Vietnam’s Mekong Delta.

Delta Offshore proposes to employ Stena’s Jetty-less Floating Terminal (JFT) and Self-Installing Regas Platform (SRP) to assist in providing 3,200 megawatts of gas-fired power from LNG imports into the Bac Lieu province of southern Vietnam.

A technology license agreement had

previously reached between Stena Power & LNG in August 2020 for Delta Offshore to use the proprietary jetty-less technology.

“The FEED agreement is pivotal in our service provision to Delta Offshore for this important, large-scale energy infrastructure project in Vietnam,” said Svein Hellesmark, Chief Technology Officer of the Norway-based subsidiary of the Gothenburg, Sweden-headquartered Stena Group.

“Our Jetty-less LNG-to-Power technology has been created to meet demand for more flexible LNG import and export terminals, such as is required for the hugely exciting Bac Lieu LNG-to-Power Project,” added Hellesmark.

“At Stena we offer innovative, integrated solutions across the LNG value chain. Our wide-ranging activity in the sector also includes new-building project support, ship management and marine engineering, all underpinned by our ethos that gas should always travel first class,” he stated.

The Stena units, the Jetty-less Floating Terminal (JFT) and Self-installing Regas Platform (SRP), will be located about 40 kilometres (25 miles) off the Vietnam coast.

Stena said that the FEED contract would include detailed model testing to ensure optimum performance with the environmental conditions in the Mekong Delta.

Bobby Quintos, Managing Director of Delta Offshore, said he now regarded the Stena equipment as “key components” his company’s LNG-to-power project in Bac Lieu.

“They allow us to position the LNG receiving terminal offshore, and thereby to minimize the project’s impact on land and on the coastline of Bac Lieu,” explained Quintos.

“This is a benefit of great value to the province because the coast sustains shrimp farms, mangroves and salt beds, all of which are important to the regional economy and environment,” he added.

“Our ethos at Delta is to provide power for progress, and the JFT and SRP will help us do so in an efficient and economical manner,” declared Quintos.

TC ENERGY, the North American pipeline company, said it was working with the Royal Dutch Shell-led LNG Canada project on a revised timetable and budget because of Covid-19 delays while boosting US Gulf Coast LNG feed-gas supplies as it posted first-quarter

losses after the cancellation of the Keystone XL oil pipeline.

The Calgary, Alberta-based company reported a quarterly net loss of C\$1.1 billion (US\$824M) compared with a net profit of C\$1.1Bn for the same three months in 2020.

The earnings included an asset impairment charge related to the formal suspension of Keystone XL pipeline from Canada to the US in January 2021 by US President Joe Biden.

“While we were very disappointed by the revocation of the Presidential Permit for Keystone XL and the resulting after-tax impairment charge, we are well positioned to deliver sustainable, high-quality growth in the years ahead,” said François Poirier, TC Energy’s President and Chief Executive.

“We are advancing a C\$20Bn secured capital program and working on a substantive portfolio of other similarly high-quality opportunities under development,” added the CEO.

TC Energy also explained the latest developments on the Coastal GasLink project to transport LNG feed gas from northeast British Columbia gas fields to the Shell liquefaction and export plant being constructed near the Pacific Coast town of Kitimat.

“In response to the Covid-19 pandemic, the British Columbia Provincial Health Officer in December 2020 issued an order restricting the number of workers on site for industrial projects in the Northern Health Authority region of BC,” the company explained.

Additional health and safety measures were implemented by Coastal GasLink to prevent and control the risk of transmission of Covid-19 among workers at the camps and at the worksites, enabling the project to proceed with critical activities,” added TC Energy.

It stated that on April 13, 2021, the provincial health order was lifted allowing the project to finalize the Coastal GasLink remobilization plans for the summer construction programme.

The company said that as a result of scope changes, permit delays and the Covid-19 impacts, it expected project costs to increase significantly along with a delay to project completion compared to the original project cost and schedule.

“Coastal GasLink will continue to mitigate cost increases and schedule deferrals and is working with LNG Canada on establishing a revised project plan and budget,” stated TC Energy.

“Incremental costs will be included in

the final pipeline tolls, subject to certain conditions. We do not anticipate our future equity contributions will increase significantly following the conclusion of this process,” it added.

In its US natural gas pipelines business TC Energy said the first phase of its Grand Chenier Xpress expansion on the American Natural Resources (ANR) pipeline system for Texas gas connecting supply directly to US Gulf Coast LNG export facilities, went into service in April 2021.

“Phase II is expected to be placed in service in early 2022,” said TC Energy.

The company additionally explained the likely final impacts of the Keystone XL pipeline cancellation.

This 1,947km (1,210-mile) pipeline was designed to deliver 830,000 barrels per day of crude oil from Hardisty in the Canadian province of Alberta to the US state of Nebraska.

It would then have connected with existing facilities to reach US Gulf Coast refiners to meet critical needs for transportation fuel and manufactured products. Keystone XL had been expected to be placed into service in 2023.

As part of the funding plan, the provincial Canadian government of Alberta had agreed to invest around US\$1.1Bn as equity in Keystone XL which substantially covered some construction costs.

“We subsequently agreed with the Government of Alberta to formally suspend the Keystone XL pipeline project and have evaluated our investment for impairment along with those in related capital projects in development including Heartland Pipeline, TC Terminals and the Keystone Hardisty Terminal,” said TC Energy.

“We determined that the carrying amount of these assets was no longer fully recoverable. As a result, we recognized an asset impairment charge, net of expected contractual recoveries and other contractual and legal obligations related to suspension activities of C\$2.8Bn (US\$2.3Bn) which was excluded from comparable earnings,” added the company.

TEEKAY LNG Partners, whose gas group units own, charter or have stakes in 77 vessels, including 47 liquefied natural gas carriers and 30 liquefied petroleum gas or multi-gas vessels, reported a first-quarter net profit following a loss in the year-ago period as voyage revenues also jumped.

First-quarter net income attributable to partners and preferred unit holders swung to a profit of \$87.59 million from a loss of \$32.90M in the prior-year period.

Voyage revenues increased 9 percent in the first quarter to \$152.80M versus the \$139.88M in the in the same three months of 2020.

“Results were positively impacted by operational claims under the Partnership’s charter contracts, lower repairs and maintenance expenses and lower net interest expense during the first quarter of 2021,” said the company.

“These increases were partially offset by redeployment of certain LNG carriers at lower rates and unscheduled off-hire for repairs,” added Teekay.

Teekay said it secured three LNG charters during March and April 2021, increasing the Partnership’s LNG fleet to 98 percent fixed for the remainder of 2021, and 89 percent fixed for 2022.

In its chartering activities, the Partnership in April 2021 secured a fixed-rate charter contract for the “Oak Spirit” LNG carrier, which is expected to commence in August or September 2021, for a period of one-year.

In March 2021, a one-year, spot market-linked charter contract, with a one-year, fixed-rate option was arranged for the “Creole Spirit” LNG vessel.

Both of the vessels are modern, next generation, large LNG carriers with two-stroke engines with M-Type Electronically Controlled Gas Injection (MEGI).

As regards the dual-fuel, diesel-electric powered carrier, “Arwa Spirit”, which is 52 percent-owned by Teekay, the company said the charterer had exercised its one-year option to extend the contract to May 2022 at a fixed-rate.

“The strength of our fixed-rate LNG contract portfolio was evident again this quarter as Teekay LNG continued to generate strong earnings and cash flows even as the broader spot LNG shipping market declined from the high levels experienced during the recent winter period,” said Mark Kremin, President and Chief Executive of Teekay Gas Group Ltd.

“This decline was short-lived, however, as LNG demand rebounded counter-seasonally in late-March and into the second quarter of 2021,” added Kremin.

“We were able to take advantage of this strength by chartering out three LNG vessels, including one on a 12-month spot market-linked contract that allows

us to achieve full utilization of the vessel while also retaining upside to strong markets,” stated the CEO.

THAILAND and its national energy exploration and production company PTTEP, a shareholder in Mozambique LNG, announced a second successive natural gas discovery at a field in Malaysian waters offshore Sarawak as the nation also aims to expand LNG imports because of growing power and industrial demand.

PTT E&P Public Company (PTTEP), which has a 8.5 percent stake in the currently suspended Mozambique onshore LNG export plant being developed by French major Total, said the discovery was a second one at the Kulintang-1 field in Block SK438, off Sarawak, the Malaysian state on the island of Borneo.

The discovery is the latest of PTTEP’s continued exploration successes in Malaysia.

PTTEP Chief Executive Phongsthorn Thavisin said in a statement on May 19 that PTTEP had started the drilling campaign at the Kulintang-1 well in March 2021.

The well was then successfully drilled to a total depth of 2,238 metres in April 2021.

PTTEP expects to drill another exploration well in this block in the second quarter of 2021 following the two discoveries.

Block SK438 is adjacent to Blocks SK405, SK309 & SK311, SK314A, all of which are operated by PTTEP, with existing facilities nearby.

PTTEP said the location provided an advantage for the future, including the potential for cluster development.

“The Kulintang-1 well adds to the consecutive discoveries PTTEP has made this year which demonstrates our significant exploration progress in Malaysia,” said the PTTEP CEO.

“The discovery highlights our strong partnership with Malaysia’s Petronas and continuous efforts in applying new techniques and interpretation to identify opportunities in mature areas,” explained Phongsthorn.

“We are determined to explore further and make more oil and gas discoveries in Malaysia to serve future energy demand,” he stated.

Block SK438 is located in the shallow waters, approximately 108 kilometres off the coast of Bintulu in Sarawak.

PTTEP is the operator with 80 percent

participating interest while the Petronas Carigali Group holds the remaining 20 percent.

Apart from the Sarawak SK438 block, there are also Blocks SK405B, SK410B, SK314A, SK417, PM407 and PM415, all still in the exploration stage.

Major projects in PTTEP's portfolio in Malaysia include the producing assets in Blocks K, SK309, SK311 and the Rotan field in Block H producing feed gas for a floating LNG hull.

Petronas, the world leader in FLNG output, said in January 2021 its second liquefaction hull, the "PFLNG Dua", had entered production and confirmed that PTTEP had debuted as an equity LNG producer.

PTTEP had purchased its stake in the Rotan gas field and other Malaysian assets from Murphy Oil, the US exploration and production company, in 2019 for \$2.12 billion.

PTTEP is also a joint investor with PTT, through the PTT Global LNG Company, in the Malaysian LNG Train 9 at the liquefaction and export plant at Bintulu in Sarawak.

Thailand is at the same time opening up its own LNG import market, handing out six LNG import licences to power and industrial operators after PTTEP parent PTT had been the only Thai importer.

The new LNG importers will be accommodated by the expanded capacity

at the Map Ta Phut LNG import terminal in Rayong province that has been operating since 2011.

PTT has completed several expansions at Map Ta Phut with the most recent from 10.7 MTPA capacity to 11.5 MTPA.

A second regasification terminal adjacent to Map Ta Phut and called Nong Fab LNG is expected to be completed in 2022 with total additional regasification capacity of 7.5 MTPA.

WOODSIDE Petroleum, the West Australian-based operator of the North West Shelf and Pluto LNG export plants, has decided to exit its 50 percent non-operated participating interest in the proposed Kitimat LNG (KLNG) development, located in British Columbia and previously more advanced than the LNG Canada joint venture.

The exit will include the divestment or wind-up and restoration of assets, leases and agreements covering the 480-kilometres Pacific Trail Pipeline route and the site for the proposed LNG export plant at Bish Cove near Kitimat.

However, Woodside will retain a position in the prolific Liard Basin upstream natural gas resources in northeast BC.

Feed-gas for the Kitimat liquefaction plant would have come from the 322,000 net acres of resources in the Horn River and Liard Basins of northeast BC.

