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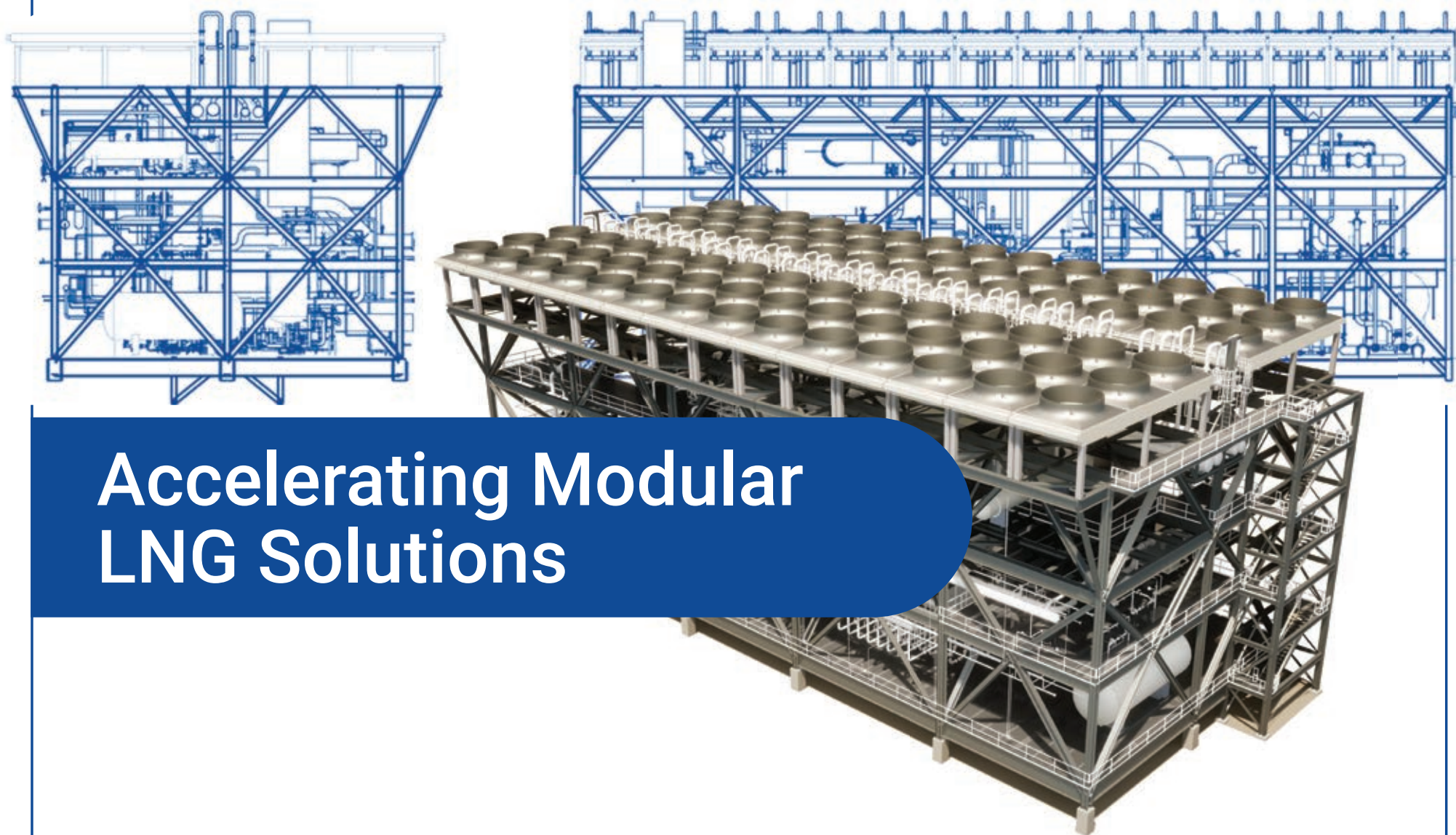
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Spain's El Musel LNG commissioning entices questions

The commissioning of Spain's El Musel LNG terminal throws several questions of Spanish and European LNG policy in sharp relief, our Markets Editor Alexander Wilk writes.

Whereas northern and eastern European countries have sought to quickly redefine their energy security outlook after the collapse of their Russian pipeline gas supply, Spain moved to commission a major conventional LNG terminal when all its neighbours scrambled to secure FSRU capacity. Indeed, our projects database indicates seven out of twelve proposed European LNG import projects are FSRU terminals, with most of them currently regarded as speculative.

The final commissioning of Spain's previously mothballed El Musel LNG terminal throws several questions of Spanish and European LNG policy in sharp relief, chief among them the role of LNG in energy security, to what extent Spain can aid neighbouring EU states in remaining by and large decoupled from Russian gas and, by extension, Spain's ongoing struggle to expand its pipeline capacity across the Pyrenees to finally ascend as a European LNG gateway of note.

The country already was in second place of European LNG importers by volume behind France in the first half of 2023, our data show. Spanish LNG imports amounted to 11.67mmt, 1.43mmt below the 13.10mmt imported by France and 0.15mmt ahead of the United Kingdom.

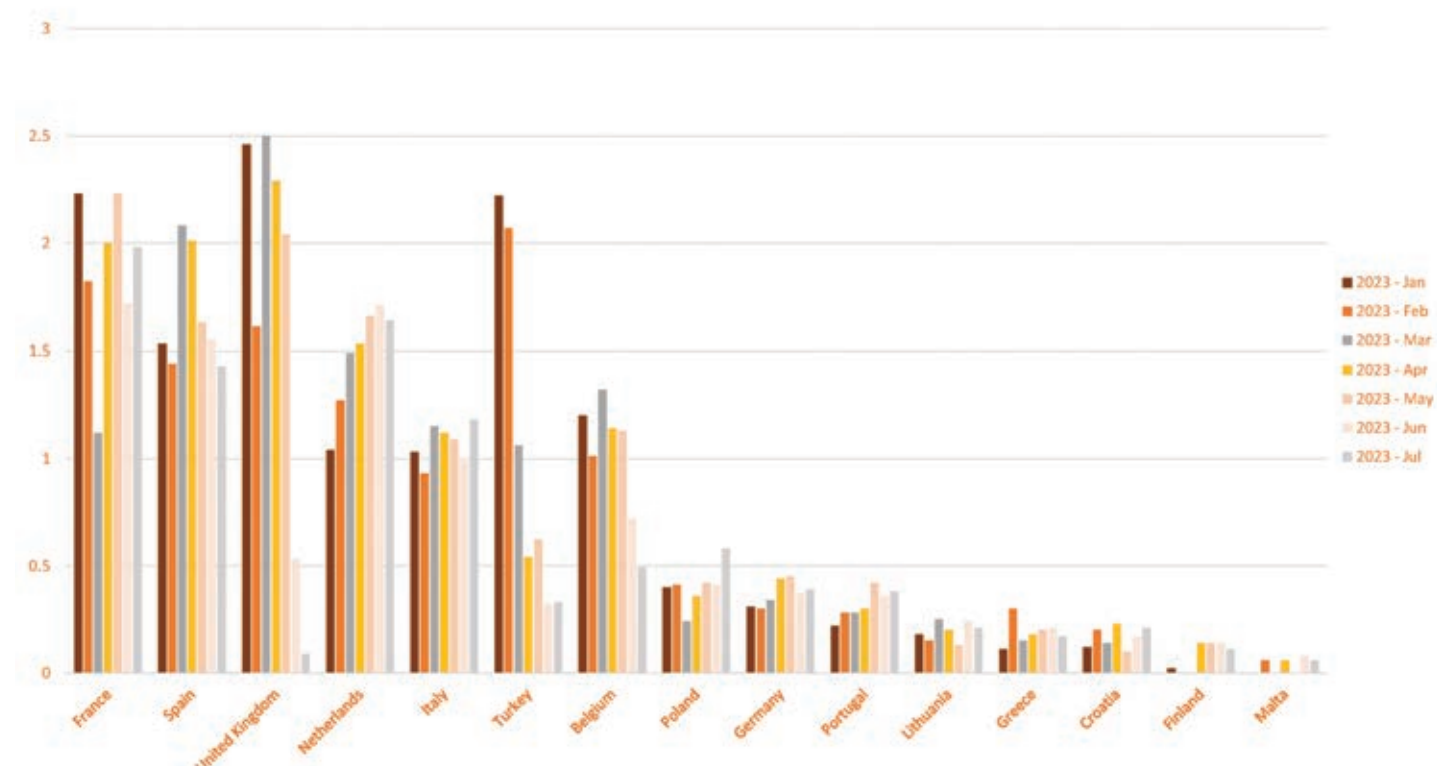
El Musel LNG terminal

Enagás, the operator of the El Musel LNG terminal located in Gijón, commenced the binding phase of the capacity allocation process (Open Season) for logistics services on 6 June, successfully concluding it in July. Enagás had already attracted significant interest from 16 marketing companies during the non-binding phase between 6 and 26 March. The terminal, a major investment in Spain's energy infrastructure, is equipped to handle ships with capacities up to 266,000 m3 and could thus accommodate Q-Max class tankers. The terminal boasts two LNG tanks with combined storage

capacity of 300,000 m3.

In a strategic move, Enagás also acquired a 130km pipeline network from Reganosa in February in return for a 25 percent stake in the El Musel terminal. The project has been advertised to strengthen Europe's energy security, designed to offer 5.8mmt of LNG capacity annually. The Ministry for the Ecological Transition and the Demographic Challenge (Miteco) gave its nod for the terminal's start-up, leaving only the Commissioning Act from the Asturias government for it to be fully operational in July. Enagás said El Musel aligns with its 2030 strategic plan and promises to diversify Spain's energy sources while reinforcing the national energy infrastructure. Permission to start LNG imports followed from a prior approval received on 17 February, when the plant obtained the singular economic regime from the National Commission for Markets and Competition (CNMC). This approval confirmed that the plant

European LNG Imports (MMt)
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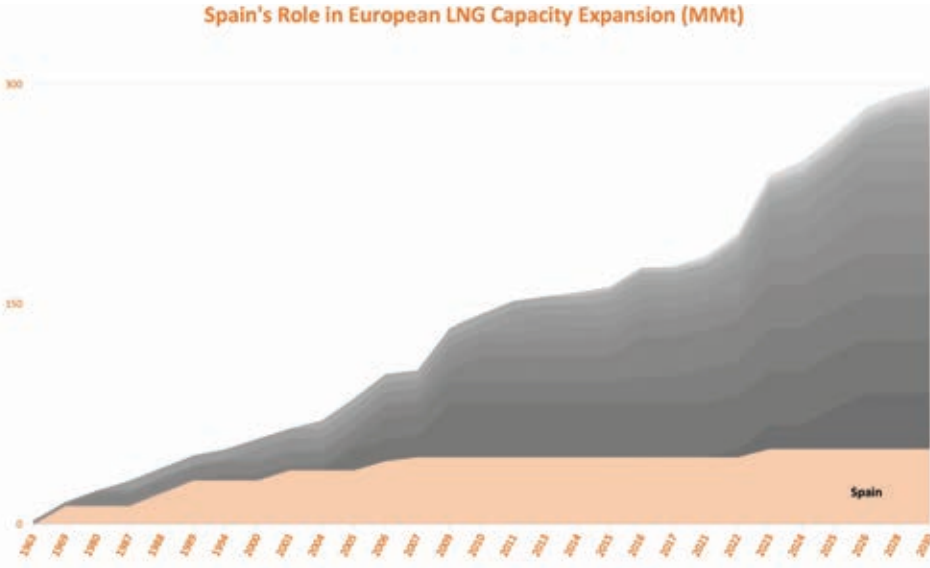
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Source: LNG Journal

complied with all the economic and regulatory requirements necessary for its operation.

The terminal received a pre-commissioning cargo via the RWE-controlled and Sabine Pass-sailed Cool Racer on 2 July, our data showed. Since then, it took in two additional deliveries from Corpus Christi LNG via the Dorado LNG in mid-July and via the GasLog Warsaw in mid-August, the latter being the terminal's first commercial cargo on behalf of Spanish utility Endesa.

Gas supply security

The theme of gas supply security is not new to Spain. The country's progression in the natural gas market was slower than many other Western European nations due to its minimal domestic production and its distance from major European gas fields. The majority of its gas infrastructure was established in the 1990s when the country prioritised energy diversification and a more prominent role of natural gas in its energy strategy. Consequently, natural gas' contribution to Spain's primary energy supply surged from 5 percent in 1990 to over 25 percent by 2004, according to the IEA.

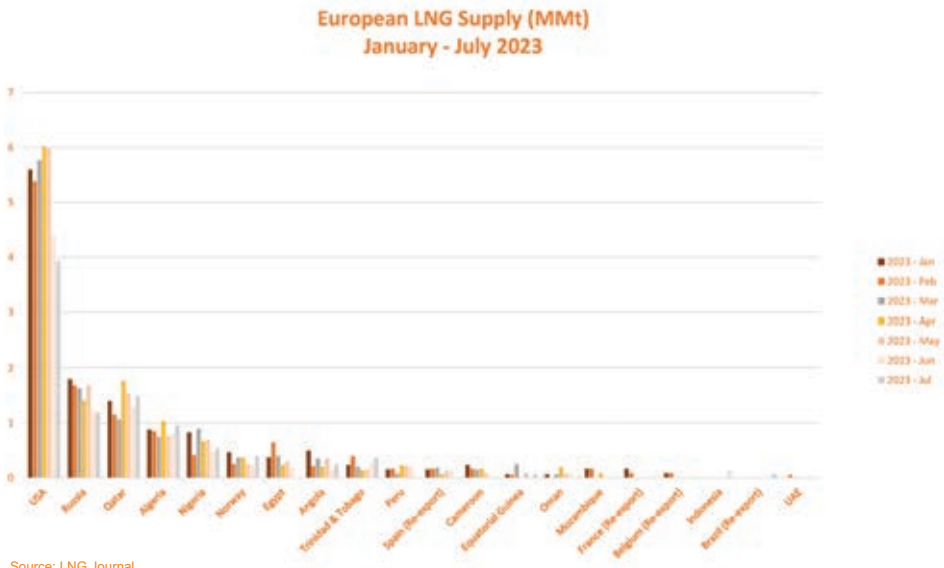
Still, at the beginning of the 1990s, Spain's LNG import capacity was relatively limited, with only three LNG terminals – Barcelona, Huelva and Cartagena – in operation. The country equally remained highly dependent on a select few sources for LNG supply, chiefly Algeria and Libya. This placed the nation in a potentially precarious position, particularly in terms of energy security at a time when its economy was booming and projections promised a rapid increase in energy demand.

Recognising the strategic benefits of LNG in enhancing energy security and diversification, the Spanish government

began to invest in expanding the country's LNG infrastructure. By the early 2000s, the country had commissioned additional LNG terminals at Bilbao and Sagunto. The Mugardos terminal further increased Spain's import capacity in 2007. Construction of the El Musel LNG terminal began in 2008, just as the global financial crisis began to bite, with an anticipated start-up date in 2015.

However, the Spanish government passed a legal decree postponing the start-up of Spain's seventh LNG import terminal on 31 March 2012. The decree asserted that the mothballing of El Musel would not affect security of supply as capacity utilisation of existing LNG import infrastructure sat at only 40-60 percent (something that has not materially changed since, according to our data). The decree allowed for construction on El Musel to continue but the plant would not be commissioned 'until demand justifies it'.

Nevertheless, the 2010s saw continued growth in Spain's LNG import capacity, with expansions at existing terminals and the commissioning of the Huelva terminal. By 2021, Spain had become one of the leading countries in Europe in terms of LNG import capacity, with a network of six LNG terminals along its coast.



Source: LNG Journal

This growth in LNG import capacity was not only to enhance Spain's energy security but also positioned Spain as a potential LNG gateway for Europe, vital as the EU seeks alternatives to Russian gas. Nowadays, Spain hosts roughly 45 percent of the EU's LNG storage capacity, according to Enagás. However, that potential was held back by a lack of pipeline interconnectors to Spain's European neighbours. Even during the peak demand month of March this year, and before the inauguration of El Musel, annualised Spanish LNG import capacity utilisation did not exceed 40 percent, according to our data and calculations. Presumably, the permission to commission El Musel was given because 'demand justified it'. However, this seems at odds with the fairly low utilisation rate even at peak times.

More Energy Security Plan

Since 1990, numerous new exporters have quickly established themselves in the Spanish market: Norway began shipments to Spain in 1995, followed by Qatar in 1997. Trinidad and Nigeria started in 1999, followed by Oman in 2000 and Egypt in 2005. These new entrants joined the ranks of longstanding exporters like Algeria and Libya. Since then, the roster of LNG suppliers has expanded to Russia, the United States, Peru, Cameroon, Angola and Equatorial Guinea, Mozambique and even some isolated cargoes from Indonesia.

Enagás highlighted in a statement on 9 June that 'the start-up of El Musel [...] is part of the Government's More Energy Security Plan, and will strengthen the security of energy supply in Europe.' However, if the theme is energy security, one LNG supplier stands out among the current roster - not just in Spain. Russia remains the second largest supplier of LNG to Europe with 10.59mmt in 1H 2023. Whilst it also remained drastically



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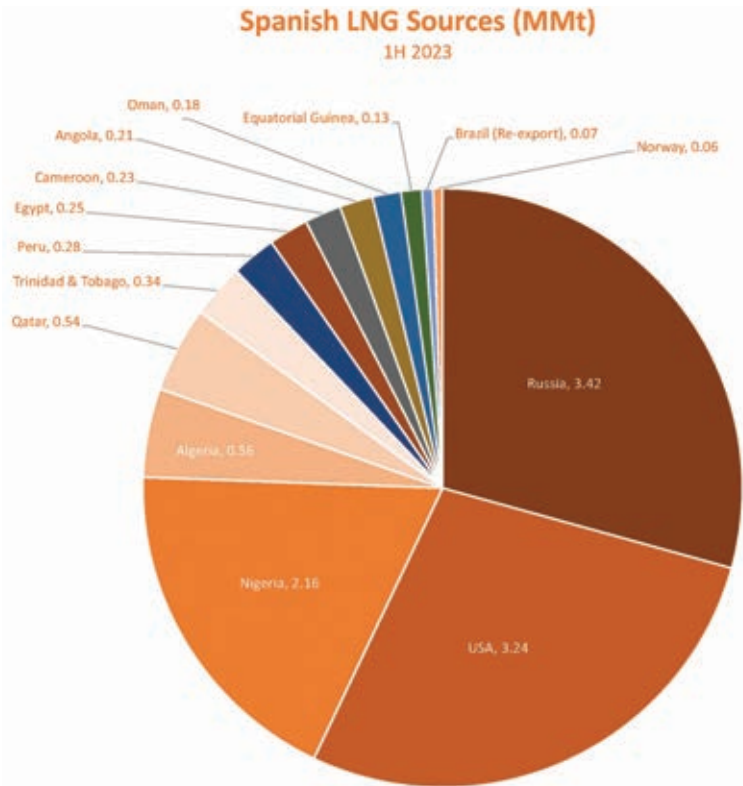
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Source: LNG Journal

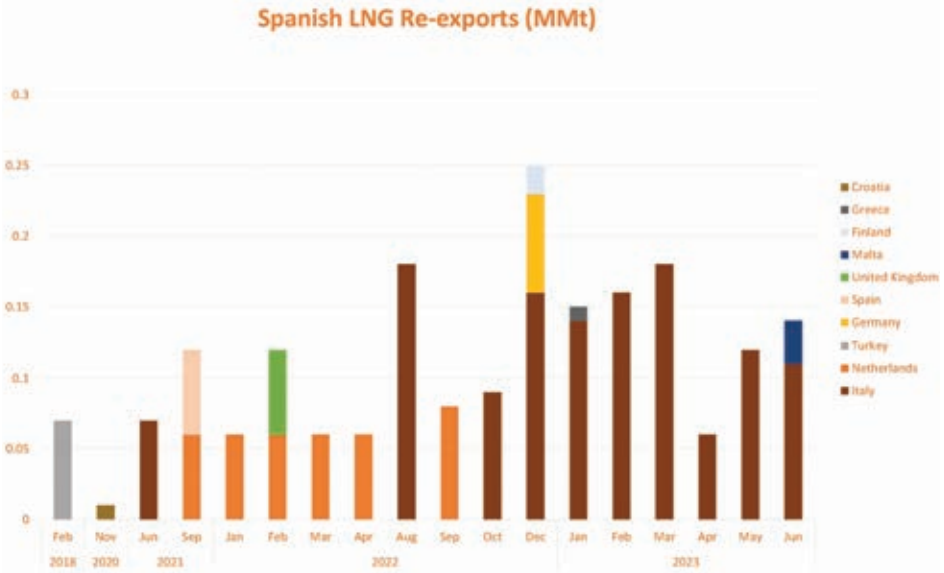
behind the 37.07mmt supplied by the United States and with a distinct downwards trend since January, this downward trend happened in a context of near-full European gas storage and Yamal LNG increasing exports to China via the Northern Sea Route. It is not clear from the data to what extent European buyers have actively begun scaling down Russian LNG exports.

By the same token, Russia was also the most significant LNG supplier to Spain with 3.42mmt in 1H 2023, according to our data. As we reported in May, Spanish Deputy Prime Minister Teresa Ribera's urged firms such as Naturgy, Repsol, Enagás and Axpo not to land Russian LNG in Spain. Axpo, Repsol and Enagás responded to the notification saying they're not purchasing LNG from Russia, according to a spokesperson of the ministry. However, Spain continues to receive Russian LNG under Naturgy's long-term contract to purchase the fuel from Yamal LNG until 2038.

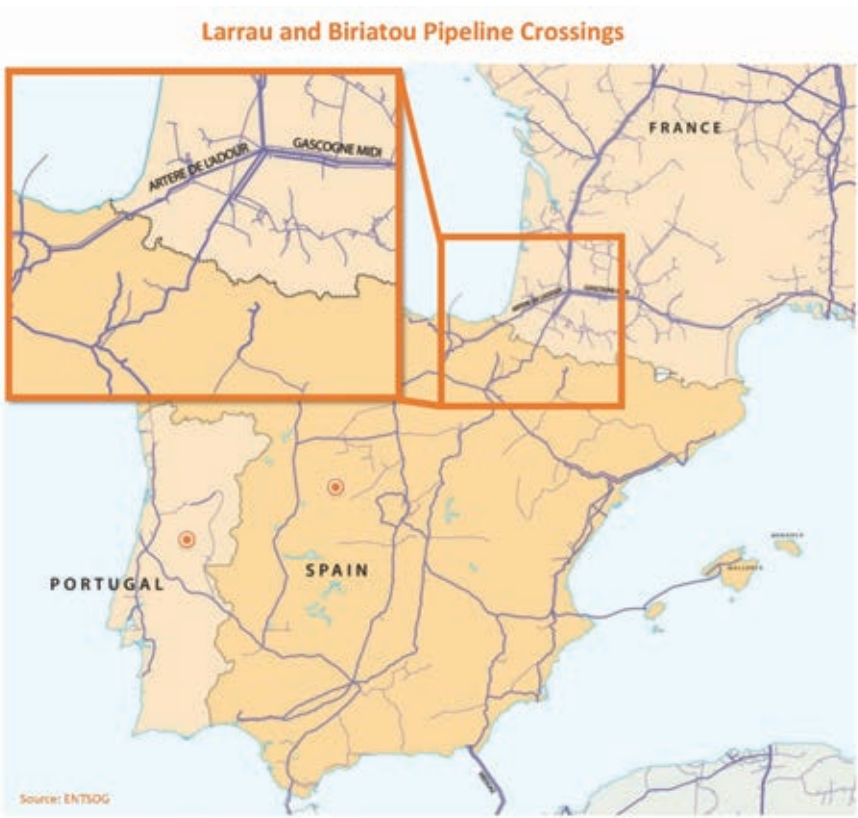
This is ironic in light of a gas price crisis induced by Russia's invasion of Ukraine, which led Spain to introduce a plan to fortify its long-term energy resilience and provide immediate relief to its citizens from surging energy prices in October 2022. According to the Spanish government, key objectives encompass 73 complementary and synergistic measures, structured in six main areas: energy savings and efficiency; boosting the energy transition; protection of vulnerable consumers, households, and businesses; fiscal measures; strategic autonomy; and solidarity with other European partners. The first measures implemented was a cut to VAT on natural gas from 21 percent to 5 percent.

Faltering hub ambitions

Enagás once again underscored El Musel's importance in a 10 August statement confirming that 'El Musel will offer [...] flexibility at a time when European terminals are overloaded.'



Source: LNG Journal



Although the French and Iberian markets are interconnected thanks to two gas pipelines crossing the border at Larrau and Biriattou, the two pipelines only offer a relatively limited exchange capacity of around 7.4bcm/yr.

It was only in 2022 that the Biriattou pipeline, transporting natural gas between Spain and France, expanded its annual capacity by 1.5bcm (75 percent) to 3.5bcm. This represented a 18 percent capacity increase to Spain's

pipeline exports to northern Europe amid concerns of a Russian gas supply cut-off.

MidCat Fail

High expectations rested on the Midi Catalonia (MidCat) pipeline project connecting Spain with France and northern Europe via a third interconnector through the southern Pyrenees, which was also championed by Germany. The project was supposed to be part of the EU's ongoing effort to reduce dependence on Russian energy imports by doubling the Iberian peninsula's gas export capacities to the rest of Europe.

The project ultimately failed due to French opposition even as the pipeline was seen as a crucial EU energy security tool and project was briefly revived in 2022.

BarMar Alternative?

After months of stagnation, on 20 October, the heads of Spain, France and Portugal agreed a compromise by advancing a 'green energy corridor' linking the Iberian Peninsula and France. This corridor will facilitate green hydrogen transportation and, temporarily, enable the transfer of natural gas from the southern to northern regions. Essentially, the so-called 'BarMar' pipeline between the port cities of Barcelona and Marseille emerged as the successor to the previously halted 'MidCat' pipeline, establishing a fresh path for LNG imports to Germany. The BarMar pipeline thus seems to have resolve the MidCat disagreement between Iberian LNG importers Spain and Portugal, who sought to expand the MidCat pipeline to sell gas to Germany and beyond, and France, which contended



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that the pipeline's construction would be too time-consuming to address immediate supply concerns.

Importantly, the subsea BarMar pipeline will avoid crossing the Pyrenees and thus promises to be technically more feasible, reduce costs and be able to

transporting green hydrogen as soon as possible, with gas being only the interim fuel. Moreover, the Spanish government is seeking to tack on an electric interconnection and is thereby risking delays to the project by increasing its scope and complexity.

sidestep opposition from French residents. 'Offshore is proving much easier to build in Europe, whether it is pipelines, electricity transmission lines, or wind generation', according to Peter Fraser, former head of the gas, coal and power markets division at the IEA, speaking to Turkish news agency Anadolu Ajansı.

However, political support for BarMar rides primarily on the prospect of

Notably, the 370km BarMar interconnector was designated in 2013 as a Project of Common Interest by the EU and was initially expected to be completed in 2025. But in June 2022, EU officials speaking to EU policy reporting network EURACTIV said it was more likely to be inaugurated in 2026, while the project's website at the time suggested '2026-2027'. The timeline shown by French TSO GRTgaz has now shifted to 2030.

Concluding thoughts

The commissioning of Spain's El Musel LNG terminal – which was hailed by operator Eneagas as an important factor in increasing European energy security – throws several questions of Spanish and European LNG policy in sharp relief. On the one hand, the anticipation of a European gas supply crisis led to the revival of the El Musel LNG terminal, which had previously been mothballed immediately after construction was completed and could previously be considered a white elephant. On the other hand, El Musel's commissioning cargo gives impetus to look at the persisting

bottlenecks in Spain's gas market position. Importantly, Spanish LNG capacity has historically been underutilised, which triggered the Spanish government's decree to mothball El Musel in the first place. To this day, Spain struggles to overcome the natural barrier that is the Pyrenees to be wholly integrated in the European energy market. Pipeline projects aimed at overcoming this natural border have either been stopped due to government and resident opposition or are at risk of having to fulfil multiple objectives simultaneously, which increases the risk of delay. To that extent, the commissioning of the El Musel terminal is unlikely going to have a significant impact on the wider European gas market in the near future, in our view.

Ironically, Russia, one of the crucial factors in Europe's prevailing gas supply concerns, continues to be a major source of LNG supply to both Spain and the European Union in general. In this context, El Musel may also serve as an additional landing point for Russian LNG under Spanish capacity access laws. ■



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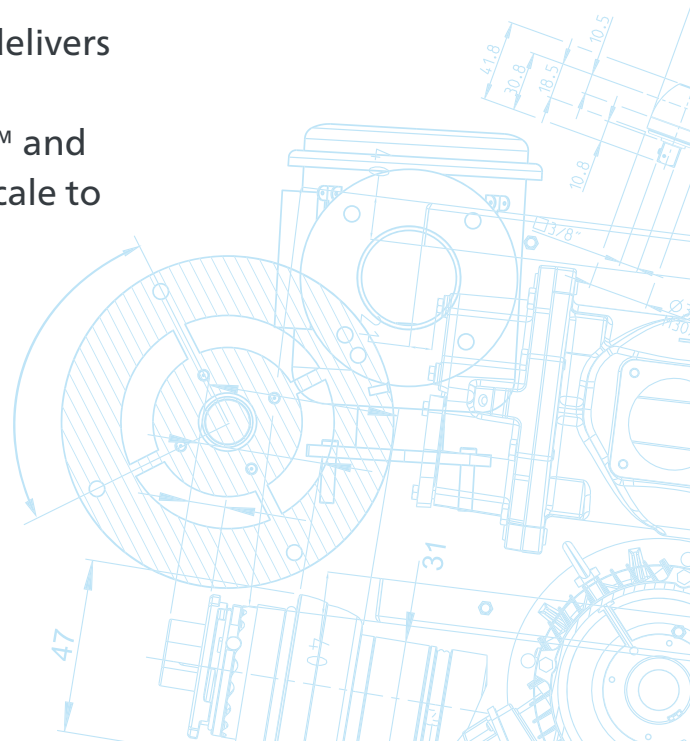
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Challenges to Vietnamese LNG expansion

Vietnam sports an extensive roster of proposed LNG projects amid ambitious government policy. But regulatory challenges are likely to slow capacity growth, Markets Editor Alexander Wilk writes.

With the inauguration of the Thi Vai LNG terminal at Vung Tau Port, Vietnam has become Southeast Asia’s latest conventional LNG importer in July 2023. The 0.08mmt commissioning cargo was delivered by the Bontang-sailed and Shell-controlled Maran Gas Achilles on 10 July.

Vietnam has suffered from a protracted gas shortage and is thus expected to add to the ongoing LNG demand growth in Southeast Asia. According to our data, the region saw demand growth of 2.99mmt (19 percent) to 19.13mmt in 2022 from 16.14mmt in 2021. Key to that growth has been the expansion of import capacity and increasing electrification in Thailand.

In similar vein, Vietnam’s Power Development Master Plan 2021-30 (PDP8) envisages ‘that by 2030, there will be 13 new LNG power plants with 22,400 MW total capacity, and two more with 3,000 MW each will come online by 2035 to balance the demand within 3 regions: North, North Central Coast, and South.’

New policy direction

In February 2020, Vietnam's Communist Party's Politburo, the country's top policy-making body, adopted a resolution redefining the strategic direction for its energy sector until 2045. This pivotal decision limited the growth of coal power and emphasised the development of LNG-fired power by prioritizing the establishment of LNG import and distribution channels instead. This marked policy update aims for an impressive leap to roughly 5.8 million tonnes per annum (mtpa) by 2030.

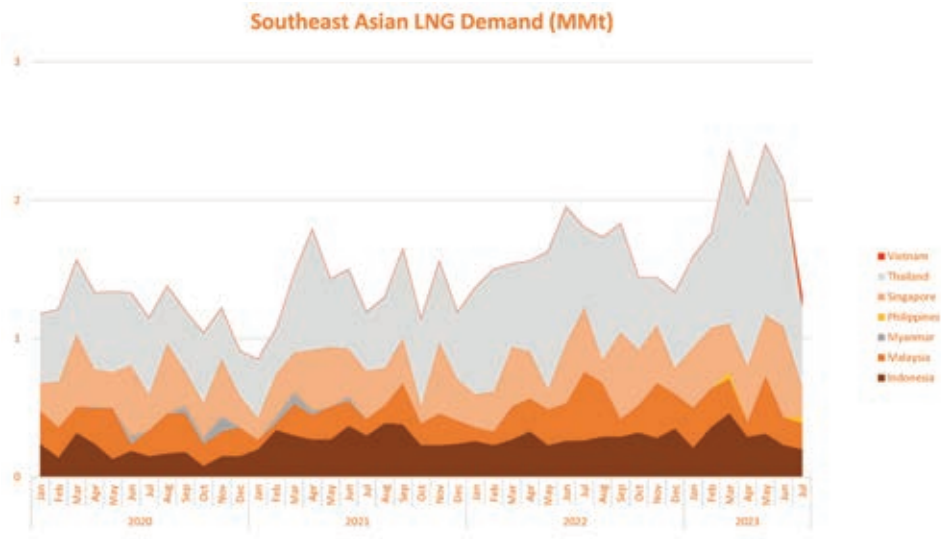
The PDP8 coincided with a global supply surplus, prompting developers to aggressively target growth prospects like

Vietnam. This unprecedented surge in Vietnam's power market has involved US developers, leading Asian energy firms as well as domestic players. The resulting hype led the country’s proposed new LNG import capacity to total more than 28mtpa by 2030 – a figure that is highly unlikely to materialise in that time frame, if ever.

To date, it has been state-owned enterprises that dominate, whilst we see several of the country’s privately promoted LNG projects to have seemingly become stuck. Yet, even the PetroVietnam Gas-operated and PetroVietnam-controlled Thi Vai terminal was originally planned to begin operations in 2015 but the start-up date was pushed back several times due to feasibility concerns. It took the establishment of LNG Vietnam by Tokyo Gas and PetroVietnam Gas to inject new impetus into the project in 2016. However, it was not until 2019 that the contract to build the contract was awarded to Samsung C&T.

Regulatory Challenges

Projects championed by other private and foreign investors have encountered steep regulatory hurdles that are inherently intricate, with various potential risks including market pricing for LNG and raw materials. Furthermore, there is ambiguity regarding their financing, according to a report by Thu Vu, Energy Finance Analyst at the IEEFA. Foreign project backers are keen on traditional finance risk-mitigation, which does not align well with Vietnam's market dynamics. For projects negotiating with the state utility, significant challenges remain. Importantly, there is a mismatch between developers seeking to mitigate financial risk and the existing legal frameworks. Concerns regarding the



Source: LNG Journal

affordability of LNG and stringent financial commitments are likely to impact the future development of Vietnam’s LNG sector. Investors are eyeing conventional risk-mitigation tactics, previously successful in coal power ventures. Presently, two options are available: The build-operate-transfer (BOT) model and the independent power project (IPP) model.

BOT Model

Historically used successfully for coal and gas projects, the BOT model offers several benefits, including the Vietnamese government’s complete power offtake obligation, guarantees against defaults, and favourable foreign exchange terms. Such incentives previously appealed to international financiers. However, the extended negotiation period necessary to hammer out such an agreement, combined with the newer Public-Private Partnership Law (PPP Law) of January 2021, complicates matters. Crucially, the PPP law insists on Vietnamese contractual law and prevents state guarantees, continuing Vietnam’s path of fiscal conservatism initiated in 2017. Such changes generate investor unease, forecasting tougher future negotiations, according to Thu Vu. Meanwhile, some ongoing BOT coal projects, likely subjected to the PPP Law, diminish expectations of legal amendments or exceptions for new LNG projects.