KLNG had once been a potential rival project to LNG Canada now being built with the Coastal GasLink Pipeline by shareholders comprising Royal Dutch Shell, Japan's Mitsubishi Corp., Petronas of Malaysia, Chinese major PetroChina and Korea Gas Corp.

Woodside said it would work with its Kitimat joint venture partner Chevron Corp, itself the operator of the Gorgon LNG and Wheatstone LNG plants in Western Australia, to protect asset value during the exit.

Chevron announced its plan to divest its own 50 percent interest in KLNG in December 2019.

Woodside said the costs associated with the decision to exit KLNG are expected to impact Woodside's 2021 net profit by around US\$40 million to US\$60 million.

These costs will be excluded from underlying net profit for the purposes of calculating the dividend.

Woodside Acting Chief Executive Meg O'Neill said exiting KLNG would allow Woodside to focus on the successful delivery of higher value opportunities in Australia and offshore Senegal in West Africa.

O'Neill was referring to the Sangomar oil project in Senegal with preparations under way for a forthcoming offshore drilling campaign in mid-2021.

Woodside is also ramping its

engineering and procurement activities for the Scarborough gas field offshore Western Australia that will provide additional LNG output at the Pluto plant and underpin the Burrup Peninsula gas hub.

"Following Chevron's decision to exit KLNG and subsequent decision in March 2021 to cease funding further feasibility work, Woodside undertook a comprehensive review of our options for the project and our wider development portfolio," O'Neill explained.

"The Kitimat LNG proposal was designed to develop a new source of LNG to supply Asian markets in the latter part of this decade," said the Acting CEO.

"However, we have decided to prioritise the allocation of capital to opportunities that will deliver nearer-term shareholder value," added O'Neill.

"Woodside is focused on working towards the targeted final investment decision for the Scarborough LNG development in Western Australia in the second half of 2021 and the continued successful execution of our Sangomar oil project," she stated.

The Acting CEO declared that retaining an upstream position in the prolific Liard Basin provides Woodside a low-cost option to investigate potential future natural gas and other clean fuel opportunities in Canadian Pacific Coast province.

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Can LNGCs take the giant step to carbon neutrality?

Greater design efficiency and the application of an array of proven technologies will provide a pathway to longer term emissions reductions, claimed Rene Sejer Laursen, ABS' Director of Fuels and Technology.

Like many specialist vessels, LNGCs are built for 25 years or more of operation, so how easily will LNGC owners find compliance with tightening IMO regulation on carbon emissions and intensity and ultimately move towards net zero carbon?

The answer may lie in fully separating the vessel's cargo containment and propulsion systems, employing renewable fuel in the engine and reliquefying the boil-off gas (BOG).

At present, LNGCs have the option to re-use gas that has boiled off from the cargo in a dual-fuel main engine, though at the scale most LNGCs carry gas, this is most likely to be produced from fossil fuels.

This provides SOx, NOx, PM and CO2 emissions reductions in operation but does not account for the gas' lifecycle carbon footprint or methane slip, Laursen said.

Faced with decisions over which propulsion systems to use for newbuildings, the options appear numerous, but in reality are closer to three.

These include high pressure 2-stroke gas injection engines, which have high efficiency—generally beneficial from an EEXI perspective—while minimising methane slip. The first gas engines systems in service are equipped with cylinder cut-out in gas mode intended to maximise gas use.

This can be important in meeting regulations requiring lower CO2 emissions in

decision on whether to include other greenhouse gases alongside CO2, the high pressure engine will give a further degree of future-proofing.

High pressure gas injection engines can also be equipped with selective catalytic reduction (SCR) or exhaust gas recirculation (EGR) system of the owner's choice to enable compliance with NOx Tier III standards.

The next well-established choice is low pressure 2-stroke gas injection principle. In their latest designs, these are increasingly fitted with an EGR type of system to create a combined solution to reduce methane slip and increase engine efficiency when using a low-pressure engine.

This engine solution offers a capex competitive solution when looking at the total cost, including the cost for the fuel gas supply system.

The third option is 4-stroke low pressure diesel-electric, examples of which have been ordered recently for LNGCs operating in ice conditions. Today, this solution is considered less efficient compared to gas-injection 2-stroke engines, when direct propulsion is mostly needed, he said.

Power generated

Diesel-electric's suitability lies in the power that it can generate—in cases of very high electricity power demand, such as for some typical LNGC design for ice conditions, high propulsive power and electricity can be produced at high efficiency.

Both of the 2-stroke gas engine solutions can be equipped with a shaft generator and a clutch to produce electricity to minimise generator engine use while in port and during normal operations. A clutch with a power take-off system to the main engine can count as a generator set, potentially providing some additional redundancy from a class perspective so potentially



Rene Laursen

fewer generator engines need to be installed.

However, adding a PTO and clutch is a function of how much electricity is needed versus how much propulsion power, so the benefit is lower fuel consumption (and thus lower CO2 emissions) and lower maintenance costs.

A battery might also be needed to manage the power from a 2-stroke engine as this may not be as stable as a 4-stroke at high rev/min. Capacitors can also be used in place of batteries, providing a cheaper option but with much shorter term storage.

As this article suggests, increasing efficiency has often been a process of applying additional technology, such as a PTO or a waste heat recovery system, though previously such decisions were related more to fuel prices than regulations.

Today, we expect this type of system will likely be more common as a means to reduce emissions and future proof the system.

The need to increase efficiency on LNGCs in future suggests a bigger leap could be considered, separating the established relationship between the containment system from the propulsion.

Containment system choice is very

much the result of which shipyard is selected since each has its preference and has knock-on implications for the gas handling system and ultimately on the choice of engine.

The efficiency of gas containment systems is such that BOG rates of 0.05/7% per day are not likely to fall much further. The issue is that to capture and use this gas in the engine adds to the CO2 budget and limits reduction potential since it is derived from fossil sources.

By applying full reliquefaction to BOG or sub-cooling the cargo to remove it completely, the owner/operator could use bioLNG as fuel and radically reduce the carbon emissions on a well-to-wake basis.

Both high and low pressure injection engines can use biofuel immediately with only minimal changes required to the engines. It should be remembered that not all biofuels provide carbon neutrality, though biofuel produced from biowaste has the biggest potential for the lowest carbon footprint.

This could provide a way forward for the LNGC newbuilding market, with better control of methane slip in the engine and a renewable fuel source, compliance with 2030 and even 2050 targets could become easier to achieve, Laursen concluded. ■

Faced with decisions over which propulsion systems to use for newbuildings, the options appear numerous, but in reality are closer to three.

daily operation. The IMO's

Accelerating LNG facilities' sustainability

Sustainability has long been an important consideration - one that flows throughout the lifecycle of a project from design, construction and operation through to decommissioning. Technical Editor Ian Cochran investigates with the help of McDermott International

Its importance becomes magnified as the size of the facilities and necessary capital expenditure increases. The question, however, remains the same, the company explained: how can we maximise the sustainability of LNG facilities?

Recent LNG projects have yielded improvements in emissions intensity, tCO₂e/tLNG, through enhancements in process configuration, equipment selection and operating efficiency. A benchmark of recent LNG facilities developed by McDermott showed the transition to more sustainable LNG facilities is not only possible — but already underway.

A variety of new solutions have the potential to accelerate this momentum and should be considered when planning, designing and constructing future LNG facilities, the engineering company said.

An operating LNG facility's major emissions sources are typically from large gas turbines driving the refrigerant compressors. Accordingly, one of the main considerations is how to minimise, if not eliminate, those emissions.

McDermott is one of the few full-service EPC contractors with experience in an all electric design (eLNG) for export-scale LNG facilities. While the majority of existing LNG facility designs use gas turbines with their corresponding emissions, eLNG eliminates the need for gas turbines by using electric motors to deliver power to the refrigerant compressors.

Power is provided from the available energy infrastructure or through an onsite generation source. It's a solution

that McDermott, with its joint venture partners, has put in place at the Freeport LNG facility.

eLNG lowers emissions at the LNG facility itself but may still draw power from the existing infrastructure. That can simply shift emissions up the chain to an existing, perhaps less sustainable, energy infrastructure. To alleviate that impact and drive sustainability, developers are increasingly seeking to partner with energy providers that, in turn, generate power through sustainable sources—such as wind, hydro or solar.

With eLNG and sustainable sources of grid power at the forefront of today's options, McDermott said it was looking ahead to zero emission power generation and is developing that solution through NET Power, which will be the key to creating a net zero emission operating LNG facility.

A NET Power plant captures the CO₂ and other atmospheric emissions by using a supercritical CO₂ cycle to generate the power necessary for the LNG facility. The captured CO₂ stream can either be converted to value-added products or sequestered together with the CO₂ removed in the liquefaction process. It's a major advancement with great potential that McDermott is working to bring to the market in partnership with forward-looking developers.

Sustainability

While a primary focus is reaching net zero operating emissions, sustainability is also a core goal in the LNG facility's



Freeport LNG

procurement and construction. This starts in engineering where the central principles of sustainability support good engineering practice — simplifying processes and removing excess equipment where possible — and demands consideration of increased modularisation.

Modularisation is not new, but the opportunities it can provide in improving a development's sustainability characteristics, combined with its other benefits, warrants reconsideration, McDermott said.

With proper planning and time to advance engineering, modularisation can reduce risk naturally arising from the facility's site location, whether due to labour, logistical hurdles or *force majeure* events.

Working in a controlled environment also generally reduces waste, increases safety, enables the use of renewable power and — when done properly — reduces

rework and site preservation costs.

As a result, this reduces construction and commissioning risk both in terms of time and the potential environmental impacts during these project phases, eg reduction in excessive flaring as the facility goes through unanticipated shutdowns, minimising the potential escape of hydrocarbons or other potentially harmful substances into the environment, etc.

Key to a successful modularisation lies not only in providing for it in FEED, detailed engineering and the project schedule, but also in partnering with a contractor or sub-contractor that has the capability to fully integrate the engineering and fabrication. The benefits are dependent on integration.

McDermott's solution lies in its own internal integration of its engineering function and its fabrication yards, including the Qingdao McDermott Wuchuan joint venture fabrication facility in Qingdao, China.

The company's next step is providing modularised LNG designs of various capacities, each accompanied by digital twin and planned digital workstreams, that will drive greater certainty—and sustainability—given the option of selecting a design where the engineering and planning is significantly progressed even before FEED has begun. These standardised modularisation efforts are already underway.

The greater certainty this affords drives the company's ability to deliver a level of sustainability that stick-built facilities simply cannot provide, McDermott claimed. ■



Modular equipment arriving at the Yamal LNG facility

E-fuel brings new competition for LNG fuelling

Accelerated moves to decarbonise supply chains may present downside risks for LNG as a transport fuel over the next decade as authorities in some regions leap-frog to new, cleaner fuels. Fuelling editor Malcolm Ramsay has more

While policymakers around the world have voiced support for stricter measures to tackle climate change in the wake of the covid pandemic, the shape of future legislation remains in the balance, driving uncertainty for many LNG infrastructure projects.

"The challenge to LNG today is that the world is moving rapidly towards decarbonisation. The viability of new LNG projects is potentially at risk - as LNG is an emissions intensive energy source at its upstream stage," Kyriacos Panayides, Managing Director at shipping line AAL, commented.

Clear investment signal

While LNG has long been seen as the most credible alternative to marine fuel oil for shipping, a raft of new technologies are now emerging that may threaten its dominant role. Earlier this month, a consortium of environmental organisations petitioned the EU to promote the use of green synthetic fuels, or e-fuels, for future shipping and aviation needs as opposed to LNG.

"Lawmakers must send a clear signal to potential investors to focus on e-fuels made with additional renewable electricity and, whenever CO₂ is required, direct air capture (DAC)," the group said in a statement.

Comprised of 17 non-governmental organisations, the consortium includes: Transport & Environment (T&E), Carbon Market Watch, Bond Beter Leefmilieu, BirdLife International, PFPI, ZERO, Welthaus Graz, Zero Waste Europe, ECODES, Mighty Earth, FERN, Natuur & Milieu, Canopée Forêts Vivantes, Green Transition Denmark, Bellona Europa, Sciaena, and Generation Climate Europe.

Public consultation

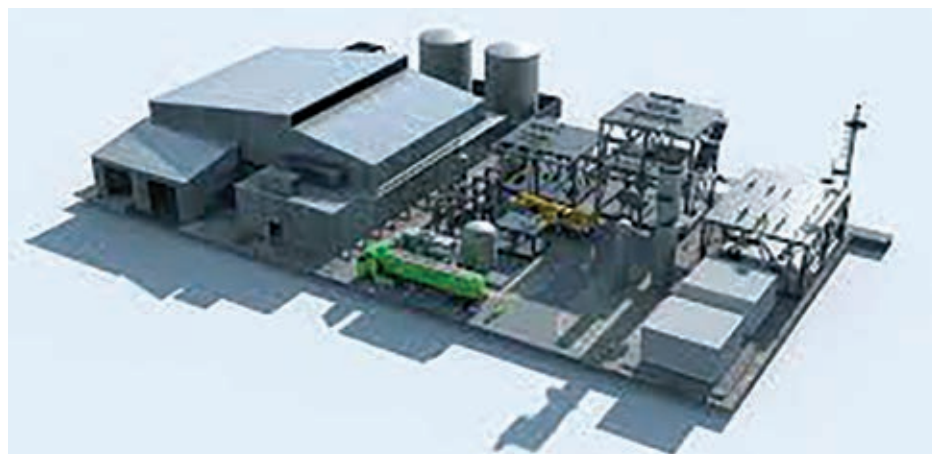
The issue of e-fuels is of heightened importance in Europe at the moment, ahead of the EU commission's recommendations for its forthcoming FuelEU Maritime and ReFuelEU initiatives.

"E-fuels offer a clean future for the shipping and aviation sectors, but also the fuels industry. The EU must give them the investment certainty they need to flourish by requiring all ships carrying EU trade and aircraft fuelling in Europe to progressively make the switch," Delphine Gozillon, shipping policy officer at T&E, said.

These dual initiatives are set to be published later this year, with the next phase of public consultation opening up in the third quarter, and are expected to play a major role in shaping future policy across the continent.

In contrast to traditional biofuels, which are formed from processing of crops, the new generation of e-fuels are generated synthetically, using processes such as electrolysis to breakdown readily available substances. A leading example of this process is the electrolysis of water to produce hydrogen and oxygen, followed by the combination of carbon dioxide with hydrogen to create drop-in hydrocarbon fuel, capable of running in many of today's existing combustion engines.

"We must learn the lessons from Europe's bad experiences of the use of biofuels in transport. All crop-based biofuels must be excluded from the Commission's policy proposals, and sustainable advanced biofuels should be reserved for aviation's needs," Jeppe Juul, senior policy advisor at Green Transition Denmark, comments.



Artist's rendition of the NBC facility

Increased complexity

Complicating the issue for policymakers is the proliferation of new production techniques and nomenclature, as well as the growing inter-relation between fuels that are now coming to market.

While LNG is typically made directly from natural gas extracted from the ground, future facilities offer the potential to blend with liquefied versions of e-fuels or directly with bioLNG.

"Shipping, aviation and heavy road transport are currently lagging far behind when it comes to contributing to sustainable mobility. They must therefore become drastically greener and e-fuels offer a way out as long as stakeholders from the entire value chain will take the necessary steps and increase production and investments in the related infrastructure," Richard Smokers of TNO, said.

While many campaigners see e-fuels as a clear frontrunner, ahead of LNG or biofuel, for fuelling future transport, they nonetheless present a number of challenges, not least their high cost, due to an inherently inefficient production process. Another complicating factor for e-fuels, or renewable synthetic fuels, is that

while they can be created entirely using renewable electricity and require very simple feedstock, they still create emissions when burnt.

For LNG operators, the lack of a clear pathway is likely to result in an ever-expanding range of options, with new fuels emerging that blend different sources of feedstock and production.

Aker progresses NBC facility

Spearheading development of this next generation of blended fuels, Norwegian engineering company Aker Solutions signed a front-end engineering design (FEED) contract this month to develop a new e-fuel facility in Heroya, Norway.

The proposed Nordic Blue Crude (NBC) site will use renewable electricity, water and CO₂ as feedstocks and aims to produce carbon neutral crude oil in the first instance, with plans to process this into a range of other transport fuels.

"The FEED contract brings the project a big step forward towards realization. The project also supports our strategy to grow the company's business related to renewables and low-carbon oil and gas projects. Based on delivery of solid front-end engineering, we aim to be in a good position for future work," said Kenneth Simonsen, interim executive vice president and head of Aker Solutions' renewables business.

The firm expects detailed engineering, construction and installation to be sanctioned "in second half of 2021", preparing the way for "significant capacity" at the site once it is fully operational. If successful, the project could provide future feedstock for liquification projects. ■



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Aamira	268,000	Nakilat SHI 1753 Inc.	Samsung	Apr-10	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas IV
Abadi	135,000	BGC One Nbd Sdn Bhd.	Mitsubishi	May-02	Brunei	Steam	Moss	5	Lumut
Adam LNG	162,000	Adam Maritime Transportation	HHI	Jul-14	Marshall Is.	Diesel	Membrane	4	Oman LNG
Adriano Knutsen	180,000	Hai Feng 1717 Ltd.	HHI	Jul-19	Spain	ME-GI	TZ Mk. III Flex Plus	4	Corpus Christi
Al Aamriya	210,168	J5 Nakilat No. 1 Ltd.	Daewoo	May-08	Marshall Is.	Diesel	GT NO 96	5	RasGas III
Al Areesh	148,786	Al Areesh LLC	Daewoo	Jan-07	Bahamas	Steam	GT NO 96	4	RasGas II
Al Bahiya	210,100	Nakilat DSME 2286 Inc.	Daewoo	Dec-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas IV
Al Biddah	137,339	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Nov-99	Japan	Steam	Moss	5	Qatargas I
Al Daayen	148,853	Al Daayen LLC	Daewoo	Mar-07	Bahamas	Steam	GT NO 96	4	RasGas II
Al Dafna	268,000	Nakilat SHI 1726 Inc.	Samsung	Oct-09	Marshall Is.	Diesel	GT NO 96	10	RasGas
Al Deebel	145,000	Peninsula LNG Transport No. 3	Samsung	Nov-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Al Gattara	216,200	Overseas LNG H1 Corp.	HHI	Nov-07	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas II
Al Ghariya	210,150	Julia Neptora	Daewoo	Dec-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Al Gharrafa	216,200	Overseas LNG H2 Corp.	HHI	Jan-08	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas II
Al Ghashamiya	217,591	Nakilat SHI 1696 Inc.	Samsung	Apr-09	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas III
Al Ghuwairiya	263,300	Nakilat Al Ghuwairiya Inc.	Daewoo	Dec-08	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
Al Hamla	216,200	Overseas LNG S2 Corp.	Samsung	Feb-08	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas II
Al Hamra	137,000	Al Hamra Ltd.	STX	Nov-96	Liberia	Steam	Moss	4	Das Island
Al Huwaila	217,000	Al Huwaila Inc.	Samsung	May-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Jasra	137,227	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Jun-00	Japan	Steam	Moss	5	Qatargas I
Al Jassasiya	145,700	Venice Maritime	Daewoo	May-07	Greece	Steam	GT NO 96	4	RasGas II
Al Karaana	210,100	Nakilat DSME 2284 Inc.	Daewoo	Oct-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas III
Al Kharaitiyat	216,300	Nakilat HHI 1909 Inc.	HHI	Jun-09	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas III
Al Kharsaah	217,000	Al Kharsaah Inc.	Samsung	Jun-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Khattiya	210,150	Nakilat DSME 2283 Inc.	Daewoo	Jul-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas IV
Al Khaznah	135,496	Al Khaznah Inc.	Mitsui E&S	Jul-94	Liberia	Steam	Moss	5	Das Island
Al Khor	137,354	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Nov-96	Japan	Steam	Moss	5	Qatargas I
Al Khuwair	217,000	Al Khuwair Inc.	Samsung	Jun-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Mafyar	266,000	Nakilat SHI 1697 Inc.	Samsung	Apr-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas III
Al Marrouna	149,539	Al Marrouna LLC	Daewoo	Sep-06	Bahamas	Steam	GT NO 96	4	RasGas II
Al Mayeda	266,000	Nakilat SHI 1694 Inc.	Samsung	Jan-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas III
Al Nuaman	210,100	Nakilat DSME 2285 Inc.	Daewoo	Dec-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas III
Al Oraiq	210,200	J5 Nakilat No. 3 Ltd.	Daewoo	Jun-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Al Rayyan	137,420	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Mar-97	Japan	Steam	Moss	5	Qatargas I
Al Rekayyat	216,293	Nakilat HHI 1910 Inc.	HHI	Jun-09	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas III
Al Ruwais	210,150	Alexandra Neptana	Daewoo	Aug-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Al Sadd	210,200	Nakilat DSME 2265 Inc.	Daewoo	Mar-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Al Safliya	210,150	Britta Nausola	Daewoo	Sep-07	Bahamas	Diesel	GT NO 96	5	Qatargas II
Al Sahla	216,200	J5 Nakilat No. 5 Ltd.	HHI	Jun-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Samriya	263,300	Nakilat Al Samriya Inc.	Daewoo	Feb-09	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
Al Shamal	217,000	Al Shamal Inc.	Samsung	Apr-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Sheehaniya	210,100	Nakilat DSME 2264 Inc.	Daewoo	Feb-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Al Thakhira	145,000	Peninsula LNG Transport No. 2	Samsung	Aug-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Al Thumama	216,200	J5 Nakilat No. 2 Ltd.	HHI	Feb-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Utouriya	215,000	J5 Nakilat No. 8 Ltd.	HHI	Sep-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Wajbah	137,308	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Jun-97	Japan	Steam	Moss	5	Qatargas I
Al Wakrah	137,371	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Nov-98	Japan	Steam	Moss	5	Qatargas I
Al Zubarah	137,573	Mitsui/Nippon/Kawasaki/lino	Mitsui E&S	Nov-96	Japan	Steam	Moss	5	Qatargas I
Alto Acrux	147,798	Bahamas LNG Transport Ltd.	Mitsubishi	Mar-08	Bahamas	Steam	Moss	4	Darwin LNG
Amadi	154,800	BGC Four Nbd Sdn Bhd.	HHI	Jul-15	Brunei	DFDE	Membrane	4	Lumut
Amali	148,000	BGC Spv Nbd Sdn Bhd.	Daewoo	Aug-11	Brunei	DFDE	GT NO 96	4	Lumut
Amani	154,800	BGC Three Nbd Sdn Bhd.	HHI	Oct-14	Brunei	DFDE	Membrane	4	Lumut
Amberjack LNG	174,000	Xiang Ch17 HK International	HHI	Apr-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Amur River	149,700	Seacrown Maritime Ltd.	HHI	Nov-07	Marshall Is.	Steam	TZ Mk. III	4	Sakhalin II
Arctic Aurora	155,000	Fareastern Shipping Ltd.	HHI	Jul-14	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Snøhvit LNG
Arctic Discoverer	142,612	Northern LNG Trans Co. I Ltd.	Mitsui E&S	Feb-06	Bahamas	Steam	Moss	4	Hammerfest
Arctic Lady	147,200	Barents Leasing Ltd.	Mitsubishi	Apr-06	Norway	Steam	Moss	4	Hammerfest
Arctic Princess	147,200	Rb-Quadrangle Leasing Ltd.	Mitsubishi	Jan-06	Norway	Steam	Moss	4	Hammerfest
Arctic Spirit	89,800	Arctic Spirit LLC	Ishikawajima	Dec-93	Bahamas	Steam	IHI SPB	4	Atlantic LNG
Arctic Voyager	142,759	Northern LNG Trans Co. II Ltd.	Kawasaki	Jul-06	Bahamas	Steam	Moss	4	Hammerfest
Aristidis I	174,000	Atrotos Gas Carrier Corp.	HHI	Jan-21	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Aristos I	174,000	Xiang Ch25 HK International	HHI	Nov-20	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Arkat	148,000	BGC Spv Nbd Sdn Bhd.	Daewoo	Feb-11	Brunei	DFDE	GT NO 96	4	Lumut
Arwa Spirit	165,500	Membrane Shipping Ltd.	Samsung	Aug-08	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Balhaf
Aseem	155,003	India LNG Transport Co. No. 3	Samsung	Nov-09	Malta	Diesel	TZ Mk. III	4	RasGas