IPP Model

IPPs in Vietnam mean entirely private power initiatives. Governed by the Investment and Enterprise Laws, alongside the BOT model's diminishing attractiveness, the IPP model seems the viable alternative. Yet, the 2021

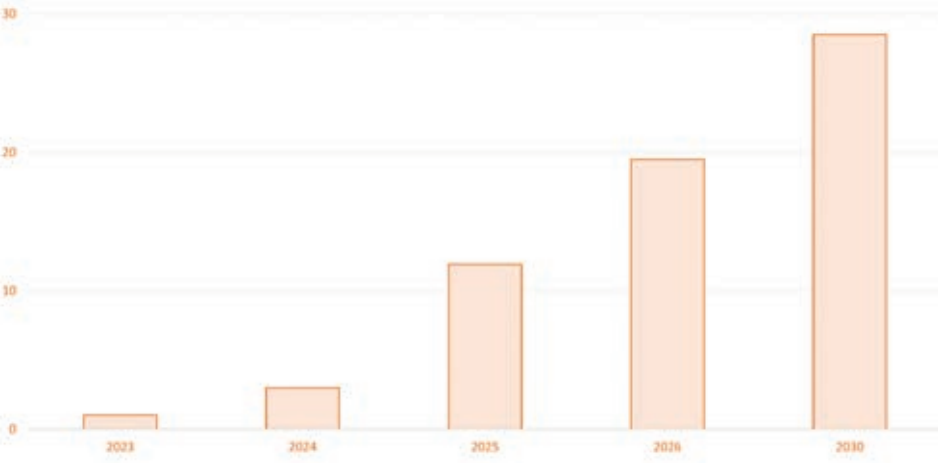
Investment Law, under which IPPs fall, offers little clarity on traditional financing terms such as government guarantees. Standard power purchase agreements for independent LNG-to-power projects will follow Vietnamese law without specific clauses, limiting offtake assurances by state-run power monopoly EVN. Historically, Vietnamese IPPs have been small-scale.

Past government reactions underscore this state of affairs. In 2020, prior to the publication of PDP8, Prime Minister Nguyen Xuan Phuc clarified his government would not issue guarantees for the Bac Lieu LNG project. Accordingly, Ninh Thuan Province's tender for the 1.5GW LNG Ca Na project required investors to forgo sovereign guarantees and adhere to Vietnamese dispute resolution, the IEEFA highlighted. The prime minister emphasized non-interference in business affairs, indicating negotiations with EVN would adhere to existing regulations without exceptions.

Concluding thoughts

Despite the positive signal set by the recent inauguration of the country’s first LNG terminal in July, independent market entrants are likely going to find it difficult to swiftly push ahead with new LNG import terminals in Vietnam. Even the new state-backed Thi Vai terminal suffered delays. Clear governmental ambition set out in the Power Development Master Plan notwithstanding, Vietnam is unlikely to meet the full potential as suggested by its current roster of proposed import projects. Key to that limitation is the dominance of the state-run power monopoly EVN alongside the government’s reluctance to grant guarantees for power offtake levels. ■

Vietnam's Potential LNG Capacity Growth (MMt)



Source: LNG Journal



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Tough choice between LNG and ammonia

As the global energy transition accelerates, gas resource holders face a tough choice: continue developing new LNG export facilities or pivot to blue ammonia. “For those seeking scale over the next 15 years, the prize is still LNG rather than blue ammonia,” Wood Mackenzie reckons – but for profitability and value, blue ammonia could prove “more attractive.” Our Markets Editor Anja Karl investigates.

Demand for LNG is expected to grow by just under 70 percent over the next 25 years to reach 700 metric tonnes per annum (mtpa) by 2050. But neither growth nor revenue is locked in for LNG. “As the energy transition gathers pace, gas stakeholders are questioning whether longer-term demand for LNG is so assured,” said Giles Farrer, Head of Gas and LNG Asset Research.

In fact, the world consumes far less gas in WoodMac’s Accelerated Energy Transition (AET-1.5) scenario whereby the market will still need 160 mtpa of new LNG supply to be developed by 2040. But beyond this time, developers face the risk of declining prices and underutilisation as demand reduces to 500 mtpa by 2050.

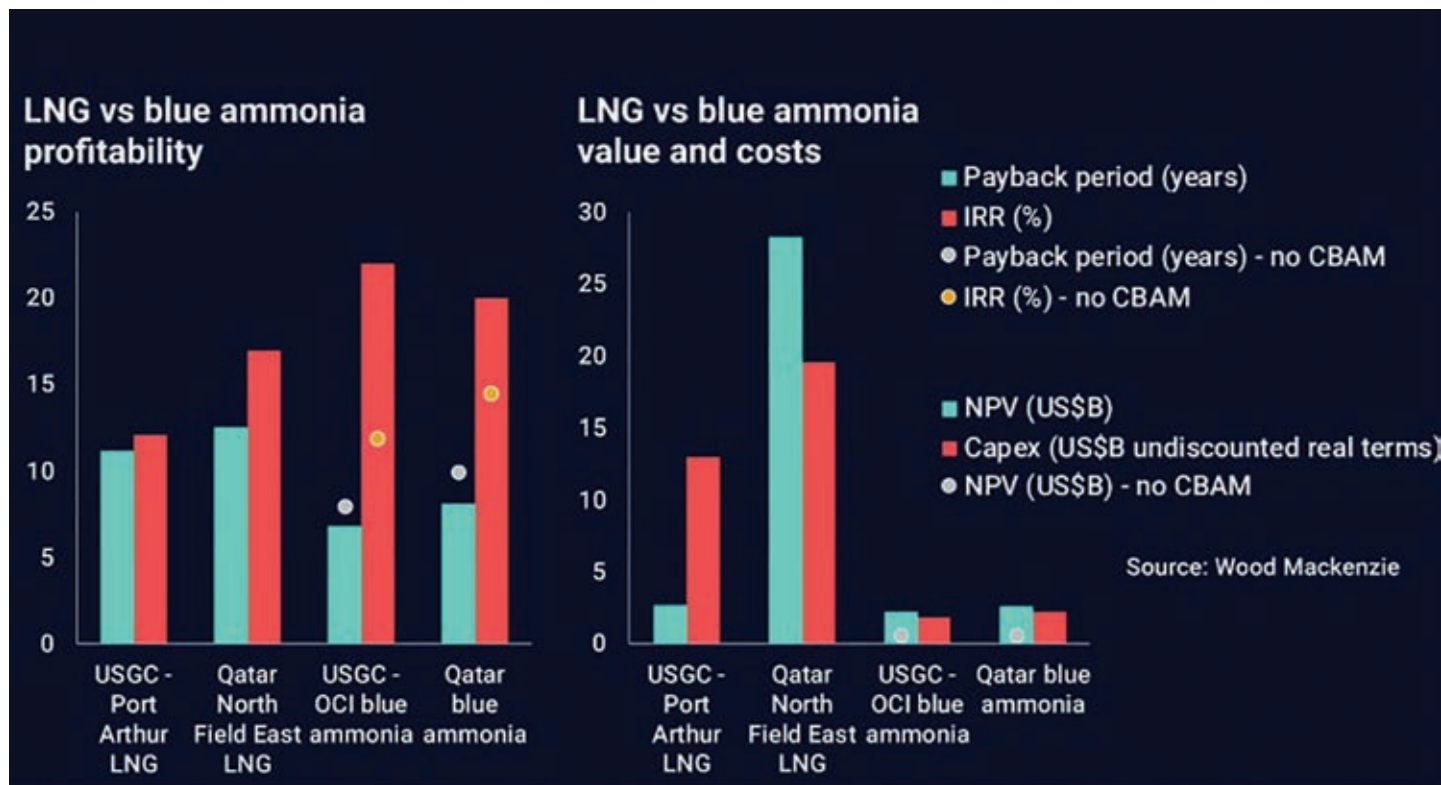
Blue ammonia, produced from hydrogen generated through gas reforming with carbon capture and combined with air-sourced nitrogen, has quickly risen to the top of the pile as a credible alternative to LNG for gas monetisation. Like-for-like comparisons are difficult, however, due to different commercial structures and relative taxation, analysts cautioned.

US LNG players back blue ammonia

Location and available incentives impact profitability and payback periods: The US 45Q tax credit, for instance, improves projects’ competitiveness against markets with lower nominal feed-gas costs. More and more project developers – especially along the US Gulf Coast – hence look to export blue ammonia to Europe and in many cases, these are backed by major LNG players.

“Shorter payback periods for blue ammonia could be particularly attractive for those with first-mover advantage in accessing Europe. And if the world was going to edge closer to our AET-1.5 scenario, lower LNG prices and higher carbon prices would further strengthen the attractiveness of blue ammonia vs LNG,” Douglas explained.

Export-led projects will look first to markets offering incentives such as Europe’s Carbon Border Adjustment Mechanism (CBAM) which is expected to increase ammonia prices by 60 percent



and make exports competitive against carbon-intensive alternatives. “Locking in European demand through long-term contracts could deliver internal rates of return for blue ammonia that are higher than those of LNG, while halving payback periods,” he reckons.

In terms of size of the market, approximately \$250 billion of additional investment in pre-FID LNG liquefaction projects is required to meet WoodMac’s base case forecasts by 2050. In contrast, \$24 billion of investment is required for blue ammonia for exports. In the AET-1.5 scenario, the case for blue ammonia investment is much stronger, with some \$80 billion required compared with \$160 billion for LNG.

Aboitiz and JERA test ammonia co-firing

AboitizPower is fast-tracking a feasibility study on co-firing ammonia with Japan’s largest utility JERA with test runs in the Philippines scheduled before 2030 – assuming the price of the fuel will fall substantially by then. JERA, meanwhile, is preparing to start a

20 percent ammonia generation test in Japan already this year, aiming for 50 percent co-firing by 2028.

As one of the Philippines’ largest utilities, AboitizPower is partly owned by JERA and the Japanese major wants to roll out a similar concept in both island nations. “Though renewables plus batteries are technically feasible, the cost for batteries to maintain a stable power supply

Shinsuke Nakayama, head of JERA’s Asia Platform Business.

Ammonia releases no carbon emissions when burnt and will initially be used to replace some thermal coal as a combustible fuel, though it may be later also used in gas-fired power plants. Aboitiz Power’s chief operating officer Felino Bernardo stressed both the combustion technology and the supply chain needs to be developed before co-firing projects can be realised. “We’re looking at having that feasibility study starting early next year, aiming to get results within the decade,” Bernardo said, adding: “If JERA can already start test in Japan [now], then hopefully by 2030 the prices [of ammonia] have already gone down, so by that time we can do our own 20-30 percent test in the Philippines in one of our facilities.”

Financial support for the study has been sought from Japan’s Ministry of Trade and Industry (METI). “I think METI is the one who’s going to finance it, specifically on the supply chain,” Aboitiz Power’s COO suggested. For now, price is still a challenge though ammonia is easier to store and transport than hydrogen given that it can use existing infrastructure and ammonia carriers are already in place.

Apart from ammonia, AboitizPower and JERA are also evaluating adding up to 1.2 gigawatt of LNG-fuelled power

“Locking in European demand through long-term contracts could deliver internal rates of return for blue ammonia that are higher than those of LNG, while halving payback periods.”

- Giles Farrer, WoodMac's Head of Gas and LNG Asset Research

would be huge. Instead, utilising existing thermal power plants and co-fire them with ammonia makes better economic sense,” explained

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generation capacity on Luzon island. Several options are being considered, including an initial 600 megawatt plant that could be scaled up later to meet the Philippines' baseload power requirement by 2028. The project is meant to include a new LNG regas and import terminal in Pagibilao on Luzon island, where Aboitiz currently operates several coal-fired power stations that could be used for ammonia co-firing tests.

Japan's LNG terminals to handle clean fuels

The Japanese technology conglomerate IHI is looking into converting LNG receiving terminals near some of the country's major gas-fired power plants into ammonia-based facilities. First LNG terminals are meant to be modified in the second half of this decade, as JERA is striving to use ammonia as a carbon-neutral fuel for boilers and turbines at its fossil power stations.

A demo project is being fast-tracked at JERA's Hekinan thermal power unit 4, where IHI will pilot its ammonia combustion technology. JERA hence started to supply small volumes of the clean-burning fuel to the coal-fired plant starting from the autumn as it aims to achieve an ammonia co-firing rate of 20 percent at Unit-4 in fiscal 2024.

Small-volume co-firing is already underway at Unit 5, where two of the 48 burners have been replaced with test burners through to March last year as IHI wants to examine the effects of different materials on hydrogen combustion. JERA and IHI said they are working to supply about 200 tons of ammonia to the test burners at Unit 5 from denitration tanks at the power plant site to underpin test runs.

Converting a nearby LNG regas terminal to source ammonia would drive the uptake of the clean-burning fuel by slashing costs and ensuring effective land usage. IHI has built one of the world's

biggest storage tanks, a 250,000-kiloliter facility and wants to leverage its know-how to develop ammonia receiving terminals and storage tanks.

Woodside strives to ship ammonia to Japan

Offshore oil and gas majors Down Under, notably the Australian LNG major Woodside aim to produce ammonia and ship it to the Japanese utilities Hokuriku Electric, Kansai Electric, Tohoku Electric and Hokkaido Electric. The government in Tokyo encourages power generators to co-fire ammonia and expects to import 4 million tons of the clean-burning fuel by the end of this year, with demand forecast to rise to 30 million tons by 2050.

"Ammonia is considered a promising next-generation lower-emission fuel for energy intensive thermal power plants and marine engines. Given existing proven technologies for the production, storage, and transportation of ammonia, it is expected to have early take-up as a lower-emission fuel," Woodside said in a feasibility study.

Cost for producing ammonia in Australia from natural gas through steam

reforming with subsequent CO₂ abatement have already been evaluated, as well as costs for marine transport to Japan. Mitsui O.S.K. Lines (MOL) completed a concept study on an ammonia/liquefied CO₂ carrier with a vessel type that could become mainstream in this transport field. The cargo tank capacity of this ammonia/liquefied CO₂ combined carrier is set at around 50,000 cbm on the assumption of the future market. Based on this ship type, MOL said it will study various other ship types and sizes to flexibly.

Saudi Arabia to produce ammonia at scale

Apart from Australia, green ammonia can also be cost-effectively produced in the Middle East. NEOM Green Hydrogen Company (NGHC), a joint venture between Saudi Arabia's ACWA Power, Air Products and NEOM, in May reached financial close on a massive green hydrogen plant designed to produce ammonia at scale in 2026.

The \$8.4 billion project received \$6.1 billion in non-recourse financing, backed by a 30-year off-take agreement for all green ammonia to be produced. Banks were pleased about the exclusive 30-year off-take agreement with Air Products for all green ammonia produced by NGHC, which guarantees a safe rate of return. The plant is currently being built at Oxagon, in Saudi Arabia's NEOM city.

Once operational, it will produce 600 tonnes per day of clean hydrogen by electrolysis using thyssenkrupp technology, along with nitrogen by air

separation using Air

"Given existing proven technologies for the production, storage, and transportation of ammonia, it is expected to have early take-up as a lower-emission fuel."

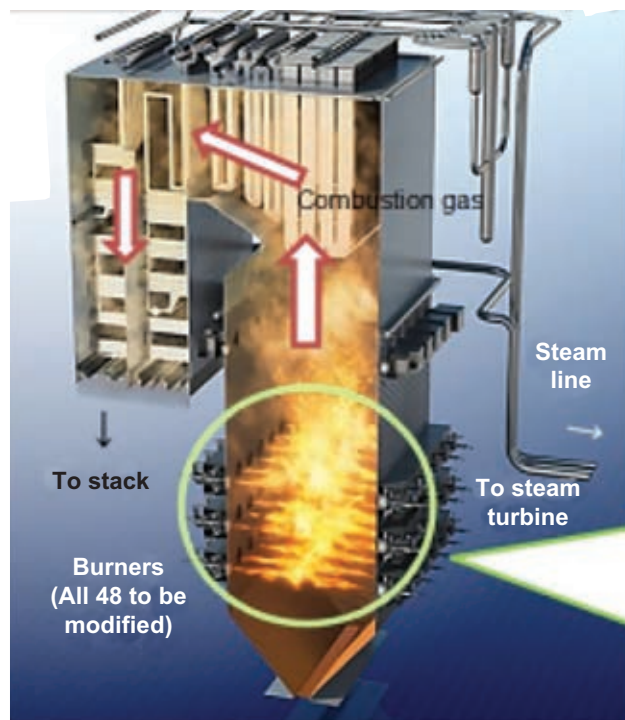
- Woodside feasibility study

Products technology and up

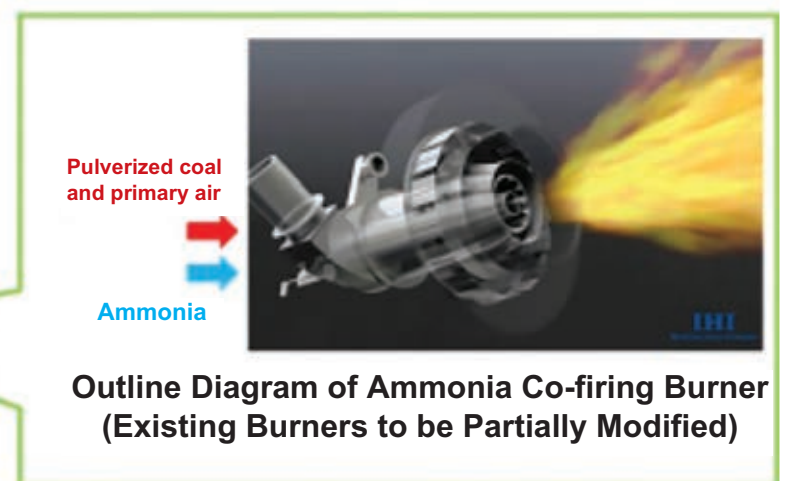
to 1.2 mtpa of green ammonia.

Over in Europe, Air Products and Mabanafit plan to build a green energy import terminal in Hamburg as the Germany government seeks to import green ammonia from Saudi Arabia by 2026. The import facility will be situated at Matabaft's existing tank terminal in the port of Hamburg, which helps to quickly realise the project at a lower cost. Mabanafit's subsidiary Oiltanking Deutschland will run the terminal, with project partners planning to initially invest €500 million, followed by a further €500 million at a later stage, to build a 55,000-ton ammonia storage tank to supply the clean-burning fuel to hard-to-abate industries and power generators.

The German utility Uniper also plans to set up a hydrogen import facility at or near the site of its LNG import terminal in Wilhelmshaven, along with an ammonia cracker. Rival RWE also vowed it will build an ammonia terminal at the site of its LNG import facility in Brunsbüttel. Around 300,000 tonnes of green ammonia per year are due to arrive in Germany via that terminal and could be distributed to customers from 2026, allowing power generators in northwest Europe switch from fossil to clean-burning fuels. ■



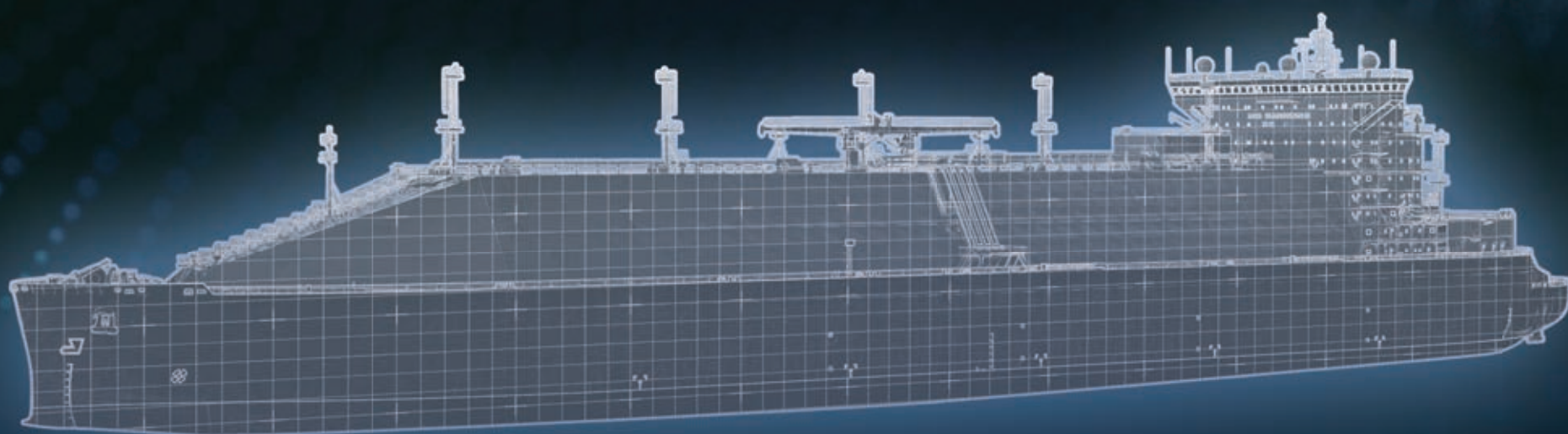
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Roster of exporters in all Basins boosts LNG flows in July

Our July data showed higher LNG output globally both month-on-month and year-on-year. Meanwhile, global net LNG demand equally picked up as temperatures intensified power generation, our Market Editor Alexander Wilk reports.

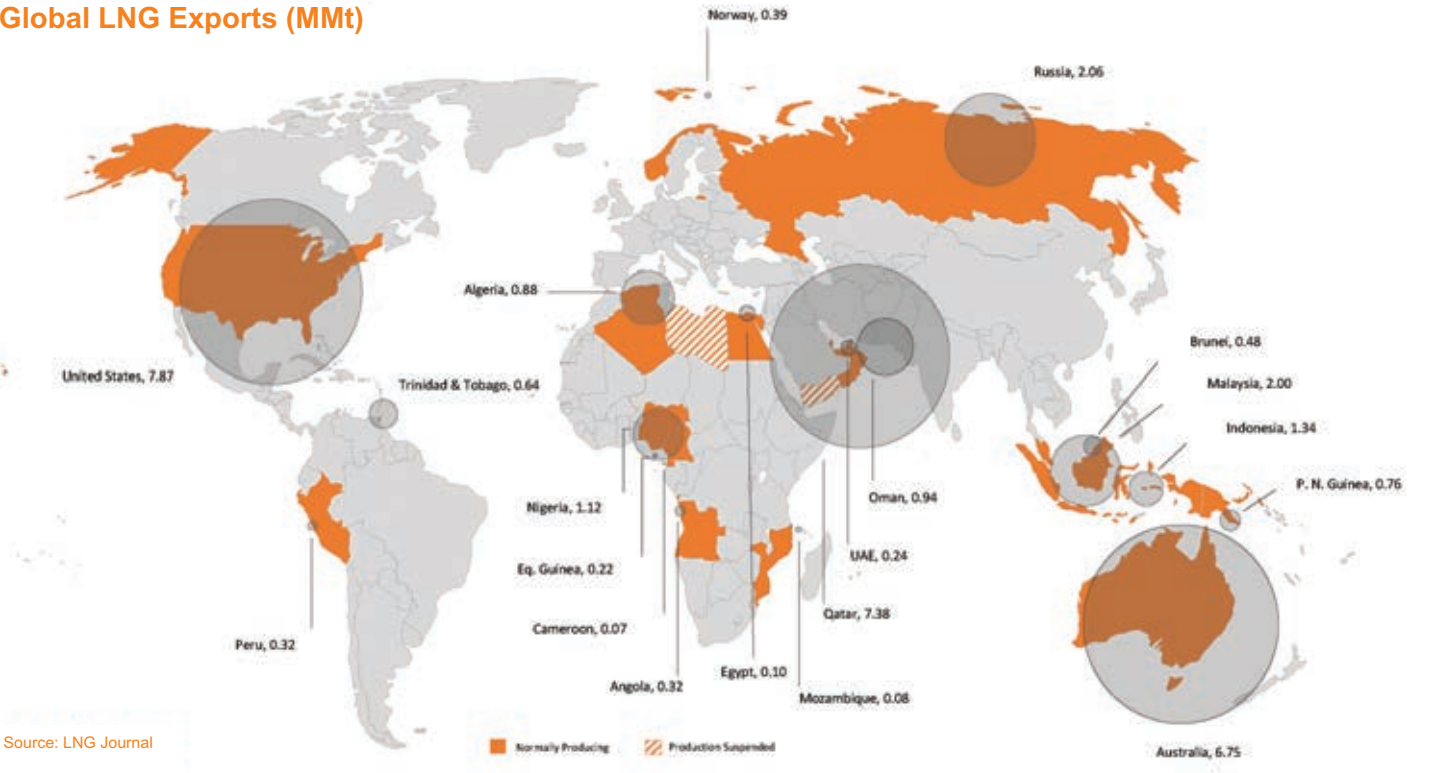
Our July data showed that the shipped amount of 34.11mmt represented considerable growth of 1.91mmt (6 percent) from 32.20mmt shipped in June. Year-on-year exports saw an equally significant increase of 2.08mmt (7 percent). July's performance was mainly due to significant export increases by the United States, Qatar, Indonesia, Brunei and Oman. However, this growth was tempered by several exporters experiencing decreases in LNG exports in July, led by Australia and Russia's capacity in the Far East. In addition, Egypt's struggle with an ongoing heatwave has thrown the country's gas economy into a vicious cycle of lower gas production and reduced power output due to feedgas shortages.

Meanwhile, strong demand growth in Japan and Taiwan cushioned the ongoing and significant offtake reductions in the United Kingdom and South Korea. The gas crisis in Egypt also led to fresh LNG demand in Jordan and Egypt itself.

Exports

In July, 34.11mmt of global LNG exports were up by 1.91mmt (6 percent) compared to their June counterparts of 32.20mmt. Pacific Basin shipments were ahead of their June counterparts by 0.35mmt (3 percent) at 12.32mmt. Atlantic Basin

Global LNG Exports (MMt)



Source: LNG Journal

exports saw an even more significant increase of 0.86mmt (7 percent) to 13.13mmt. We also recorded a significant export increase in the Middle East, where shipments were up by 0.70mmt (9 percent) to 8.66mmt from 7.96mmt in June. Exports in July were also up by 2.08mmt (7 percent) year-on-year.

Pacific Basin

Our July data at the time of writing

showed Pacific exports reached 12.32mmt, coming in above July's volume of 11.97mmt by 0.35mmt (3 percent). Consequently, annualised capacity utilisation stood at 84 percent at the time of writing. Exports were also up by 0.67mmt (6 percent) year-on-year.

Australia: Wheatstone LNG showed a substantial increase of 0.35mmt to 1.18mmt from 0.83mmt in June, up 42 percent month-on-month. Consequently, it also significantly boosted Wheatstone's annualised capacity utilisation to 156 percent. Similarly, Pluto LNG saw exports surge by 0.29mmt (363 percent) to 0.37mmt from the 0.08mmt recorded in June, resulting in annualised capacity utilisation of 101 percent. Australia Pacific LNG's exports, meanwhile, saw an uptick of 0.03mmt (4 percent) to 0.76mmt from 0.73mmt in June, maintaining a relatively stable annualised capacity utilisation of 99 percent.

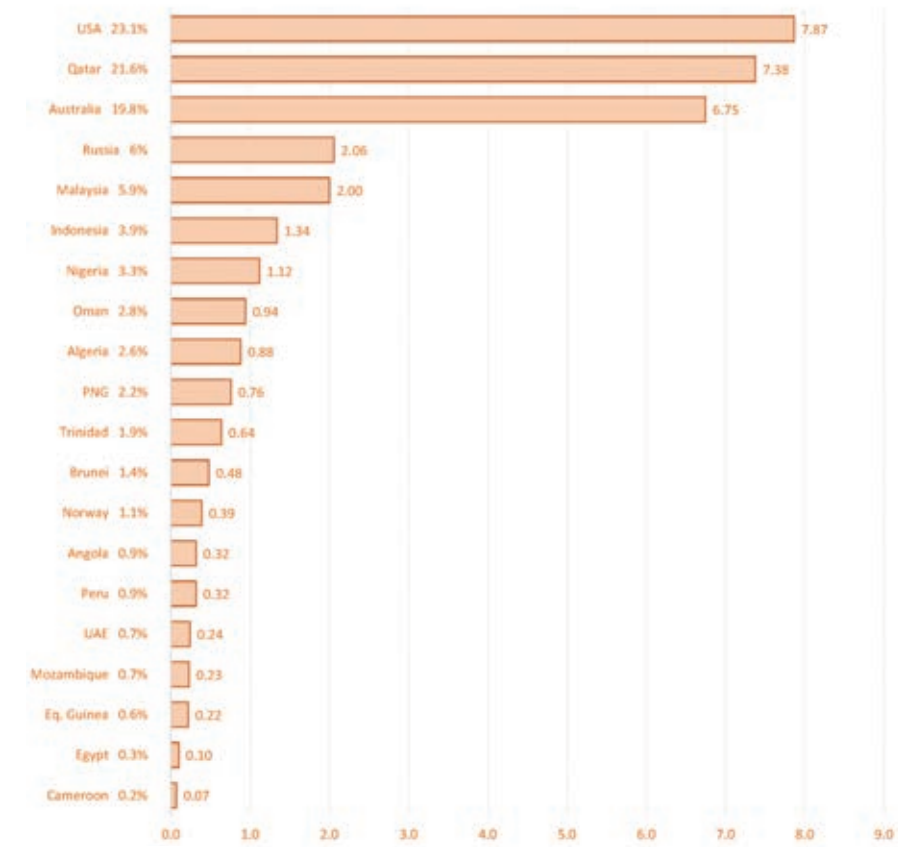
However, not all plants experienced growth in July. NWS LNG saw the most significant reduction in exports, which were down by 0.27mmt (-20 percent) to 1.08mmt from 1.35mmt in June. This resulted in annualised capacity utilisation of 78 percent. Gorgon LNG showed a more moderate export decrease with shipments down by 0.14mmt (-9 percent) to 1.37mmt from 1.51mmt in June. Nevertheless, Gorgon's annualised capacity utilisation remained high at 103 percent as it still led all Australian plants

in terms of monthly output. The Prelude FLNG barge dropped exports similarly in volume terms by 0.13mmt (-48 percent) to 0.14mmt. Concurrently, Darwin LNG was not seen in the market after it had shipped 0.14mmt in June. These reductions were exacerbated by individually moderate reductions at Gladstone LNG, Queensland Curtis LNG and Ichthys LNG but which in total amounted to 0.29mmt. Nevertheless, the three plants still maintained respective capacity utilisations between 80 and 96 percent.

Notably, Japan and Taiwan recorded significant growth in LNG imports from Australia of 0.66mmt in total, but which was overshadowed by significant decreases totalling 1.13mmt in China, South Korea and Singapore. India did not import Australian LNG. However, 0.31mmt of Australia's July shipments still had to declare their destinations in the Pacific at the time of writing.

Southeast Asia: PNG LNG recorded a production increase of 0.09mmt to 0.76mmt, representing growth of 13 percent compared to June, when it produced 0.67mmt. The plant's utilisation rate thus stood at 108 percent. PNG exports to China stood out with 0.39mmt, reflecting an impressive 160 percent increase. Taiwan followed with 0.13mmt of imports, which indicates growth of 63 percent, making it the second-highest percentage increase among PNG LNG

Market Share & LNG Exports by Country (MMt)



Source: LNG Journal

destinations. In contrast, South Korea was not seen in the market following imports of 0.08mmt in June. Lastly, Japan's imports also declined by 0.12mmt to 0.24mmt, equivalent to a 33 percent reduction month-on-month.

In neighbouring Indonesia, the Bontang plant experienced a notable increase of 0.14mmt (50 percent) to 0.42mmt from 0.28mmt in June, resulting in an annualised capacity utilisation of 43 percent. Concurrently, the Tangguh plant saw an increase of 0.09mmt (15 percent) to 0.69mmt compared to 0.60mmt in June. As a result, its annualised capacity utilisation stood at 107 percent in July. Donggi-Senoro LNG also increased output, up by 0.07mmt (44 percent) to 0.23mmt from 0.16mmt in June, resulting in an annualised capacity utilisation of 135 percent.

Malaysia also saw an increase in shipments by 0.15mmt (8 percent) to 2.00mmt from 1.85mmt in June. This was mainly due to a 0.08mmt (5 percent) increase to 1.72mmt at the Malaysia LNG plant. Malaysia LNG thus saw its annualised capacity utilisation at 69

percent. Meanwhile, the PFLNG Dua vessel had doubled its production to 0.14mmt, pegging annualised utilisation at 137 percent, our data and calculations indicated, whilst the PFLNG Satu facility retained output at 0.14mmt. Its annualised capacity utilisation also stood at 137 percent in July.

Brunei, meanwhile, increased LNG exports substantially by 0.29mmt (153 percent) to 0.48mmt in July from 0.19mmt in June, with annualised capacity utilisation at 78 percent. The bulk of Brunei LNG went to Japan in July as the country's imports saw a significant increase of 0.22mmt (183 percent) to 0.34mmt. Additionally, South Korea and Thailand both recorded imports of 0.07mmt after no offtakes from Brunei in June. On the other hand, China did not import LNG from the Sultanate in July.

Russia, Peru & Mozambique: Elsewhere in the Pacific, Russia's Sakhalin-2 LNG slashed LNG exports by 0.44mmt (-50 percent). The plant's shipments amounted to 0.44mmt in July compared to 0.88mmt in June. July's performance suffered from lower exports

to Japan, which were down by 0.26mmt (-65 percent) to 0.14mmt, alongside a lack of demand for Sakhalin-2 supply in South Korea following flows in that direction of 0.18mmt in June. Concurrently, exports to China remained flat at 0.30mmt. The plant thus also saw significantly lower annualised capacity utilisation of 54 percent after flat-out production in June.

Meanwhile, Peru's Pampa Melchorita plant also decreased exports. Shipments of 0.32mmt were down by 0.05mmt (-14 percent) from the 0.37mmt recorded in June and pegged the plant's annualised capacity utilisation at 85 percent. The plant typically exports between 0.30mmt and 0.40mmt per month, our historical data show.

Finally, Mozambique's Coral Sul FLNG unit almost tripled exports to 0.23mmt from 0.08mmt in June. Nobly, its shipments pivoted away from Europe and towards Pacific buyers such as China and Thailand.

Atlantic Basin

In line with growth in the Pacific, the Atlantic Basin's overall shipped LNG

amount increased by 0.86mmt (7 percent) to 13.13mmt from 12.27mmt in June. This translated into annualised export capacity utilisation of 75 percent for the Basin.

North Africa & Europe: The amount of LNG shipped from within its northeastern part – comprising the EEA, Russia and North Africa (and not including re-exports) – increased by 0.11mmt (4 percent) to 2.89mmt from 2.78mmt.

At 0.39mmt, output from Snøhvit LNG in Norway was up by 0.15mmt (63 percent) following exports of 0.24mmt in June. The plant thus produced at 109 percent of annualised capacity at the time of writing.

Russia's LNG exports from its capacity in the Atlantic Basin were also up by 0.08mmt (5 percent), which was solely due to corresponding output growth from Yamal LNG to 1.55mmt. In June, the plant exported 1.47mmt. Yamal LNG thus produced at 111 percent of annualised nameplate capacity. Portovaya LNG exports, meanwhile, remained flat at 0.07mmt. The plant thus produced at



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LNG

ExxonMobil

41 percent of annualised nameplate capacity in July.

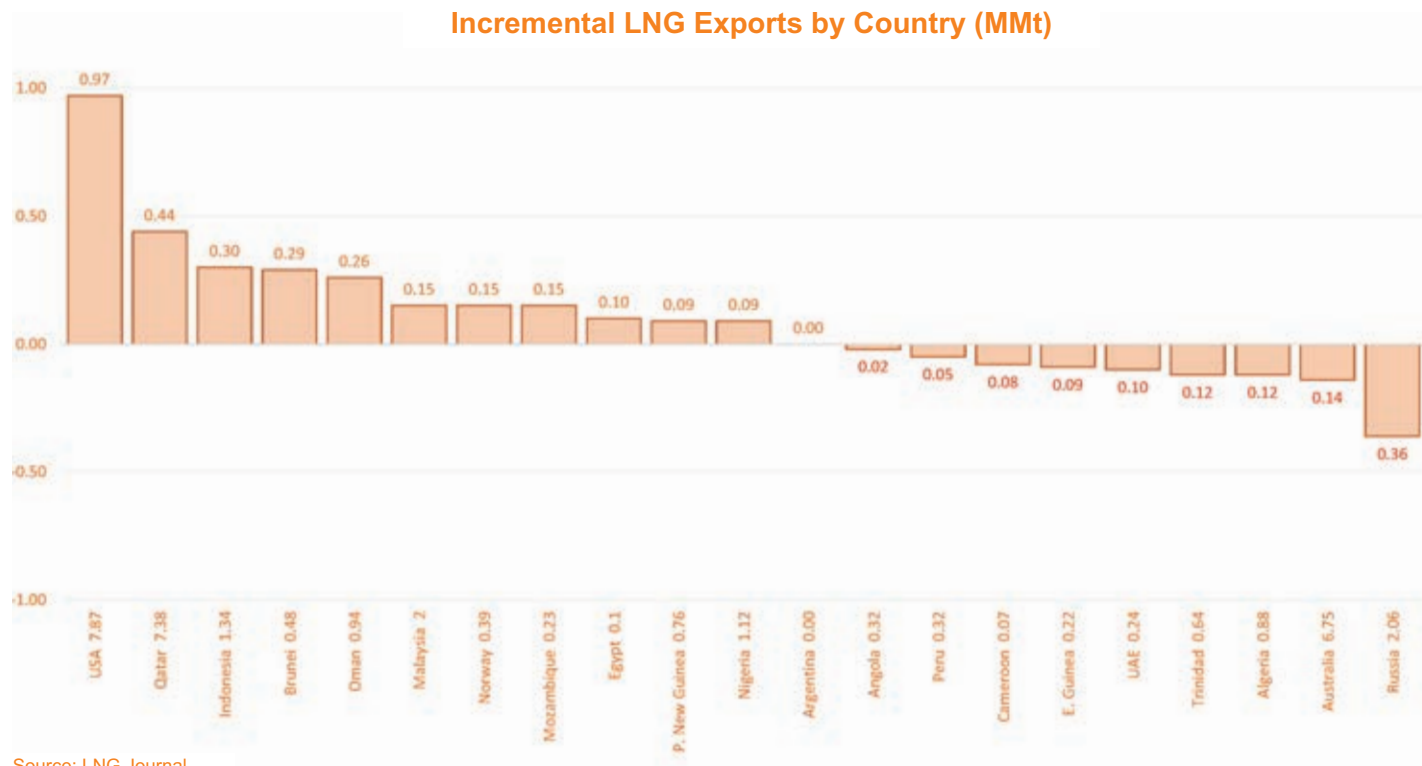
This growth was tempered, however, by lower output in Algeria. Whilst the Skikda plant kept exports steady at 0.27mmt with 40 percent of annualised capacity utilisation, Arzew LNG decreased shipments by 0.12mmt (-16 percent) to 0.61mmt in July from 0.73mmt in June. It thereby produced at just 35 percent of annualised capacity utilisation.

West Africa: West African exports were down by 0.10mmt (-5 percent) to 1.73mmt in July from 1.83mmt in June.

Although Nigeria saw LNG export growth by 0.09mmt (9 percent) to 1.12mmt, which pegged annualised capacity utilisation at 59 percent, Cameroon more than halved LNG exports to 0.07mmt, pegging its annualised capacity utilisation at 34 percent. Moreover, Angola LNG decreased output by 0.02mmt (-6 percent) to 0.32mmt, pegging its annualised capacity utilisation at 72 percent. EG LNG, meanwhile, cut exports by 0.09mmt (-29 percent) to 0.22mmt from 0.31mmt. The plant thus operated at 70 percent of annualised nameplate capacity in July.

Overall, West African exporters lost market share in China, Taiwan, Chile, Puerto Rico, Bangladesh and India. Notable exceptions were Spain and Kuwait, which in the case of Spain boosted offtakes from Nigeria by 0.40mmt (308mmt) to 0.53mmt and in the case of Kuwait by 0.25mmt from no such trade in June.

Americas: July exports from the US Gulf Coast were up by 0.97mmt (14 percent) to 7.87mmt from the 6.90mmt we recorded in June. Sabine Pass LNG



demonstrated a notable increase of 0.84mmt to 2.65mmt (46 percent) from 1.81mmt in June, resulting in an annualised capacity utilisation of 104 percent. Calcasieu Pass LNG also more than doubled exports to 0.94mmt from 0.42mmt in June, leading to an annualised capacity utilisation of 98 percent. Meanwhile, Corpus Christi LNG showed a modest increase of 0.07mmt (5 percent) to 1.39mmt compared to 1.32mmt in the previous month and thereby increased its annualised capacity utilisation to 109 percent.

This growth was tempered, however, by sizeable reductions at Elba Island LNG, Cove Point LNG, Cameron LNG and Freeport LNG. Elba Island LNG plant saw a decrease of 0.04mmt (-14 percent) to 0.24mmt whilst Cove Point LNG and Cameron LNG both faced a reduction of

0.14mmt, indicating a decline of 26 percent and 11 percent in exports, respectively.

Cove Point LNG's exports amounted to 0.39mmt in July, down from 0.53mmt in June, resulting in an annualised capacity utilisation of 87 percent. Similarly, Cameron LNG's exports reached only 1.08mmt, down from 1.22mmt in June. This led to an annualised capacity utilisation of 85 percent.

Freeport LNG also experienced a decrease of 0.14mmt (-11 percent) to 1.18mmt, down from 1.32mmt in June. Freeport's annualised capacity utilisation thus stood at 90 percent.

In South America, Atlantic LNG in Trinidad & Tobago saw exports decrease by 0.12mmt (-16 percent) to 0.64mmt from the 0.76mmt we recorded in June. Atlantic LNG shipments particularly suffered from lower exports to Chile

whilst only partially offsetting those reductions with additional cargoes to Europe.

Middle East

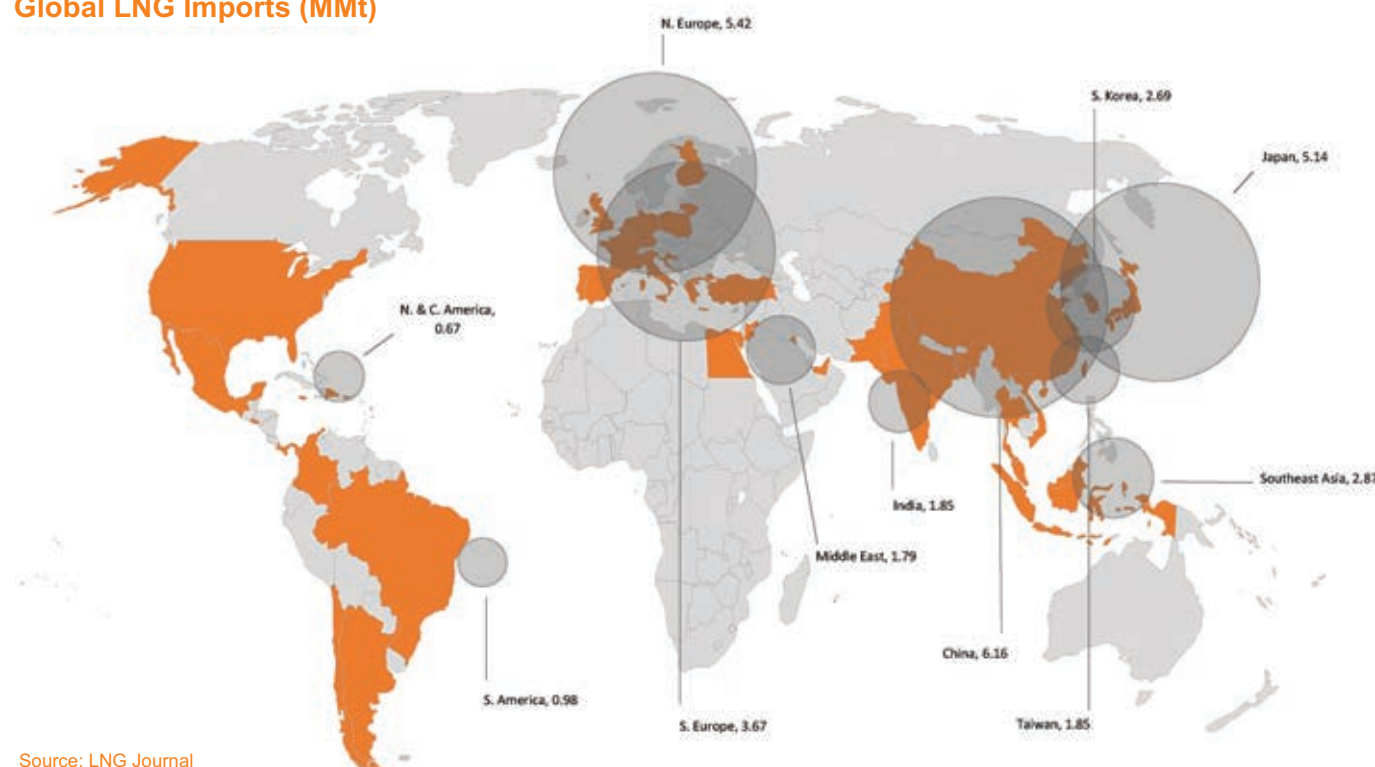
Shipments from Middle Eastern plants continued to increase significantly month-on-month. Regional LNG exports were up by 0.70mmt (9 percent) from 8.66mmt to 7.96mmt. Accordingly, our data showed the Basin's annualised utilisation of operational export capacity (i.e., excluding Yemen) at 109 percent in July.

The Middle East's overall export growth was pushed by Qatar's Ras Laffan LNG complex. The facility increased exports to 7.38mmt, up by 0.44mmt (6 percent) from 6.97mmt in June. In line with the month-on-month increase, the complex continued with flat-out production at 112 percent of annualised capacity utilisation. Notably, Qatar's July trade favoured Europe and Far Eastern offtakers such as China instead of the Middle East as was the case in June.

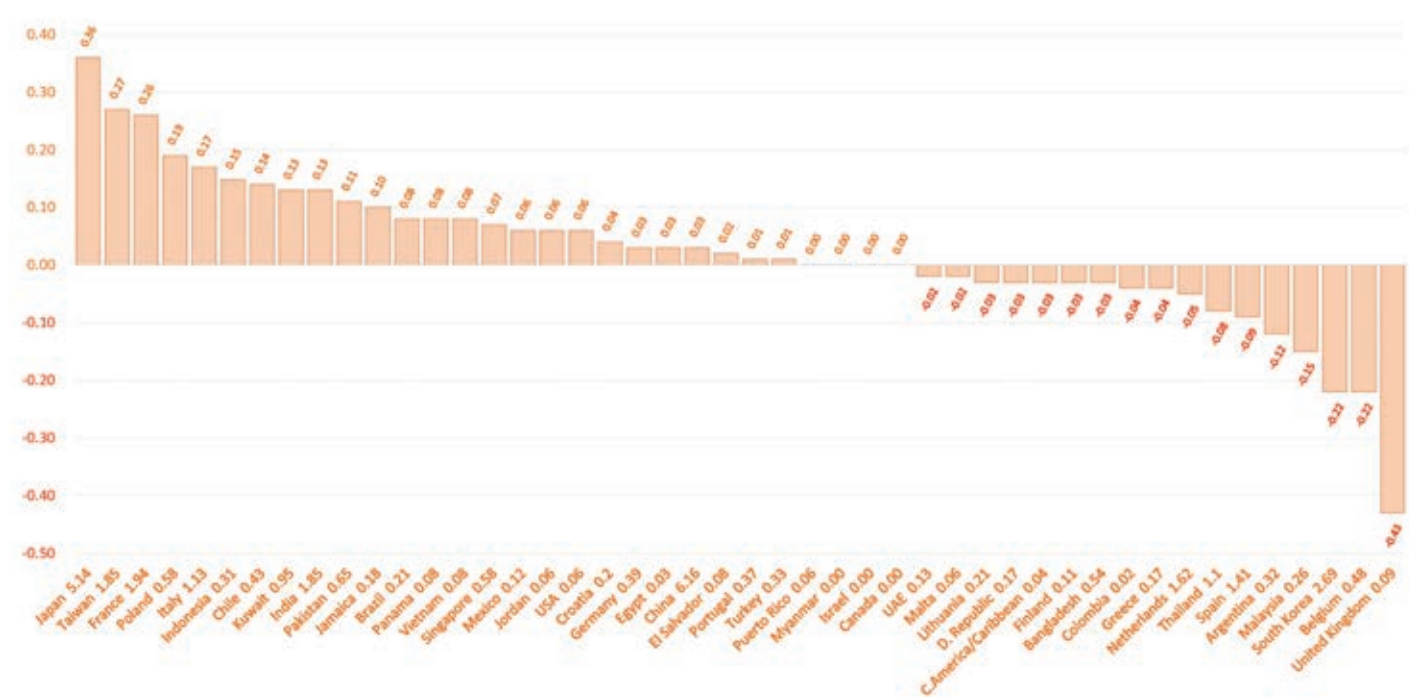
However, except for Oman, which grew exports by 0.26mmt (38 percent) to 0.94mmt, Middle Eastern export growth in July continued to be tempered by the UAE and Egypt. In the UAE, exports were down by 0.10mmt (-29 percent) to 0.24mmt from 0.34mmt in June.

In Egypt, both the Damietta and Idku LNG plants were both only seen once in July. Egyptian LNG cargoes totalled 0.10mmt as Idku LNG only shipped one cargo of 0.07mmt whilst Damietta did not ship internationally but only delivered a small 0.03mmt cargo to Egypt's Ain Sokhna FSRU terminal. This highlights a steep increase in Egyptian energy

Global LNG Imports (MMt)



Incremental LNG Imports by Country (MMt)



Source: LNG Journal

demand from air conditioning as the country struggles with a protracted heatwave of up to 45°C and points to insufficient gas production (upstream operations tend to be energy intensive). As a result, despite having a nominally adequate buffer between peak electricity load and installed capacity, Egypt’s predominantly gas-fired power plants are left with insufficient fuel to operate effectively.

Imports & Domestic Trade

Alongside a bump in supply, global LNG offtakes saw an uptick of 1.09mmt (3 percent) to 33.29mmt in July from the 32.20mmt we recorded in June. Demand growth was mainly due to higher imports in the Pacific Basin and the Middle East whilst Atlantic Basin offtakes remained broadly flat.

Pacific Basin

Month-on-month Pacific Basin imports were up by 0.82mmt (4 percent) net to 21.18mmt in July from 20.36mmt in June. Among larger-scale importers, Japan and Taiwan increased their offtakes by 0.63mmt (10 percent) in total to 6.99mmt. India’s imports increased more moderately by 0.13mmt (8 percent) to 1.85mmt. China, meanwhile, kept offtakes broadly flat at 6.16mmt, partially because there seemed to have been a delay of the Wenzhou LNG startup into August. Growth among the Pacific’s major buyers was thus only tempered by a demand decrease of 0.22mmt (-8 percent) to 2.69mmt in South Korea.

Concurrently, the roster of smaller Pacific buyers – including Bangladesh, Thailand, Chile, Indonesia, Malaysia, Mexico, Singapore, El Salvador, Myanmar

and Vietnam – collectively saw imports increase by 0.26mmt (8 percent) to 3.50mmt in July. This increase was primarily due to demand growth in Indonesia and Chile, where offtakes were up by 0.15mmt (91 percent) to 0.31mmt and by 0.14mmt (48 percent) to 0.43mmt, respectively. Smaller bouts of growth totalling 0.15mmt came from Singapore, Mexico and El Salvador. Vietnam also entered the LNG market with the Thi Via terminal and a 0.08mmt import.

This growth was tempered, however, by reductions totalling 0.26mmt (-12 percent) to 1.90mmt in Indonesia, Thailand and Bangladesh. Myanmar continued its market absence in July.

Atlantic Basin

In contrast to the Pacific, LNG demand in the Atlantic Basin remained broadly steady. Demand was down marginally by 0.04mmt to 10.29mmt in July compared to 10.33mmt in June, with annualised utilisation of installed capacity at 37 percent.

The slight European net demand decrease of 0.20mmt (-2 percent) to 8.59mmt was an important factor. Strong negative import growth in the United Kingdom by 0.43mmt (-83 percent) to just 0.09mmt in addition to reductions totalling 0.48mmt in Belgium, Spain, the Netherlands, Greece, Finland, Lithuania and Malta could not be compensated by growth of 0.62mmt stemming from France, Poland and Italy as well as 0.09mmt from several other European buyers such as Croatia and Germany.

The decrease in European demand was cushioned by modest net growth in the Americas in July, with total imports up by 0.16mmt (15 percent) net. The region saw

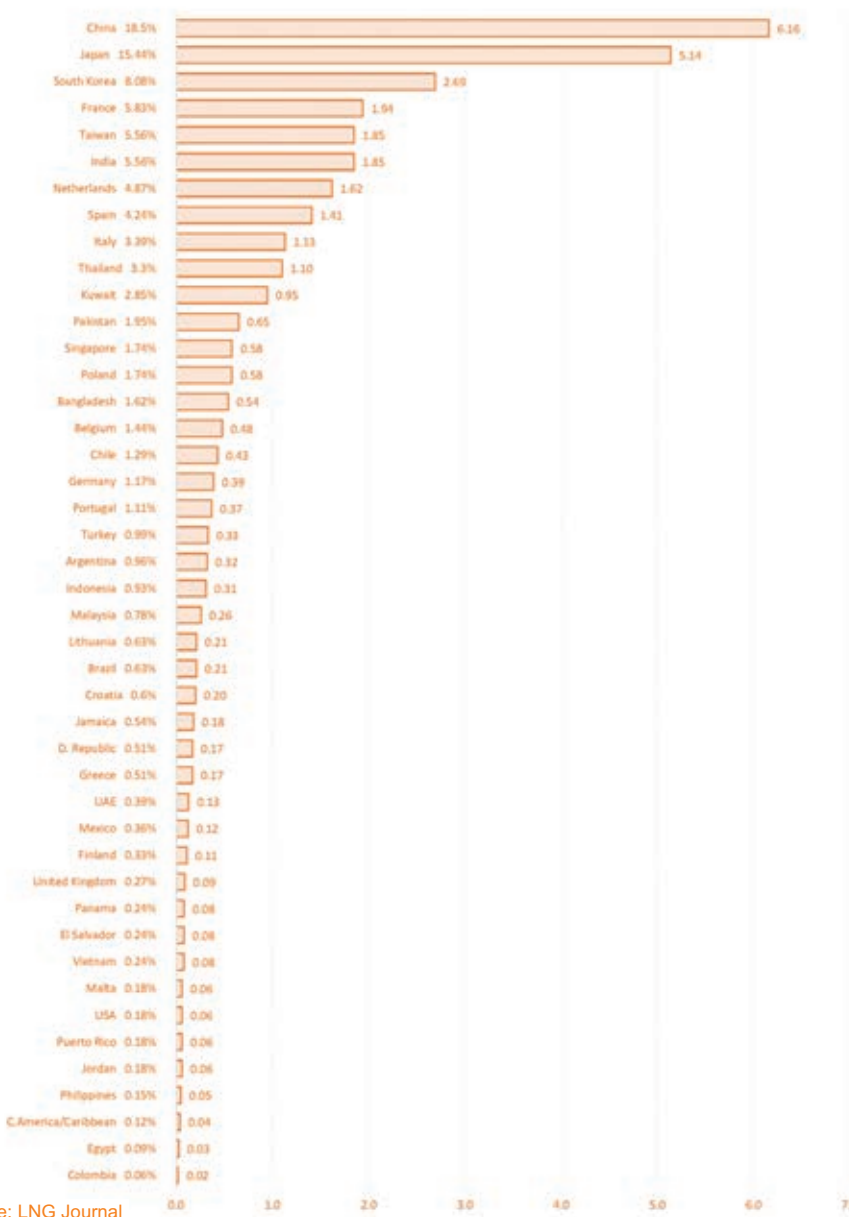
monthly LNG demand increase particularly in Jamaica, where offtakes were up by 0.10mmt (125 percent) to 0.18mmt. Brazil, Panama and the United States also increased their total offtakes to 0.22mmt alongside steady demand of 0.06mmt in Puerto Rico. This growth in the Caribbean was tempered, however, by a demand reduction of 0.22mmt (-29 percent) to 0.55 in Argentina, Colombia,

the Dominican Republic and the Caribbean in general via the US Virgin Islands’ OPT LNG Hub.

Middle East

Middle Eastern LNG demand of 1.82mmt in July represented robust growth of 0.31mmt (21 percent) over the 1.51mmt seen in June. Offtake levels were underpinned by demand growth of 0.13mmt (16 percent) in Kuwait, which compensated for a 0.02mmt (-13 percent) reduction to 0.13mmt in the UAE. Concurrently, Pakistan’s month-on-month demand was up by 0.11mmt (20 percent) to 0.65mmt. Jordan, meanwhile, imported a rare cargo of 0.06mmt in July and thereby underscored the collapse in Egypt’s gas exports since May due to shortages. Egypt normally is a major pipeline gas supplier to Jordan, which had previously rendered the FSRU at Aqaba idle for more than a year. Notably, Egypt’s FSRU at Ain Sokhna equally took in a rare cargo of 0.03mmt in July, although it was supplied domestically by the country’s Damietta LNG plant. As such, the Middle East’s annualised import capacity utilisation stood at 26 percent at the time of writing.

Market Share & LNG Imports by Country (MMt)



Source: LNG Journal



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Unique solution for optimising LNGC voyages from Blue Water Services

India based software solutions provider, Blue Water Services has designed an optimisation tool specifically for the carriage of LNG by sea.

Over the years, LNGC voyage optimisation has been limited to just weather routing, Blue Water Trade Winds explained.

However, to fully exploit its scope, it is crucial to strike the right balance between boil-off rate (BOR), speed, course and commercial factors.

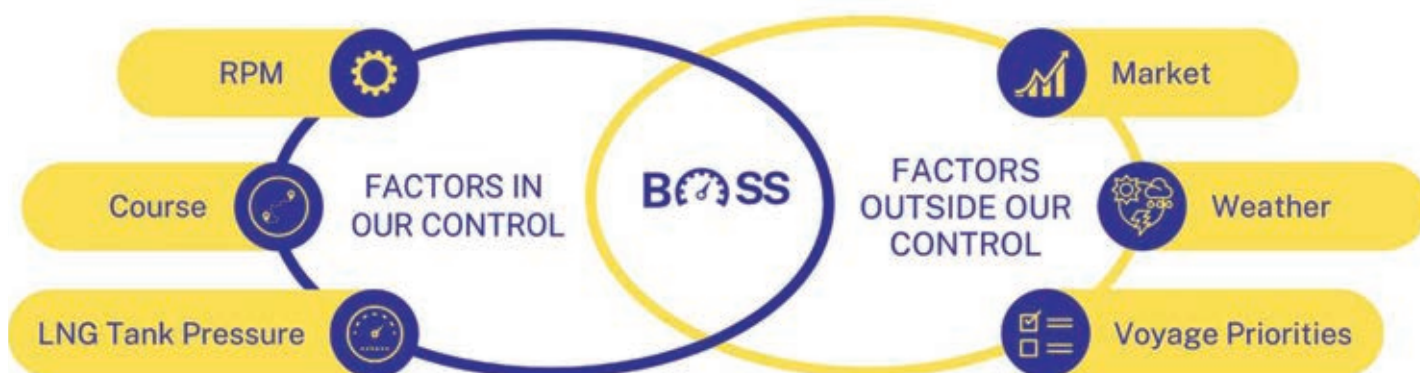
With more than 650 LNGCs operating globally and hire rates hitting \$500,000 per day on occasions, LNG voyage optimisation is more imperative than ever, the company explained.

Blue Water Optimum Speed Services (BOSS) offers the most complete LNG voyage optimisation solution that can potentially yield 5-7% proven bunker savings, while ensuring timely arrival, Blue Water added.

Powered by machine learning and thermodynamic models, BOSS can optimally plan and monitor LNGC voyages with efficient boil-off-gas (BOG) management, speed scheduling and weather routing.

Benchmarking

The claimed annual savings, when translated into a dollar value for a fleet of 50 vessels, may well look illusionary and inflated, however, the numbers are real and derived by using a transparent and logical benchmarking system - yet another innovative approach of BOSS,



BOSS provides an optimisation solution to exploit factors outside our control by controlling factors which are in our control. Source: Blue Water Trade Winds

the company stressed.

LNG is shipped as a cryogenic liquid at around minus 160 deg C in large insulated tanks. Naturally, heat ingress into the tanks can disturb the liquid/gas equilibrium resulting in BOG being generated.

Today, this natural gas generated through boil-off serves as the primary fuel in the majority of LNGCs.

Predicting natural boil-off-gas (NBOG) in LNGCs is a complex problem. BOR is extremely sensitive to the operating parameters and thermophysical properties of the LNG cargo, both of which dynamically change throughout the voyage.

Sub-optimal operating pressure and speed can result in excess NBOG, which either needs to be burnt in the gas

combustion unit (GCU) or partially reliquefied if the vessel is equipped with a reliquefaction plant.

On the positive side, if the NBOG generation phenomenon and vessel hydrodynamics can be accurately modelled, LNGCs scope of optimisation is far greater than ships powered by fuel oil.

BOSS LNG optimisation solution maximises this potential by not only reducing the BOR, but also by maximising the utilisation of the generated NBOG.

This is achieved by planning an LNGC's optimum schedule for speed, course and operating pressure and by closely monitoring the voyage plan implementation using Blue Water Trade Winds C-ORCA tool.

The NBOG prediction challenge has been tackled using a hybrid approach based on thermodynamic principles and machine learning.

STASCO opts for Blue Water voyage planning software for its LNGCs

Shell International Trading & Shipping Co Ltd (STASCO) has extended its partnership with Indian software provider Blue Water Trade Winds for another three years.

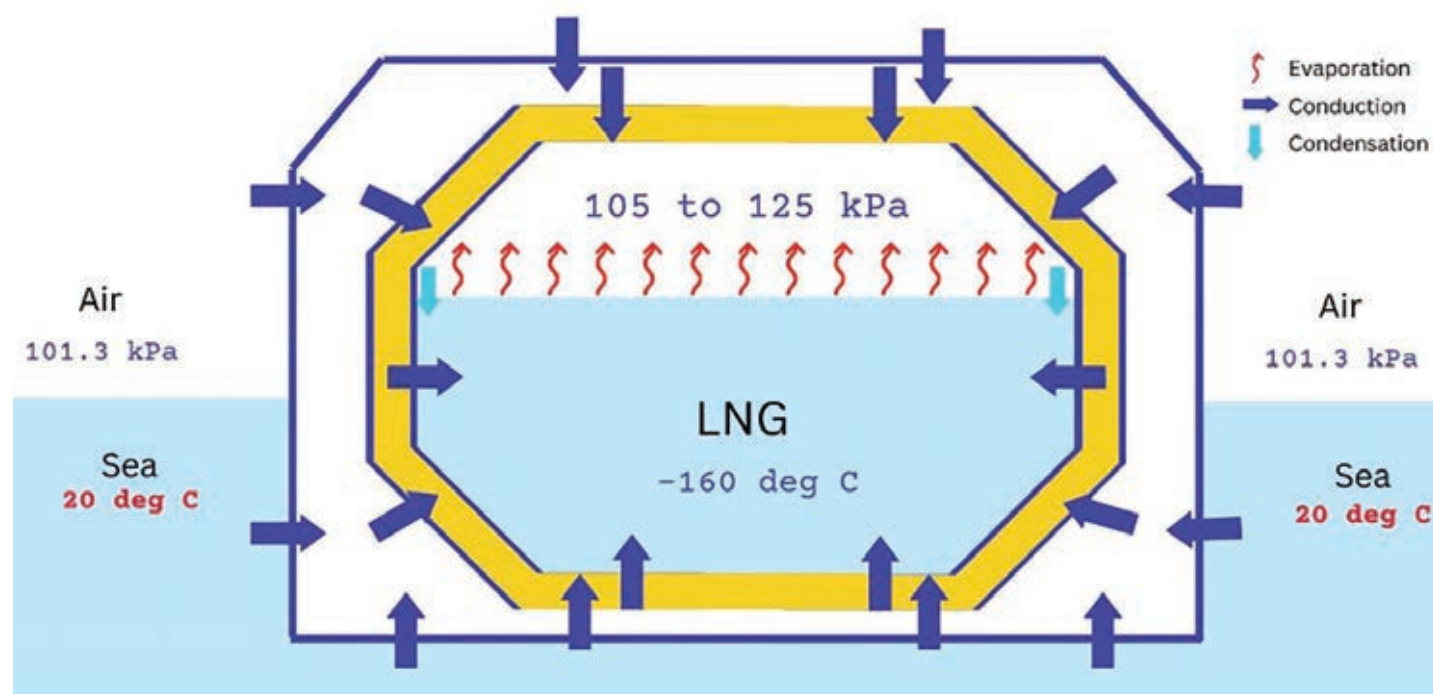
This involves STASCO's crude & product timecharter (TC) fleet. The software in use is called BOSS (Blue Water Optimum Speed Services).

STASCO has been using BOSS, which can improve fuel efficiency by between 4~6% and therefore reduce carbon emissions on the company's crude & product TC fleet for the past five years.

In addition, the Shell's timecharter LNGC fleet was recently enrolled in BOSS. This involves Blue Water Trade Winds' fuel and voyage optimisation solution and follows a benchmarking exercise among competing industry systems and extensive trials carried out by the energy major.

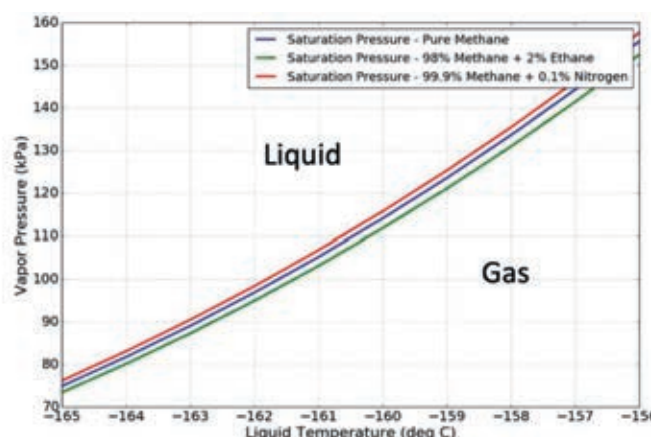
As a result, Shell is now rolling out the BOSS voyage planning software for LNG applications across its TC LNGC fleet.

All of the Shell controlled fleets will now be covered initially for three years, with an option for one more year.



Cross-section of an LNG cargo tank under typical operating conditions. The Boil-off gas generated due to the heat-ingress is used as fuel for propulsion and hotel. Source: Blue Water Trade Winds

Liquid Temp. (deg C)	Pure Methane Sat Pressure (kPa)	98% Methane 2% Ethane Sat Pressure (kPa)	99.9% Methane 0.1% Nitrogen Sat Pressure (kPa)
-161.0	105.1	103.1	106.7
-160.0	114.0	111.8	115.7
-159.0	123.5	121.0	125.2



Saturation Pressure vs Liquid Temperature for LNG grades with different molar compositions. As evident above, saturation pressure is extremely sensitive to both LNG temperature and the molar composition of the LNG grade.
Source: Blue Water Trade Winds

NBOG is affected by several variables, some of which are static and do not change during the course of the voyage (eg, thermal coefficients of tank insulation, tank geometry, etc) while others change dynamically throughout the voyage (eg, LNG molar composition, temperature, operating pressure and tank stowage).

Thermodynamic models are used to predict the liquid/gas equilibrium conditions for the given LNG

composition, liquid temperature and stowage. Machine learning models are used to derive empirical coefficients for predicting the BOR based on the deviation from the theoretical liquid/gas equilibrium.

Hybrid approach

This hybrid approach accounts for the heat ingress entering the tanks, sloshing caused by rough seas and chemical properties of the LNG grade

to predict the BOR.

Optimum operating pressure for limiting the BOR is another complex problem since it depends on many dynamic variables like target speed, LNG composition, liquid temperature and weather.

LNG composition varies significantly across different loading ports and also changes throughout the voyage. During the voyage, more volatile components, like nitrogen, evaporate first and cause an

increased NBOG with lower calorific value during the initial days.

To monitor this, BOSS NBOG software model takes into account the initial LNG composition and predicts the ageing as the voyage progresses.

Finally, the algorithm takes into account the temperature and pressure requirements at the discharge port to plan a schedule that minimises the total LNG consumption, while adhering to the discharge requirements.

BOSS has been verified by several shipowners and oil majors as being an accurate, complete and transparent optimisation and weather routing service.

This LNG optimisation solution encompasses accurate NBOG models with time-tested hydrodynamic models, weather forecasts and exhaustive voyage simulation, providing a one-stop optimisation solution for LNGCs, Blue Water said.

Voyage planning is where BOSS starts. The AI-assisted voyage monitoring ensures voyage plan compliance, high data quality and efficient error resolution, the company explained.



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Environmental concerns continue at all levels

In July, the two largest LNG importers, South Korea's Korea Gas Corp (KOGAS) and Japan's JERA, launched the 'Coalition for LNG Emission Abatement towards Net Zero (CLEAN)' initiative.

This coalition involves LNG buyers and producers and is aimed at reducing methane emissions in the value chain, the companies explained.

In accordance with a Memorandum of Understanding (MoU) to co-operate in the LNG space concluded in April this year, KOGAS and JERA agreed to strengthen their strategic relationship and work together to ensure a stable supply of energy for both South Korea and Japan.

Both companies said that they recognised LNG as a transition energy for a de-carbonised world and believed that the reduction in emissions in the LNG value chain will become more important in the future.

With the support of the Japanese, US and South Korean Governments, plus the Japan Organisation for Metals and Energy Security (JOGMEC), the companies will work to increase methane emissions' visibility through dialogue with LNG producers and to develop and disseminate best practices to reduce emissions.

As the largest Japanese power producer, JERA said that it respected the energy and environmental policies represented by Japan's Strategic Energy Plan and actively promotes renewable energy development.

JERA also claimed that it fully recognised the need for environmental protection on a global scale, strictly complies with the environmental laws and ordinances of each country and region worldwide and works to reduce the environmental impact, including the reduction of CO2 emissions with the aim of achieving a sustainable environment, society and economy.

As South Korea's largest natural gas importer and provider, KOGAS will also aim at enhancing methane emissions' visibility, the company said, through the LNG value chain in collaboration with JERA and JOGMEC, to support the global response to climate change and sustainable energy system.

KOGAS also said that it fully acknowledged the importance of reducing methane emissions in the world's LNG value chain and will take a leading role in implementing the follow-up actions of the coalition and will collaborate with other LNG players.

Also included in the MoU was an agreement to discuss opportunities for mutual collaboration in LNG business, involving LNG swaps, trading, vessel optimisation and market view exchanges.