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Asia Endeavour	160,000	Chevron Transport Corp. Ltd.	Samsung	Jun-15	Bahamas	Diesel/Gas-Electric	TZ MK. III	4	Gorgon
Asia Energy	154,800	Chevron Transport Corp. Ltd.	Samsung	Oct-14	Bahamas	DFDE	TZ MK. III	4	Gorgon
Asia Excellence	160,000	Chevron Transport Corp. Ltd.	Samsung	Feb-15	Bahamas	DFDE	TZ MK. III	4	Gorgon
Asia Integrity	160,000	Chevron Transport Corp. Ltd.	Samsung	Feb-17	Bahamas	DFDE	TZ Mk. III	4	Wheatstone
Asia Venture	160,000	Chevron Transport Corp. Ltd.	Samsung	Jul-17	Bahamas	Diesel/Gas-Electric	TZ Mk. III Flex	4	Wheatstone
Asia Vision	154,800	Chevron Transport Corp. Ltd.	Samsung	Jul-14	Bahamas	Diesel/Gas-Electric	TZ MK. III	4	Gorgon
Barcelona Knutsen	173,400	Norspan LNG V AS	Daewoo	Jan-10	Spain	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Beidou Star	172,000	Capricorn LNG Shipping Ltd.	Hudong Zhonghua	Sep-15	Hong Kong	Diesel	TZ MK. III	4	PNG LNG
Berge Arzew	138,088	Berge Arzew/Sonatrach Berge	Daewoo	Jul-04	Bahamas	Steam	GT NO 96	4	Arzew
Bilbao Knutsen	138,000	Norspan LNG AS	Izar	Jan-04	Spain	Steam	GT NO 96	4	Portfolio
Bishu Maru	164,700	Trans Pacific Shipping 3 SA	Kawasaki	Dec-17	Panama	TFDE	Moss	4	Wheatstone
Bonito LNG	174,000	Xiang Ch18 HK International	HHI	May-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Boris Davydov	172,410	Hai Kuo Shipping 1605 Ltd.	Daewoo	Dec-18	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Boris Vilkitsky	172,410	Hai Kuo Shipping 1601 Ltd.	Daewoo	Jun-17	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
British Achiever	173,644	Ngoti No. 20 Spc B SA	Daewoo	Nov-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Contributor	173,644	Hai Kuo Shipping 1533 Ltd.	Daewoo	Dec-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Listener	173,644	Hai Kuo Shipping 1535 Ltd.	Daewoo	Jan-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Mentor	173,644	Ngoti No. 20 Spc C SA	Daewoo	Mar-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Partner	173,400	Ngoti No. 20 Spc A SA	Daewoo	Jun-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Sapphire	155,000	Sg Leasing Gems Ltd.	HHI	Jun-08	Isle of Man	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
British Sponsor	173,644	Ngoti No. 20 Spc D SA	Daewoo	May-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
Broog	137,529	Mitsui/Nippon/Kawasaki/Iino	Mitsui E&S	Apr-98	Japan	Steam	Moss	5	Qatargas I
Bu Samra	266,000	Nakilat Bu Samra Inc.	Samsung	Dec-08	Marshall Is.	DRL	TZ Mk. III	5	Qatargas II
Bushu Maru	180,000	Trans Pacific Shipping 6 Ltd.	Mitsubishi	Jul-19	Bahamas	Reheat Steam Turbine	TZ MK. III Flex	4	Sabine Pass
BW Boston	138,059	BW Gas Global LNG DA	Daewoo	Jan-03	Norway	Steam	GT NO 96	4	Atlantic LNG
BW Brussels	162,400	BW LNG IV Pte Ltd.	Daewoo	Aug-09	Singapore	Diesel/Gas-Electric	GT NO 96	4	Balhaf
BW Everett	138,028	Everett LNG Pte Ltd.	Daewoo	Jun-03	Singapore	Steam	GT NO 96	4	Atlantic LNG
BW Lesmes	174,000	BW Gas AS	Daewoo	Mar-21	Bermuda	ME-GI	Membrane	4	Portfolio
BW Lilac	173,400	Helianthus Navigation Corp.	Daewoo	Mar-18	Malta	ME-GI	GT NO 96	4	Portfolio
BW Magna	173,000	BW FSRU III Pte Ltd.	Daewoo	Mar-19	Sinapore	DFDE	TZ MK. III Flex	4	Portfolio
BW Magnolia	173,400	Helen Navigation Pte Ltd.	Daewoo	Feb-20	Singapore	ME-GI	GT NO 96	4	Portfolio
BW Paris	162,400	BW FSRU IV Pte Ltd.	Daewoo	Jul-09	Sinapore	Diesel/Gas-Electric	GT NO 96	4	Balhaf
BW Pavilion Aranda	173,400	BW Diamond LNG Pte Ltd.	Daewoo	Sep-19	Singapore	ME-GI	TZ MK. III Flex	4	Portfolio
BW Pavilion Aranthera	173,400	BW Diamond LNG Pte Ltd.	Daewoo	Jul-20	Singapore	ME-GI	GT NO 96	4	Portfolio
BW Pavilion Leeara	158,629	BW Pavilion Leeara Pte Ltd.	HHI	Jun-15	Singapore	Diesel/Gas-Electric	Membrane	4	Portfolio
BW Pavilion Vanda	155,000	BW Pavilion Vanda Pte Ltd.	HHI	Feb-15	Singapore	DFDE	Membrane	4	Portfolio
BW Tatiana	135,269	FSRU Development Pte Ltd.	Mitsubishi	Dec-02	Marshall Is.	Steam	Moss	5	Atlantic LNG
BW Tulip	173,400	BW LNG I Pte Ltd.	Daewoo	Dec-17	Singapore	ME-GI	GT NO 96	4	Portfolio
Cadiz Knutsen	138,826	Norspan LNG II As	Navantia	Apr-04	Spain	Steam	GT NO 96	4	Portfolio
Cape Ann	145,130	SRV Joint Gas Two Ltd.	Samsung	Apr-10	Norway	Diesel/Gas-Electric	TZ Mk. III	4	Jaigarh LNG
Castillo De Caldelas	176,300	La Arena Nav SA	Imabari Shipbuilding	Jun-18	Malta	ME-GI	TZ Mk. III Flex	4	Portfolio
Castillo de Merida	176,300	San Isidro LNG I BV	Imabari Shipbuilding	Mar-18	Malta	ME-GI	TZ MK. III Flex	4	Portfolio
Castillo de Santisteban	170,000	Trans Gas Naviera Aie	STX	Jun-10	Malta	Diesel Electric	GT NO 96	4	Portfolio
Castillo de Villalba	138,000	Trans Gas Naviera Aie	Navantia Cadiz	Sep-03	Spain	Steam	GT NO 96	4	Portfolio
Catalunya Spirit	138,000	Teekay Gas III SL	Izar	Jun-03	Spain	Steam	GT NO 96	4	Atlantic LNG
Celsius Canberra	180,000	Xiang CH27 HK Int.	Samsung	Jan-21	Marshall Is.	X-DF	Membrane	4	Portfolio
Celsius Copenhagen	180,000	Greenheart Gas Shipco I LLC	Samsung	Nov-20	Marshall Is.	X-DF	TZ Mk. III Flex Plus	4	Portfolio
CESI Beihai	174,000	China Energy Aspiration LNG	Hudong Zhonghua	Jun-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Gladstone	174,000	China Energy Aspiration LNG	Hudong Zhonghua	Oct-16	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI LianYungAng	174,000	China Energy Glory LNG	Hudong Zhonghua	Jun-18	Hong Kong	TFDE	GT NO 97	4	APLNG
CESI Qingdao	174,000	China Energy Hope LNG	Hudong Zhonghua	Feb-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Tianjin	174,000	China Energy Pioneer LNG	Hudong Zhonghua	Jul-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Wenzhou	174,000	China Energy Peace LNG	Hudong Zhonghua	Feb-18	Hong Kong	Diesel-Electric	GT NO 96	4	APLNG
Cheikh Bouamama	75,558	Skikda LNG Trans Corp.	Universal SB	Jul-08	Bahamas	Steam	TZ Mk. III	4	Arzew/Skikda
Cheikh El Mokrani	75,759	Mediterranean LNG Transport	Japan Marine United	Jun-07	Bahamas	Steam	TZ Mk. III	4	Skikda
Christophe de Margerie	170,000	Zelitiko Shipping Co. Ltd.	Daewoo	Nov-16	Cyprus	Diesel/Gas-Electric	GT NO 96 GW	4	Yamal
Clean Energy	149,700	Pegasus Shipholding SA	HHI	Mar-07	Marshall Is.	Steam	TZ Mk. III	4	Portfolio
Clean Horizon	162,000	Sea 43 Leasing Co Ltd.	HHI	Apr-15	Malta	Diesel/Gas-Electric	Membrane	4	Portfolio
Clean Ocean	162,000	Cdbl Ocean Ltd.	HHI	May-14	Marshall Is.	Diesel/Gas-Electric	Membrane	4	Sabine Pass
Clean Planet	162,000	Cdbl Planet Ltd.	HHI	Aug-14	Marshall Is.	Diesel Electric	Membrane	4	Yamal
Clean Vision	162,000	Sea 44 Leasing Co. Ltd.	HHI	Aug-15	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
CNTIC VPower Global	28,260	CNTIC VPower LNG Logistics	COSCO (Dalian) Shipyard Co.	Apr-20	Hong Kong	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Cobia LNG	174,000	Cardiff LNG ETA Owning LLC	HHI	Feb-21	Malta	X-DF	NO-96-GW+PRS	4	Portfolio
Cool Discoverer	174,000	Serendipity Maritime Ltd.	HHI	Sep-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Cool Explorer	160,000	Safe Port Marine Ltd.	Samsung	Jan-15	Malta	DFDE	TZ Mk. III	4	Spot
Cool Racer	174,000	Eloquent Shipping	Samsung	Feb-21	Malta	X-DF	NO-96-GW+PRS	4	Portfolio
Cool Runner	160,000	Priority Maritime Corp.	Samsung	Mar-14	Malta	Diesel Electric	TZ Mk. III	4	Wheatstone
Cool Voyager	160,000	Energy Shipping & Trading SA	Samsung	Oct-13	Malta	TFDE	TZ Mk. III	4	Wheatstone
Coral Encanto	30,000	Maxluck Plus Ltd.	Ningbo Xinle	Jul-20	Marshall Is.	DFDE	Cylinders	2	Portfolio