Russia's invasion of Ukraine has



Several major players in the LNG space are now taking methane emissions seriously

created a severe energy environment, including the reduction in European pipeline gas supply and the uncertainty over the energy supply, which is drastically increasing, JERA claimed.

In response, both companies said that under the MoU, they will strengthen their relationship and consider co-operative initiatives, such as their respective LNG supply and demand to enhance a stable energy supply in both countries.

Due to these significant changes, in order to ensure a stable Japanese energy supply, JERA said that it will continue to work together with LNG buyers and other leading companies, both within

and outside Japan, such as KOGAS, as it seeks to enhance procurement capabilities.

Also addressing the environment, HE Saad Sherida Al-Kaabi, Qatar's Minister of State for Energy Affairs and President and CEO of QatarEnergy, delivered a keynote speech at the recent 12th LNG Producer-Consumer Conference held in Tokyo, Japan.

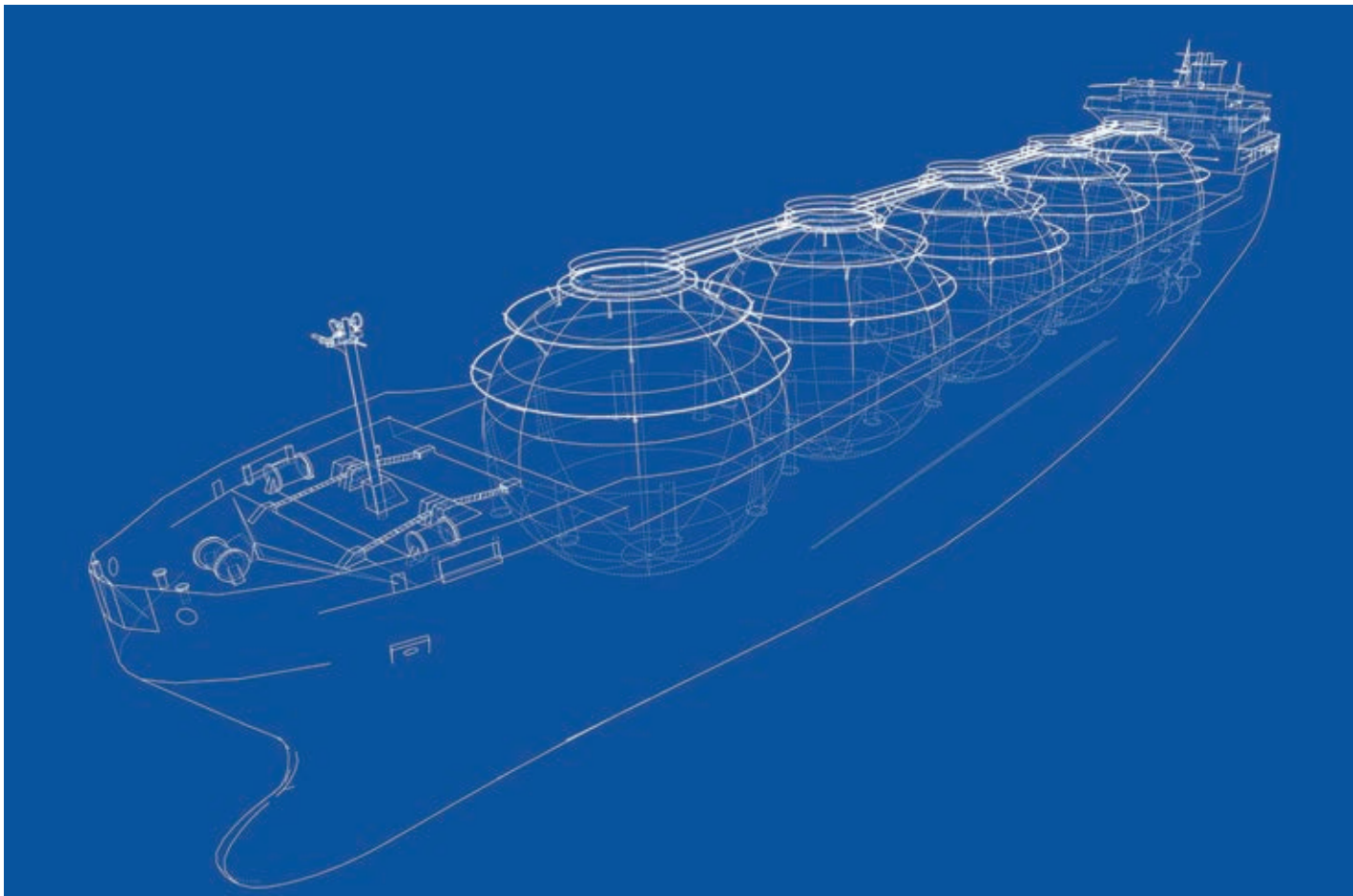
Roadmap

In his speech, he stressed the need for a clear roadmap with specific targets to achieve a fair and effective energy transition with a realistic and stable path towards the reduction of the global carbon footprint.

"I would like everyone around the world calling for a speedy energy transition to consider that the world needs a fair and effective transition with a realistic and stable path, which wisely balances humans flourishing with environmental protection, it should not continue to only focus on the needs of the rich and well-developed countries but must prioritise the needs of developing countries.

"This highlights the need for a realistic and resolute energy transition, starting with a solid integration of natural gas in the energy mix of today and tomorrow. We strongly believe that gas will be needed as a safer reliable base load in the energy mix for most nations for decades well beyond 2050," he said.

Highlighting the challenges facing the energy industry, Minister Al-Kaabi added: "Lack of investments in the oil and gas upstream sector remain as an unresolved and unchallenged chronic problem,



An LNGC is a complicated structure. Photo credit- Ocean Technologies

contributing to greater lack of clarity, volatility, and supply uncertainty. This lack of investment will likely cause increased instability for every region around the world.

“Qatar is providing the world with the cleanest available hydrocarbon source of energy, which has met both the economic and environmental aspirations for a better future. By 2029, about 40% of all new global LNG supplies will be provided by QatarEnergy projects.

“These projects will achieve significant reductions in greenhouse gas emissions through carbon capture and sequestration, as well as the use of solar energy. In all, we aim to reduce the overall carbon intensity by about 30%, compared to previous generation designs,” he said.

He concluded his remarks by stressing Qatar’s determination to work with its clients and partners to realise the full potential of LNG as a vital contributor to a realistic and responsible energy transition, and to continue to take concrete action across the entire spectrum of the energy industry to address the challenges of climate change.

EC position

For its part, the European Commission (EC) recently signed a joint statement alongside global partners, which reinforces continued efforts towards the reduction of methane emissions, from production to consumption.

This joint statement was signed by the EC, Japan, the US, South Korea, and Australia in Tokyo at the LNG Producer-

Consumer conference, co-organised by Japan and the IEA’s Task Force on gas and clean fuels market monitoring and supply security (TFFS). The EC was represented by Ditte Juul Jørgensen, Director-General for Energy.

This initiative builds on already strong co-operation between the EU and other global leaders on methane abatement across the natural gas value chain. The EU is currently spearheading the Global Methane Pledge and the Joint Declaration from Energy Importers and Exporters on Reducing Greenhouse Gas Emissions from Fossil Fuels alongside the US, while implementing the EU Methane Strategy at EU level.

The EU claimed to play a prominent role globally in methane emissions monitoring, reporting and verification

(MRV) and methane emissions abatement.

The EC has reaffirmed its commitment to taking action on reducing methane emissions in the LNG supply chain on a number of fronts including:

- Continued collaboration with global partners, as well as the IEA, the International Methane Emissions Observatory, and the Greenhouse Gases Supply Chain Emissions MMRV international working group.
- The creation of a globally aligned methane emissions assessment framework for LNG projects.
- Continuing to support international public-private co-ordination on GHG reduction in LNG, especially on methane, and to work with LNG producers and consumers globally. ■

Ocean Technologies Group supports SIGTTO LNG competency guidelines

Training is vital in any industry and at any level, none more so than in the LNGC sector of the LNG space. Technical Editor Ian Cochran reports.

This comes in several forms - classroom, on board and remote, the latter taking advantage of today’s digital age.

Down the years, the Ocean Technologies Group (OTG) has built up a significant portfolio of maritime e-learning courses by absorbing leading names in the training sector.

Recently, OTG released a series of comprehensive interactive e-learning courses to support competency guidelines for personnel working in the liquefied gas shipping industry.

These guidelines, which were developed by the Society of International Gas Tanker and Terminal Operators (SIGTTO), outline the required competencies and skills for various roles involved in the transportation and handling of LNG cargoes.

OTG has structured the courses into four different versions to target the competencies required for each rank.

Comprising a total of 113 modules, with 330 micro-learning units that map directly to the required proficiencies, the courses are a valuable resource enabling seafarers to build their LNGC competency across seven different subject areas at a time and place to suit them, OTG explained.

The courses set out specific performance outcomes comprising defined levels of competence.

“We’re proud to support tanker operators with these interactive modules

which are the most comprehensive LNG e-learning courses ever produced. They are designed to provide the knowledge required for each rank serving on LNG tankers in accordance with the standards suggested by SIGTTO. The courses cover the management and best operational practises to safely handle LNG as a cargo while on board,” said Thomas Zanzinger, OTG’s CEO.

“These kind of detailed competency frameworks will become increasingly important in the setting of standards required for the safe handling and management of new fuels and cargoes, as the industry transitions to de-carbonised supply chains. OTG is committed to developing appropriate training in support of these frameworks, so that seafarers have the right knowledge and learning in place to work safely and efficiently,” he added.

The courses can either be added as part of an OTG client’s subscription to the Ocean Learning Platform library of courses or purchased via OTG’s ‘Pay as You Go’ online shop.

Certification options are also available for those seafarers that want to obtain official recognition of that they completed the course.

Certification

Raal Harris, OTG’s Chief Creative Officer, told *LNG Journal* that SIGTTO specifies

the recommended competencies, while OTG’s certificate offer specifies that a person has undertaken the learning required to meet those competencies.

As a result, they are over and above any mandated certificates eg, STCW Tanker Courses.

He also said that LNG represents one of the most specialised and regulated areas of the maritime sector. Charterers requirements set an even higher expectation of standards and consequently, LNGC operations is one of the most demanding from a knowledge and skills perspective.

“This also makes it harder to find good trainers and educators who can pass on the knowledge, particular at a global level,” Harris stressed.

He also advised *LNG Journal* that as OTG already has the STCW tanker courses and plenty of material, including on LNG as fuel (SGMF guidelines and IGF Code) and, as these are extremely comprehensive, the company doesn’t anticipate anything more being required.

As mentioned, there are four main SIGTTO courses offered -

- LNG Deck Management Training course.
- LNG Deck Operational Training Course.
- LNG Cargo Equipment Operational Training Course.
- LNG Cargo Equipment Management



OTG’s Raal Harris

Training Course

Other LNG related training courses include - ship-to-ship (STS) transfer familiarisation, fire hazard management, gas properties and general LNG familiarisation courses, plus others.

To increase its visibility in the maritime industry, in the past few years, OTG has grown both organically and by acquisitions. For example, the company has acquired Seagull, Tero Marine, Marlins, Videotel, MTS and Compas.

Harris explained: “We have effectively merged all our training brands and consolidated around a single Ocean Learning Platform and Ocean Learning Library that takes the best of all. We operate as one team going forward.” ■

First ME-GA engine completes gas trials

The race to market the most efficient propulsion unit for LNGCs heats up as MAN Energy Solutions (MAN ES) has completed gas trials at sea of its latest offering. Technical Editor Ian Cochran reports.

Since its launch in May, 2021, MAN ES answer to the latest generation of propulsion systems for 2-stroke powered LNGCs - MAN B&W Otto-cycle engine ME-GA - has taken a giant step towards ship deliveries.

The first ME-GA engine, a 70-bore version, specifically developed for the LNGC market, recently completed gas trials on board a gas carrier built by Hyundai Samho Heavy Industries (HSHI) for Norwegian shipping company, Knutsen OAS Shipping.

Built by Hyundai Heavy Industries' Engine Machinery Division (HHI-EMD), Knutsen's ME-GA is fitted with an exhaust gas recirculation (EGR) system that was developed in-house to reduce emissions, including methane slip. MAN ES claimed a 50% reduction, when compared to first-generation Otto-cycle 2-stroke engines without an EGR installed.

By fitting an EGR system, this also means that the engine is Tier III compliant when operating with conventional fuels.

The MAN B&W ME-GA engine delivers a low CAPEX solution and is aimed at LNGCs that are able to use 'boil-off' gas (BOG) as a source of fuel, the engine designer said.

Based on the MAN B&W dual-fuel design with minimal installation

requirements, the ME-GA uses an efficient ignition concept and unique gas-admission system that delivers safe and reliable operation.

Minimal OPEX

Furthermore, the new engine is claimed to have minimal operational costs, simple supply and purging concepts, and low maintenance costs for its fuel-gas supply system (FGSS).

It joins the established ME-GI diesel-cycle engine in MES' 2-stroke-engine portfolio, which now offers both low- and high-pressure, dual-fuel solutions for vessels operating on LNG as a fuel.

More than 260 ME-GA engines have been ordered since May, 2021, MAN ES claimed.

Bjarne Foldager, MAN ES' Head of 2-Stroke Business, said of the trials: "This successful gas trial is a very important milestone in the development of the ME-GA engine. We developed this engine for easy application to most contemporary LNG carrier designs and, indeed, all ME-GA orders to date have been exclusively for this segment."

Thomas Hansen, Head of Promotion and Customer Support, MES, added: "We have had more than 260 orders for the ME-GA since its launch in May, 2021 and our orderbook contains ME-GA engine orders for ship deliveries stretching all the way into 2027.

EGR as standard enables the ME-GA to significantly reduce emissions, while simultaneously improving fuel efficiency and operation in both gas and fuel-oil operation," he said.

HHI-EMD placed the world's first order for the ME-GA engine by contracting two 5G70ME-GA10.5 engines for each of six 174,000 cu m LNGCs for shipowners, KLC (two vessels), PANOcean (two), Knutsen (one), and JP Morgan (one).



MAN ES' Bjarne Foldager

Hyundai's Shipbuilding Division (HHI-SBD) is constructing the vessels, which will be chartered by Shell Tankers (Singapore) upon their delivery.

In November, 2020, MAN ES had announced that it would offer its proprietary EGR system as an emissions solution for the ME-GA design.

EGR is a NOx-emissions reduction system that ensures the ME-GA's IMO Tier III compliance in diesel mode.

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

This EGR solution is an engine-integrated design that interacts with the exhaust gas before the turbocharger, and can be integrated into existing engine room designs, since the EGR unit itself does not change the engine footprint.

Its design-similar to that of ME-C engines' EGR systems, which will lower its pricing, since the supply chain and components are already mature, MAN ES said.

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

New control system

As a first, MAN ES' ME-GA's engine-control system is fitted with a new control feature called 'ME-GA opti' for optimal engine operation via individual cylinder control.

Foldager explained: "MAN Energy Solutions has always played a leading role in developing ground breaking



MAN ES' Thomas Hansen

technologies that add value to our customers' operations. Thus we have made EGR standard for the ME-GA, thereby reducing methane slip compared to first-generation Otto-cycle engines without EGR, which simultaneously improves fuel efficiency in both gas and fuel-oil operation. ME-GA-opti continues this trend and will further boost the ME-GA's reputation."

Hansen added: "ME-GA-opti is the latest and most advanced control feature for the ME-GA engine and significantly improves its operation. It comprises an advanced and intelligent network of control algorithms that have been developed to optimise the combustion process on an individual-cylinder basis, and which ensure optimal operating conditions. I'm certain it will be received well by the market."

ME-GA-opti's intelligent functionality benefits engine performance in several ways, including:

- Ensuring optimised conditions for the combustion process by reducing the influences of ambient temperature, pressure and humidity that can influence Otto-cycle engines;
- Enabling maximum and stable gas potential for the engine;
- Reducing fuel-ratio control activation – ME-GA-opti is able to adapt the engine's running conditions as the combustion moves towards the pre-ignition limit. ■

ME-GA Principal Particulars

- Engine cycle (gas) 2-stroke Otto type
- No of cylinders 5 or 6
- Bore 700 mm
- Stroke/bore ratio 4.65



A schematic of the ME-GA engine

tapes, foils, sealants and adhesives • polykraft and polysurlyn® laminated metal jacketing
tedlar® laminated stainless steel and aluminium jacketing • cladding coil, sheet, perforated
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PHMSA has proposed new methane leak detection and repair requirements

LNG Journal has reproduced a paper examining the US Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) proposed requirements for methane slip detection and repair. The paper was written by law firm's K&L Gates, David Wochner and Timothy Furdyna.

The background. On 5th May, 2023, the PHMSA issued a notice of proposed rule making entitled 'Pipeline Safety: Gas Pipeline Leak Detection and Repair' (NPRM) regarding regulatory amendments to the administration's Federal safety requirements for pipeline facilities and LNG facilities.

The NPRM is in response to bipartisan congressional mandates in the Protecting Pipelines' Infrastructure and Enhancing Safety Act of 2020 (PIPES Act) and the US Methane Emissions Reduction Action Plan.

With comments on the NPRM due on 16 August 2023, below is an overview of the impacts the NPRM would have on owners and operators of LNG facilities.

In an overview, the authors explained that the NPRM generally adopts PIPES Act Sections 113 and 114 requirements and proposes comprehensive amendments to PHMSA's regulations.

These amendments increase methane emission detection and reduce methane emissions through more stringent methane leak prevention, detection, and repair requirements and best practices.

The wide-ranging NPRM would impact

new and existing gas transmission pipelines, distribution pipelines, gas gathering pipelines, underground natural gas storage facilities and LNG facilities.

At a high level, PHMSA's NPRM and corresponding proposed regulations would:

- Expand pipeline, storage, and LNG facility survey and leak detection requirements;
- Require LNG facilities to identify and select a proven method to mitigate methane releases during blowdowns, tank boil-offs, and other vented emissions;
- Expand the definition of 'hazard' in certain 49 CFR Parts 191 and 192 provisions to include emissions that are 'environmentally hazardous;'
- Remove the exemption for offshore gathering, and Type A, B, and C onshore gathering pipelines from the National Pipeline Mapping System reporting requirements;
- Add new gas operator reporting and record keeping requirements;
- Require all overpressure protection devices be designed and configured to minimise unnecessary releases of gas;

- Expand service line installation and valve requirements; and
- Require gas pipeline facility operators to implement written procedures to eliminate hazardous leaks, minimise releases of natural gas, and remediate or replace pipelines known to leak.

PHMSA claimed that these new proposals will improve public safety, promote environmental justice, and address the climate crisis by reducing both 'fugitive emissions' (unintentional emissions resulting from leaks and equipment failures) and 'vented emissions' (emissions resulting from blowdowns, equipment design features, and other intentional releases) from over 2.7 mill miles of gas transmission, distribution, gathering pipelines, other gas pipeline facilities, storage facilities, and LNG facilities.

Although most of the NPRM addresses methane leak detection and repair for gas pipeline facilities, it does propose significant additions or revisions to existing LNG operator methane emission detection, repair, and minimisation requirements.

For example, PHMSA's federal safety

standards for LNG facilities do not currently require LNG facility operators to perform routine, periodic surveys of facility components and equipment for methane leakage. However, for the first time, it is proposing affirmative LNG facility and export terminal methane leakage monitoring and minimisation requirements.

PHMSA is seeking to implement these new requirements in order to reduce both fugitive and vented methane emissions, explaining that these emissions are the second largest methane emission source from LNG storage facilities and the largest methane emissions source from LNG export terminals.

While the current sections of CFR Part 191 and 193 require LNG facilities to complete an annual reporting form, PHMSA believed that these current reporting requirements do not provide comprehensive and accurate methane emissions and repair data. To address this deficiency, PHMSA proposes four new reporting and record keeping requirements that apply specifically to LNG terminals.

An overview of what aspects of the NPRM apply to LNG facilities, specifically the new proposals includes:

- Require quarterly methane leakage surveys and repairs;
- Require emission minimisation from blowdowns, boil-offs, and vented emissions;
- Require additional leak and repair reporting and record keeping; and
- Update written operation and maintenance procedures.

As noted above, PHMSA currently does not require LNG facility operators to perform periodic leakage surveys. Now, for the first time, PHMSA is asking LNG facilities operators to perform routine, periodic surveys for methane leaks to reduce fugitive methane emissions and other equipment leaks, the two most common methane emission sources from LNG storage facilities and LNG export terminals.

Under PHMSA's proposed regulations, LNG operators will be required to perform quarterly methane leakage surveys of equipment containing methane



Facilities, such as Freeport LNG, could come under stricter PHMSA methane emissions abatement rules soon



Washington, DC Associate Timothy Furdyna

or LNG during normal facility operations, with a minimum sensitivity requirement of five parts per million.

In the event a leak is detected, PHMSA's NPRM would require LNG facility operators to repair the identified leaks under written maintenance or abnormal operations procedures, which are discussed below. PHMSA's proposed quarterly methane leakage survey requirement would be codified as a new regulation.

PHMSA further explained that a net benefit of requiring quarterly methane leakage surveys is that this proactive leak detection and repair will result in less product loss, more cost savings, and provide LNG storage and export facilities a competitive advantage.

The association also said that it expected that these new and enhanced methane leak detection and repair requirements will improve public safety by allowing for timely identification and remediation of potential LNG facility ignition sources and reducing the emission of a key fugitive green house gas (GHG) source.

In addition, PHMSA explained that LNG facility operators who currently transport natural gas to their facilities with transmission pipelines could use their existing leakage survey practices as a foundation to develop their LNG facility specific requirements.

Although PHMSA proposes to require methane leak detection generally, in order to avoid conflicting with existing regulatory requirements and the US National Fire Protection Association LNG standards, it is not proposing a comprehensive advanced leak detection and repair programme framework, like it is for CFR Part 192-regulated gas pipeline facilities. It is pursuing a parallel rule making in which it is updating its Part 193 safety standards where it could



Washington, DC Managing Partner David Wochner

consider leak monitoring, surveying, and patrolling requirements more holistically.

Blowdowns and boil-offs

According to PHMSA, LNG blowdowns and boil-offs represent about 48% of total LNG methane emissions. Specifically, they represent 80% of LNG storage methane emissions, 33% of import terminal emissions, and 4% of export terminal emissions.

PHMSA said that mitigating these non-emergency vented emissions is essential to reduce overall methane emissions and that there are several cost-effective and recommended technologies that can help LNG facilities reduce methane emission from operations, maintenance, and construction.

Therefore, it proposed amending existing regulations to add new rules to require LNG facilities to identify and select a proven method to mitigate methane releases during blowdowns, tank boil-offs, and other vented emissions. It proposed the following approved measures to minimise blowdowns, boil-offs, and vented emissions:

- Installation and use of valves or control fittings to reduce the volume of gas that must be removed from pipeline facility segments;
- Routing vented gas to a flare stack to be ignited or to other equipment to be collected for later use (burning reduces the climate change impact and under favourable conditions a well-designed and maintained flare stack can combust gas with almost 100% efficiency);
- Any LNG facility operator that selects this option would be subject to flaring equipment leak and repair requirements as outlined in the NPRM;
- Isolating the pipeline segment upstream of the vented segment and using the downstream compressor

station to reduce the pressure of the affected segment;

- Using a mobile compressor unit to reduce the pressure of the segment by compressing gas or diverting LNG into adjacent facilities or a storage vessel; or
- Transferring gas or LNG to a lower-pressure pipeline segment.

In addition, PHMSA would allow LNG facility operators to suggest alternative approaches to minimise blowdown emissions; however any such alternative approach must: (1) reduce the volume of released gas by at least 50% when compared to taking no action; and (2) be approved by the association.

Finally, the NPRM would require LNG operators to develop documentation describing the actions undertaken—including, but not limited to, their choice from among the blowdown mitigation methods, to minimise vented emissions from their systems.

Reporting and record keeping

In addition to quarterly methane leak surveying and blowdown and boil-off minimisation measures, PHMSA proposes to introduce four new reporting and record keeping requirements for methane leaks, pipeline repairs, and total emissions.

Currently, PHMSA relies on historic methane emissions studies or other agency data to estimate total LNG facility methane emissions. PHMSA said that it believed these new survey, record keeping, and reporting requirements will allow the provision of more accurate and timely methane emissions data. These new requirements would revise certain sections of the LNG facility annual reporting Form F7100.3-1 and add a new maintenance-focused section.

First, in response to a general lack of data regarding LNG facilities annual methane leak detections, repairs, and emissions, PHMSA proposes to require LNG facility operators to track and report every methane leak detected and repaired, the number of remaining unrepaired leaks, and the estimated total fugitive methane leak emissions from all identified leaks on their annual reporting form.

Second, in response to lack of data about large-volume gas releases, PHMSA proposes to add new rules, which would require LNG facility operators to report all intentional and unintentional large-volume gas releases (defined as gas releases with a volume of 1 mill cu ft or greater).

This new reporting form would require LNG facility operators to track all unintentional (ie fugitive) and intentional (ie vented) emissions. Operators would be required to submit a report within 30 days from the date that a large-volume gas release was detected or 30 days from the date that a previously detected release became reportable.

Third, PHMSA proposes to revise its annual reporting requirements by removing a statement in Form F71003-1 suggesting that leaks that can be addressed by routine maintenance need not be counted as leaks but instead require LNG facility operators to report all leaks eliminated by routine maintenance.

Finally, PHMSA proposes to require LNG facility operators to document every action taken to minimise vented emissions from their systems.

Written procedures

In order for LNG facility operators to implement the changes outlined above and proactively detect leaks, repair and replace necessary pipelines, and effectively track and report leaks and repairs, PHMSA proposes two new regulations requiring LNG facilities to update and follow new operating and maintenance procedures.

Specifically, new rules would require LNG facilities to update their normal and abnormal operational procedures to eliminate leaks and minimise gas releases from pipeline facilities. Similarly, they would require LNG facilities to update maintenance procedures to eliminate leaks and minimise gases released.

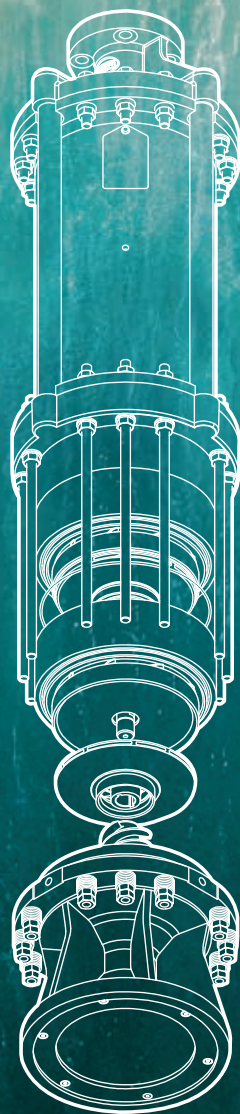
The authors noted that beyond the proposals outlined above, these two proposed regulations do not dictate what procedures LNG facilities must follow to eliminate leaks and minimise gas releases. Instead, they simply require LNG facilities to have procedures and follow them. The LNG facility operator, then, has the discretion to determine how best to update their procedures to be in compliance.

Once PHMSA has reviewed the comments called for on the NRPM and issued a final rule, it will become effective six months after the publication of the final rule.

It was explained that providing affected operators six months to comply with the new requirements was ample time to implement necessary changes to their leakage detection, repair, and minimisation practices and manage related compliance costs. ■

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Of the LNG marine expansion



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Germany shifts gears with LNG transport

With toll exemptions for LNG vehicles in Germany set to end by 2024, there is significant market uncertainty, but industry insiders remain optimistic about the viability of LNG in long-distance heavy-duty transport, as small logistics companies transition away from diesel. Fuelling Editor Malcolm Ramsay reports.

Initially planned to end in 2020, the exemptions for LNG vehicles give added financial incentive for logistics operators to switch fuels. Following the disruption of Covid, this was lengthened until December 31, 2023, by the Federal Logistics and Mobility Office (BALM) but there is no sign as yet that this will be further extended.

"There is a great deal of uncertainty in the market as to how politicians will position themselves with regard to LNG after the end of the toll exemption in 2023," Stefan Tahedl, managing director of BayWa Power Liquids, tells *LNG Journal*. "This uncertainty particularly affects small logistics companies that are faced with the decision of whether to buy a diesel or an LNG truck. In our view, however, LNG is competitive in long-distance heavy-duty transport even without toll exemption."

Part of Munich-headquartered conglomerate BayWa Group, BayWa Power Liquids is responsible for decarbonizing heavy-duty transport by developing LNG and Bio LNG refuelling stations and is one of a number of firms entering the increasingly competitive space.

Evolving fuel landscape

The legal basis for the current exemptions is Article 5 of the Eighth Law under the Federal Highway Act and covers all trucks powered by LNG or CNG but not liquefied petroleum gas (LPG).

"Our aim as BayWa Power Liquids is to reconcile the economic requirements of logistics companies with current social

and environmental requirements. From our point of view, CNG, hydrogen and e-mobility are therefore also justified in the truck sector - in addition to LNG."

The temporary exception for vehicles was issued by BALM with the aim of reducing the environmental damage caused by emissions, however the fuelling landscape has changed dramatically since it was first introduced.

"The intended goal of this legislation is only possible if the use of diesel fuel is clear for vehicles powered by bivalent natural gas and converted diesel engines takes a back seat," a spokesperson for BALM said.

The outbreak of the war in Ukraine has drastically altered Germany's relationship to natural gas as a fuel, with traditional sources of pipeline gas greatly reduced and imports of LNG soaring. As a result, the cost of energy has risen sharply but so too has awareness of LNG as a vital fuel.

"The shift towards LNG poses certain challenges," Michał Kędzierski, research fellow at the Centre for Eastern Studies, cautions. "For example, it creates the need to adjust the network to receive gas from new directions, and to find new suppliers of liquefied gas. The initiative to build LNG terminals on such a large scale has sparked major controversy in Germany because many observers view it as an unnecessary cost and a threat to Germany's ambitious climate policy."

New investment

Despite these concerns LNG fuelled transport has grown rapidly and at the



Avenir LNG truck unloading operation

start of this year UK fuelling specialist Avenir LNG conducted Germany's first direct LNG unloading operation from an ocean vessel to truck. This new link in the supply chain allows imported LNG to be transferred directly to the European truck fuelling station network.

"This milestone underlines our commitment to ensure the supply of energy for our customers worldwide by providing the full small-scale supply chain from the major energy hubs to the end customers," Peter Mackey, CEO of Avenir LNG Limited, said at the time.

BayWa is also investing heavily in LNG infrastructure in the country and launched its latest fuelling station for trucks in June, opening a facility in the Zwickau district of Germany's eastern state of Saxony. Tahedl of BayWa explains that the firm currently has 12 LNG filling stations in operation in Germany and "expansion of the business in the field of LNG is planned".

"The next step is to build an LNG filling station in Gochsheim, Lower Franconia," Tahedl adds. "We are concentrating on Germany for the construction and operation of LNG filling stations. The stations of other companies are accessible via so-called cross-acceptances via BayWa fuel card: users can use this to access around 50 LNG filling stations in Germany, which corresponds to a market share of more than 40 percent."

Price stability

Looking ahead, several challenges are poised to shape the landscape for LNG-fuelled transport in Germany. Key among

these are price stability, fuel choice diversity, infrastructure development, and supply reliability.

Tahedl acknowledges these challenges, stating, "Our goal is to convert all BayWa LNG filling stations to bio-LNG by mid-2024 [but] the challenge is not just about obtaining sufficient quantities of bio-LNG, or competing with diesel - these are a given. The real challenge lies in restoring confidence in LNG / Bio-LNG amongst trucking companies, particularly smaller ones, and encouraging investment in LNG trucks."

Following massive price fluctuations over the past two years, potential buyers have been hesitant to commit funding to new projects but Tahedl remains optimistic, asserting that "the times of price fluctuations are over, as service station operators have much more stable supply chains at their disposal."

In Tahedl's view, there's no one-size-fits-all fuel or technology solution, and demand-oriented, multifaceted approaches will be necessary to tackle future mobility challenges. Technology openness is also likely to remain crucial to maximise flexibility within an evolving market.

"Everyone - small and large logistics companies alike - must be brought on board - then the journey to the energy future will succeed. With regard to LNG, most large logistics companies are currently converting their fleets to LNG trucks, which benefit monetarily from the CO2 reduction. It would be ideal if politicians could make LNG interesting for all freight forwarders - for example, by offering tax breaks," Tahedl concludes. ■



BayWa LNG fuelling station

Infrastructure challenges drive LNG manufacturing investment

New manufacturing capacity and unified industry development is needed to counter a lack of LNG fuelling infrastructure and drive widespread adoption, according to engineering group Celeros Flow Technology.

The slow acceptance of LNG as a short-sea shipping fuel is one key challenge as the race to achieve critical mass in key markets is balanced against tightening emissions regulation and increased cost.

"The greatest challenge today remains the availability of infrastructure and the cost to develop it," Iulian Maciuca, Global Market Vertical Sales Leader - Energy Transition, Celeros Flow Technology tells LNG Journal. "The LNG industry must start investing in a more comprehensive development plan to tackle issues with operational standards and skills development."

The call to action brings to light the critical issue, that without significant scaling up of infrastructure, costs for LNG adoption will remain high, acting as a barrier to progress, yet in this climate of high costs many investors remain cautious.

"Even with suitable frameworks in place, the lag between major ship owners deciding to move towards LNG and subsequently demonstrating success and other ship owners building or deploying ships could still be 5+ years," Maciuca adds. "A longer-term challenge will be the widespread adoption of LNG shipping fuel for deep-sea shipping, which requires further development of pricing models and infrastructure."

Bigger projects

Addressing the shortcomings in infrastructure availability and funding is

a must for the maritime industry, yet it also offers an opportunity for engineering and technological solutions to come to the fore. Maciuca highlights the potential here, noting that "the continued development of LNG bunkering infrastructure in North America, Asia and Europe, coupled with low gas prices and emission regulations, should encourage LNG's wider adoption of LNG."

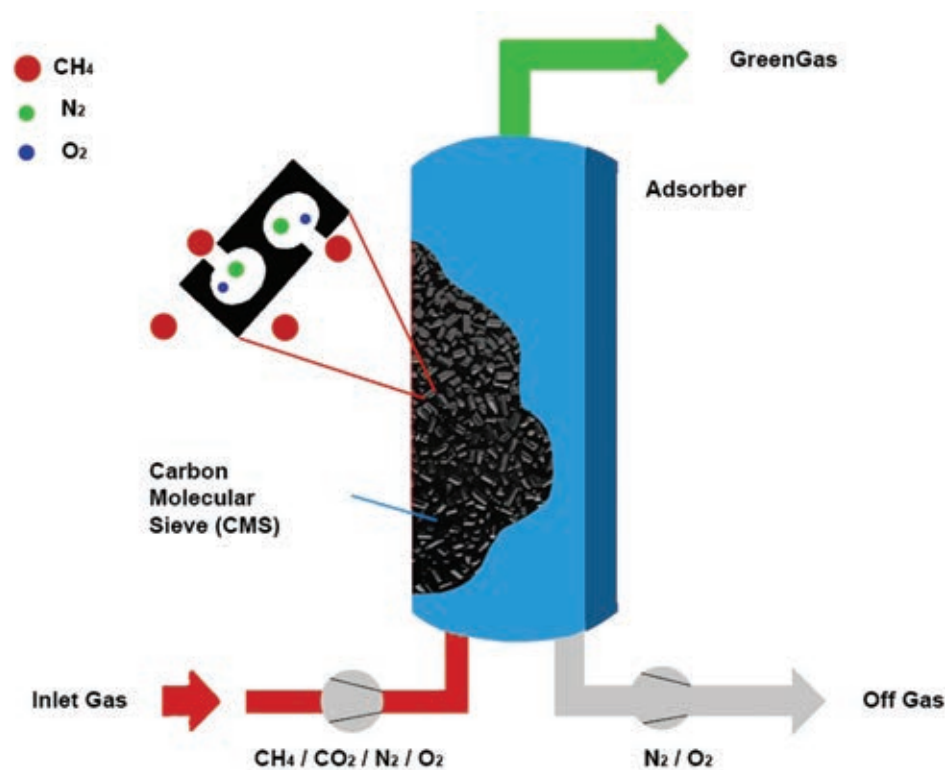
Taking proactive measures to address these challenges, Celeros Flow Technology is investing heavily in expanding and updating its manufacturing capabilities at its ClydeUnion Pumps facility in Glasgow. This investment draws on a rich 140-year history at the site and aims to enhance the company's capacity alongside research to develop new applications in biofuels and LNG storage applications.

"This will enable us to take on bigger projects and offer customers an even better service," Maciuca explains. "We are also committed to developing the workforce of the future through our new apprenticeship programme, which will offer 48 apprenticeships over six years."

Part of a portfolio of renowned brands headquartered in Charlotte, North Carolina, Celeros also operates: M&J Valve, GD Engineering, Plenty, Copes Vulcan, Dollinger, OFM Services, Airpel, and Vokes. Across these subsidiaries the firm aims to build a workforce with the skills to navigate the evolving energy



Celeros ClydeUnion Pumps facility in Glasgow



Schematic of PSA system

landscape, with a particular emphasis on the role of LNG as a crucial transitional fuel and the impending shift towards BioLNG.

Increased polishing

Looking ahead, Maciuca sees the shift to bioLNG gaining momentum as it can leverage "the mature technology of LNG" with the establishment of LNG infrastructure and LNG-propulsion ships but sees the ultimate switch to bioLNG bunkering as "strongly linked to the development of the bioLNG value chain."

Considerations such as the cost to end-users of adopting BioLNG blended with fossil-based LNG will therefore be crucial in determining the trajectory of BioLNG bunkering.

"As regards the handling and flow control aspects, there are no technical/hardware challenges because BioLNG has chemical properties practically identical to that of LNG," Maciuca notes. "However, in the BioLNG sector as a whole there are a few challenges still to overcome."

One example of this is the need for a "polishing plant" to reduce the CO₂ from biogas to less than 50ppm after the standard CO₂ removal steps. This is crucial because if CO₂ isn't reduced to this ultra-low level, it will freeze into dry ice during the biomethane liquefaction process. This can cause obstructions in

pipes, heat exchangers, and valves, among other things. Traditional biogas upgrading technologies, including membranes, Pressure Swing Adsorptions (PSAs), and water scrubbers, struggle to achieve such low CO₂ levels.

"Such polishing plants, usually based on PSA technology, significantly increase both the capital and operating expenditure of BioLNG production plants," Maciuca explains, adding that other technical challenges in developing a future BioLNG supply chain "include the need for better standardization of the liquefaction process technology and pressure storage optimization."

Despite these extra costs, the race towards widespread LNG adoption continues, and Maciuca predicts, "The switch to BioLNG will be strongly related to regulations and policy for GHG emissions reduction, because bio-LNG is considered to be a good candidate as a drop-in biofuel alongside LNG. If LNG does become a major marine fuel, the sector could see a switch to BioLNG bunkering over the next 10-20 years."

As the LNG and bioLNG landscapes continue to evolve, Celeros is proactively positioning itself for success and is keenly monitoring BioLNG infrastructure developments in Europe and APAC, as it sees these regions emerging as the drivers for change in the flow control solutions space.



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ESG regulation reshaping LNG bunkering finance

Financing for new LNG bunkering projects is undergoing rapid evolution as environmental, social, and governance (ESG) considerations become increasingly paramount, reshaping decision-making processes and outcomes.

This trend, which is mirrored in the broader energy industry, is pushing project financiers and investors to take a deeper look at the sustainability credentials of the projects they back and go beyond mere compliance to measure the long-term sustainability impact of their investments.

This shift in focus is not without implications for the cost dynamics of LNG bunkering projects. "As sustainability risks become increasingly central into investment decision-making processes (and as the cost of polluting soars amid increasingly stringent emission reduction requirements), the cost-competitiveness of LNG bunkering projects will start to decline significantly," Matteo Ilardo, Europe Analyst at RANE, tells *LNG Journal*.

In this changing landscape, projects that can demonstrate strong ESG credentials and innovative practices for reducing environmental impact are likely to attract easier access to financing and possibly at lower costs. The converse, however, could mean financing challenges for projects lacking in these areas, a reality that underscores the importance of integrating sustainability into LNG project planning and execution.

"If we try to identify winners and losers," Ilardo says, "projects with more robust ESG credentials and/or early adopters of innovative technologies/practices that reduce the environmental impact of LNG as a maritime fuel will be viewed more favourably by lenders and may benefit from comparatively easier access to

financing at potentially lower costs."

Lower emissions will obviously be a key metric, but Ilardo also points out that finance providers will increasingly demand to see reporting systems and evidence of effective climate and transition risk management. This is likely to include measures to prevent/reduce leakage, onboard carbon capture systems, and a clear pathway to increase use of bioLNG or sustainable synthetic alternatives.

Regulatory challenges

Long touted as a "bridge fuel" to a low-carbon future, LNG has faced relatively little competition in the past as it was normally compared to highly polluting marine fuel oil. However, as new alternative fuels come to market and ESG requirements for financing tighten the landscape is subtly shifting.

"Through the next decade at least (ignoring for a moment LNG's actual environmental impacts), LNG should nevertheless remain the most cost-effective option to meet compliance requirements considering the overall regulatory landscape in the EU as it has lower emissions than heavy fuel oil," Ilardo comments.

The EU's Sustainable Finance Disclosure Regulation (SFDR), introduced and revised in recent years, exemplifies the changing landscape. Enacted as of March 2021, the SFDR is a statutory instrument known as a Delegated Act containing more precise disclosure standards. The latest revisions were launched in February this year and



LNG bunker tank

tighten the requirements for new projects, outlining a range of new considerations for investment decision-makers.

"For now, SFDR mostly just creates extra administrative burden to meet new reporting and disclosure requirements," Ilardo explains, adding that these requirements fall on both the companies, who must assess and disclose their ESG performances, and investors who need to interpret these performances.

However, the SFDR is more than just a reporting requirement. It serves as an indicator of the future direction of travel and the potential risks and rewards this entails. As regulatory bodies around the world follow in the footsteps of the European Union, the impact of such regulations is likely to grow.

"The wider trend it speaks of and the uncertainty it brings carry far greater implications for shipping financing strategies," Ilardo notes.

Part of the EU's Sustainable Finance agenda, the SFDR was introduced by the European Commission as a core part of its 2018 Sustainable Finance Action Plan, which also includes the Taxonomy Regulation and the Low Carbon Benchmarks Regulation. Despite its current limited impact, it lays the groundwork for future regulatory change and it is clear that investors will need to adapt to the shifting landscape influenced by ESG considerations and regulations like the SFDR.

Increased competition

As the industry shifts, the competition for LNG projects is also growing. These projects are no longer competing only with traditional fossil fuels but also with alternative and renewable energy sources that are emerging as viable options. These include hydrogen, ammonia, biofuels, and potentially in the future, fusion and advanced battery technologies.

"While a costlier option, having LNG-fuelled ships retrofitted to run on zero-emissions fuels such as ammonia could reduce the risk for those vessels to become stranded assets as the industry moves towards decarbonization," Ilardo suggests. Such a transformation would mean a complete overhaul of the vessel's engine system, an expensive prospect, but one that could potentially secure the ship's operational viability in a zero-carbon future.

This also represents a new dimension of competition, as traditional and alternative fuels vie for dominance in the new era of sustainable shipping. LNG projects will need to showcase not only their immediate sustainability credentials but also their long-term compatibility with the shifting energy landscape.

Moreover, the competitiveness of LNG projects could be challenged by the increasing pressure on financial institutions to divest from fossil fuel projects. As the regulatory environment changes and as pressure from stakeholders and the public increases, banks and financial institutions may be more cautious in funding LNG projects.

The next decade will undoubtedly be pivotal in shaping the future of LNG's role in the global transport system, with the evolving financing landscape underpinned by stringent ESG considerations and regulatory changes like SFDR.

"Projects that do not score well...may face challenges in securing financing as lenders would perceive them as carrying higher potential for reputational damage and regulatory uncertainty," Ilardo cautions. As a result, LNG project developers and operators will need to adapt to these changes, proving their robust ESG credentials and demonstrating innovative sustainability practices to secure financing. ■



LNG bunkering at the Port of Rotterdam

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For the Record

ABU DHABI NATIONAL Oil CO (ADNOC) is to acquire a 30% equity stake in the Absheron gas and condensate field in the Caspian Sea.

ADNOC, together with State Oil Company of Azerbaijan (SOCAR) and TotalEnergies have agreed the deal.

Its investment into the Caspian region is aimed at creating a substantial growth position as ADNOC enters the international gas market, and reinforces the energy partnership between the United Arab Emirates (UAE) and Azerbaijan.

Upon completion of the purchase, which is subject to customary regulatory approvals, ADNOC will own a 30% participating interest in Absheron, with SOCAR and TotalEnergies holding the other 35% stake each.

Entering into a strategic partnership with SOCAR also elevates ADNOC's long-standing partnership with TotalEnergies, who until now had held a 50% share alongside SOCAR in Absheron.

This partnership will enable ADNOC to build a major foothold in a region, which has huge natural resources and significant growth potential, facilitating a route into international growth markets for gas in Europe and Central Asia.

The transaction also complements ADNOC's investment through Masdar to develop 10 GW of renewable energy capacity from solar, onshore and offshore wind, and green hydrogen in collaboration with SOCAR, supporting both nations' shared energy transition agenda.

Commenting on the transaction, Musabbeh Al Kaabi, ADNOC's Executive Director, Low Carbon Solutions and International Growth, said: "With global gas demand expected to steadily increase over the coming decades, ADNOC will continue to responsibly meet the world's energy needs by developing and producing natural gas from world-class assets such as Absheron.

"We believe this strategic partnership with SOCAR and TotalEnergies, unlocks the potential of the Caspian region for decades to come, and complements a broader energy collaboration between the UAE and Azerbaijan that will accelerate the growth of the global renewable energy

sector, as both countries take bold steps to transition towards a lower-carbon future," he said.

SOCAR President, Rovshan Najaf, added: "Azerbaijan's favourable investment climate offers conducive conditions for foreign investors in the energy sector. This particular deal underscores our commitment to strengthening the relations with our partners and reaffirms Azerbaijan's position as a reliable partner in the energy sector. We are excited to embark on this journey with ADNOC along with TotalEnergies, building upon our shared vision and complementary strengths."

"TotalEnergies is pleased to welcome ADNOC, one of its strategic partners, into the Absheron gas field, where production of the first phase started in early July, and which offers a significant further development potential to meet the growing gas demand," said Nicolas Terraz, President, Exploration & Production at TotalEnergies.

First gas from Absheron was delivered in early July, 2023.

AIR PRODUCTS, the LNG technology and equipment provider, is to make a significant investment to increase the winding capacity at its Port Manatee, Florida LNG equipment manufacturing facility.

Air Products said that this increase in capacity, coupled with new proprietary fabrication method innovations, will enable it to improve equipment delivery schedules.

Winding is a fabrication process for the internal components of coil-wound heat exchangers (CWHE) in which layers of tubes are wound around a central mandrel.

This initiative will increase the company's manufacturing capacity by almost 20%, adding to the previous expansion project completed in 2019 that increased the facility's original capacity by 60%.

Air Products' liquefaction process technologies and equipment are used to produce a majority of the worldwide LNG, the company claimed.

"This continued investment in our manufacturing capacity reflects Air Products' commitment to serving the needs of the LNG industry with unrivalled liquefaction process technology and equipment.

"As the use of LNG continues to increase around the world with strong demands for clean, reliable, and affordable energy, we are investing in our

business to ensure we meet the needs of our customers with proven reliability and on-time delivery of our world-leading technology," said Dr John Palamara, Air Products' General Manager, LNG.

Air Products opened its Port Manatee LNG equipment manufacturing facility in January, 2014 and rolled out its first LNG heat exchanger in September, 2016. Since then, over 20 CWHEs have been shipped.

For over 50 years, the company has manufactured LNG heat exchangers, which currently operate in over 100 LNG trains in 20 countries worldwide.

AIR PRODUCTS has signed contracts with Bechtel Energy to supply its LNG process technology and equipment to NextDecade's Rio Grande LNG (RGLNG) Phase 1 project.

This project will involve three natural gas liquefaction trains employing Air Products' liquefaction equipment with a total production capacity of around 17.6 mill tonnes per annum of LNG.

Air Products' coil-wound heat exchangers (CWHEs) and patented AP-C3MR LNG process technology were chosen for their proven reliability for large-scale LNG production, the company said.

The CWHEs will be manufactured at Air Products' LNG equipment manufacturing facility in Port Manatee, Florida, which is being upgraded.

"We are pleased to be selected to provide our LNG technology and equipment for the Rio Grande LNG project with its focus on sustainability. Air Products' LNG processes and equipment provide for low emissions and carbon intensity with the AP-C3MR LNG process being the industry standard and used to produce more LNG than any other process in the world. Additionally, this project enables us to further support the growing North American LNG market," said Dr Samir Serhan, Air Products' COO.

"We're proud to partner with Air Products, who like Bechtel bring a proven track record of excellence to the Rio Grande LNG project," said Paul Marsden, President of Bechtel Energy. "Using Air Products' state-of-the-art liquefaction technology, we look forward to delivering an exactly engineered, world-class plant that will enable NextDecade to produce lower carbon-intensive LNG, contributing to energy security and supporting the energy transition."

AUSTRALIAN STRIKES. Talks are currently underway to avert strikes at three Australian gas developments,

operated by Woodside and Chevron.

The threat of Australian oil and gas workers strikes resulted in European natural gas jumping above €40 for the first time since June during the middle of this week.

Benchmark futures soared as much as 40% this week, the most since March, 2022. Traders were concerned about a long-lasting strike, as Citigroup analysts predicted strikes could cause the price of European and Asian LNG contracts for January to double.

Workers at Chevron and Woodside Energy Group facilities in Australia are threatening to strike, which has the potential to disrupt LNG exports, tightening the global market.

The exact timing of the industrial action depends on the outcome of today's talks. Workers could stop by giving seven days' notice as early as next week, depending on progress at a meeting, the Australian Financial Review reported.

If there are supply disruptions, Asian buyers "are likely to bid up LNG imports" to replace Australian volumes, which would affect Europe as well, said Nick Campbell, a director at consultant Inspired Plc, talking with newswires.

Bullish sentiment has contributed to pressure on gas prices recently. This included a drop in LNG imports to Europe last month and increased flows from the region to Ukraine, which has spare storage capacity. Potential delays in Norway's seasonal maintenance also posed a risk.

It's also possible that this week's price surge could cause a wave of position covering by investors who had previously bet on further gas price declines. Similar moves had resulted in extreme volatility in June.

Investment funds' net-short positions in the benchmark Dutch gas futures (TTF) increased last week — after falling to the lowest level since January a week before, according to data released on Wednesday by market operator, Intercontinental Exchange.

"Significant demand destruction has been a key offset, but a narrowing global LNG pool leaves Europe exposed to price-competition for spare cargoes with Asia, particularly amid seasonally higher demand next winter," Patricio Alvarez, an analyst at Bloomberg Intelligence said.

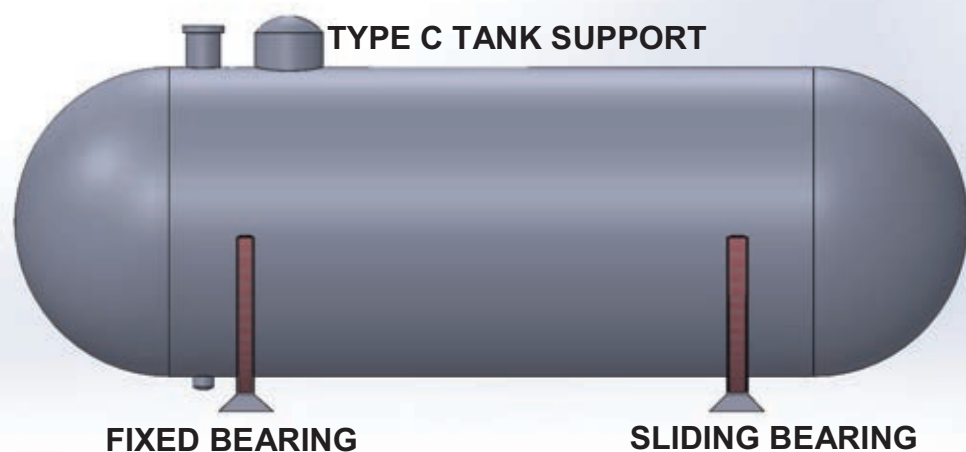
Industrial action could disrupt LNG operations at Woodside's North West Shelf facility, said Jake Horslen, a senior LNG analyst at Energy Aspects, adding that Japanese buyers would be most affected by any strikes in Australia.

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“Asian buyers would need to pull more strongly on Atlantic LNG to balance any shortfalls in the event of a strike, which would tighten supply fundamentals in Europe and the Atlantic,” Horslen said. “This creates upside risk for TTF.”

TTF front-month futures, Europe’s gas benchmark, traded 28% higher at €39.77 per MWh on Wednesday. The UK equivalent added 30%.

BAKER HUGHES, the US energy technology company and compressor provider for liquefaction plants, was awarded an order by Bechtel Energy to supply equipment for the Rio Grande export project in Texas being developed by NextDecade Corp. and partners.

Baker Hughes said the order would be booked and value revealed in the second quarter of 2023 to supply three Main Refrigerant Compressors (MRCs) for the Rio Grande facility to be constructed on the Brownsville Ship Channel.

The order from Bechtel comprises six Frame 7 gas turbines paired with 18 centrifugal compressors across Rio Grande’s first three LNG Trains in a

parallel configuration arrangement, providing more operational flexibility for a nameplate capacity of 17.61 million tonnes per annum.

“This order builds on our longstanding relationship with Bechtel and is a significant milestone in our partnership with NextDecade, supporting them on this key LNG project,” said Ganesh Ramaswamy, executive vice president of Industrial & Energy Technology at Baker Hughes.

“We are delighted that our proven and reliable technology solution will support the production of LNG in the US, which is crucial in balancing energy affordability, security and sustainability globally,” Ramaswamy explained.

Baker Hughes said the technology for Rio Grande LNG provides NextDecade with the “highest production levels for the plant’s design’ well-proven energy efficiency.

“Packaging of the turbine/compressor train, a unique Baker Hughes offering, as well as assembly of the compressors and testing of the Trains will take place at the Baker Hughes facilities in Italy,”

said the company.

NextDecade signed agreements in mid-June 2023 to team up with a New York investment fund Global Infrastructure Partners (GIP) and French major TotalEnergies to enable a final investment decision for the first three Rio Grande Trains.

TotalEnergies bought 5.4 million tonnes per annum of cargoes from the completed Rio Grande facility and agreed to acquire a 16.67 percent stake in NextDecade.

NextDecade, listed on the Nasdaq global exchange, also signed project framework agreement with GIP.

Houston, Texas-based NextDecade has ultimate plans and permits to produce up to 27 MTPA of LNG from five liquefaction Trains constructed in two phases at the facility on the Brownsville Ship Channel.

The agreements also further provide GIP and TotalEnergies options to invest in Rio Grande LNG Train 4 and Train 5 and options to invest in the planned carbon capture and sequestration project.

BERKSHIRE HATHAWAY
Energy group of US investor Warren

Buffett has acquired the 50 percent of the Cove Point LNG plant in Maryland it didn’t already own for \$3.3 billion from US utility Dominion Energy.

Dominion had a 50 percent non-controlling limited partner interest in Cove Point LNG and this is now owned by Berkshire Hathaway Energy, which already operates the facility.

Berkshire Hathaway Energy confirmed the acquisition for \$3.3Bln and said it would now own a 75 percent limited partnership stake in Cove Point LNG LP.

It added that a subsidiary of Brookfield Infrastructure Partners, the Canadian equity fund, owns the remaining 25 percent limited partnership interest in the Cove Point business.

Berkshire Hathaway Energy holds the Cove Point stake in the BHE Gas Transmission and Storage (BHE GT&S) unit, an interstate natural gas transmission and storage company headquartered in Richmond, Virginia and with operations in 10 states.

Dominion said its own total transaction value was in fact \$3.5Bln inclusive of transaction proceeds of

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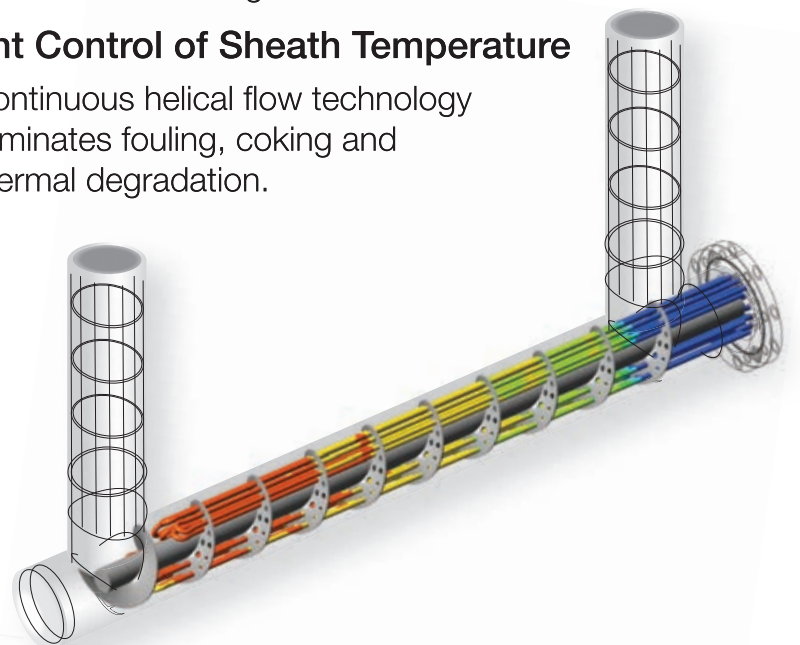
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\$3.3Bln and expected proceeds from the termination of related interest rate derivatives of \$200 million.

"Since 2002, Cove Point has been an excellent service provider to its international and domestic customers - linking global gas supplies with American customers, and American gas supplies with customers around the world," said Robert M. Blue, Dominion President and Chief Executive.

"However, this investment is non-core to Dominion Energy as we focus on our state-regulated utility operations," CEO Blue added.

"The sale demonstrates our commitment to the company's credit profile and represents an attractive exit from what has been an excellent investment for our shareholders," Blue stated.

Cove Point produces around 5.2 million tonnes per annum from a single Train and has tolling agreements with Gas Authority of India and Sumitomo Corp. and Tokyo Gas of Japan.

Buffett's company agreed to acquire its initial Cove Point stake in July 2020. That deal between Dominion and Berkshire Hathaway was valued at \$9.7Bln and included gas transmission and gas storage assets as well as the Cove Point stake. It also gave the Buffett company operatorship of the LNG export plant.

Buffett's company said at the time it was acquiring the Cove Point plant as it was one of only a limited number of such LNG export facilities in the US.

When agreeing to buy the Cove Point stake in July 2020 Buffett was also concluding his first big acquisition since 2015 and it happened to be in the natural gas and LNG business.

Buffett's BHE GT&S currently operates around 5,500 miles of transmission lines in the eastern US and 756 billion cubic feet of total natural gas storage, with 420 Bcf of working gas capacity.

BHE GT&S also provides LNG solutions through another of its units called Pivotal LNG and other processing and storage ventures.

BP, the UK energy major said in its second quarter 2023 results presentation that it expected to increase its oil and gas production this year, supported by four major project start-ups.

This is despite further delays to the Greater Tortue Ahmeyim (GTA) LNG project in Mauritania and Senegal.

bp revealed that it now expects GTA Phase 1 to start up during the first

quarter of 2024, up to six months later than planned.

GTA is one of nine major projects that bp hopes will boost its production by 200,000 barrels of oil equivalent per day by 2025.

The initial phase of this project is expected to deliver 2.3 mill tonnes per year of LNG, eventually producing up to 10 mill tonnes per year when fully operational.

In the main upstream sector, bp reported 2Q23 production of 1.37 mill boe/d, 7.5% higher than 2Q22. A further 903,000 boe/d of production was achieved from its gas segment, some 2.2% lower than the same period last year.

bp provided a more upbeat growth production forecast but was still concentrating on managing a longer term oil and gas output decline, as it transitions to low-carbon energy.

For example, in 2030, it forecast that its oil and gas production will be around 2 mill boe/d, about 25% lower than in 2019, rising to around 2.3 mill boe/d in 2025, compared with 2.25 mill boe/d in 2022.

For 2Q23, bp reported adjusted earnings of \$2.59 bill, down from \$8.45 bill in 2Q22, due to lower oil and gas prices and weaker refining margins.

The result was below analysts' expectations of around \$3.5 bill, largely on the back of the weaker refining margins and lower results from oil trading in the quarter, S&P Global Platts said.

Despite a weaker result result, bp remained upbeat over its underlying cash flow and raised its dividend by 10%, as well as announcing a further \$1.5 bill of share buybacks.

It also confirmed its capital expenditure target of \$16-18 bill in 2023, including inorganic spending.

"Our underlying performance was resilient with good cash delivery during a period of significant turnaround activity and weaker margins in our refining business," CEO Bernard Looney said in a statement.

Looney also said that bp was continuing to drive down the company's unit production costs helped by deflation in some of its key supply markets.

"Across the world, we're seeing things like steel costs coming down and some of the raw material costs coming down," Looney said in an earnings call. "Labour is an area where we do see inflation right across the world and that is unchanged and we do our best to offset that with some productivity improvements."

Looney advised that bp is currently seeing costs come down by around 20% year-on-year in its US shale unit.

CAPITAL PRODUCTS PARTNERS, owner of a fleet of LNGCs took a look at the LNG market's future in its second quarter results presentation.

Despite the seasonal softening of spot and term rates from the highs of the fourth quarter of 2022, demand for LNGCs remained strong, CPP said.

As of July 2023, the 174,000 cu m 12-month timecharter rate stood at \$140,000 per day.

Overall, analysts expected the term market to tighten as the winter period approaches, particularly for modern vessels, due to increased commodity demand.

Trade patterns were consistent, with the bulk of US LNG heading to Europe, thus maintaining last year's import levels.

Expected LNG trade growth is 4.4% for 2023, and 4.2% for 2024, reaching 432.9 mill tonnes per annum.

Corresponding tonne/mile trade growth is estimated at 4.5% for 2023 and 5.1% for 2024.

For the second quarter of this year, CPP reported a net income of \$7.4 mill, or \$15.4 mill before an impairment charge was taken into account from the agreed sale of a large bulk carrier.

Net income for 2Q22 was \$20.4 mill.

Including the interest attributable to the general partner and the allocation of net income to unvested units, net income per common unit for 2Q23 was \$0.36 or \$0.75 before the impairment charge, compared to net income per common unit of \$1 in 2Q22.

This decrease was primarily attributable to increased interest expense and finance costs, resulting from the rise in the Partnership's total average debt and the increase in the weighted average interest rate, compared to the same period of 2022; the rise in operating expenses, as a result of the net increase in the average size of the fleet and costs incurred during scheduled maintenance of some of the vessels.

Total revenue for the quarter was \$88.5 mill, compared to \$74 mill during 2Q22.

This increase was primarily down to the revenue contributed by newbuilding vessels acquired by the Partnership, including the LNGC 'Asterix I', as well as a rise in the daily rate earned by two of the Partnership's LNGCs, which came into effect on 1st September, 2022.

CPP's contracted revenue backlog stood at \$1.8 bill, with over 63% of the revenue coming from LNGCs with seven charters.

CENTRICA, the UK owner of the British Gas utility business and a liquefied natural gas importer, has signed a long-term LNG supply agreement with US export plant developer Delfin Midstream Inc.

The Sale and Purchase Agreement is for 1.0 million tonnes per annum for 15 years on a free-on-board basis whereby Centrica uses its own ships.

The Delfin Deepwater Port floating production venture is to be located 40 nautical miles off the coast of Louisiana.

This agreement will see Centrica take delivery of around 14 LNG cargoes per year.

"The deal, with a market value of \$8 billion, marks an additional move by Centrica to build further resilience in the UK's energy security," said the UK company with capacity at National Grid's Isle of Grain terminal near London.

The SPA follows a preliminary accord signed between Centrica and Delfin in August 2022.

Operations and the first LNG are expected to commence at the Delfin Deepwater Port in 2027.

"We are pleased to be a foundation customer of the Delfin LNG project, an innovative floating liquefied natural gas infrastructure solution with a shorter construction time frame and hence expedited export of natural gas from the US," said Cassim Mangerah, Managing Director for Energy, Marketing & Trading at Centrica.

"Building on our 15 years of experience with LNG, this deal is truly market leading. It provides Centrica with access to flexible supply which is fully aligned with EM&T's overall strategy to grow the trading and optimising business across LNG, gas, power and renewables," Mangerah added.

Delfin Chief Executive Dudley Poston said he was delighted to finalize the supply deal with Centrica.

"There is growing global demand for long-term, scalable LNG supply. With the off-take capacity for Delfin's first FLNG vessel now sold, we continue to move towards a final investment decision and bring this important project forward," stated Poston.

Delfin in June 2023 also entered into a strategic investment agreement with Japanese shipping company Mitsui OSK Lines to help advance the project and

bring in even more expertise.

Under the deal, MOL will make an investment in Delfin and a MOL representative will join Delfin's Board of Directors.

The Delfin floating LNG project is based on the deployment of vessel-borne liquefaction facilities with other moored production and storage vessels.

Delfin has said it would require minimal additional infrastructure investment to support up to four FLN vessels producing around 13.3 million tonnes per annum.

Delfin also owns the UTOS pipeline, the largest natural gas pipeline in the Gulf of Mexico.

The Delfin developers have already been awarded a deepwater port licence by the US Maritime Administration (MARAD) and the project has been approved by the US Coast Guard.

Delfin is additionally seeking to construct, operate and maintain certain onshore metering, compression, and piping facilities located onshore in Cameron Parish in Louisiana.

The Centrica LNG deal with Delfin

follows a three-year supply agreement with Norwegian company Equinor for the supply of more pipeline gas to the UK each winter season through to 2024.

It also comes as Centrica has reopened the Rough gas storage facility in the North Sea since October 2022.

"Rough now provides half of the UK's total gas storage capacity with the potential to store over 50 billion cubic feet of gas, enough to heat almost 10 percent of UK homes throughout winter," said Centrica.

CHENIERE, the US' largest LNG exporter, said that for the second quarter and first half of this year it generated revenues of around \$4.1 bill and \$11.4 bill, respectively, compared to around \$741 mill and a negative \$124 mill for the corresponding 2022 months.

In addition, the company reported net income of about \$1.4 bill and \$6.8 bill, consolidated adjusted EBITDA of around \$1.9 bill and \$5.5 bill, and distributable cash flow of about \$1.4 bill and \$4.3 bill, respectively for the two periods.

Cheniere also raised its full year 2023

consolidated adjusted EBITDA guidance to \$8.3 bill - \$8.8 bill and full year 2023 distributable cash flow guidance to \$5.8 bill - \$6.3 bill.

During the 2Q23 and 1H23, Cheniere pre-paid about \$201 mill and \$1.1 bill, respectively, of consolidated long-term debt, repurchased an aggregate of around 2.3 mill shares and 5.4 mill shares of common stock for around \$337 mill and \$788 mill, respectively, and paid a quarterly dividend of \$0.395 per share of common stock attributable to 1Q23 on 17th May, 2023.

In 2Q23, Cheniere's subsidiaries signed new long-term contracts totalling up to around 76 mill tonnes of LNG with expected deliveries between 2026 and 2049:

"The outstanding financial, commercial and operational results announced are a product of our team's commitment to safe, efficient and strategic execution throughout the second quarter," said Jack Fusco, Cheniere's President and CEO.

"In addition to the safe and successful completion of our planned maintenance turnaround at Sabine Pass, our team

achieved several key milestones on construction and development across our growth projects at both sites, as well as building significant commercial momentum, all of which supports the continued growth of our market-leading LNG platform and further evidences the long-term role of our reliable, cleaner-burning LNG in the global energy mix," he said.

The company explained that the net income increases were primarily due to changes in fair value of Cheniere's derivative portfolio of about \$782 mill and \$5.5 bill for 2Q23 and 1H23, before tax and non-controlling interests, compared to a negative \$728 mill and a negative \$4.2 bill of changes in the previous year's periods.

These were partially offset by decreased total margins per MMBtu of LNG delivered, higher provisions for income tax, as well as higher net income attributable to non-controlling interests in both periods.

Consolidated adjusted EBITDA decreased by about \$671 mill and \$225 mill for the periods, compared to 2Q22 and 1H22, respectively.

This fall was primarily due to

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decreased total margins per MMBtu of LNG delivered driven by a higher proportion of volumes sold under long-term contracts, lower total volumes sold into short-term markets, and lower international gas prices.

The decreases were partly offset by an increased contribution from certain portfolio optimisation activities.

As of 30th June, 2023, Cheniere's total consolidated available liquidity was about \$12.7 bill. Cash and cash equivalents were \$4.5 bill, of which \$1.8 bill was held by Cheniere Partners.

In addition, the company had restricted cash and cash equivalents of \$640 mill, \$1.3 bill of available commitments under the Cheniere revolving credit facility, \$1.3 bill of available commitments under the Cheniere Corpus Christi Holdings working capital facility, \$3.3 bill of available commitments under CCH's term loan credit facility, \$1 bill of available commitments under the CQP revolving credit facility and \$671 mill of available commitments under the SPL revolving credit facility.

CHENIERE Energy has revealed its efforts to link US energy supply with global markets.

The efforts were highlighted in the 'Power of Connection', the company's 2022 Corporate Responsibility report and comes at a time when energy security and energy transition goals have become key for countries worldwide.

Cheniere's report underlined the company's progress on environmental, social and governance (ESG) matters, including the company's safety-first culture, commitment to the communities in which it operates, environmental management and strategic climate initiatives.

"In 2022, the power of Cheniere's connection to the world was made clear. We connected abundant North American natural gas to markets where it was needed most and did so in a safe and responsible manner, helping to ensure hundreds of millions of people around the world had secure and reliable energy," explained Jack Fusco, Cheniere's President and CEO.

"We also advanced key initiatives that enhanced our environmental transparency

and improved the sustainability of our product, including our science- and evidenced-based emissions programmes and our sixth consecutive year of safety performance improvements," he added.

Last year's highlight included:

- Bolstering Europe's energy security during an energy crisis, with over 460 LNG cargoes, or more than 70% of LNG produced by Cheniere, being delivered to the continent.
- Achieving record safety performance, with a Total Recordable Incident Rate of 0.05 and Lost Time Incident Rate of 0.00, for a sixth consecutive year of performance improvement.
- Commencing the issuing to all long-term customers of Cargo Emissions Tags, which provide estimated greenhouse gas emissions associated with each cargo produced at Cheniere's plants.
- Initiating Quantification, Monitoring, Reporting and Verification (QMRV) projects with midstream partners and at the company's liquefaction facilities, complementing the company's upstream and shipping QMRV programmes launched in 2021.