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Corcovado LNG	160,162	Oceanus LNG Alpha LLC	Daewoo	Apr-14	Malta	Diesel Electric	GT NO 96	4	Spot
Creole Spirit	173,400	Hai Jiao 1601 Ltd.	Daewoo	Feb-16	Bahamas	ME-GI	GT NO 96	4	Sabine Pass
Cubal	160,276	Mint LNG IV Ltd.	Samsung	Jan-12	Bahamas	DFDE	TZ Mk. III	4	Soyo
Cygnus Passage	145,400	Cygnus LNG Shipping Ltd.	Mitsubishi	Jan-09	Bahamas	Steam	Moss	4	Sakhalin II
Dapeng Moon	147,200	Yue Gang LNG Shipping Co. Ltd.	Hudong Zhonghua	Jul-08	Hong Kong	Steam	TZ MK. III	4	Pluto
Dapeng Star	147,210	Yue Yang LNG Shipping Co. Ltd.	Hudong Zhonghua	Nov-09	Hong Kong	Steam	TZ MK. III	4	Pluto
Dapeng Sun	147,200	Yue Peng LNG Shipping Co. Ltd.	Hudong Zhonghua	Apr-08	Hong Kong	Steam	GT NO 96	4	North West Shelf
Diamond Gas Metropolis	174,000	Diamond LNG Shipping 4 Ltd.	HHI	Nov-20	Bahamas	X-DF	TZ Mk. III Flex	4	Portfolio
Diamond Gas Orchid	165,000	Diamond LNG Shipping 1 Pte Ltd.	Mitsubishi	Jun-18	Bahamas	STaGE	Sayaringo	4	Cameron
Diamond Gas Rose	165,000	Diamond LNG Shipping 2 Pte Ltd.	Mitsubishi	Aug-18	Bahamas	STaGE	Sayaringo	4	Cameron
Diamond Gas Sakura	165,000	Diamond LNG Shipping 3 Pte Ltd.	Japan Marine United	May-19	Bahamas	STaGE	Sayaringo	4	Cameron
Disha	136,025	India LNG Transport Co. No. 1	Daewoo	Dec-03	Malta	Gas Turbine	GT NO 96	4	RasGas
Doha	137,262	Mitsui/Nippon/Kawasaki/Iino	Mitsubishi	Jun-99	Japan	Steam	Moss	5	Qatargas I
Dorado LNG	174,000	Cardiff LNG Epsilon Owning LLC	Samsung	Dec-20	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Duhail	210,150	Gabriela Nauranto	Daewoo	Dec-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Dukhan	137,661	LNG Water Lily Shipping Corp.	Mitsui E&S	Sep-04	Liberia	Steam	Moss	5	Qatargas II
East Energy	122,255	Sinokor Maritime Co. Ltd.	STX	Aug-82	South Korea	Steam	Membrane	4	NLNG
Eduard Toll	172,410	TC LNG Explorer I LLC	Daewoo	Sep-17	Bahamas	TFDE - Azipod	GT NO 96 GW	4	Yamal
Ejnan	145,000	Peninsula LNG Transport No. 4	Samsung	Jan-07	Bahamas	Steam	TZ Mk. III	4	RasGas II
Ekaputra	136,400	Hikmah Sarana Bahari Pt.	Mitsubishi	Jan-89	Indonesia	Steam	Moss	5	Bontang
Elisa Larus	174,000	Caroline 77 Sasu	Hyundai Samho	May-20	France	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Energy Advance	147,624	Tokyo LNG Tanker/Toho LNG	Kawasaki	Mar-05	Japan	Steam	Moss	4	Portfolio
Energy Atlantic	156,000	Spectacle Shipping & Trading	STX	Sep-15	Malta	TFDE	Moss	4	Sabine Pass
Energy Confidence	153,000	Tokyo LNG Tanker/Nippon Yusen	Kawasaki	Apr-09	Japan	Steam	Moss	4	Darwin LNG
Energy Endeavour	173,400	Rossini Navigation SA	Daewoo	Jan-21	Marshall Is.	ME-GI	TZ Mk. III Flex	4	TBC
Energy Frontier	147,599	Tokyo LNG Tanker Co. Ltd.	Kawasaki	Sep-03	Japan	Steam	Moss	4	Sakhalin II
Energy Glory	165,000	Tokyo LNG Tanker/Nippon Yusen	Japan Marine United	Mar-19	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Horizon	177,000	Tokyo LNG Tanker/Nippon Yusen	Kawasaki	Aug-11	Japan	Steam	Moss	4	Pluto
Energy Innovator	165,000	Tokyo LNG Tanker/Mitsui OSK	Japan Marine United	Jun-19	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Liberty	165,000	Tokyo LNG Tanker/Mitsui OSK	Japan Marine United	Oct-18	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Navigator	145,000	Tokyo LNG Tanker/Mitsui OSK	Kawasaki	May-08	Japan	Steam	Moss	4	Sakhalin II
Energy Pacific	173,400	Ravel Navigation SA	Daewoo	Aug-20	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Portfolio
Energy Progress	147,558	Jovial Shipping Navigation SA	Kawasaki	Nov-06	Bahamas	Steam	Moss	4	Darwin LNG
Energy Universe	166,571	Lusby Shipping SA	Japan Marine United	Aug-19	Panama	TFDE	TZ Mk. III Flex	4	Cove Point
Enshu Maru	164,700	Trans Pacific Shipping 4 SA	Kawasaki	Aug-18	Panama	Reheat Steam Turbine	Moss	4	Wheatstone
Esshu Maru	153,000	Trans Pacific Shipping 2 Ltd.	Mitsubishi	Dec-14	Bahamas	Steam	Sayaendo	4	Portfolio
Etyfa Prometheas	135,269	Enlink Trading FZE	Mitsubishi	Oct-02	Cyprus	Steam	Moss	5	Portfolio
Excalibur	138,034	Solaia Shipping LLC	Daewoo	May-02	Belgium	Steam	GT NO 96	4	Portfolio
Fedor Litke	172,410	Hai Kuo Shipping 1602 Ltd.	Daewoo	May-17	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Flex Amber	174,000	Bund 10 Holding Ltd.	HHI	Oct-20	Marshall Is.	X-DF	TZ Mk. III Flex	4	Portfolio
Flex Artemis	174,000	Flex LNG Reliance Ltd.	Daewoo	Aug-20	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Flex Aurora	174,000	Flex LNG Aurora Ltd.	HHI	Jun-20	Marshall Is.	X-DF	TZ Mk. III Flex	4	Portfolio
Flex Constellation	173,400	Flex LNG Constellation Ltd.	Daewoo	Jun-19	Marshall Is.	ME-GI	NO-96-GW+PRS	4	Portfolio
Flex Courageous	173,400	Flex LNG Courageous Ltd.	Daewoo	Aug-19	Marshall Is.	ME-GI	NO-96-GW+PRS	4	Portfolio
Flex Endeavour	172,400	Triple H No. 3 Ltd.	Daewoo	Jan-18	Malta	ME-GI	NO-96-GW+PRS	4	Portfolio
Flex Enterprise	172,400	Triple H No. 4 Ltd.	Daewoo	Jan-18	Malta	ME-GI	NO-96-GW+PRS	4	Portfolio
Flex Freedom	173,400	Flex Freedom Ltd.	HHI	Jan-21	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Flex Rainbow	174,000	Xiang Ch13 HK International	Samsung	Jun-18	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Spot
Flex Ranger	174,101	Flex LNG Ranger Ltd.	Samsung	Jun-18	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Portfolio
Flex Resolute	173,400	Flex LNG Resolute Ltd.	HHI	Sep-20	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Flex Volunteer	170,520	Flex Volunteer Ltd.	HHI	Feb-21	Marshall Is.	X-DF	TZ Mk. III Flex	4	Portfolio
Fraiha	210,100	J5 Nakilat No. 6 Ltd.	Daewoo	Aug-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Fuji LNG	149,172	Aletheia Owning Co Ltd.	Kawasaki	Mar-04	Malta	Steam	Moss	4	Sabine Pass
Fuwairit	138,200	Camartina Shipping Co.	Samsung	Jan-04	Bahamas	Steam	TZ Mk. III	4	RasGas II
Gail Bhuwan	180,000	Primavera Montana SA	Daewoo	Feb-21	Marshall Islnds.		X-DF	Membrane 4	Portfolio
Galia Spirit	140,624	Teekay Gas II SL	Daewoo	Jul-04	Spain	Steam	GT NO 96	4	Portfolio
Gaslog Chelsea	153,000	Gas-Fifteen Ltd.	Hanjin (Busan)	Jun-10	Bermuda	Diesel/Gas-Electric	Sayaendo	4	Portfolio
GasLog Galveston	174,000	Gas-Thirty Three Ltd.	Samsung	Jan-21	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Geneva	174,000	Gas-Thirteen Ltd.	Samsung	Oct-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Genoa	174,000	Gas-Twenty Two Ltd.	Samsung	Mar-18	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
GasLog Georgetown	174,000	Ceres Shipping Ltd.	Samsung	Nov-20	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Gibraltar	174,000	Gas-Fourteen Ltd.	Samsung	Nov-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Gladstone	174,000	Gas-Twenty Three Ltd.	Samsung	Mar-19	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Glasgow	174,000	Gas-Twelve Ltd.	Samsung	Jul-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Greece	174,000	Gas-Eleven Ltd.	Samsung	Mar-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Hong Kong	174,000	Gas-Twenty Five Ltd.	HHI	Mar-18	Bermuda	X-DF	TZ Mk. III Flex	4	Portfolio
Gaslog Houston	174,000	Gas-Twenty Four Ltd.	HHI	Dec-18	Bermuda	X-DF	TZ Mk. III Flex	4	GoM
Gaslog Salem	155,000	Gas-Ten Ltd.	Samsung	May-15	Bermuda	Diesel/Gas-Electric	Membrane	4	Portfolio
Gaslog Santiago	155,000	Gas-Four Ltd.	Samsung	Mar-13	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Gaslog Saratoga	155,000	Gas-Nine Ltd.	Samsung	Dec-14	Bermuda	Diesel/Gas-Electric	Membrane	4	Spot