- Joining the Oil and Gas Methane Partnership 2.0, the United Nations Environment Programme's flagship oil and gas methane emissions reporting and mitigation initiative.
- Expanding the weight of ESG metrics to 30% in our annual performance scorecard that applies to all employees.
- Tallying more than 15,000 volunteer hours by employees and contributing \$1 mill to historically underserved Communities.

CROWN LNG Holdings, a developer of harsh weather condition LNG terminals, is to float on the New York Stock Exchange (NYSE) through a merger with a blank check firm.

The merger will value the combined company at \$685 mill.

Oslo-based Crown will combine with Catcha Investment Corp, a special purpose acquisition company (SPAC) backed by tech entrepreneurs, Patrick Grove and Luke Elliott, the two companies said in a statement.

Catcha Investment Corp had raised \$275 mill through its initial public

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offering (IPO) in February, 2021.

Once this deal is completed, Crown will be listed on the NYSE.

Crown is currently developing two infrastructure projects in India and Scotland.

The company plans to use the proceeds from the SPAC to take final investment decisions (FIDs) and invest in new markets, including Vietnam and Canada, CEO, Swapan Kataria, said.

Crown's terminals deploy gravity-based structures (GBS) that utilise a large concrete construction, which sits on the seabed and houses storage tanks and infrastructure for LNG importing/exporting.

Being offshore makes these terminals cheaper and easier to operate than land-based LNG infrastructure, the company claimed.

The terminals are located at fixed offshore points, which makes it easier for LNGCs to connect up in harsh weather, compared with FLNG terminals that can be affected by rough seas.

Founded in 1999 by Grove and Elliott, Catcha has invested in several technology and media companies in Southeast Asia and Australia. However, this investment marks Catcha's first venture into the energy sector.

A cross border Asia and US Goodwin legal team advised Catcha Investment Corp with its agreement with Crown LNG Holdings to form a business combination that would result in the company becoming a US publicly listed company.

DEUTSCHE REGAS has fully booked the long-term regasification capacity awards for the proposed Phase II of the 'Deutsche Ostsee' energy terminal in Mukran.

"We are very pleased that the capacities offered could be fully allocated. The strong response from customers from Germany and in particular, Eastern European neighbouring countries, shows that they are looking at security of supply from the gas infrastructure at the energy terminal in Mukran and the OPAL/EUGAL pipelines," said Dr Stephan Knabe, Chairman of the Supervisory Board of Deutsche ReGas.

"With these and the existing capacity lies the bulk of the supplies for the planned 'Deutsche Ostsee' energy terminal in Mukran. The great demand confirms emphatically the assessments of the gas supply of the (German) Federal Network Agency and the federal government," he said.

In the recently completed binding open season procedure for the planned energy terminal, in co-ordination with the Federal Network Agency, an annual regasification capacity of 4 bill cu m of natural gas was fully booked for at least 10 years on 7th August.

More quantities regarding further award processes, in particular for capacities that can be booked at short notice, will be offered at a later date, the company said.

DEUTSCHE UMWELTHILFE (DUH), a German environmental group, has filed a lawsuit against a privately operated LNG terminal on the Baltic coast.

DUH claimed that Deutsche ReGas' Lubmin terminal causes noise pollution and is too small to be exempted from environmental permits.

Deutsche ReGas chartered the FSRU 'Neptune' from TotalEnergies to serve the terminal in Lubmin, which was officially inaugurated by German Chancellor, Olaf Scholz last January.

DUH said it had filed a lawsuit with the German Federal Administrative Court demanding Deutsche ReGas revoke its terminal operation licence, saying the permit had significant shortcomings.

"Neither the shuttle traffic (used to access the 'Neptune'), nor the resulting environmental impact on the sensitive Greifswalder Bodden have been subject to environmental permits," DUH said in a statement, adding that the project's noise pollution values were different than the company's estimates during the approval process.

DUH also said the terminal's contribution to Germany's energy supply security was marginal, citing the LNG volume imported through the terminal in the first half of the year, which was far below the company's estimate for the project's capacity.

Deutsche ReGas imported the equivalent of 7 terawatt hours in the first half of this year, which would only correspond to around 0.7 bill cu m per year, DUH claimed.

The company has estimated the project's annual capacity at 5.2 bill cu m.

"What is currently happening in Lubmin and what has been approved are two different things," DUH Managing Director, Sascha Mueller-Kraenner, said in a statement.

Newswires said that neither Deutsche Regas nor the Federal Ministry were available for comment.

ENAGAS, the Spanish gas grid and terminals operator, increased profits in the first six months of 2023 helped by one-time items as LNG activities increased to help the European Union's natural gas shortfall and the utility also boosted future capacity on the Trans-Adriatic Pipeline from Azerbaijan.

The company's net profits jumped to €172.8M including a net gain of €42.2M from the sale of a stake in the Morelos Pipeline in Mexico and an €133.8M adjustment relating to the Tallgrass Energy operations in the US.

"The Spanish Gas System operated 100 percent availability, Spain increased its total gas exports by 55 percent in the first half of the year and ship reloading has increased by 67 percent, contributing to Europe's security of supply," Enagás stated.

Italy was a main destination for LNG re-exports to Europe while pipeline gas connections increased by 33 percent to 28.6 terawatt hours. The company already trans-ships LNG to the EU from terminals like Barcelona.

"Spain's underground natural gas storage facilities are at 98 percent capacity, an all-time high for the month of July," it added.

The Madrid-based company reported first-half revenues of €450.5M, a drop of 5.8 percent from €472.2M registered in the first six months of 2022.

Enagás said it was still on track to meet the full-year earnings target of between €310M and €320M.

Enagás added that in July it closed the agreement announced in January to acquire an additional 4 percent stake from European trader AXPO in the Trans-Adriatic Pipeline (TAP) for €168M, taking its stake in the pipeline bringing Azerbaijan gas to Europe up to 20 percent.

During the first half, Enagás contracted additional transport capacity of 1.2 billion cubic metres from TAP, in addition to the current 10 Bcm starting in 2026.

During an eventful first half, Enagás noted the start-up of the El Musel LNG trans-shipment terminal in the Port of Gijón in northwest Spain and the assignment of its logistics services to the European utility Endesa.

"The terminal has already received two LNG shipments and will start commercial operation on July 31 after a capacity allocation process that has aroused great interest," the company added.

Another highlight was the agreement with regional gas company Reganosa through which Enagás acquired its 130-

kilometres of strategic gas pipelines in northern Spain and Reganosa agreed to purchase a 25 percent stake in the El Musel regasification terminal.

"The closing of the deal was expected in the second half of this year," said the company.

In LNG activities outside of Spain, Enagás became an industrial partner with a 10 percent stake in the Hanseatic Energy Hub consortium planning an onshore LNG import terminal at the German North Sea port of Stade.

ENI, the Italian energy major, delivered the first commercial liquefied natural gas shipment to the nation's fourth import terminal at the Tuscan port of Piombino.

The Piombino terminal is owned by Italian utility SNAM and comprises the 154,950 cubic metres capacity floating storage and regasification unit (FSRU), the "Golar Tundra".

The vessel had received its commissioning cargo on May 8 and is now fully operational with 2 billion cubic metres of gas deliveries expected in 2023 and double that next year.

The Algerian-owned LNG carrier "Ougarta", with 171,800 cubic metres of capacity, delivered the shipment from the Arzew plant in Algeria, according to shipping data.

The cargo was lifted on July 5 from Arzew and delivered to the Tuscan port on July 7.

"This additional delivery confirms the value of gas as a reliable energy source, capable of providing a reliable response to growing energy demand," said Eni.

Eni has close ties with Algeria and the state energy company Sonatrach and has extensive oil and gas assets in the North Africa country as well as supply deals for LNG and pipeline gas deliveries.

"The partnership with Sonatrach and Algeria plays a central role in Eni's strategy to diversify supplies and expand its gas portfolio, with investments in fast-track projects that will increase available volumes for the Italian and European markets," Milan-based Eni added.

Eni, which has LNG production projects under development in countries like Mozambique and the Republic of Congo noted that it was targeting contracted LNG volumes of over 18 million tonnes per annum in 2026, more than double that of 2022.

SNAM purchased two FSRUs as part of Italy's plan to support the European Union's replacement of Russian pipeline gas with more LNG deliveries.

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The utility, whose name comes from Societa Nazionale Metanodotti (National Pipeline Company), already operates the onshore Panigaglia LNG facility near Genoa. The Panigaglia terminal has been in service since 1969 and deliveries doubled in 2022.

SNAM also has a controlling stake in the “FSRU Toscana” moored off the Italian port of Livorno.

The Piombino FSRU and the second SNAM FSRU when deployed in 2024 would give Italy five terminals including Panigaglia, the “FSRU Toscana” and the Adriatic LNG facility, a gravity-based structure on the East Coast.

The second SNAM FSRU is the 170,000 cubic metres capacity “BW Singapore”.

While the vessel has already been purchased by SNAM, it is currently bound by a charter agreement with a third party until November 2023.

According to SNAM the “BW Singapore” could be deployed eventually in the upper Adriatic Sea, close to the Port of Ravenna where there is already a small-scale onshore LNG fuel terminal and other petroleum storage infrastructure.

ENI, the Italian energy giant suffered a 41% drop in its second quarter Q2 2023 adjusted profit before tax to €3.7 bill.

However, this represents a highly robust outcome given the 30% fall in crude oil prices and with gas price and refining margins down over 60%, the company said.

In particular, pro-forma adjusted EBIT, including the operating margin of equity accounted entities, was €4.2 bill versus €7 bill in 2Q22.

This performance reflected resilient exploration and production (E&P) earnings, featuring growing production, another very strong contribution from Global Gas & LNG Portfolio (GGP), plus contributions from Sustainable Mobility and Plenitude sectors.

In the gas sector, GGP earned €1.1 bill of adjusted EBIT in 2Q23, compared to around breakeven in the same period of 2022, resulting in a very good first half EBIT outcome of €2.5 bill, Eni said.

GGP’s 2Q23 result was mostly driven by specific benefits relating to contractual triggers, plus renegotiations and settlements related to previous periods that are a feature of the business.

In addition, in a market environment still characterised by some degree of volatility and arbitrage opportunities, the continued asset optimisation and trading have also contributed to the quarterly performance, Eni said.

Second quarter adjusted net profit attributable to Eni shareholders was €1.94 bill, which was impacted by the weaker scenario, but significantly offset by underlying business performance.

The Group’s adjusted tax rate, which did not include Italian extraordinary contributions, was under 50%, despite inclusion of the UK energy profit levy.

First half of 2023 adjusted net profit attributable to Eni shareholders was €4.84 bill.

In 2Q23, Group adjusted operating cash flow before working capital at replacement cost was €4.2 bill, exceeding outflows related to organic capex of €2.6 bill and dividend payments (€0.7 bill).

For 1H23, adjusted cash flow was €9.5 bill, resulting in an organic free cash flow of €3 bill.

Eni’s Board approved the distribution of the first of the four tranches (resulting in a total annual dividend of €0.94) of the dividend for the fiscal year 2023 of €0.24 per share outstanding at the ex-dividend date as of 18th September, 2023.

Eni also issued the updated operational and financial guidance.

Specifically for GGP, adjusted EBIT guidance was raised to €2.7 bill - €3 bill for the year, versus the previous guidance of €2 bill - €2.2 bill.

EQT Corp., the leading US natural gas producer in the Appalachia Shale Basin, reported second-quarter losses due to falls in output and prices, though advanced its direct liquefied natural gas prospects by signing a heads of agreement for tolling at the Lake Charles LNG export project in Louisiana for 1 million tonnes per annum.

EQT posted second-quarter losses of \$67 million versus profits of \$894M in the same three months of 2022.

The Pittsburgh-based company’s balance sheet showed that net cash provided in the quarter from operating activities increased to \$437M compared with \$230M in the prior-year quarter.

EQT, which has shale-gas operations in the Marcellus and Utica formations of western Pennsylvania, Ohio and West Virginia, said quarterly production dropped to 471 billion cubic feet equivalent from 502 Bcfe in the second quarter of 2022.

EQT’s LNG accord is with US pipelines and terminals company Energy Transfer, which signed three HOAs in July 2023 for volumes, two of them with global commodities firm Gunvor and with US company Chesapeake Energy Marketing.

The third HOA is with EQT with

proposals for a tolling arrangement over a term of 15 years.

EQT added in its earnings statement that the company’s average realised prices declined to \$2.01 per thousand feet of gas equivalent versus \$3.21 per Mcfe in the prior-year quarter.

“Our drilling and completions teams performed extremely well during the quarter, setting multiple internal and world records,” said EQT President and Chief Executive Toby Z. Rice.

“These achievements underscore EQT’s best-in-class execution capabilities and our continuous drive to push the envelope when it comes to achieving peak performance,” Rice added.

“We also signed an HOA for 1 million tons per annum of Gulf Coast tolling capacity, marking the initial implementation of our risk-adjusted LNG strategy,” Rice explained.

“We are excited to begin unleashing EQT’S reliable low-emissions natural gas on the global stage,” Rice stated.

“Our scale, peer-leading inventory depth and environmental attributes uniquely position EQT to facilitate energy security and emissions reductions objectives both domestically and abroad,” Rice declared.

Rice said that on the capital returns front, EQT took another material step toward achieving its balance sheet goals by retiring \$800M of incremental debt during the quarter.

“We have now retired a total of \$1.9 billion of debt since initiating our shareholder return framework in late 2021, which has driven a step-change improvement in our leverage profile,” Rice added.

EQT maintained its expectation of 1,900 Bcfe to 2,000 Bcfe of total sales volume for 2023.

The company also maintained its expectation of \$1.70Bln to \$1.90Bln of capital expenditures, excluding non-controlling interests, for 2023, including \$1.40Bln to \$1.53Bln planned for reserve development.

EQUINOR. The Norwegian Government has approved Snøhvit partners’ plans for the Equinor operated Snøhvit and Hammerfest LNG plant’s futures, subject to certain conditions.

The plans call for onshore compression to be activated from 2028, and electrification of the plant from 2030.

“The Snøhvit owners are pleased that the Government has now approved Snøhvit Future, a project that will strengthen Norway’s position as a reliable,

long-term supplier of gas produced with very low greenhouse gas emissions.

“The project ensures long-term operation and export from Melkøya towards 2050. We fully understand that there have been many factors to consider, and we will recommend the partnership to meet the conditions for the authorities’ approval,” said Geir Tungesvik, Norwegian energy major Equinor’s Executive Vice President for Projects, Drilling & Procurement.

The authorities postponed the start of electrification by two years, to 2030, compared with the original schedule. In the interim, the plant will continue to run on gas turbines. The gas turbines are set to be maintained for back-up power from 2030 to 2033, which will be assessed by 2028 at the latest.

Hammerfest LNG’s electrification plan will see the replacement of the gas turbines with electricity from the grid. This will reduce CO2 emissions from the plant by around 850,000 tonnes annually.

“The project generates substantial spin-offs and jobs both in Finnmark, Northern Norway and nationally. Around 70% of value creation in the development phase is expected to go to Norwegian companies. Regional employment is estimated at almost 1,700 person-years of employment, mainly in Finnmark,” Tungesvik added.

The government has also approved Statnett’s licence application for a power cable (420 kV) between Skaidi and Hyggevatn, and Equinor’s licence application for a power cable (132 kV) between Hyggevatn and Melkøya.

Snøhvit licensees are Equinor Energy (36.79%), Petoro (30%), TotalEnergies EP Norge (18.40%), Neptune Energy Norge (12%) and Wintershall Dea Norge (2.81%).

FIRST GEN Corp., the utility and energy group in the Philippines delivering the southeast Asian nation’s second floating LNG import terminal, concluded an international tender deal for an LNG commissioning cargo with Shell Eastern Trading.

First Gen said that Shell Eastern Trading, the Singapore-based unit of Shell plc, would supply one LNG cargo of around 154,500 cubic metres within the required delivery window of August 1 to September 30.

The cargo will be supplied on a delivered ex-ship (DES) basis whereby Shell provides the LNG carrier.

“The cargo will facilitate the gassing-up and cooling-down of the ‘BW Batangas’ FSRU and be transferred to the storage

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tanks on board the ‘BW Batangas’ at Subic Bay,” explained First Gen in a statement filed with the Philippines Stock Exchange.

“The ‘BW Batangas’ will then return to the FGEN LNG Terminal in Batangas Bay to complete commissioning activities,” First Gen explained.

“The overall LNG volumes to be purchased by FGEN will subsequently be utilized by FGEN’s existing gas-fired power plants in the First Gen Clean Energy Complex in Batangas City,” it added.

The move towards commercial operations of the second floating LNG import terminal follow the successful start-up of the first facility earlier in 2023 using the floating storage unit (FSU) vessel “Ish”.

That FLNG terminal is servicing another Filipino utility, SMC Global Power, after being developed by Atlantic, Gulf & Pacific Company (AG&P) to supply SMC Global’s 1,200-megawatt gas-fired power plant at Ilijan.

The First Gen and SMC Global ventures are aimed at easing gas shortages at Filipino power plants that have worsened over the past two years.

FGEN has started up First Gen LNG Corp. to run the import terminal and the vessel moored for the first time on July 7 at the terminal facilities in Batangas.

“The ‘BW Batangas’ is expected to remain in the Batangas City area until it is required to depart for Subic Bay to collect the first LNG cargo that will be delivered by Shell Eastern,” added First Gen.

FGEN noted that it has a portfolio of four existing gas-fired power plants with a combined capacity of 2,017 megawatts that have been supplied for many years with gas from the Malampaya field, the indigenous offshore gas field now nearing depletion.

FGEN LNG has developed its project and executed a five-year time charter party for the “BW Batangas” to provide LNG storage and regasification services as part of the project.

“The FGEN LNG Terminal will accelerate the ability to introduce LNG to the Philippines to serve the natural gas requirements of existing and future gas-fired power plants of third parties and FGEN’s affiliates,” the company said.

“FGEN believes the FGEN LNG Terminal will play a critical role in ensuring the energy security of the Luzon Grid and the Philippines,” it added.

The company also previously announced the signing of a memorandum of understanding with Prime Infrastructure Capital Inc. (Prime Infra) of

the Philippines for the proposed lease and operation of the FGEN LNG Terminal.

“No definitive agreements have been signed but FGEN LNG and Prime Infra continue to develop a Gas Aggregator Framework of which the FGEN LNG Terminal is a primary element,” First Gen said.

“The Gas Aggregator Framework is intended to make it possible to blend currently declining volumes of indigenous Malampaya gas with imported LNG to ensure a least-cost solution for consumers, enhance energy security and provide a competitive power generation market, while exploration activities leading to the commercial development of new indigenous natural gas fields are undertaken,” concluded the First Gen statement.

The Malampaya gas field discovered in 1989 is nearing depletion and existing supply licences run out in February 2024.

Malampaya supplies five power plants in the province of Luzon, the Ilijan plant, the 1,200-MW St Rita power plant, the 500-MW San Lorenzo facility, the 414-MW San Gabriel plant and the 97-MW Avion facility.

GASUNIE, the Dutch utility and co-owner of the Rotterdam and Eemshaven LNG import facilities and a stakeholder in the onshore German regasification facility planned for Brunsbüttel, has named Willemien Terpstra as the next Chief Executive and Chairwoman of the Board.

Under the Dutch nomination system for state-backed companies, Terpstra has received the blessing of the Gasunie Supervisory Board, the Works Council at Gasunie as well as from the Minister of Finance of the Netherlands.

The new CEO will take up her position on March 2024 for a term of four years.

She is currently the Vice President for Decarbonization with LyondellBasell Industries NV, the multinational chemicals company incorporated in the Netherlands.

Terpstra will be succeeding Han Fennema who earlier in 2023 said he would be leaving the company after serving nearly 10 years at the helm.

Fennema will be stepping down as CEO on 1 November 2023 and Gasunie Chief Financial Officer Janneke Hermes will act as Interim Chair of the Executive Board until Terpstra steps in as CEO.

In Gasunie’s most recent results to the end of March, it was CFO Hermes who explained that more than 85 percent of the additional revenue in 2022 fell within the scope of the regulatory powers of the

Authority for Consumers and Markets (ACM) in the Netherlands and the Bundesnetzagentur (BNetzA) in Germany.

“These costs were almost €300M higher in 2022 than in 2021, bringing the result after taxation to €555M (€311M in 2021),” added Gasunie.

Under the regulations of these supervisory bodies, much of the additional revenue will be returned to Gasunie network users over the next few years in the form of lower tariffs.

“When the revenue to be offset is deducted from the revenue achieved, the underlying revenue amounted to €1.51Bln (€1.37Bln in 2021),” explained CFO Hermes.

Gasunie added in that earnings statement that it had fully written off its stake in the Gazprom Nord Stream natural gas pipeline system.

“We are very pleased with the (planned) arrival of Willemien Terpstra,” said Gasunie Supervisory Board Chairman Pieter Duisenberg.

“She is extremely motivated to further shape Gasunie’s social task of bringing about the energy transition,” explained Duisenberg.

“Her knowledge, experience and competencies make her perfectly suited to lead the strategic development of Gasunie and the implementation of our agenda for the future concerning hydrogen, heat, CO2 and natural and green gas,” the Chairman added.

The Supervisory Board said it saw her as “an enthusiastic successor” to Han Fennema to whom Gasunie “owe tremendous gratitude”.

“Under his expert, passionate, down-to-earth leadership, Gasunie has developed from a gas Transmission System Operator into a green energy infrastructure company. With this, Han has laid the foundation for the next chapter in Gasunie’s story,” the Board stated.

Gasunie’s soon-to-be new CEO Terpstra said she was “extremely motivated” to work together with all Gasunie staff on “further shaping the energy system of the future”.

She said she would try for a balance between “sustainability, reliability and security of supply” in the business.

“Gasunie plays a crucial role in the energy sector and has an ambitious vision of the future concerning the energy supply for the Netherlands and its neighbouring countries,” she stated.

Terpstra was born in 1970 in Hallum in the north of the Netherlands and is married with four children.

She studied business administration at Nyenrode Business University, a private institution in the Dutch town of Breukelen.

She also obtained a US MBA at Emory University in Atlanta, Georgia.

Terpstra started her career working at ARCO Chemical, a predecessor company and now part of LyondellBasell in Rotterdam, and filled numerous senior management positions in various business units at the multinational.

GUJARAT GAS’ board has approved the Indian energy company’s equity investment of Rs100 cr in GSPC LNG Ltd, the company said in regulatory filings.

Gujarat Gas said that the acquisition will help to create better synergy and integration in the gas value chain.

The Gujarat Government holds a majority 43.5% share, Gujarat State Petroleum Corp (GSPC), which is also a promoter of Gujarat Gas, holds 1.07% and Gujarat State Petronet (GSPL) holds 2.34% share in GSPC LNG.

After the investment, Gujarat Gas’ stake in GSPC LNG will rise to 7.87%, the company said.

GSPC LNG is involved in LNG receiving, storage and regasification. The company currently operates on a tolling model and offers its regasification services to prospective users for a fee.

In addition, GSPC offers LNG tanker truck loading services, which supports the development of small-scale LNG business to customers who are not connected to pipelines.

GLL’s LNG terminal can also undertake the reloading of LNGCs.

The company’s revenue from operations stood at Rs147.54 crore in FY2021/22 and at Rs232.07 crore in FY2022/23.

GUNVOR Group, the Swiss-based global commodities firm and liquefied natural gas trader, has expanded its shipping fleet by chartering four modern LNG carriers being constructed in China for Celsius Tankers.

Celsius, with offices in Copenhagen, Monaco and Hong Kong, has ordered the ships from the China Merchants Heavy Industry (Jiangsu) (CMHI) shipyards.

With this transaction, the Celsius LNG fleet now numbers 18 ships each with around with 180,000 cubic metres capacity.

Celsius has formed a joint venture with an affiliate of ArcLight Capital Partners, the midstream infrastructure investor, to fund two of the LNG vessels.

Gunvor will have a significant equity interest in the other two newbuilds, the



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first for any independent LNG trading company.

“All four vessels will enter long-term time charters with Clearlake Shipping, a subsidiary of Gunvor. Delivery will take place during 2026 and 2027,” said the commodities firm.

“Celsius and Gunvor are committed to pushing boundaries for available design improvements and to reducing environmental impact,” they added.

Gunvor said the newbuilds would use enhanced designs for reliquefaction capacity and optimized hull shapes.

The commodities firm said the vessels ordered from China will be similar to the “ultra eco” Celsius ships on order from South Korean yards with improvements for emissions and reduced fuel consumption.

The new vessels will be fitted with ME-GA propulsion, the low-pressure, dual-fuel, two-stroke engines from MAN Energy Solutions, the Denmark-based subsidiary of the German engine-maker.

It sits alongside MAN’s well-established high-pressure M-Type Electronically Controlled-Gas Injection (ME-GI) engines.

The ME-GA, according to MAN, offers LNG carriers and other vessels an alternative way to cut greenhouse-gas emissions and minimize air pollution.

“We are very pleased to further expand our relationship with Celsius while demonstrating our commitment to the industry, both as charterers and now through our first major equity investment in LNG carriers,” stated Gunvor’s Co-Head of LNG, Kalpesh Patel.

“Importantly, these vessels are in line with Gunvor’s commitment to cut Scope 1 and 2 emissions by 40 percent by 2025,” added Patel.

Celsius Chairman, Jeppe Jensen said he was very pleased to continue the growth of the LNG fleet and to expand the relationship with Clearlake and Gunvor.

“The ‘Celsius Copenhagen’, our first LNG carrier, was delivered to Clearlake in 2020, and the relationship with Clearlake has further strengthened with this latest transaction,” added Jensen.

HENRY HUB In late July, Henry Hub spot price rose 10 cents to \$2.61/MMBtu, compared with the previous period.

In addition, the August 2023 NYMEX contract increased 6.2 cents, from \$2.603 per MMBtu to \$2.665/MMBtu.

The 12-month strip price averaging August 2023 through July 2024 futures contracts climbed 11.8 cents to \$3.259 per MMBtu. According to the US Energy

Information Association’s (EIA) weekly report.

International natural gas futures price movements were mixed during the reporting week.

According to Bloomberg Finance, weekly average front-month futures prices for LNG cargoes in East Asia fell by 10 cents to an average of \$11.13 per MMBtu.

Title Transfer Facility (TTF) natural gas futures delivery increased by \$1 to a weekly average of \$9.67 per MMBtu. By comparison, in the week ending 27th July, 2022, East Asia stood at \$39.96 per MMBtu and \$53.64 per MMBtu at TTF.

Some 24 LNG vessels (seven from Sabine Pass, four each from Cameron and Freeport, three each from Calcasieu Pass and Corpus Christi, two from Elba Island, and one from Cove Point) with a combined LNG lifting capacity of 86 bill cu ft left the US between 20th and 26th July, according to shipping data provided by Bloomberg Finance.

Net injections into storage totalled 16 bill cu ft for the week ending 21st July, compared with the five-year (2018–2022) average net injections of 31 bill cu ft and last year's net injections of 18 bill during the same week.

Working natural gas stocks stood at 2,987 bill cu ft, which is 345 bill (13%) more than the five-year average and 573 bill cu ft (24%) more than last year at this time.

KINDER MORGAN and Howard Energy Partners have announced expansions of their Eagle Ford projects designed to deliver more LNG feed gas and domestic supplies to US Gulf Coast markets.

Kinder Morgan said that the fast-track ventures are to be completed as early as the fourth quarter of 2023 and to be capable of delivering up to 2 billion cubic feet per day of natural gas on the transportation systems.

The Kinder Morgan Tejas Pipeline unit and Howard Energy Partners (HEP), through its joint venture Dos Caminos, have received the necessary binding commercial agreements to expand their respective Eagle Ford pipeline systems and facilities.

Dos Caminos is a joint venture between HEP and an affiliate of Eagle Ford Midstream LP.

Kinder Morgan’s Tejas is constructing a 67-mile, 42-inch pipeline commencing at the existing Kinder Morgan Texas Pipeline (KMTP) compressor station near Freer in Texas and connecting to the Tejas pipeline system near Sinton in Texas.

Dos Caminos is separately constructing an 62 mile, 36-inch pipeline, as well as compression, treating and dehydration facilities commencing near HEP’s existing midstream pipelines and facilities in Webb County, in Texas to the KMTP compressor station in Freer.

“We are pleased to be working with Dos Caminos and HEP to provide Gulf Coast market access to Eagle Ford natural gas supply,” said KMI’s Natural Gas Midstream President Tom Dender.

“This approximately \$251M expansion project, referred to as the Eagle Ford project in our January backlog, will be a critical supply link for the impending growth being discussed with power generators, industrial customers and LNG exporters along our Texas intrastate pipeline network,” stated Dender.

Mike Howard, Chief Executive of HEP, said he was pleased to have started his company’s expansion project.

“We have a long history of helping producers in Webb County and surrounding areas find access to premier natural gas markets,” Howard explained.

“We believe this expansion, in conjunction with Kinder Morgan’s expansion will be an important next chapter in that history,” he added.

Interested shippers have been invited to obtain more information by contacting Larry Bell, Chief Commercial Officer for Intrastate Pipelines in KMI’s Midstream group, or the Dos Caminos Expansion Project at HEP.

MCDERMOTT, the US energy and liquefied natural gas project engineering company, was awarded an offshore pipeline and installation contract from Shell subsidiary Sarawak Shell for the Selasih natural gas fields pipelay and heavy-lift project off the coast of Sarawak in East Malaysia to help underpin LNG production.

Shell is the operator for the exploration acreage and new fields in the F22 and F27 Selasih area which are part of the Malaysia LNG extension and production sharing contract (PSC).

Nearly all the gas produced offshore Sarawak is supplied to Malaysia LNG and to the gas-to-liquids (GTL) plants in Bintulu.

Analysts note that Shell is still very active in Malaysia and is involved in oil and gas offshore Sabah and Sarawak under about 16 PSCs in which its interests range from 20 percent to 85 percent.

Offshore Sabah, the UK-based major’s local subsidiary operates two producing

oil fields, including the Gumusut-Kakap deepwater field, with Shell’s interest 29 percent, and the Malikai deepwater field, Shell interest 35 percent.

However, Shell is even more active offshore Sarawak where it is the operator of eight producing gas fields with Shell’s interest 50 percent.

Among the projects included were the 2019 abandonment of depleted wells for the Serai field and the Saderi fields.

Shell then signed agreements for the extension of the Malaysia LNG PSC using other sources.

Under the scope of the latest contract with Shell, McDermott said it would perform transportation and installation services for two pipeline segments and one section of flexible pipelay.

McDermott will also provide pre-commissioning works on all infield pipelines and perform the structural installation of three jackets and topsides.

“This is the fourth project we are executing for Shell under the Subsea and Floating Facilities project portfolio, demonstrating the strength of our long-standing relationship,” said Mahesh Swaminathan, McDermott's Senior Vice President for Subsea and Floating Facilities.

The project management and engineering will be executed in Malaysia, leveraging the local expertise.

Offshore installations will be performed using the “DLV2000”, McDermott's versatile heavy lift and pipelay vessel.

“To ensure efficient project delivery, we will draw upon the expertise from our Kuala Lumpur centre, which supports the global execution of subsea and offshore projects,” stated Swaminathan.

mitsui & Co, Japan’s commodity trading house, has signed sales and purchase agreements (SPAs) for its equity lifting volumes from NOVATEK’s Arctic LNG 2 project.

A company spokesperson told S&P Global Commodity Insights that the first train was due to come online later this year.

"We are working toward starting production from the first train [of the Arctic LNG 2 project] in 2023," said the spokesperson, adding that the company has signed SPAs that correspond to its equity lifting volumes from the project.

He declined to elaborate on buyers and supply destinations.

Mitsui joined the Arctic LNG 2 project in 2019 through a subsidiary - Japan Arctic LNG - which secured substantial



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financial support from state-owned Japan Organisation for Metals and Energy Security (JOGMEC), as part of Japanese efforts to ensure stable LNG supply and diversify import sources.

Mitsui handles LNG marketing for Japan Arctic LNG's 10% equity offtake volume of 1.98 mill tonnes per year from the project.

On 20th July, NOVATEK CEO, Leonid Mikhelson, said that the first LNG from Arctic LNG was still expected before the end of 2023, with the ramp-up to design capacity being undertaken between January and March 2024.

"We are going to meet the deadlines of the first line's launch scheduled for 2023," Mikhelson said at a ceremony to mark the shipment of the first train - a gravity based structure (GBS) - from Murmansk to the project site on the Gydan peninsula.

Once fully operational, Arctic LNG 2 will have three production trains, each with a capacity of 6.6 mill tonnes per year, giving a total capacity of 19.8 mill tonnes per year.

The second and third trains are expected online in 2024 and 2026, respectively.

NOVATEK has a 60% stake in the project, together with TotalEnergies (10%), Chinese companies CNPC and CNOOC (10% each) and Japan Arctic LNG (also 10%).

NAKILAT, the Qatari LNGC fleet operator, reported a net profit of QAR775 mill for the first half of this year, a 6.1% rise compared to the same period in 2022.

Profits from joint venture companies, operating in LNG transportation and shipyards, increased by 18.6%.

Through a combination of strategic initiatives, and effective cost management, Nakilat said that it had successfully navigated through a challenging business landscape, delivering sound results for its shareholders.

This profitability reflects the company's ability to adapt to changing global market dynamics and business environment, the company claimed.

Eng Abdullah Al-Sulaiti, Nakilat CEO, said: "This success is a testament to Nakilat's outstanding operational excellence in energy transportation and maritime services, optimising resource allocation, and fostering a culture of continuous improvement.

"We remain committed to delivering exceptional value to our clients to stay at the forefront of our industry. As the demand for clean energy shipping

capacities continue to rise worldwide, Nakilat is fully dedicated to meeting the long-term requirements for diversified, secure, and reliable energy transportation solutions.

"By doing so, it will enable us to further enhance the company's value to our esteemed customer base, expand our asset portfolio, scale operations, and explore new business opportunities, ultimately driving sustainable growth and creating additional value for all stakeholders involved," he said.

With the world's largest LNGC fleet comprising 69 LNGCs, Nakilat also manages and operates one FSRU, plus four very large LPG carriers (VLGCs).

In addition, the company provides large shiprepair and offshore fabrication services, shipping agency services, as well as towage and other marine support services, through its joint ventures - Nakilat-Keppel Offshore & Marine (N-KOM), Qatar Fabrication Company (QFAB), Nakilat SvitserWisjmulder (NSW), and Nakilat Agency Company (NAC).

NATURGY Group, the Spanish global utility company with LNG supplies from the US and Russia and natural gas and utility businesses in Spain and South America as well as renewables projects in Europe, the US and Australia, reported a first-half surge in revenues and net profits.

The company posted a 39 percent increase in gross earnings of €2.85 billion (\$3.15Bln) and a 39 percent jump in net profits to €1.04Bln while debts declined by 16 percent to €10.75Bln in the first half to the end of June.

The group's regulated businesses made up 43 percent of the total EBITDA, amounting to €1.26Bln.

"Grid activity in Spain was primarily impacted by reduced remuneration and demand, particularly in the gas sector, due to milder weather conditions and lower industrial demand," said the company.

In what it calls "Energy Management" Naturgy posted gross earnings of €1.09 billion compared with €580M in the prior-year quarter, an increase of 89 percent.

In this segment, Naturgy's LNG and Markets income increased to €858 million from €385M.

"The LNG & Markets segment benefited from the reappraisal of the financial hedging ineffectiveness accounted for in 2022, while Spanish thermal generation benefited from higher margins," Naturgy explained.

LNG and Markets was formed from the integration of the former Markets &

Procurement and International LNG business segments at Naturgy.

"Against a backdrop of lower sales and gas prices, the segment benefited from the termination in 2022 of less profitable sales commitments in the EU and Iberia, and the expiry of negative financial hedging contracts present in 2022," said Naturgy.

Total sales from its LNG activities dropped by 21.1 percent compared with the same six months of 2022.

Naturgy also receives pipeline gas on the Medgaz pipeline from Algeria of around 9 billion cubic metres per annum. That contract with Sonatrach, the Algerian state-owned energy company, was renewed in October 2022.

Its contracted LNG volumes come from the US, Russian, Oman, Nigeria and the global markets when required.

The company has a long-term contract of 2.5 million tonnes per annum of cargoes from Yamal LNG in Russia until 2038. The LNG is delivered on an ex-ship (DES) basis whereby Russian LNG operator Novatek pays for the shipping.

The Spanish company also has 3.5 MTPA of supplies on a free-on-board (FOB) basis from Cheniere's Energy's Sabine Pass plant until 2038 and 1.5 MTPA FOB from Cheniere's Corpus Christi facility until 2040.

Other volumes come from the 1.65 MTPA per annum contract at Oman LNG on a delivered basis until 2025 under a contract signed when Naturgy was known as Union Fenosa Gas.

Naturgy additionally has 2 MTPA of DES cargoes from Nigeria until 2024.

"These results continue the positive trajectory we presented to the market for 2022 and exceed our goals for operational efficiency, cash generation, investment execution, and debt reduction," explained Francisco Reynés, Chairman and Chief Executive of Naturgy.

"Furthermore, they showcase the robustness of our industrial plan, which is driving our energy mix transformation through strategic investments while solidifying our position as a key player in ensuring energy supply security in Spain," he added.

In other activities, Naturgy said power and gas activity in Latin America experienced positive effects from tariff updates and other factors.

These businesses include gas supplies in Brazil, Chile and Mexico, a power business in Panama and gas and electricity utilities in Argentina. Naturgy is also engaged in LNG activities in the Caribbean, including the US territory of

Puerto Rico.

Earnings from the region increased 5.3 percent to €1.26Bln during the six months, mainly driven by its Networks Latam division with a 33 percent rise in income to €529M as it benefited from tariff updates which were catching up with inflation from prior periods.

In Chile and Brazil, gas demand was reported by Naturgy to have decreased by 1.5 percent and 34 percent respectively.

However, in the rest of the Latin American countries where the group operates, there was some growth in gas and electricity demand.

There was a rise of 1.9 percent in gas demand in Mexico, 9.6 percent in gas and 3.9 percent in electricity demand in Argentina and a 5.9 percent increase in electricity use in Panama.

Naturgy is also in the process of boosting its output from renewables in Spain and overseas with multiple new projects.

It generated EBITDA of €235M during the period from renewables, an increase of 34.3 percent from the same six months of 2022. The company is in the process of increasing wind and solar capacity in Spain.

NEW FORTRESS ENERGY (NFE). During the second quarter of this year, the US energy developer installed the first rig for its Fast LNG project FLNG 1 at Altamira, Mexico.

FLNG 1's operational delivery is targeted for the third quarter of this year.

In its second quarter earnings release, NFE confirmed that FLNG 2 and 3 were already under construction and all long-lead items have been procured, with expected operations starting in the first quarter of 2025.

The company also revealed that it expected an increase in earnings and decrease in capex in 2H23 through 2024, as \$3.2 bill of invested capital projects is placed online over the next 90 days.

However, the 2024 capex will decline to \$250 mill reflecting the completion of a number of projects.

Illustrative adjusted EBITDA guidance for the full year 2023 was revised to \$1.6 bill, due to lower than expected cargo earnings and timing of infrastructure projects coming online, while full year 2024 guidance was restated at \$2.4 bill.

For the second quarter of this year, NFE reported adjusted EBITDA of \$246 mill and \$686 mill for the first half of the year.

Net income was \$120 mill in 2Q23 and

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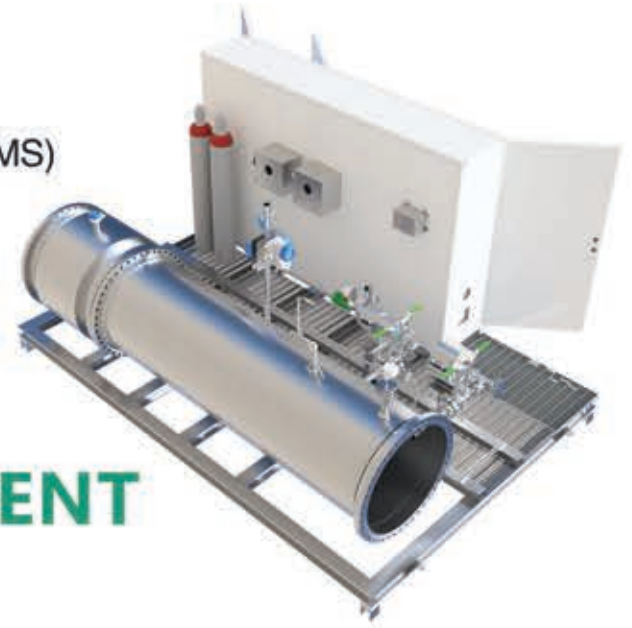
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\$272 mill in 1H23. Adjusted earnings per share of \$0.58 on a fully diluted basis was recorded for 2Q23 and \$1.48 in 1H23.

In addition, during 2Q23, NFE completed the Barcarena terminal with first gas on schedule for the end of this year upon the arrival of the FSRU, which is currently being converted from an LNGC.

As for financing, NFE explained that in June and July, it closed \$200 mill of asset level debt for the instalment of power generation at the Puerto Rico complex at an interest rate of SOFR + 3.00%.

In August, NFE received credit approval for \$575 mill of asset level debt for the construction of the Barcarena power plant at a blended interest rate of 9.2%, while the company closed a \$400 mill term loan with Morgan Stanley at an interest rate of SOFR + 3.50%.

NEXTDECADE Corp., the developer of the Rio Grande LNG export project in Texas, has formally taken a final investment decision to build the first three liquefaction Trains and export facilities with anticipated full capacity of around 27 million tonnes per annum with funding from the US, the Middle East and Asia.

The FID statement followed financial and volumes agreements announced in June 2023 for the first phase of the Rio Grande project signed with French oil and gas major TotalEnergies, which has taken an equity stake in NextDecade and bought 5.4 MTPA of volumes from the first three Trains, and the US equity fund Global Infrastructure Partners (GIP).

Joint venture financial commitments for \$5.9 billion have now been made by the investors previously unmentioned in public by NextDecade, the Abu Dhabi-based firm Mubadala Investment Company, the investment fund of the emirate of Abu Dhabi in the United Arab Emirates, and GIC Private Limited, the Singaporean sovereign wealth fund.

New York-based GIP and the Abu Dhabi and Singapore wealth funds are referred to be NextDecade in the statement as the “Financial Investors”.

“The \$18.4Bln project financing for Rio Grande LNG Phase 1 is the largest greenfield energy project financing in US history and underscores the critical role that LNG and natural gas will continue to play,” said NextDecade.

In conjunction with the FID, the NextDecade venture issued a notice to proceed (NTP) to US LNG engineers Bechtel Energy for the lump-sum turnkey engineering, procurement and construction contracts (EPC) for the first phase of the

Rio Grande plant to produce 17.2 MTPA (higher than the 16.2 MTPA aggregate) of LNG from the initial three Trains.

“The final EPC cost at NTP is approximately \$12.0Bln. The remaining expected project costs (are) to be covered by the financing,” said the statement.

Financing facilities were also being created in the form of a closed senior secured non-recourse bank credit of \$11.6Bln, consisting of \$11.1Bln in construction term loans and a \$500M working capital facility.

The venture has already closed a \$700M senior secured non-recourse private placement notes offering.

“Achieving FID and issuing NTP on RGLNG Phase 1 is a landmark event reflecting years of hard work and dedication by NextDecade’s employees, shareholders, construction partners, equipment suppliers and customers,” said Matt Schatzman, NextDecade’s Chairman and Chief Executive.

“I want to specifically recognize the Rio Grande Valley community, the Port of Brownsville and the countless leaders and officials at the local, state, and federal levels that have supported us throughout the development of RGLNG Phase 1,” added Schatzman.

As part of the staged investments, the venture has already committed to spend around \$283 million in Phase 1, including \$125M of pre-FID capital investment.

Other project expenses mentioned by NextDecade are owner’s costs and contingencies of about \$2.3Bln, dredging for the Brazos Island Harbor Channel Improvement Project, conservation of more than 4,000 acres of wetland and wildlife habitat area and the installation of utilities at a cost of \$600M and interest during construction and other financing costs of about \$3.1Bln.

“We are delighted with this final investment decision that enables us to launch the construction of this new LNG liquefaction plant in the United States, to which TotalEnergies will contribute its expertise in the development of major LNG projects,” said Patrick Pouyanné, Chairman and CEO of TotalEnergies.

“This project gives TotalEnergies access to competitive LNG thanks to its low production costs. LNG from this first phase will boost TotalEnergies US export capacity to over 15 MTPA by 2030, and thus our ability to contribute to European gas security, and to provide customers in Asia with an alternative form of energy that is half as emissive as coal,” explained Pouyanné.

The Port of Brownsville also welcomed the decision to build the Rio Grande plant that will create around 5,000 jobs in the construction sector alone.

“The future of the Rio Grande Valley’s economy begins at the Port of Brownsville,” said Brownsville Navigation District Chairman Esteban Guerra.

“On behalf of the port and our Brownsville Navigation District Board of Commissioners, we congratulate NextDecade on their final investment decision announcement for the development of the Rio Grande LNG facility,” added Guerra.

“This dynamic project, the largest private infrastructure investment in the State of Texas, will provide good-paying jobs and economic growth to the region,” Guerra declared.

NYK LINE, the Japanese shipping company, is continuing to expand its liquefied natural gas-powered fleet of vessels now numbering over 800 owned and operated ships, including 86 LNG carriers.

NYK Line said it has just taken delivery of the “Freesia Leader”, the company’s fifth LNG-powered pure car and truck carrier (PCTC) in the fleet.

“The vessel arrived at the Japanese Port of Nagoya in Aichi Prefecture for a commemorative delivery ceremony that was held to celebrate the vessel’s arrival and to pray for its safe voyaging,” said NYK Line.

“After arriving at Nagoya, the vessel received LNG fuel from the bunkering ship ‘Kaguya’, operated by Central LNG Marine Fuel Japan Corp., a joint venture involving NYK and other companies,” the statement added.

The ship is the third of four LNG-fuelled PCTCs constructed for NYK by the Chinese shipbuilders, China Merchants Jinling Shipyard (Nanjing) Co.

“The new PCTC was named after the freesia flower in the hope of realizing and passing on a prosperous global environment through eco-friendly transportation,” NYK declared.

The “Freesia Leader” will be engaged in the transportation of finished vehicles for the Toyota Motor Corp. and other customers seeking to use cleaner shipping for their logistics operations.

NYK said it aimed to take delivery of a total of 20 new LNG-powered PCTCs by 2028 and is also leading Japanese efforts to boost LNG fuel for shipping.

The shipping company and several partners took delivery in 2020 from the

Kawasaki Heavy Industries Sakaide shipyard of the “Kaguya”, which was Japan’s first commercial LNG bunkering vessel.

The “Kaguya”, with 3,500 cubic metres of capacity, is owned by the joint venture Central LNG group comprising NYK, the utility JERA Co. Inc. and another shipping company Kawasaki Kisen Co. (K-Line), as well as Toyota Tsusho Co., the logistics arm of the Toyota trading house.

The bunkering vessel has since 2020 carried out many LNG fuel operations in Japan for the growing number of LNG-powered vessels, including ferries as well as open ocean ships, being delivered or on order.

ORIGIN ENERGY, the soon to be taken over Australian oil and gas player, has reported that revenue from its share of the Australia Pacific LNG (APLNG) project fell 12.3% in the fourth quarter of its fiscal year.

The drop was due to softer prices, the company said.

Oil and LNG prices have fallen from their 2022 peaks, as slower-than-expected economic growth in key consumer, China and concerns about global economic prospects, cloud the outlook for fuel demand.

Australia’s second largest power producer said its share of revenue from APLNG, a joint venture with ConocoPhillips and Sinopec, fell to A\$611 mill (\$406.62 mill) for the three months to 30th June, compared with A\$697 mill a year earlier.

Origin, which is nearing the conclusion of its A\$15.35 bill takeover by a consortium led by Canada’s Brookfield, said the average realised price for LNG in the quarter was \$12.24 per MMBtu, down from \$14.24 per MMBtu, a year earlier.

Production in the quarter, however, was higher than the previous period, as more optimisation activities were carried out following the impacts of wet weather, the company said.

Total production from Origin’s share of APLNG came to 48.3 petajoules (PJ) for the quarter, higher than 45.4 PJ in the previous quarter and 46.9 PJ a year ago.

PEMBINA PIPELINE Corp has formed a partnership with the Haisla Nation to develop the proposed Cedar LNG project.

This project is a 3 mill tonne per annum FLNG facility to be strategically positioned to leverage Canada’s abundant natural gas supply and British

Columbia's growing LNG infrastructure to produce cost-competitive Canadian LNG for overseas markets.

Cedar LNG is expected to achieve higher prices for Canadian producers, contribute to lower overall emissions, and enhance global energy security. Given that the project will be based on an FLNG, it is expected that Cedar LNG will have lower construction and execution risk.

In addition, powered by BC Hydro, Cedar LNG is expected to be one of the greenest LNG facilities in the world.

It is expected to be structured as a tolling business providing a low risk, long-term cash flow stream, and strengthening Pembina's financial resilience.

On 6th July, 2023, Cedar LNG received an LNG Facility Permit from the BC Energy Regulator. This is another major regulatory milestone following on from the receipt of the Environmental Assessment Certificate from the British Columbia Environmental Assessment Office and a pipeline permit for a connection to the Coastal GasLink Pipeline.

In addition to the Memorandum of Understanding (MoU) with ARC Resources, Cedar LNG has signed incremental non-binding MoUs with investment grade counterparties for long-term liquefaction services and is fully subscribed in relation to the project's total capacity, the project's developer claimed.

Work towards the signing of definitive commercial agreements is ongoing. Cedar LNG chose to progress a second front end engineering design (FEED) process for the FLNG vessel in late 2022 and has been waiting for work to progress to the same stage as the original FEED.

In conjunction with detailed commercial discussions and ongoing negotiations between LNG Canada and Coastal GasLink, this has resulted in the anticipated final investment decision (FID) being revised to the fourth quarter of 2023, Pembina said.

Pembina's 2Q23 results included earnings of \$363 mill and adjusted EBITDA of \$823 mill. At the same time, Adjusted EBITDA guidance for the full year was narrowed to \$3.55 bill - \$3.75 bill from the previously \$3.5 bill to \$3.8 bill.

PETRONET. India's gas importer hopes to extend its long-term gas import deal with Qatar at lower prices, compared with those offered in recent deals to China and Bangladesh.

Indications are that the deals were concluded at a slope of 12-13% to Brent, said AK Singh, Petronet's CEO.

"We are hopeful that we will get better deals than others," Singh told a press conference to announce its quarterly earnings.

Petronet is negotiating with Qatar to extend its long-term deal to beyond 2028, Singh said, adding that the company has until the end of this year to complete the renewal.

At present, Petronet buys 8.5 mill metric tonnes per annum of LNG from Qatar, with pricing based on a slope of about 12.67% of Brent, plus a fixed charge of about 50 cents per MMBtu.

Petronet operates two LNG import terminals located on the country's west coast - the 17.5 mill tonne per annum Dahej terminal and the 5 mill tonne Kochi facility.

The company hopes to commission a third LNG import plant in the shape of a 4 mill tonnes FSRU at Gopalpur in eastern Odisha state by mid-2026.

Petronet LNG recently reported a 13.02% year-on-year (yoy) increase in its consolidated net profit for the April/June quarter at 819.29 crore amid softening gas prices.

However, revenue from operations fell 18.28% to 11,656.38 crore during the first quarter of its fiscal year 2024, compared to 14,263.82 crore earned during the corresponding quarter of FY23.

Growth in net profit, was aided by 20.25% fall in its expenses on lower LNG prices.

In a regulatory filing, the company said: "Pursuant to the relevant provision under long term regasification contracts entered by the company, income towards 'Use or Pay charges' of 848.92 crore in FY 2022/23 for calendar year 2022 has been recognised on account of lower capacity utilisation by its customers. The balance confirmation against payment due/advance adjusted is yet to be received.

LNG volumes processed by the company in total during 1Q FY2024 was 230 trill BTu, against the previous and corresponding quarters of 185 TBTu and 208 TBTu, a growth of 24% and 11%, respectively.

RELIANCE Industries, the Indian conglomerate and a leading energy company with domestic gas volumes backing the nation's LNG imports, reported a decline in fiscal first-quarter earnings while strategic oil and gas operations advanced amid likely continued volatility in gas markets.

Reliance said overall revenue for the first quarter to the end of June 2023

amounted to 231,132 crore Indian rupees (\$28.18 billion) a fall of 4.7 percent year-on-year from the 242,529 crore rupees (\$29.57Bln) reported in the same quarter of 2022.

Reliance, based in Mumbai, is a group involved in textiles, retail, telecoms and media and other business as well as oil, gas and chemicals.

Quarterly net profits at Reliance were 18,258 crore rupees (\$2.22Bln), which was 5.9 percent lower than the 19,443 crore rupees (\$2.37Bln) posted in the April to June period of 2022 and 14.0 percent down from the previous quarter.

The company said overall net profits were lower because of higher financing costs and depreciations.

Reliance highlights included the start-up of a third gas field in the Krishna Godavari Basin KG-D6 block on the East Coast of India.

The three on-stream fields operated by Reliance and in partnership with BP of the UK are the R-Cluster, Satellite-Cluster and the third one recently started is the MJ field.

The KG-D6 block's production for Reliance is expected to increase by 50 percent from last year's levels to reach 30 million standard cubic metres per day in the coming months.

"Oil and gas revenues grew to 4,632 crore rupees (\$564.7M) and EBITDA grew to about 4,015 crore rupees (\$489.5M)," said Sanjay Roy, head of Hydrocarbons Exploration and Production at Reliance in a post-earnings conference call.

"So that's a 46.7 percent growth year-on-year, or 5.6 percent growth on a quarter-on-quarter basis. This is mainly led by an increase in production over the quarter. With the commissioning of the MJ production, we have now pretty much ramped up production to slightly over 28 million standard cubic metres per day, as well as producing close to about 18,500 barrels of condensate per day," Roy explained.

"In terms of realizations, the ceiling price in the last half was about \$12.42 (million British thermal units) and in this quarter it was about \$12.12. Additionally, we have seen that the global gas prices, particularly the LNG prices, due to demand factors have come down considerably, so the realization was around \$10.81, which is a combination of all these factors," Roy stated.

Reliance also reported that during the quarter it completed two online auctions for the sale of 6 million standard cubic metres per day and 5 million standard

cubic metres per day of pipeline natural gas from the KG-D6 block.

"So, as I mentioned earlier, we are well on course. We have commissioned the MJ and all three new fields are currently producing," Roy said.

"With production coming on stream, we have conducted two rounds of e-auctions for total cumulative volume of about 11 million standard cubic metres," he stated.

"This was very successful. We have signed contracts with over 45 customers across city-gas distribution, fertilizer, refinery and other industries," Roy added.

"In terms of the outlook, we expect price volatility to continue this fiscal year, particularly considering high storage levels and higher nuclear output from Japan and France," he said.

"We hope to see a recovery in demand in China in the second half. And with the policy support, this should at least hold us in good stead on the price outlook," Roy added.

The company's reported price comprised the Japan-Korea Marker spot cargo price plus US\$0.75 per million British thermal units subject to the government ceiling price applicable for the KG-D6 at \$12.12 per MMBtu.

The oil-to-chemicals business revenues fell 17.7 percent to 133,031 crore rupees (\$16.22 billion) and gross earnings fell 23.2 percent compared with the 2022 quarter to 15,271 crore rupees (\$1.86Bln).

"It had been an exceptionally strong year-ago quarter with dislocation in energy markets," said Reliance.

"Downstream chemical margins were muted with supply overhang and subdued demand," the company added.

The company noted a decline in gross earnings from refining from the previous quarter due to "a sharp correction in fuel cracks with higher supplies and global macro headwinds".

However, Reliance said that "operational excellence supported the O-2-C performance" with high utilization levels, advantaged feedstock sourcing and strong domestic markets for fuels and chemicals.

The company additionally reported a coal bed methane (CBM) price of \$14.15 per MMBtu, down 37.1 percent year on year and 27.7 percent lower versus the previous quarter.

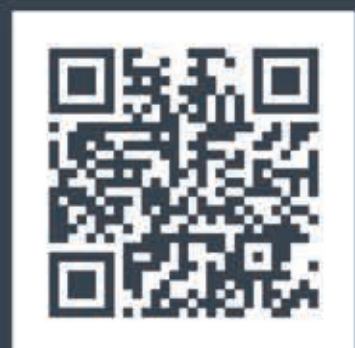
Reliance has CMB assets in the Mahanadi Basin as well as two blocks at Sohagpur (East) and Sohagpur (West) in Madhya Pradesh state in central India south of New Delhi. ■



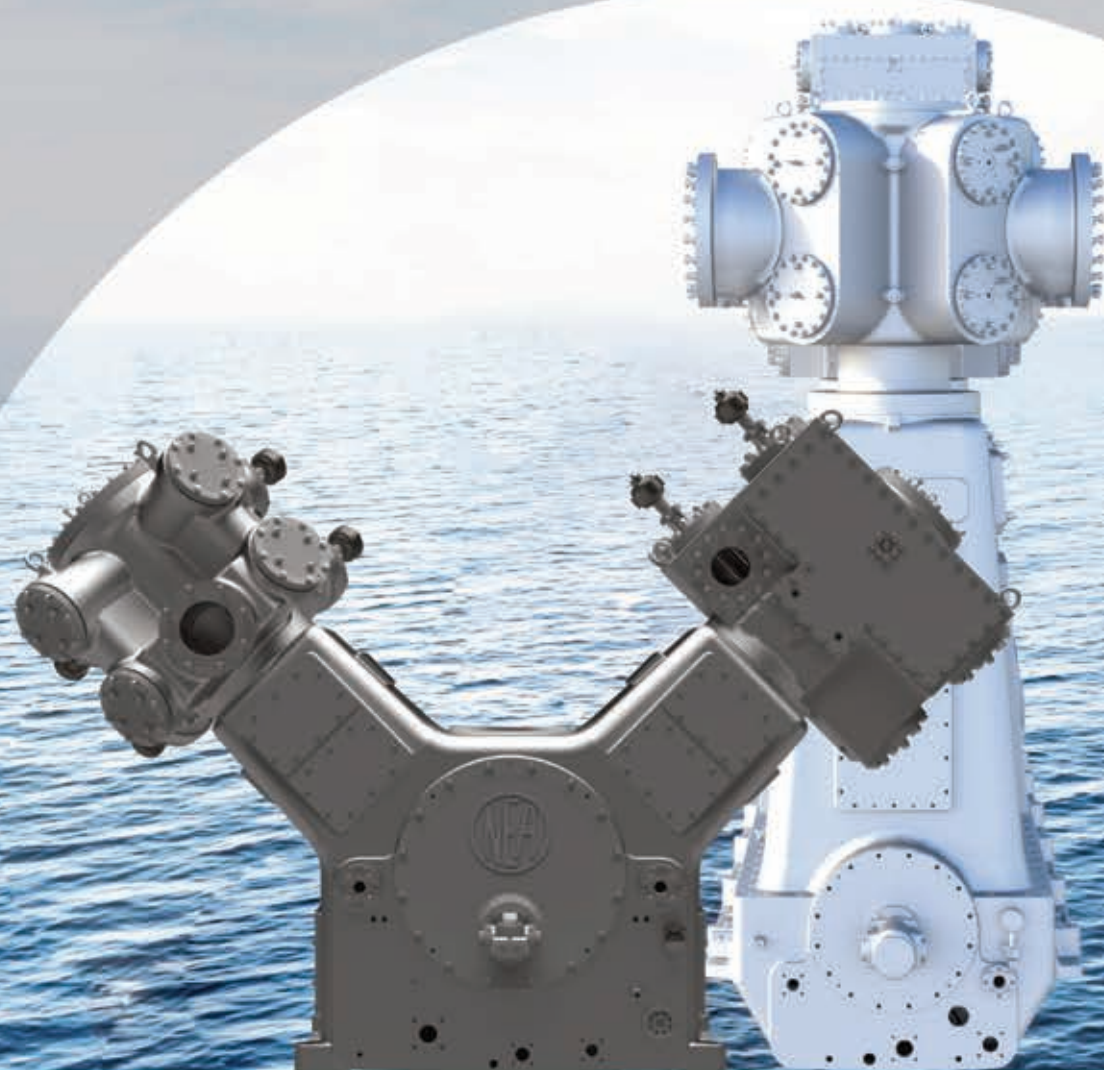
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Explanatory Notes

■ 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.

In addition to our own database, the information in these tables has been derived and cross-referenced from multiple sources, including GEM, IEEJ, IGU, GIE, GIIGNL and facility operators/ developers.

Comments, corrections or additional information would be most welcome. They should be sent to alexander@lngjournal.com

Conventional LNG Terminals

Country	Location (Project)	Owners	Start up	Nom. Capacity (MTPA)	Storage Tanks	Storage Capacity
Belgium	Zeebrugge	Fluxys	1987	6.6	5	566,000
Canada	St. John (Canaport) LNG	Repsol	2009	7.1	3	480,000
Chile	Mejillones LNG	Tractebel Engie, Ameris Capital AGF	2010	1.5	1	187,000
	Quintero	ENAP, Metrogas, Enagas	2009	3.8	3	334,000
China	Beihai LNG	PipeChina	2013	6.0	4	640,000
	Caofeidian LNG	PetroChina	2012	10.0	8	1,280,000
	Caofeidian Xintian LNG	China Suntien Green Energy Corp.	2023	5.0	2	—
	Dalian LNG	PipeChina	2011	6.0	3	480,000
	Dongguan LNG	JOVO Energy	2010	1.5	2	160,000
	Fujian LNG	CNOOC	2008	6.3	6	960,000
	Guangdong Dapeng LNG	CNOOC	2006	6.8	4	640,000
	Hainan LNG	PipeChina	2020	3.0	2	320,000
	Hainan Transfer Station	PetroChina	2020	0.6	2	40,000
	Jiangsu LNG	PetroChina	2011	10.0	5	1,080,000
	Jieyang LNG	PipeChina	2018	4.2	3	480,000
	Nansha LNG	Guangzhou Gas	2023	1.0	2	160,000
	Pinghu LNG	Zhejiang Hangjiixin Clean Energy	2022	1.0	2	200,000
	Qidong LNG	Guanghui Energy	2009	4.0	5	620,000
	Qingdao LNG	Sinopec	2006	7.0	6	960,000
	Shanghai (Yangshan) LNG	CNOOC	2009	3.0	5	895,000
	Shanghai Peak Shaving	Shenergy	2008	1.5	5	320,000
	Shenzhen Peak Shaving	Hua'an	2012	0.8	1	80,000
	Shenzhen Diefu LNG	PipeChina	2018	4.0	4	640,000
	Tianjin - Nangang LNG	Sinopec	2018	6.0	4	640,000
	Tianjin LNG	PipeChina	2013	6.0	7	397,000
	Wenzhou LNG	Zhejiang Energy, Sinopec	2023	3.0	4	—
	Yancheng LNG	CNOOC	2022	3.0	4	880,000
	Zhejiang LNG	CNOOC	2018	6.0	6	960,000
	Zhoushan LNG	ENN	2019	5.0	4	640,000
	Zhuhai LNG	CNOOC	2014	3.4	3	480,000
Dominican Republic	Andres LNG	AES Andres	2003	1.9	1	160,000
France	Dunkerque Le Clijton	EDF, Fluxys, TotalEnergies	2016	9.5	3	600,000
	Fos-sur-Mer	TotalEnergies, Elengy	2010	9.2	4	410,000
	Montoir-de-Bretagne	Elengy	1980	8.0	3	360,000
Greece	Revithoussa	DESFA	2000	7.1	3	225,000
India	Cochin	Petronet	2013	5.0	2	368,000
	Dabhol	GAIL, NTPC	2007	5.0	3	480,000
	Dahej	Petronet	2004	17.5	6	932,000
	Ennore LNG	IndianOil LNG	2019	5.0	2	360,000
	Hazira	Shell, TotalEnergies	2005	5.0	2	320,000
	Mundra LNG	Adani, GSP	2019	5.0	2	320,000
Indonesia	Arun Conversion	Pertamina	2015	3.0	4	508,000
Italy	Panigaglia	Snam	1963	2.5	2	100,000
	Rovigo Adriatic LNG	QatarEnergy, ExxonMobil, Snam	2009	6.6	2	250,000
Jamaica	Montego Bay	New Fortress Energy	2020	0.5	7	7,000
Japan	Chita	JERA, Toho Gas	1977	24.0	14	1,560,000
	Fukuoka	Saibu Gas	1993	0.8	1	70,000
	Futtsu	JERA	1985	20.0	10	1,110,000
	Hachinohe	ENEOS	2015	1.6	2	280,000
	Hatsukaichi	Hiroshima Gas	1996	0.9	2	170,000
	Hibiki LNG	Saibu Gas, Kitakyushu Gas	2014	4.0	2	360,000
	Higashi-Ogishima	Tokyo Electric	1984	15.0	9	540,000
	Himeji	Kansai Electric, Osaka Gas	1979	12.9	15	1,360,000
	Hitachi LNG	JERA	2015	2.2	2	230,000
	Ishikari LNG	Hokkaido Gas	2012	1.4	1	180,000
	Joetsu LNG	JERA	2012	2.3	3	540,000
	Kagoshima	JERA	1996	0.2	1	86,000
	Kawagoe	Chubu Electric	1997	8.0	3	480,000
	Mizushima	Chugoku Electric, ENEOS	2006	1.7	2	320,000
	Nagasaki LNG	Saibu Gas	2003	0.1	1	35,000
	Nakagusuku LNG	Okinawa Electric	2012	0.7	2	280,000
	Negishi	TEPCO, JERA	1969	11.0	14	1,180,000
	Niigata	Tohoku Electric	1984	10.0	8	720,000
	Ogishima	JERA	1998	3.0	4	850,000

Conventional LNG Terminals (Continued)

Country	Location (Project)	Owners	Start up	Nom. Capacity (MTPA)	Storage Tanks	Storage Capacity
Japan (continued)	Oita	Kyushu Electric	1990	5.1	5	460,000
	Sakai	Kansai Electric	2006	6.4	4	420,000
	Sakaide	Shikoku Electric, Cosmo Oil, Shikoku-Gas	2010	1.2	1	180,000
	Senboku	Osaka Gas	1972	12.5	20	1,675,000
	Shin Sendai	Tohoku Electric	2016	1.0	2	320,000
	Sodegaura	JERA	1973	29.4	35	2,660,000
	Sodeshi Shimizu	Shizuoka Gas, ENEOS	1996	2.9	3	337,200
	Soma LNG	JAPEX	2018	1.5	2	460,000
	Tobata Ward	Kita-Kyushu LNG	1977	7.6	8	480,000
	Toyama LNG	Hokuriku Electric	2018	1.8	1	180,000
	Yanai	Chugoku Electric	1990	2.4	6	480,000
	Yokkaichi	Chubu Electric	1987	7.2	2	320,000
Kuwait	Al Zour LNG	KIPIC	2022	22.0	8	1,800,000
Malaysia	Pengerang LNG	Petronas	2017	3.5	2	400,000
Mexico	Energia Costa Azul	Sempra	2008	7.6	2	320,000
	Manzanillo	Samsung, KOGAS, Mitsui	2012	3.8	2	300,000
Netherlands	Maasvlakte Gate Terminal	Gasunie	2011	8.9	3	540,000
Panama	AES Costa Norte LNG	AES	2018	1.5	1	130,000
Philippines	PHLNG	AG&P	2023	5.0	1	137,512
	Batangas FSRU	First Gen Corp.	2023	3.5	1	162,400
Poland	Swinoujscie LNG	Polskie LNG	2015	3.6	2	320,000
Portugal	Sines	REN	2004	5.6	3	390,000
Puerto Rico	Penuelas	EcoElectrica	2000	1.4	1	160,000
Singapore	Singapore LNG	Singapore LNG Corp.	2013	11.0	4	800,000
South Korea	Boryeong	GS Energy	2017	10.8	6	1,200,000
	Gwangyang	POSCO Energy	2005	7.1	5	730,000
	Incheon	KOGAS	1996	54.4	23	3,480,000
	Pyeongtaek	KOGAS	1986	41.0	23	3,360,000
	Samcheok	KOGAS	2014	11.6	12	2,400,000
	Tongyeong	KOGAS	2002	26.6	17	2,600,000
	Jeju Island	KOGAS	2019	1.1	2	90,000
Spain	Bahia de Bizkaia LNG	BP, Enagás, EVE	2003	6.9	3	450,000
	Barcelona	Enagás	1969	12.6	6	760,000
	Cartagena	Enagás	1989	8.7	5	587,000
	Huelva	Enagás	1988	8.7	5	619,500
	Mugardos	Reganosa	2007	2.6	2	300,000
	Sagunto	Enagás	2006	6.4	4	600,000
	El Musel	Enagás	2023	5.8	2	300,000
Taiwan	Taichung	CPC	2009	7.0	6	960,000
	Yung-An	CPC	1990	10.5	6	690,000
Thailand	Map Ta Phut LNG	PTT	2011	19.0	6	940,000
Turkey	Izmir	BOTAS	2006	10.6	2	280,000
	Marmara Ereglisi	BOTAS	1994	4.2	3	255,000
UK	Dragon LNG	Shell, Ancala Partners	2009	6.5	2	320,000
	Isle of Grain	National Grid	2005	14.8	8	1,000,000
	South Hook LNG	QatarEnergy, ExxonMobil, TotalEnergies	2009	15.6	5	775,000
United States	Everett Marine Terminal	Constellation Energy	1971	5.1	2	155,000
Vietnam	Thi Vai LNG	PetroVietnam Gas	2023	1.0	1	180,000

FSRU Terminals

Country	Location (Project)	Owners	Start up
Argentina	Escobar GasPort	Excelerate/Enarsa	2011
	Bahia Blanca	YPF	2023
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	Hrvatska Elektroprivreda Plc, Plinacro Ltd	2021
Colombia	Cartagena FSRU	Promigas, Sociedad Portuaria El Cayao	2016
Egypt	Ain Sokhna, Suez	EGAS, BW Gas	2015
El Salvador	Acajutla	Energía del Pacífico	2022
Finland	Inkoo FSRU	Gasgrid Finland	2022
Germany	Wilhelmshaven FSRU	Uniper	2022
	Lubmin FSRU	Deutsche ReGas	2022
	Brunsbüttel	RWE	2023
Ghana	Tema LNG	Helios/GNPC	2021
Greece	Revithoussa FSU	DESFA	2022
Hong Kong, China	FSRU Bauhinia	CLP Power	2023
India	Dhamra	Adani, TotalEnergies	2023