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



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La Seine	174,000	Xiang Ch16 HK International	HHI	Feb-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Lalla Fatma N'Soumer	145,000	Algeria Nippon Gas	Kawasaki	Oct-04	Bahamas	Steam	Moss	4	Arzew
Lena River	155,000	Solana Holding Ltd.	HHI	Sep-13	Marshall Is.	DFDE	TZ Mk. III	4	Portfolio
Lijmiliya	263,300	Nakilat Lijmiliya Inc.	Daewoo	Dec-08	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
LNG Abalamabie	162,000	Bonny Gas Transport Ltd.	Samsung	Jul-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Abuja II	162,000	Bonny Gas Transport Ltd.	Samsung	Mar-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Adamawa	141,000	Bonny Gas Transport Ltd.	HHI	Apr-05	Bermuda	Steam	Moss	4	NLNG
LNG Adventure	170,520	NYK	Samsung	Apr-21	France	X-DF	Membrane	4	Portfolio
LNG Akwa Ibom	141,000	Bonny Gas Transport Ltd.	HHI	Oct-04	Bermuda	Steam	Moss	4	NLNG
LNG Alliance	154,472	NYK Armateur	STX	Mar-07	France	Diesel/Gas-Electric	CS1	4	Portfolio
LNG Aquarius	126,300	Hanochem Shipping Pt.	General Dynamics	Jan-77	Indonesia	Steam	Moss	5	Bontang
LNG Barka	155,982	Lloyds TSB General Leasing 3	Kawasaki	Dec-08	Bahamas	Steam	Moss	4	Oman LNG
LNG Bayelsa	137,500	Bonny Gas Transport Ltd.	HHI	Mar-03	Bermuda	Steam	Moss	4	NLNG
LNG Benue	145,952	BW Gas LNG Carriers Pte Ltd.	Daewoo	Apr-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Bonny li	174,000	Bonny Gas Transport Ltd.	HHI	Dec-15	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	NLNG
LNG Borno	149,600	Okra Shipping No. 1	Samsung	Aug-07	Bermuda	Steam	TZ Mk. III	4	NLNG
LNG Cross River	141,000	Bonny Gas Transport Ltd.	HHI	Aug-05	Bermuda	Steam	Moss	4	NLNG
LNG Dream	145,000	OJV Cayman 1 Ltd.	Kawasaki	Sep-06	Bahamas	Steam	Moss	4	North West Shelf
LNG Dubhe	174,000	Arctic Red LNG Shipping Ltd.	Hudong Zhonghua	Nov-19	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Ebisu	147,546	LNG Ebisu Shipping Corp.	Kawasaki	Jul-08	Bahamas	Steam	Moss	4	Pluto
LNG Enugu	145,926	BW Gas LNG Carriers Pte Ltd.	Daewoo	Oct-05	Bermuda	Steam	GT NO 96	4	NLNG
LNG Finima II	162,000	Bonny Gas Transport Ltd.	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Fukurokuju	164,700	LNG Fukurokuju Shipping Corp. .	Kawasaki	Jul-16	Bahamas	Steam	Moss	4	APLNG
LNG Imo	148,452	Bergesen LNG XI Pte Ltd.	Daewoo	Jun-08	Bermuda	Steam	GT NO 96	4	NLNG
LNG Jamal	135,333	Jamal Shipholding SA	Mitsubishi	Oct-00	Japan	Steam	Moss	5	Oman LNG
LNG Juno	180,000	Mog-X LNG Shipholding SA	Mitsubishi	Oct-18	Bahamas	STaGE	Moss	4	Freeport
LNG Jupiter	153,000	Lloyds TSB Equipment No. 7 Ltd.	Kawasaki	Jul-09	Bahamas	Steam	Moss	4	PNG LNG
LNG Jurojin	160,000	LNG Jurojin Shipping Corp. .	Mitsubishi	Nov-15	Bahamas	Steam	Moss	4	Portfolio
LNG Kano	148,565	Bergesen LNG IX Pte Ltd.	Daewoo	Jan-07	Bermuda	Steam	TZ MK. III	4	NLNG
LNG Kolt	153,595	KLT 5 International SA	Hanjin (Busan)	Dec-08	Panama	Steam	TZ Mk. III	4	Portfolio
LNG Lagos II	174,000	Bonny Gas Transport Ltd.	HHI	Jan-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Lerici	65,000	Portovenere & Lerici Pte Ltd.	Sestri Ponente	Apr-98	Singapore	Steam	GT NO 96	4	Malaysia LNG
LNG Lokoja	148,471	Bergesen LNG VIII Pte Ltd.	Daewoo	Nov-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Maleo	127,544	Nippon/Mitsui/Kawasaki	Mitsui E&S	Jan-89	Japan	Steam	Moss	4	North West Shelf
LNG Mars	155,693	Osaka Gas Int. & Mitsui OSK	Mitsubishi	Oct-16	Japan	Steam	Moss	4	PNG LNG
LNG Megrez	174,000	Arctic Indigo LNG Shipping Ltd.	Hudong Zhonghua	Nov-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Merak	174,000	Arctic Yellow LNG Shipping Ltd.	Hudong Zhonghua	Jan-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Ogun	149,000	Okra Shipping No. 2	Samsung	Jul-07	Bermuda	Steam	TZ Mk. III	4	NLNG
LNG Ondo	148,478	Bergesen LNG X Pte Ltd.	Daewoo	Sep-07	Bermuda	Steam	TZ MK. III	4	NLNG
LNG Oyo	145,842	BW Gas LNG Carriers Pte Ltd.	Daewoo	Jan-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Phecda	174,000	Arctic Orange LNG Shipping Ltd.	Hudong Zhonghua	Sep-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Pioneer	138,121	M&S Shipping 3 SA	Daewoo	Jul-05	Bahamas	Steam	GT NO 96	4	Das Island
LNG Port-Harcourt II	162,000	Bonny Gas Transport Ltd.	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Portovenere	65,000	Portovenere & Lerici Pte Ltd.	Sestri Ponente	Apr-97	Singapore	Steam	GT NO 96	4	Portfolio
LNG River Niger	141,000	Bonny Gas Transport Ltd.	HHI	Jul-06	Bermuda	Steam	Moss	4	NLNG
LNG River Orashi	145,914	BW Gas LNG Carriers Pte Ltd.	Daewoo	Nov-04	Bermuda	Steam	GT NO 96	4	NLNG
LNG Rivers	137,200	Bonny Gas Transport Ltd.	HHI	Jun-02	Bermuda	Steam	Moss	4	NLNG
LNG Rosenrot	176,523	Fair Wind Navigation SA	Daewoo	Jan-21	Marshall Is.	X-DF	Membrane	4	Portfolio
LNG Sakura	177,000	LNG Sakura Shipping Corp.	Kawasaki	Feb-18	Bahamas	TFDE	Moss	4	Freeport
LNG Saturn	155,300	Mog-IX LNG Shipholding SA	Mitsubishi	Feb-16	Bahamas	Ultra Steam Turbine	Moss	4	Gorgon
LNG Schneeweisschen	180,000	LNG Rose Shipping Corp.	Daewoo	Sep-18	Panama	TFDE	TZ Mk. III Flex	4	Freeport
LNG Sokoto	137,425	Bonny Gas Transport Ltd.	HHI	Sep-02	Bermuda	Steam	Moss	4	NLNG
LNG Unity	154,472	Global LNG Armateur SAS	STX	Nov-06	France	Diesel/Gas-Electric	CS1	4	Portfolio
LNG Venus	153,000	Osaka Gas Int. & Mitsui OSK	Mitsubishi	Nov-14	Japan	Steam	Sayaendo	4	North West Shelf
LNG Vesta	127,386	Europe LNGT Co. Ltd.	Mitsubishi	Jun-94	Liberia	Steam	Moss	4	Portfolio
LNGShips Athena	170,618	Cardiff LNG Iota Owning LLC	HHI	Mar-21	Malta	X-DF	Membrane	4	Portfolio
LNGShips Empress	170,520	Cardiff LNG Kappa Owning LLC	Samsung	Mar-21	Malta	X-DF	Membrane	4	Portfolio
LNGShips Manhattan	174,000	Cardiff LNG Theta Owning LLC	HHI	May-21	Malta	X-DF-HPSCR	NO-96-GW+PRS	4	Portfolio
Lobito	160,276	Mint LNG III Ltd.	Samsung	Nov-11	Bahamas	DFDE	TZ Mk. III	4	Soyo
Lusail	145,000	Peninsula LNG Transport No. 1	Samsung	May-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Macoma	145,400	Compass Shipping 9 Corp. Ltd.	Daewoo	Sep-17	Bahamas	ME-GI	GT NO 96	4	Portfolio
Madrid Spirit	138,000	Teekay Gas IV SL	Navantia	Dec-04	Spain	Steam	GT NO 96	4	Atlantic LNG
Magdala	173,400	Hai Jiao 1606 Ltd.	Daewoo	Feb-18	Bahamas	ME-GI	GT NO 96	4	Portfolio
Magellan Spirit	165,500	Magellan Spirit Aps	Samsung	Apr-09	Denmark	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Malanje	160,276	Mint LNG II Ltd.	Samsung	Oct-11	Bahamas	DFDE	TZ Mk. III	4	Soyo
Maran Gas Achilles	174,000	Adonis Investment Corp.	Hyundai Samho	Jan-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Agamemnon	174,000	Doris Navigation Inc.	Hyundai Samho	May-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Alexandria	161,870	Greenmare Navigation Corp.	Hyundai Samho	Oct-15	Greece	DFDE	Membrane	4	QCLNG
Maran Gas Amphipolis	174,000	Nestor Navigation Corp.	Daewoo	Aug-16	Greece	DFDE	Membrane	4	Portfolio
Maran Gas Andros	173,400	Crusandel Marine Co.	Daewoo	Nov-19	Greece	ME-GI	GT NO 96	4	Freeport



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



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Nohshu Maru	180,000	Trans Pacific Shipping 5 Ltd.	Mitsubishi	Feb-19	Bahamas	Reheat Steam Turbine	Moss	4	Portfolio
Northwest Sanderling	127,525	BHP/BP/Chevron/Japan & Others	Mitsubishi	Jan-89	Australia	Steam	Moss	4	North West Shelf
Northwest Sandpiper	125,042	BHP/BP/Chevron/Japan & Others	Mitsui E&S	Jan-93	Australia	Steam	Moss	4	North West Shelf
Northwest Snipe	127,500	BHP/BP/Chevron/Japan & Others	Mitsui E&S	Jan-90	Australia	Steam	Moss	4	North West Shelf
Northwest Stormpetrel	127,500	BHP/BP/Chevron/Japan & Others	Mitsubishi	Dec-94	Australia	Steam	Moss	4	North West Shelf
Oak Spirit	173,400	Sea 64 Leasing Co Ltd.	Daewoo	Mar-16	Bahamas	ME-GI	GT NO 96	4	Sabine Pass
Ob River	149,700	Lance Shipping SA	HHI	May-07	Marshall Is.	Steam	TZ Mk. III	4	Sakhalin II
Oceanic Breeze	155,300	Oceanic Breeze LNG Transport	Mitsubishi	Apr-18	Marshall Is.	Reheat Steam Turbine	Moss	4	Ichthys
Onaiza	210,150	Nakilat DSME 2266 Inc.	Daewoo	Apr-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Ougarta	170,000	Hyproc Shipping Co.	HHI	Mar-17	Algeria	DFDE	TZ Mk. III Flex	4	Arzew
Pacific Arcadia	145,400	Bahamas LNG Shipping Ltd.	Mitsubishi	Oct-14	Bahamas	Steam	Moss	4	PNG LNG
Pacific Breeze	180,000	Pacific Breeze LNG Transport	Kawasaki	Mar-18	Marshall Is.	TFDE	Moss	4	Ichthys
Pacific Enlighten	145,400	Pacific Hope Shipping Ltd.	Mitsubishi	Mar-09	Bahamas	Steam	Moss	4	North West Shelf
Pacific Eurus	137,000	Pacific Eurus Shipping	Mitsubishi	Mar-06	Bahamas	Steam	Moss	4	Das Island
Pacific Mimosa	155,300	Kaede Shipholding SA	Mitsubishi	Mar-18	Japan	Reheat Steam Turbine	Moss	4	Wheatstone
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi	Sep-03	Bahamas	Steam	Moss	5	Darwin LNG
Palu LNG	159,800	Oceanus LNG Gamma LLC	Daewoo	Nov-14	Malta	TFDE	GT NO 96	4	Spot
Pan Africa	174,000	Pan Africa LNG Transportation	Hudong Zhonghua	Jan-19	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Americas	174,000	Pan Americas LNG Trans	Hudong Zhonghua	Jan-18	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Asia	174,000	Pan Asia LNG Transportation	Hudong Zhonghua	Sep-17	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Europe	174,000	Pan Europe LNG Transportation	Hudong Zhonghua	Jul-18	Hong Kong	TFDE	GT NO 96	4	QCLNG
Papua	170,000	Aquarius LNG Shipping Ltd.	Hudong Zhonghua	Nov-14	Hong Kong	DFDE	TZ MK. III	4	PNG LNG
Patris	174,000	Artemis Gas 1 Shipping Inc.	Daewoo	Jan-18	Liberia	ME-GI	GT NO 96	4	Freeport
Pearl LNG	174,000	Cardiff LNG Delta Owning LLC	HHI	Aug-20	Malta	X-DF	NO-96-GW+PRS	4	Portfolio
Point Fortin	154,200	Los Halillos Shipping Co. SA	Koyo Dockyard	Jan-10	Panama	Steam	TZ Mk. III	4	Portfolio
Polar Spirit	89,800	Polar Spirit LLC	Ishikawajima	Jun-93	Bahamas	Steam	IHI SPB	4	Atlantic LNG
Portovyy	138,107	Global LNG Ltd.	Daewoo	Aug-03	Malta	Steam	GT NO 96	4	Portfolio
Prachi	162,000	India LNG Transport Co. No. 4	HHI	Nov-16	Singapore	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon
Prism Agility	180,000	HHI ENS1 Shipholding SA	HHI	May-19	Panama	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Prism Brilliance	180,000	HHI ENS2 Shipholding SA	HHI	May-19	Panama	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Pskov	170,200	Scalpay Shipping Ltd.	STX	Sep-14	Liberia	DFDE	GT NO 96	4	Portfolio
Puteri Delima	130,400	Puteri Delima Sdn Bhd.	STX	Jan-95	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Delima Satu	137,100	Puteri Delima Satu L Pte Ltd.	Mitsui E&S	Oct-02	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Firus Satu	137,100	Puteri Firus Satu	Mitsubishi	Aug-04	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Intan	137,100	Puteri Intan Sdn Bhd.	STX	Aug-94	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Intan Satu	137,100	Puteri Intan Satu L Pte Ltd.	Mitsubishi	Aug-02	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Mutiara Satu	137,100	Puteri Mutiara Satu	Mitsui E&S	Apr-05	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Nilam	130,400	Puteri Nilam Sdn Bhd.	STX	Jul-95	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Nilam Satu	137,100	Puteri Nilam Satu L Pte Ltd.	Mitsubishi	Jul-03	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Zamrud	130,400	MISC Bhd.	STX	Jun-96	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Zamrud Satu	137,100	Puteri Zamrud Satu L Pvt Ltd.	Mitsui E&S	Feb-04	Malaysia	Steam	GT NO 96	4	MLNG III
Qogir	174,000	Xiang Ch15 HK International	Samsung	Jun-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Raahi	138,076	India LNG Transport Co. No. 2	Daewoo	Oct-04	Malta	Steam	GT NO 96	4	RasGas
Ramdane Abane	126,130	Hyproc Shipping Co.	STX	Jun-81	Algeria	Steam	GT NO 85	5	Arzew
Rasheeda	266,000	Nakilat SHI 1754 Inc.	Samsung	Aug-10	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas IV
Rias Baixas Knutsen	180,000	Knutsen OAS Espana SL	HHI	Sep-19	Spain	ME-GI	TZ Mk. III Flex Plus	4	Corpus Christi
Ribera Del Duero Knutsen	173,400	Norspan LNG VIII AS	Daewoo	Dec-10	Norway	DFDE	GT NO 96	4	Portfolio
Rioja Knutsen	170,000	Norspan LNG X As	HHI	Dec-16	Spain	ME-GI	TZ Mk. III	4	Portfolio
Rudolf Samoylovich	172,410	TC LNG Explorer II LLC	Daewoo	Aug-18	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Saga Dawn	45,000	Saga LNG Shipping Pte Ltd.	China Merchants H.I.	Aug-19	Singapore	Diesel/Gas-Electric	TZ MK. III Flex	4	Portfolio
Salalah LNG	147,000	Tiwi LNG Carrier SA	Samsung	Dec-05	Panama	Steam	TZ Mk. III	4	Oman LNG
SCF Barents	174,000	Heliconia Maritime SA	HHI	Sep-20	Liberia	DFDS	TZ Mk. III Flex	4	Portfolio
SCF La Perouse	174,000	Albus Shipping Ltd.	HHI	Feb-20	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio
SCF Melampus	170,200	Pabbay Shipping Ltd.	STX	Jan-15	Liberia	Diesel Electric	Membrane	4	Portfolio
SCF Mitre	170,200	Ensay Shipping Ltd.	STX	Apr-15	Liberia	Diesel Electric	Membrane	4	Portfolio
SCF Timmerman	174,000	Headliner Maritime SA	HHI	Jan-21	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio
Sean Spirit	174,162	HHI Hull No. S856 LLC	Hyundai Samho	Dec-18	Bahamas	ME-GI	TZ Mk. III Flex	4	Freeport
Seishu Maru	138,000	Trans Pacific Shipping 1 Ltd.	Mitsubishi	Sep-14	Bahamas	Steam	Moss	4	PNG LNG
Senshu Maru	127,167	Nippon/Mitsui/Kawasaki	Mitsui E&S	Feb-84	Japan	Steam	Moss	5	Bontang
Seri Alam	145,572	MISC Bhd.	Samsung	Jul-05	Malaysia	Steam	Moss Seri-C	4	Bintulu
Seri Amanah	145,709	MISC Bhd.	Samsung	Mar-06	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Anggun	145,731	MISC Bhd.	Samsung	Oct-06	Malaysia	Steam	TZ Mk. III	4	North West Shelf
Seri Angkasa	145,130	MISC Bhd.	Samsung	Dec-06	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Ayu	145,894	MISC Bhd.	Samsung	Oct-07	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Bakti	152,944	MISC Bhd.	Mitsubishi	Apr-07	Malaysia	Steam	TZ MK. III	4	Gladstone
Seri Balhaf	152,000	MISC Bhd.	Mitsubishi	Jan-09	Malaysia	Steam	TZ MK. III	4	Bontang
Seri Balqis	152,000	MISC Bhd.	Mitsubishi	Mar-09	Malaysia	Steam	TZ MK. III	4	NLNG
Seri Begawan	152,900	MISC Bhd.	Mitsubishi	Nov-07	Malaysia	Steam	TZ MK. III	4	Bintulu
Seri Bijaksana	152,300	MISC Bhd.	Mitsubishi	Apr-08	Malaysia	Steam	TZ MK. III	4	Bintulu



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



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Woodside Charles Allen	173,400	Newberry Shiptrade Ltd.	Daewoo	Oct-20	Greece	ME-GI	Membrane	4	Portfolio
Woodside Donaldson	165,500	Malt Singapore Pte Ltd.	Samsung	Oct-09	Singapore	Diesel/Gas-Electric	TZ Mk. III	4	Pluto
Woodside Goode	159,800	Armour Co. Ltd.	Daewoo	Nov-13	Greece	Diesel Electric	GT NO 96	4	RasGas
Woodside Rees Withers	173,400	Franklin Navigation Co.	Daewoo	Oct-19	Greece	ME-GI	GT NO 96	4	Portfolio
Woodside Rogers	159,800	Margie Seaway Corp.	Daewoo	Jul-13	Greece	Diesel/Gas-Electric	GT NO 96	4	Pluto
Yakov Gakkel	172,658	TC LNG Explorer VI LLC	Daewoo	Nov-19	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Yamal Spirit	174,000	Xiang Ch2 HK International	Hyundai Samho	Jan-19	Bahamas	ME-GI	TZ Mk. III Flex	4	Freeport
Yari LNG	159,800	Oceanus LNG Delta LLC	Daewoo	Nov-14	Malta	TFDE	GT NO 96	4	Spot
Yenisei River	155000	Navajo Marine Ltd.	HHI	41486	Marshall Is.	DFDE	TZ Mk. III	4	Yamal
YK Sovereign	127125	SK Shipping Co. Ltd. -Krs	HHI	34669	South Korea Steam		Moss	4	MLNG
Zarga	268000	Nakilat SHI 1752 Inc.	Samsung	40201	Marshall Is.	DRL	TZ Mk. III	5	Qatargas IV
Zekreet	137482	Mitsui/Nippon/Kawasaki/Iino	Mitsui E&S	36130	Japan	Steam	Moss	5	Qatargas I

Fleet – LNG Bunkering

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

Fleet – Small-scale/Multipurpose

Name	Built	Capacity	Registered Owner	Builder	Flag	Engine Type	Cargo System	No. of tanks	Project
Akebono Maru	Jun-11	3,500	Chuo Kaiun K.K.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Aman Sendai	May-97	18,928	Asia LNG Transport	NKK	Malaysia	Steam	TZ Mk. III	3	Malaysia LNG
Coral Acropora	Dec-12	6,573	Coral Acropora Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Actinia	Jan-13	6,573	Coral Actinia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Alicia	Dec-12	6,573	Coral Alicia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Anthelia	May-13	6,500	Coral Anthelia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Energice	Feb-18	18,000	Anthony Veder Chartering	Neptun Werft	Netherlands	Gas-Diesel	TZ MK. III Flex 2		Portfolio
Coral Energy	Dec-12	15,600	Anthony Veder Rederijzaken	Meyer Werft	Netherlands	Gas-Diesel	IMO Type C	3	Portfolio
Coral Favia	Jul-10	10,000	Somargas II Pvt. Ltd.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Baltic portfolio
Coral Fraseri	Jan-10	10,000	Innovation Shipping Co.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Portfolio
Coral Fungia	Jan-11	10,000	Somargas II Pvt. Ltd.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Baltic portfolio
Coral Furcata	Nov-11	10,000	Conception Shipping Company	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Portfolio
Hai Yang Shi You 301	Apr-15	30,000	COSL	Jiangnan Shipyard	China	Gas-Diesel	Membrane	4	Hainan LNG shuttle
Kakurei Maru	Nov-08	2,536	Tsurumi Sunmarine Co.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Kakuyu Maru	Nov-13	2,538	Tsurumi Sunmarine Co.	Kawasaki	Japan	Diesel	Cylinders	1	Japan coastal trade
Lucia Ambition	Dec-93	18,927	Asia LNG Transport	NKK	Malaysia	Steam	TZ Mk. III	3	Malaysia-Hainan
North Pioneer	Nov-05	2,500	Japan Liquid & Gas Transport Co. & Japan Railway Agency	Shin Kurushima	Japan	Diesel	Cylinders	2	Japan coastal trade
Pioneer Knutsen	Mar-04	1,100	Knutsen Kyst LNG K/S	Bijlsma Lemmer B.V. Scheepswerf	Norway	LNG-Diesel	Cylinders	2	Norway coastal trade
Ravenna Knutsen	Feb-21	30,000	Norspan LNG 14 AS	Hyundai Mipo	Spain	X-DF	Cylinders	3	Italy coastal trade
Seoul Gas	Jul-98	4,365	Chemgas Schiffahrts GmbH & Co. mt Oste KG	Severnav Shipbuilding	Liberia	Diesel	Cylinders	2	S. Korea-China
Shinju Maru No. 1	Aug-03	2,538	JRTT & NS United Coastal Tankers	Kawasaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Shinju Maru No. 2	Oct-08	2,536	Chuo Kaiun K.K.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Sun Arrows	Sep-07	19,531	Maple LNG Transport Inc.	Kawasaki	Bahamas	Diesel	Moss	3	Malaysia LNG
Surya Aki	Feb-96	19,538	MCGC International Limited & Hiroshima Gas Co.		Kawasaki	Bahamas	Steam	Moss	3 Thanlyin LNG
Triputra	Dec-00	23,097	Nusantara Shipping	NKK	Indonesia	Steam	TZ Mk. III	3	Pertamina Portfolio
Unikum Spirit	Jun-11	12,000	DHJS Hull No.2007-001 LLC	AVIC Dingheng	Singapore	Diesel	Cylinders	2	Kuantan
Vision Spirit	Sep-11	12,000	I.M. Skaugen Marine Services	AVIC Dingheng	Singapore	Diesel	Cylinders	2	Portfolio

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

LNG Import Terminals

Explanatory Notes

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

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

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

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Japan (continued)	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Hokkaido Electric	2012	2	380,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	JERA Co. Inc.	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
Korea	Soma Fukushima	Japan Petroleum Exploration	2017	1	225,000
	Boryyeong	GS Energy, SK E&S	2017	3	200,000
	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO SK E&S	2005	4	530,000
	Pyeong-Taek	Kogas	1986	23	3,360,000
	Samcheok	Kogas	2014	3	600,000
	Tong-Yeong	Kogas	2002	17	2,620,000
Malaysia	Jeju	Kogas	2019	2	90,000
	Pengerang Johor	Petronas Gas	2017	2	400,000
Mexico	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	Sempra LNG	2008	2	320,000
	Manzanillo	Samsung, Kogas, Mitsui	2012	2	300,000
Netherlands	Gate LNG	Gasunie, Royal Vopak	2011	3	540,000
Panama	Costa Norte	AES	2018	1	130,000
Phillipines	Pagbilao LNG	Energy World Corp.	2017	1	130,000
Poland	Swinoujscie	Baltic Gaz System	2015	2	320,000
Portugal	Sines	REN Atlantico	2004	3	390,000
Puerto Rico	Penuelas	EcoElectrica	2000	1	160,000
Singapore	Singapore	Singapore Energy Authority	2013	3	540,000
Spain	Barcelona	Enagas	1969	8	840,000
	Huelva	Enagas	1988	5	610,000
	Cartagena	Enagas	1989	5	587,000
	Bilbao	Enagas, EVE	2003	3	450,000
	Sagunto	GNF, Osaka Gas, Oman Oil	2006	4	600,000
	Mugardos, El Ferrol	Reganosa, Sonatrach, Sojitz Corp.	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
Sweden	Lysekil	Gasum	2014	1	30,000
	Nynashamn	AGA Gas	2011	1	20,000
Taiwan	Yung-An	CPC	1990	6	690,000
	Tai-Chung	CPC	2009	5	800,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereglisi	Botas	1994	3	255,000
	Izmir	EgeGaz	2006	2	280,000
USA	Everett	Suez LNG NA	1971	2	155,000
	Lake Charles	Shell, ETE	1982	4	425,000
	Freeport	Freeport LNG Development	2008	2	320,000
	Golden Pass, TX	Qatar Petroleum, ExxonMobil	2010	5	775,000
	Pascagoula, MS	Gulf LNG, Kinder	2012	2	320,000
UK	Isle of Grain	National Grid	2005	8	1,000,000
	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

Country	Location/Project	Owners/Project Developers	Start up	Storage	
				Tanks	Capacity
China	Shenzhen	CNPC Yudean Power	2021	2	120,000
	Tianjin (Nangang)	Beijing Energy	2022	10	2,000,000
	Yangjiang	CNPC Yudean Power	2023	2	120,000
	Zhangzhou Fujian	CNOOC	2022	2	160,000
India	Dhamra Odisha	Indian Oil, Adani, GAIL	2020	2	320,000
	Jaigarh	Hiranandani Group	2021	2	320,000
	Kodinar	Hindustan Petroleum Corp.	2022	1	160,000
Japan	Himuka	Diagas Group-Osaka Gas	2022	1	65,000

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	Escobar GasPort	Excelerate/Enarsa	2011
Bangladesh	Moheshkhali	Excelerate, PetroBangla	2018
	Cox's Bazar	Summit Power International, Excelerate Energy	2019
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
	Porto Sergipe FSRU	Golar LNG/Stonepeak	2020
	Porto do Acu FSRU	GNA	2020
China	Tianjin FSRU	CNOOC, Hoegh, various	2013
Croatia	Hrvatska LNG	MVM	2021
Colombia	Cartagena FSRU	Promigas, Sociedad Portuaria El Cayao	2016
Egypt	Ain Sokhna, Suez	EGAS, BW Gas	2015
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertamina	2012
	Benoa LNG	PT Pertagas Niaga	2016
	Amurang	Karadeniz	2020
	Jawa Satu FSRU	Pertamina	2021
Israel	Hadera Gateway	Israel Electric	2013
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jamaica	Old Harbour	Golar FSRU, New Fortress	2019
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterranea	ElectroGas	2016
Myanmar	Thanlyin	CNTIC Vpower	2020
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Russia	Kaliningrad FSRU	Gazprom	2020
Turkey	Aliaga FSRU, Turquoise FLNG	Etki LNG	2016
	Dortyol FSRU Terminal	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
INDONESIA	Sengkang LNG	Energy World Corp.	2021+	4	2.0
MALAYSIA	Rotan FLNG (Sabah)	Petronas, Murphy Oil	2021	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2023+	2	10.0
	Area 4 Onshore	Eni and partners	2023+	2	10.0
	Area 4 FLNG	Eni and partners	2022	1	3.4
NIGERIA	NLNG Train 7	NNPC, Shell, Eni, Total	2022+	1	7.0
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, ExxonMobil Oil Search, Petromin	Studies		
RUSSIA	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2021	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2023+	2	10.0
	Arctic LNG II Siberia	Novatek, Total	2023	3	19.8
USA	Alaska LNG Nikiski	Alaska Gasline Development Corp.	2023+	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2023+	6	6.0
	Commonwealth LNG, Louisiana	Commonwealth LNG LLP	2023+	8	9.0
	Delfin LNG, Louisiana	Delfin	2023+	3	9.0
	Driftwood LNG, Louisiana	Tellurian, Total and others	2023	6	27.6
	Galveston Bay LNG	NextDecade	2023+	6	27.0
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2024	3	15.6
	Jacksonville, St John's River	Eagle LNG, Ferus Natural Gas Fuels	2021+	small	TBC
	Jordan Cove, Coos Bay	Pembina Corp.	2024	2	7.8
	Lake Charles, Louisiana	Shell, ETE	2024	3	15.0
	Magnolia LNG	Louisiana LNG Ltd.	2023+	4	8.0
	Port Arthur LNG	Sempra	2023+	2	10.0
	Rio Grande LNG	NextDecade	2023+	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2016-19	1	4.5
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2023+	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2022	5	12.0
	VG LNG (Plaquemines)	Venture Global	2022	10	20.0
	VG LNG (Delta-Plaquemines)	Venture Global	2024	36	22.5

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 1994	2 1	3.2 2.5	3	240,000
ALGERIA	Arzew	Sonatrach GL4Z	1964	3	1.1	3	35,000
	Arzew	Sonatrach GL1Z	1978	6	7.8	3	300,000
	Arzew	Sonatrach GL2Z	1980	6	8.0	3	300,000
	Arzew	Sonatrach	2014	1	4.7		
	Skikda	Sonatrach GL1K II	1980	3	3.0	5	308,000
	Skikda	Sonatrach (rebuild)	2013	1	4.5		
ANGOLA	Soyo	Sonangol, Chevron, BP, ENI, Total	2012	1	5.2	2	370,000
AUSTRALIA	Karratha	NWS Woodside, Shell, BHP	1989	2	5.0	4	260,000
		(BP, Chevron	1992	1	2.5	1	130,000
		(Mitsubishi/Mitsui)	2004	1	4.4	1	130,000
		NWS partners	2008	1	4.4	1	130,000
	Darwin	Darwin (Bayu Undan) ConocoPhillips, Santos, Eni, Inpex, TEPCO, Tokyo Gas	2006	1	3.5	1	188,000
	Australia Pacific LNG	ConocoPhillips, Origin Energy, Sinopec	2016	2	7.5	2	320,000
	Gladstone LNG	Santos, Petronas, Total, Kogas	2015	2	7.8	2	280,000
	Gorgon LNG	Chevron, Shell, ExxonMobil	2016	3	15.6	2	360,000
	Pluto LNG	Woodside, Tokyo Gas, Kansei	2012	1	4.8	2	240,000
	QCLNG	Shell, CNOOC	2014	2	8.0	2	280,000
	Wheatstone LNG	Chevron, Woodside, Kuwait (KUFPEC), Jera, Kyushu	2017	2	8.9	2	300,000
	Ichthys LNG	Inpex Corp., Total	2018	2	8.9	2	330,000
	Prelude FLNG	Shell, Inpex, Kogas CPC	2019	1	3.5		
BRUNEI	Lumut	Brunei/Shell/Mitsubishi/Total	1972-74	5	7.2	3	176,000
CAMEROON	Hilli Episeyo FLNG	Kribi Perenco	2018	1	1.2	1	125,000
EGYPT	Damietta	Union Fenosa, EGPC, EGAS	2004	1	5.0	2	300,000
	Idku	EGPC, EGAS, Shell, Total, Petronas	2005	2	7.2	2	280,000
EQ.GUINEA	Bioko Island	Marathon, Sonagas, Mitsui, Marubeni	2007	1	3.4	2	272,000
INDONESIA	Bontang I	Pertamina, VICO, JILCO, Total	1977	2	5.2	5	635,000
	Bontang II		1983	2	5.2		
	Bontang III		1989	1	2.8		
	Bontang IV		1993	1	2.8		
	Bontang V		1997	1	2.8		
	Bontang VI		1999	1	3.0		
	Sulawesi LNG	Medco Energi, Pertamina, Mitsubishi	2015	1	2.0	1	170,000
	Tangguh	BP, MI Berau, CNOOC, Nippon, LNG Japan	2008	2	7.6	2	340,000
MALAYSIA	Bintulu (MLNG Satu)	Petronas, Sarawak, Mitsubishi	1983	3	8.1	4	260,000
	Bintulu (MLNG Dua)	Petronas, Shell, Sarawak, Mitsubishi	1995	3	7.8	1	65,000
	Bintulu (MLNG Tiga)	Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil	2003	2	6.8	1	120,000
	Bintulu Train 9	Petronas	2016	1	3.6		
	Kanowit FLNG	Petronas	2016	1	1.2		
NIGERIA	Bonny Island	NNPC, Shell, Total, Eni	1999	2	6.4	2	168,400
		Nigeria LNG (formed by above)	2002	1	3.2	1	84,200
		Nigeria LNG	2006	2	8.2		
		Nigeria LNG	2008	1	4.1	1	84,200
			2007	1	4.2	2	280,000
NORWAY	Snøhvit/Melkoya	Equinor, Total, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
		Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
PAPUA NEW GUINEA	PNG LNG	ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-TI	QP, Shell	2010	1	7.8		
	RasGas I- T1&2	QP, ExxonMobil, Kogas, Itochu, LNG Japan	1999	2	6.6		
	RasGas II- T3	QP, ExxonMobil	2004	1	4.7		
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7	6	840,000
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
	Yamal LNG Siberia	Novatek, Total, CNPC, Silk Fund	2017	3	16.5	4	640,000
TRINIDAD & TOBAGO	Point Fortin Train 1	BP, Shell, CIC, NGC	1999	1	3.0	2	204,000
	Train 2	BP, Shell	2002	1	3.3	1	160,000
	Train 3	BP, Shell	2003	1	3.3	1	160,000
	Train 4	BP, Shell, NGC	2005	1	5.2	1	160,000
USA	Cheniere Sabine Pass	Cheniere Energy	2016	5	22.5	5	800,000
	Cove Point LNG	Dominion Energy	2017	1	5.3	7	695,000
	Cheniere Corpus Christi	Texas Cheniere	2018	3	15.0	3	480,000
	Cameron Hackberry	Sempra, Total, Mitsui, Mitsubishi	2019	2	9.8	3	480,000
	Elba Island Georgia	Kinder Morgan, EIG Energy	2019	10	2.5	5	535,000
	Freeport LNG, Texas	Freeport LNG	2019	2	10.2	3	483,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000



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