Country	Location (Project)	Owners	Start up
India (contd)	Jaigarh (Mothballed)	H-Energy	2022
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
Italy	Livorno	OLT Offshore LNG Toscana	2013
	Piombino	Snam	2023
Jamaica	Old Harbour	Golar FSRU, New Fortress	2019
Jordan	Aqaba, Jordan	Golar LNG	2015
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterrana	ElectroGas	2016
Myanmar	Thanlyin	CNTIC Vpower	2020
Netherlands	Eemshaven	Gasunie	2022
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Philippines	Batangas	AG&P International	2023
Russia	Kaliningrad FSRU	Gazprom	2020
Senegal	Dakar	KarMOL	2023
Turkey	Iskenderun & Saros FSRUs	BOTAS	2016 & 2023
	Aliaga (ETKI LNG)	Etki Liman	2017
UAE	Ruwais, Abu Dhabi	Gasco (UAE)	2016
	Jebel Ali Port, Dubai	DSA (UAE)	2010

LNG Import Projects

Country	Location/Project	Owners	Start up	Nom. Capacity (MTPA)	Storage Tanks	Capacity	Status
Albania	Port of Vlorë FSRU	Excelerate Energy, ExxonMobil	–	3.5	–	–	Speculative
Antigua and Barbuda	Antigua Power LNG	Antigua Power Co Ltd, Eagle LNG Partners	2023	–	–	–	Speculative
Australia	Port Phillip Bay FSRU	Vopak	2024	–	–	–	Speculative
	Geelong FSRU	Viva Energy	2024	–	–	–	Speculative
	Adelaide FSRU	Venice Energy	2024	–	–	–	Speculative
	Port Kembla FSRU	Squadron Energy	2023	1.9	1	170,000	U. Construction
Bangladesh	Matarbari LNG	Petrobangla	2028	7.5	–	–	Speculative
	Payra FSRU	Excelerate Energy	2028	–	–	–	Speculative
Belgium	Zeebrugge Exp. I	Fluxys	2024	4.6	–	–	U. Construction
	Zeebrugge Exp. II	Fluxys	2026	1.3	–	–	U. Construction
Brazil	Tergás Rio Grande LNG	Grupo Cobra	2024	1.61	–	–	Speculative
	Geramar FSRU	–	2026	–	–	–	Speculative
	Porto Norte Fluminense FSRU	Porto Norte Fluminense SA	2027	5.64	–	–	Speculative
	Imetame LNG	Imetame	2025	–	–	–	Speculative
China	Penglai LNG	Shandong Penglai Baota Ina Natural Gas Co., Ltd.	2026	2.8	–	–	Proposed
	Wuhan LNG	Hubei Minsheng Petroleum Liquefied Gas Co., Ltd.	2035	1.86	–	–	Speculative
	Zhiwan Island LNG	Macau Gas Co.	–	5	–	–	Speculative
	Yueyang LNG	Yueyang LNG Co., Ltd.	2023	2	–	–	U. Construction
	Yangjiang LNG	Guangdong Yangjiang Hailing Bay LNG Co., Ltd.	2023	2.8	–	–	U. Construction
	Rudong LNG (Jiangsu Guoxin)	Jiangsu Guoxin LNG Co., Ltd.	2024	2.95	–	–	U. Construction
	Jiangyin LNG (Garson Gas)	Jiangsu Jiasheng Gas Co., Ltd.	2023	3	–	–	U. Construction
	Huizhou LNG	Guangdong Huizhou LNG Co., Ltd.	2023	4	–	–	U. Construction
	Longkou	PipeChina	2024	5	6	1,420,000	U. Construction
	Yingkou LNG	China Urban Rural Energy	2025	6.5	4	800,000	U. Construction
	Yancheng LNG Expansion	CNOOC	2023	3	–	1,620,000	U. Construction
	Yantai LNG	China Urban Rural Energy	–	5.9	5	1,000,000	U. Construction
	Zhangzhou LNG	PipeChina	2024	3	3	–	U. Construction
	Tianjin Binhai LNG	Beijing Gas	2023	5	10	–	U. Construction
Colombia	Buenaventura FSRU	Unidad de Planeación Minero Energética (UPME)	2024	–	–	–	Speculative
Cyprus	Vasilikos FSRU	DEFA	2023	0.6	–	–	U. Construction
Ecuador	Jambelí FSRU	Sycar LLC	2025	0.38	–	–	Proposed
Estonia	Paldiski LNG	Espa	2024	1.8	–	–	Proposed
France	Le Havre FSRU	TotalEnergies	2023	1.8	–	–	U. Construction
Germany	Stade LNG	Buss Group, Dow Chemical, Fluxys, Partners Group	2026	9.78	–	–	Proposed
	TES Wilhelmshaven LNG	Tree Energy Solutions	2025	11.76	–	–	Proposed
	Stade FSRU	German company Hanseatic Energy Hub	2023	3.5	–	–	U. Construction
Greece	Dioriga FSRU	Motor Oil	2024	1.91	–	–	Proposed
	Argo FSRU	Mediterranean Gas	2023	3.38	–	–	Proposed
	Thessaloniki FSRU	Edison, Hellenic Petroleum	2025	5.37	–	–	Proposed
	Alexandroupolis FSRU	GasTrade	2023	4.04	1	135,000	U. Construction
India	Jaigarh LNG	H-Energy	–	8	–	–	Speculative
	Kakinada FSU	H-Energy	2024	4	–	–	Speculative
	Kukrahati LNG	H-Energy	2024	3	–	180,000	Speculative
	Chhara LNG Terminal	Hindustan Petroleum	2025	5	–	–	U. Construction
	Karaikal LNG	AG&P	TBC	5	–	–	Speculative
Indonesia	Karimun Island LNG	Panbil Group	2024	–	–	–	Speculative
	Sengkang LNG	Energy World	–	2	–	–	U. Construction
Ireland	Mag Mell FSRU	Predator Oil & Gas	–	1.91	–	–	Speculative
Italy	Porto Torres FSRU	Snam	2023	0.5	–	–	Proposed
	Gioia Tauro LNG	Iren Group, Sorgenia	2026	8.6	–	–	Proposed
	Portovesme FSRU	Snam SpA	2024	–	–	–	Speculative
Morocco	Jorf Lasfar LNG	SIGER/ERGIS Group	2025	5.15	–	–	Speculative
Mozambique	Matola FSRU	Gigajoule, TotalEnergies, CTB, Matola Gas Co.	2025	0.5	–	–	Speculative
Myanmar	Mee Laung Gyaing FSRU	Supreme Group, ZHEFU Hydropower	2023	–	–	–	Speculative
	Ahlong LNG	TTCL	2024	–	–	–	Speculative
	Thilawa LNG	Eden Group, Marubeni Corp., Mitsui, Sumitomo Corp.	2026	–	–	–	Speculative
Pakistan	Tabeer Energy FSRU	Mitsubishi	–	5.7	–	–	Speculative
Philippines	Vires FSRU	Argo Group	–	3	–	–	Speculative
	Pagbilao Power	Energy World	–	3	2	260,000	U. Construction
Poland	Gdańsk FSRU	PGNiG	2028	8.82	–	–	Speculative
South Africa	Richards Bay FSRU	South Africa Department of Public Enterprises	2027	1	–	–	Speculative
South Korea	Dangjin LNG	POSCO	2027	3.5	–	–	Proposed
	Hanyang LNG	Hanyang Group	2024	–	–	–	Speculative
Sri Lanka	New Fortress Colombo LNG	New Fortress Energy	–	0.71	–	–	Speculative
Taiwan	Hsieh-Ho LNG	Taipower	2025	1.8	–	–	Proposed
	Taichung (TaiPower) LNG	Taipower	2025	3	–	–	Proposed
Thailand	Chana LNG	–	2028	2	–	–	Speculative
Vietnam	Hai Linh	Hai Linh Co. Ltd.	2020	3	3	219,000	Mothballed
	Mui Ke Ga FSRU	B.Grimm Power, Energy Capital Vietnam, Gunvor	2025	1.5	–	–	Proposed
	Son My LNG	AES, PetroVietnam	2026	3.6	–	–	Proposed
	Thai Binh FSRU	–	2026	0.5	–	–	Speculative
	South West FSRU	–	2030	1	–	–	Speculative
	Bac Lieu LNG	Delta Offshore Energy	–	2	–	–	Speculative
	Cat Hai FSRU	Chubu Electric, ExxonMobil, Government of Hai Phong, TEPCO	2030	3	–	–	Speculative
	Khanh Hoa LNG	Millenium Energy	2030	3	–	–	Speculative
	Long Son LNG	EVN	2025	4.4	–	–	Speculative
	Tien Lang FSRU	ExxonMobil, Chubu Electric Power, Tokyo Electric Power Co.	2026	–	–	–	Speculative
	Ca Na LNG	Novatek	2024	–	–	–	Speculative
	Chan May LNG	Chan May LNG	2024	–	–	–	Speculative
	Vung Ang LNG	KG Electric Power Corp., PECC2, Siemens	2026	–	–	–	Speculative
	Hai Lang LNG	T&T Group, Hanwa, KOGAS, KOSPO	2026	1.5	2	160,000	U. Construction

Planned LNG Export Projects

Country	Project	Project Developers	Estimated Start Up	Number of Trains	Capacity In MTPA
Argentina	Vaca Muerta (YPF) LNG	YPF	2024+	—	5.37
Australia	Browse FLNG	Woodside Energy, Japan Australia LNG, Shell, BP, PetroChina	—	2	11.4
	Darwin LNG Life Extension	Santos, SK E&S, JERA, INPEX, Eni SpA, Tokyo Gas	2025	1	3.7
	Pluto LNG T2	Woodside Burrup Train 2A Pty Ltd., Global Infrastructure Partners	2026	1	5
Cameroon	Etinde FLNG	Perenco, Bowleven	2023+	—	1.3
Canada	Bear Head LNG	Bear Head LNG	2027	4	12
	Cedar FLNG	Haisla Nation, Pembina Pipeline Corp.	2027	—	3
	Energie Saguenay LNG	GNL Quebec	2026	2	11
	Ksi Lisims FLNG	Ksi Lisims LNG GP Ltd.	2027	—	12
	Placentia Bay FLNG	Horizon Maritime Services, LNG Newfoundland and Labrador Ltd.	2030	—	4
	Tilbury Island LNG T1	FortisBC	2026	1	0.9
	Tilbury Island LNG T2	FortisBC	2028	1	2.5
Equatorial Guinea	Fortuna FLNG	New Fortress Energy	—	1	—
Gabon	Boudji FLNG	Petronas	—	—	—
Guinea	Guinea LNG	West Africa LNG Group	2026+	1	—
Indonesia	Abadi FLNG	INPEX Masela Ltd.	2030	—	9.5
Israel	NewMed FLNG	NewMed Energy	2026	—	5
Mauritania	New Fortress Banda LNG	New Fortress Energy	2024	—	1.4
Mexico	Mexico Pacific LNG Ph. I	AECOM Capital, DKRW Energy	2025	2	9.4
	Mexico Pacific LNG Ph. II	AECOM Capital, DKRW Energy	2026+	1	4.7
	AMIGO LNG	Epsilon LNG, LNG Alliance	2026	1	4.2
	Vista Pacifico LNG	Sempra Energy	2025+	—	4
	Lakach FLNG	New Fortress Energy	—	1	1.4
	Altamira FLNG	New Fortress Energy	—	2	2.8
Mozambique	Rovuma LNG	Eni, ExxonMobil, CNPC, ENH, Galp, KOGAS	2025+	2	15.2
Nigeria	Brass LNG	Brass LNG Ltd.	—	2	10
	Greenville LNG	Greenville LNG	—	1	1.1
	UTM Offshore FLNG	UTM Offshore	2026	—	1.52
Papua New Guinea	Papua LNG	TotalEnergies, ExxonMobil, Papua New Guinea Gov., Santos	2027	2	5.4
	PNG LNG Expansion	ExxonMobil, Kumul Petroleum, Santos, JX Nippon O&G, MRDC	2025	1	2.6
Republic of the Congo	Congo FLNG	Eni Congo	2025	2	3
Russia	Yakutia LNG	A-Property, Globaltek, Zhejiang Energy	2027	—	18
	Far East LNG I	ExxonMobil, SODECO, ONGC, Rosneft	2027+	1	6.2
	Far East LNG II	ExxonMobil, SODECO, ONGC, Rosneft	2035	1	10
	Vladivostok LNG	Gazprom, INPEX, Itochu Corp., JAPEx, Marubeni Corp.	2025	3	1.5
	Arctic LNG II	Novatek	2027	—	19.8
	Obssky LNG	Novatek	2026	—	6.6
	Chemomorsky LNG	Gazprom	2025	—	1.5
	Arctic LNG III	OOO Arctic LNG 3	2032	—	19.8
	Kara LNG	Rosneft	2030	—	30
Tanzania	Tanzania LNG	Equinor, ExxonMobil, Ophir Energy, Pavilion Energy, Shell, TPDC	2027	2	10
United Arab Emirates	Ruwais (ex Fujairah) LNG	ADNOC	2027+	2	6
United States	Fourchon LNG	Energy World	—	1	2
	Alaska LNG	Alaska Gasline Development Corp.	2030	3	20.1
	Cameron LNG Expansion	Cameron LNG LLC	2026	1	6.75
	Commonwealth LNG	Commonwealth LNG	2026	6	9.3
	Corpus Christi LNG Midscale Expansion	Cheniere Energy	2031	2	3.28
	Delfin FLNG	Delfin LNG LLC	2026+	4	12
	Driftwood LNG T1-5	Tellurian	—	5	27.6
	Freeport LNG Expansion	Freeport LNG Dev.	2026	1	5.1
	Gulf LNG	KinderMorgan	—	2	10.86
	Lake Charles LNG	Energy Transfer	2026+	3	17.79
	Magnolia LNG	Glenfarne Group	—	4	8.8
	Port Arthur LNG Ph. I	PALNG Common Facilities Co., Port Arthur LNG, LLC	—	2	13.5
	Port Arthur LNG Ph. II	PALNG Common Facilities Co., Port Arthur LNG, LLC	—	2	13.5
	Texas LNG	Glenfarne Energy Transition	2027	2	4
	Rio Grande LNG Ph. I	NextDecade	2026	2	10.8
	Rio Grande LNG Ph. II	NextDecade	—	3	16.2
	Pointe LNG	Pointe LNG, Pointe Pipeline Co.	2026	3	6
	Repauno Works LNG	Delaware River Partners LLC	—	—	1.5
	Qilak LNG	Qilak Energyy	2026	—	4
	CP2 LNG Ph. I	Venture Global	2026+	9	10
	CP2 LNG Ph. II	Venture Global	2027+	9	10
	Delta LNG Ph. I	Venture Global	2028+	—	10
	Delta LNG Ph. II	Venture Global	2029+	—	10
	West Delta LNG Deepwater Port	LNG21 Group	2026+	6	6.1
	Grand Isle FLNG	New Fortress Energy	2025+	—	2.8

LNG Export Plants

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	Nom. capacity (MTPA)	No. of tanks	Capacity m ³
UAE	Das Island	ADNOC, Mitsui, BP, TotalEnergies	1977/1994	3	5.7	3	240,000
Algeria	Arzew	Sonatrach	1964-2014	13	20.8	6	920,000
	Skikda	Sonatrach	1980/2013	4	7.9	5	308,000
Angola	Soyo	Sonangol, Chevron, BP, Eni, TotalEnergies	2012	1	5.2	2	370,000
Australia	NWS LNG	BP, Chevron, MIMI, Shell, Woodside Energy, CNOOC	1989-2004	5	16.3	6	520,000
	Darwin LNG	Santos, Eni, INPEX, JERA, Tokyo Gas	2006	1	3.7	1	188,000
	Australia Pacific LNG	ConocoPhillips, Origin, Sinopec	2016	2	9.0	2	320,000
	Gladstone LNG	Santos, Petronas, TotalEnergies, KOGAS	2015-2016	2	7.8	2	280,000
	Gorgon LNG	Chevron, Shell, ExxonMobil, Osaka Gas, Tokyo Gas, JERA	2016-2017	3	15.6	2	360,000
	Pluto LNG	Woodside Energy, Kansai Electric, Tokyo Gas	2012	1	4.9	2	240,000
	Queensland C. LNG	Shell, CNOOC	2014	2	4.5	2	280,000
	Wheatstone LNG	Chevron, KUFPEC, Woodside Petroleum, Kyushu Electric Power Co., PEW	2017	2	8.9	2	300,000
	Ichthys LNG	INPEX, TotalEnergies, CPC, Tokyo Gas, Osaka Gas, Kansai Electric, JERA, Toho Gas	2018	2	8.9	2	330,000
	Prelude FLNG	Shell, INPEX, CPC, KOGAS	2018	1	3.6	6	228,000
Brunei	Brunei LNG	Gov. of Brunei, Shell, Mitsubishi	1972-74	5	7.2	3	195,000
Cameroon	Cameroon FLNG	Golar LNG	2018	4	2.4	1	125,000
Egypt	Damietta	Eni, EGAS, EGPC	2004	1	5.0	2	300,000
	Idku	EGPC, EGAS, Shell, Petronas, TotalEnergies	2005	1	7.2	2	280,000
Equ. Guinea	EG LNG	Marathon, Sonagas, Marubeni	2007	1	3.4	2	272,000
Indonesia	Bontang (E-H)	Pertamina, VICO, JILCO, TotalEnergies	1990-1998	4	11.5	5	635,000
	Dongi-Senoro	Medco Energi, Pertamina, Mitsubishi	2015	1	2.0	1	170,000
	Tangguh	BP, Mitsubishi, Inpex, CNOOC, JX Nippon, KG Mitsui, LNG Japan	2008	2	7.6	2	340,000
Malaysia	Malaysia LNG	Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil	1983-2016	9	29.3	6	445,000
	PFLNG Satu	Petronas	2016	1	1.2	4	177,000
	PFLNG Dua	Petronas	2020	1	1.5	4	177,000
Mozambique	Coral Sul FLNG	Eni, ExxonMobil, CNPC, GALP, KOGAS, ENH	2022	1	3.4	8	227,840
Nigeria	Bonny Island	NNPC, Shell, TotalEnergies, Eni	1999-2007	6	22.2	6	505,200
Norway	Snøhvit LNG	Equinor, TotalEnergies, Petoro, Neptune Energy, Wintershall DEA Norge	2007	1	4.2	2	250,000
Oman	Oman LNG	Oman Gov., Shell, TotalEnergies, Korea LNG, Mitsubishi, Mitsui, Partex O&G, Itochu Corp.	2000	3	10.4	4	480,000
Papua New Guinea	PNG LNG	ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	8.3	2	320,000
Peru	Pampa Melchorita	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.5	2	260,000
Qatar	Ras Laffan	QatarEnergy, Shell, ExxonMobil, TotalEnergies, ConocoPhillips et al.	1997-2010	14	77.4	18	2,340,000
Russia	Sakhalin-2 LNG	Gazprom, Sakhalin Energy, Mitsubishi, Mitsui	2009	2	9.6	2	200,000
	Yamal LNG	Novatek, TotalEnergies, CNPC, Silk Road Investment Fund	2017-2019	3	16.5	4	640,000
	Portovaya LNG	Gazprom	2022	1	2.0	1	42,000
Trinidad & Tobago	Atlantic LNG	BP, Shell, NGC	1999-2005	4	15.3	4	640,000
USA	Sabine Pass LNG	Cheniere	2016-2022	6	30.0	5	800,000
	Corpus Christi LNG	Cheniere	2019-2021	3	15.0	3	480,000
	Freeport LNG	Freeport LNG, JERA, Osaka Gas	2019-2020	3	15.5	3	480,000
	Cameron LNG	Sempra, TotalEnergies, Mitsui, Mitsubishi	2019	3	15.0	3	480,000
	Calcasieu Pass LNG	VentureGlobal	2022-2023	18	11.3	2	440,000
	Cove Point LNG	BHE GT&S, Dominion Energy, Brookfield Asset Management	2017	1	5.3	7	695,000
	Elba Island LNG	Kinder Morgan, EIG Energy, Blackstone	2019-2020	10	2.5	5	560,000
Yemen	Balhaf LNG (Mothballed)	TotalEnergies, Hunt Oil, SK Innovation, Hyundai, KOGAS, Yemen Gas Corp., GASSP	2009	2	6.7	2	320,000

LNG Export Projects U. Construction

Country	Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
Canada	LNG Canada	Shell, Petronas, PetroChina, Mitsubishi	2025	2	14
	Woodfibre LNG	Pacific Energy Corp., Enbridge	2027	2	2.2
Indonesia	Sengkang LNG	Energy World	2023+	4	2
	Tangguh LNG T3	BP, MI Berau B.V., CNOOC, Nippon Oil Expl. et al	2023	1	3.8
Malaysia	ZLNG FLNG	Petronas	2027	1	2
Mauritania	Greater Tortue Ahmeyim FLNG	BP, Kosmos Energy	2023+	—	2.52
Mexico	Costa Azul Export	Sempra Energy, TotalEnergies	2024	1	3.25
Mozambique	Mozambique LNG Ph. I	TotalEnergies, Mitsui, ONGC, ENH, PTTEP, Bharat Petroleum, Oil India	2024+	2	—
Nigeria	Nigeria LNG Expansion	Nigeria LNG	2024	1	8
Qatar	Ras Laffan Expansion I	QatarEnergy	2026	4	33
	Ras Laffan Expansion II	QatarEnergy	2027	2	16
Russia	Ust Luga LNG	RusKhimAlyans	2024+	2	13
	Arctic LNG 2 T1	Novatek et al	2023+	1	6.6
United States	Golden Pass LNG T1-2	Golden Pass LNG	2024	2	12
	Golden Pass LNG T3	Golden Pass LNG	2025	1	6.03
	Corpus Christi LNG Stage 3	Cheniere Energy	2027	7	11.48
	Plaquemines LNG Ph. I	Venture Global	2024	1	10
	Plaquemines LNG Ph. II	Venture Global	2025	1	10



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World LNG Carrier Fleet

LNG Carrier	Capacity m ³	Registered Owner	Builder	Delivery	Flag	Power Plant	Cargo System	No. of Tanks	Original Project	Hull Number
Aamira	268,000	Nakilat SHI 1753 Inc.	Samsung	16/04/2010	M. Islnds	Diesel	TZ Mk. III	10	Qatargas IV	1753
Abadi	135,000	Tost Two (NBD) Sendirian Berhad	Mitsubishi	29/05/2002	Liberia	Steam	Moss	5	Lumut	2163
Adam LNG	162,000	Oman Shipping Co.	HHI	10/07/2014	M. Islnds	Diesel	TZ Mk. III Flex	4	Oman LNG	2584
Adamastos	170,800	Shin Doun Kisen Co. Ltd.	HHI	23/08/2021	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	3109
Adriano Knutsen	180,000	Knutsen OAS Shipping	HHI	13/07/2019	Spain	ME-GI	TZ Mk. III Flex	4	Corpus Christi	2963
Al Aamriya	210,168	J5 Nakilat No.1 Ltd.	Daewoo	04/05/2008	M. Islnds	Diesel	GT NO 96	5	RasGas III	2249
Al Areesh	148,786	Al Areesh LLC	Daewoo	01/01/2007	Bahamas	Steam	GT NO 96	4	RasGas II	2239
Al Bahiya	210,100	Nakilat DSME 2286 Inc.	Daewoo	02/12/2009	M. Islnds	Diesel	GT NO 96	5	Qatargas IV	1726
Al Bidda	137,339	Mitsui O.S.K. Lines	Kawasaki	08/11/1999	M. Islnds	Steam	Moss	5	Qatargas I	1470
Al Daayen	148,853	Seaspirit Leasing	Daewoo	21/03/2007	Bahamas	Steam	GT NO 96	4	RasGas II	2240
Al Dafna	268,000	Nakilat SHI 1726 Inc.	Samsung	03/10/2009	M. Islnds	Diesel	TZ Mk. III	10	RasGas	1726
Al Deebel	145,000	Peninsula LNG Transport No. 3	Samsung	15/11/2005	Bahamas	Steam	TZ Mk. III	4	RasGas II	1442
Al Gattara	216,200	Overseas LNG H1 Corp.	HHI	06/11/2007	M. Islnds	Diesel	TZ Mk. III	4	Qatargas II	1791
Al Ghariya	210,150	Neptora Schiffsbetriebsgesellschaft	Daewoo	13/12/2007	Bahamas	Diesel	GT NO 96	4	Qatargas II	2248
Al Gharrafa	216,200	Overseas LNG H2 Corp.	HHI	11/01/2008	M. Islnds	Diesel	TZ Mk. III	5	Qatargas II	1792
Al Ghashamiya	217,591	Nakilat SHI 1696 Inc.	Samsung	29/04/2009	M. Islnds	Diesel	TZ Mk. III	10	Qatargas III	1696
Al Ghuwairiya	263,300	Nakilat Al Ghuwairiya Inc.	Daewoo	15/12/2008	M. Islnds	Diesel	GT NO 96	5	Qatargas II	2255
Al Hamla	216,200	Overseas LNG S2 Corp.	Samsung	15/02/2008	M. Islnds	Diesel	TZ Mk. III	4	Qatargas II	1606
Al Hamra	137,000	Al Hamra Ltd.	STX	24/11/1996	Liberia	Steam	Moss	4	Das Island	1332
Al Huwaila	217,000	Al Huwaila Inc.	Samsung	06/05/2008	Bahamas	Diesel	TZ Mk. III	10	RasGas III	1643
Al Jasra	137,227	Mitsui O.S.K. Lines	Mitsubishi	05/06/2000	M. Islnds	Steam	Moss	5	Qatargas I	2117
Al Jassasiya	145,700	Venice Maritime Inc.	Daewoo	21/05/2007	Greece	Steam	GT NO 96	4	RasGas II	2243
Al Karaana	210,100	Nakilat DSME 2284 Inc.	Daewoo	06/10/2009	M. Islnds	Diesel	GT NO 96	4	Qatargas III	2284
Al Kharaitiyat	216,300	Nakilat HHI 1909 Inc.	HHI	30/06/2009	M. Islnds	Diesel	TZ Mk. III	4	Qatargas III	1909
Al Kharsaah	217,000	Al Kharsaah Inc.	Samsung	12/06/2008	Bahamas	Diesel	TZ Mk. III	10	RasGas III	1644
Al Khatiya	210,150	Nakilat DSME 2283 Inc.	Daewoo	08/07/2009	M. Islnds	Diesel	GT NO 96	4	Qatargas IV	2283
Al Khaznah	135,496	Al Khaznah Inc.	Mitsui E&S	01/07/1994	Liberia	Steam	Moss	5	Das Island	1390
Al Khor	137,354	Mitsui O.S.K. Lines	Mitsubishi	15/11/1996	M. Islnds	Steam	Moss	5	Qatargas I	2089
Al Khuwair	217,000	Al Khuwair Inc.	Samsung	27/06/2008	Bahamas	Diesel	TZ Mk. III	10	RasGas III	1646
Al Mafyar	266,000	Nakilat SHI 1697 Inc.	Samsung	28/04/2009	M. Islnds	Diesel	TZ Mk. III	5	Qatargas III	1697
Al Marrouna	149,539	Seaspirit Leasing	Daewoo	19/09/2006	Bahamas	Steam	GT NO 96	4	RasGas II	2238
Al Mayeda	266,000	Nakilat SHI 1694 Inc.	Samsung	06/01/2009	M. Islnds	Diesel	TZ Mk. III	5	Qatargas III	1694
Al Nuaman	210,100	Nakilat DSME 2285 Inc.	Daewoo	06/12/2009	M. Islnds	Diesel	GT NO 96	4	Qatargas III	2286
Al Oraiq	210,200	J5 Nakilat No.3 Ltd.	Daewoo	13/06/2008	M. Islnds	Diesel	GT NO 96	18	RasGas III	2250
Al Rayyan	137,420	Mitsui O.S.K. Lines	Kawasaki	14/03/1997	M. Islnds	Steam	Moss	5	Qatargas I	1445
Al Rekayyat	216,293	Nakilat HHI 1910 Inc.	HHI	30/06/2009	M. Islnds	Diesel	TZ Mk. III	4	Qatargas III	1910
Al Ruwais	210,150	Neptana Schiffsbetriebsgesellschaft	Daewoo	09/08/2007	Bahamas	Diesel	GT NO 96	4	Qatargas II	2245
Al Sadd	210,200	Nakilat DSME 2265 Inc.	Daewoo	07/03/2009	M. Islnds	Diesel	GT NO 96	12	Qatargas III	2265
Al Safliya	210,150	Nausola Schiffsbetriebsgesellschaft	Daewoo	12/09/2007	Bahamas	Diesel	GT NO 96	5	Qatargas II	2246
Al Sahla	216,200	J5 Nakilat No.5 Ltd.	HHI	13/06/2008	M. Islnds	Diesel	TZ Mk. III	4	RasGas III	1863
Al Samriya	263,300	Nakilat Al Samriya Inc.	Daewoo	28/02/2009	M. Islnds	Diesel	GT NO 96	5	Qatargas II	2257
Al Shamal	217,000	Al Shamal Inc.	Samsung	28/04/2008	Bahamas	Diesel	TZ Mk. III	10	RasGas III	1645
Al Sheehaniya	210,100	Nakilat DSME 2264 Inc.	Daewoo	17/02/2009	M. Islnds	Diesel	GT NO 96	12	Qatargas III	2264
Al Thakhira	145,000	Peninsula LNG Transport No. 2	Samsung	22/08/2005	Bahamas	Steam	TZ Mk. III	4	RasGas II	1441
Al Thumama	216,200	J5 Nakilat No.2 Ltd.	HHI	27/02/2008	M. Islnds	Diesel	TZ Mk. III	4	RasGas III	1862
Al Utouriya	215,000	J5 Nakilat No.8 Ltd.	HHI	01/09/2008	M. Islnds	Diesel	TZ Mk. III	4	RasGas III	1875
Al Wajbah	137,308	Mitsui O.S.K. Lines	Mitsubishi	22/06/1997	M. Islnds	Steam	Moss	5	Qatargas I	2090
Al Wakrah	137,371	Mitsui O.S.K. Lines	Kawasaki	26/11/1998	M. Islnds	Steam	Moss	5	Qatargas I	1446
Al Zubarah	137,573	Mitsui O.S.K. Lines	Mitsui E&S	30/11/1996	M. Islnds	Steam	Moss	5	Qatargas I	1411
Alexandroupoli	153,000	Gas-Fifteen Ltd.	Hanjin (Busan)	01/06/2010	Greece	TFDE	TZ Mk. III	4	–	193
Alicante Knutsen	174,000	–	Hyundai Samho	01/09/2022	France	X-DF	TZ Mk. III Flex+	4	Portfolio	8093
Alto Acrux	147,798	Bahamas LNG Shipping	Mitsubishi	17/03/2008	Bahamas	Steam	Moss	4	Darwin LNG	2219
Amadi	154,800	Brunei Gas Carriers	HHI	16/07/2015	Brunei	–	TZ Mk. III	4	Lumut	2607
Amali	148,000	BGC SPV NBD	Daewoo	01/08/2011	Brunei	–	GT NO 96	4	Lumut	2277
Amani	154,800	Brunei Gas Carriers	HHI	13/10/2014	Brunei	–	TZ Mk. III	4	Lumut	H2606
Amberjack LNG	174,000	LNGShips	HHI	17/04/2020	Malta	X-DF	TZ Mk. III Flex	–	–	3021
Amur River	149,700	Seacrown Maritime	HHI	01/11/2007	M. Islnds	Steam	TZ Mk. III	4	Sakhalin II	1734
Arctic Aurora	155,000	Fareastern Shipping	HHI	04/07/2014	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Snøhvit LNG	2580
Arctic Discoverer	142,612	Northern LNG Transport II Company S.A.	Mitsui E&S	12/02/2006	Bahamas	–	Moss	4	Hammerfest	1564
Arctic Lady	147,200	Leif Hoegh (UK) Ltd.	Mitsubishi	12/04/2006	Norway	Steam	Moss	4	Hammerfest	2185
Arctic Princess	147,200	R.B. Quadrangle Leasing	Mitsubishi	13/01/2006	Norway	Steam	Moss	4	Hammerfest	2184
Arctic Voyager	142,759	Lloyds TSB Equipment Leasing (No.1)	Kawasaki	14/07/2006	Bahamas	Steam	Moss	4	Hammerfest	1532

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Aristarchos	174,000	Dias Gas Carrier Corp.	HHI	15/06/2021	Malta	X-DF	TZ Mk. III Flex	4	–	3107
Aristidis I	174,000	Atrotos Gas Carrier Corp.	HHI	04/01/2021	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	3106
Aristos I	174,000	Xiang Ch25 HK International	HHI	13/11/2020	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	3105
Arkat	148,000	BGC SPV NBD	Daewoo	18/02/2011	Brunei	–	GT NO 96	4	Lumut	2273
Arrow Spirit	154,982	Luster Maritime S.A. et al	Koyo Dockyard	08/02/2008	Panama	Steam	TZ Mk. III	4	Portfolio	2258
Aseem	155,003	India LNG Transport Company No.3 S.A.	Samsung	16/11/2009	Malta	Diesel	TZ Mk. III	4	RasGas	1686
Asia Endeavour	154,948	Chevron Global Tech Services Co.	Samsung	17/06/2015	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon	1942
Asia Energy	154,948	Chevron Global Tech Services Co.	Samsung	03/10/2014	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon	1921
Asia Excellence	154,948	Chevron Global Tech Services Co.	Samsung	20/01/2015	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon	1941
Asia Integrity	154,948	Chevron Global Tech Services Co.	Samsung	27/02/2017	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Wheatstone	2069
Asia Venture	154,948	Chevron Global Tech Services Co.	Samsung	06/07/2017	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Wheatstone	2070
Asia Vision	154,948	Chevron Global Tech Services Co.	Samsung	11/07/2014	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon	1920
Asklipios	174,000	Sea 199 Leasing Co Ltd.	HHI	29/09/2021	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	3110
Asterix I	174,000	Sea 335 Leasing Co Ltd	HHI	12/02/2023	Greece	X-DF	TZ Mk. III Flex	4	Portfolio	3111
Attalos	170,800	Sea 200 Leasing Co. Ltd.	HHI	13/08/2021	Malta	X-DF	TZ Mk. III Flex	4	–	3108
Barcelona Knutsen	173,400	Norspan LNG V AS	Daewoo	21/01/2010	Spain	Diesel/Gas-Electric	GT NO 96	4	Portfolio	2267
Beidou Star	172,000	Mitsui O.S.K. Lines	Hudong Zhonghua	14/09/2015	H.K., China	Diesel	GT NO 96	4	PNG LNG	H1672A
Berge Arzew	138,088	Sonatrach Berge Arzew Corp.	Daewoo	29/07/2004	Bahamas	Steam	GT NO 96	4	Arzew	2217
Bilbao Knutsen	138,000	Norspan LNG AS	Izar	29/01/2004	Spain	Steam	GT NO 96	4	Portfolio	321
Bishu Maru	164,700	"K" Line - Kawasaki Kisen Kaisha	Kawasaki	12/12/2017	Panama	TFDE	Moss	4	Wheatstone	1713
Bonito LNG	174,000	LNGShips	HHI	19/05/2020	Malta	–	TZ Mk. III Flex	–	–	3022
Boris Davydov	172,410	Arctic LNG 4 Ltd.	Daewoo	23/12/2018	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal	2428
Boris Vilkitsky	172,410	Arctic LNG 1 Ltd.	Daewoo	04/06/2017	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal	2421
British Achiever	173,644	BP	Daewoo	06/11/2018	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2442
British Contributor	173,644	BP	Daewoo	16/12/2018	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2443
British Listener	173,644	BP	Daewoo	31/01/2019	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2444
British Mentor	173,644	BP	Daewoo	15/03/2019	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2445
British Partner	173,400	BP	Daewoo	18/06/2018	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2441
British Sponsor	173,644	BP	Daewoo	01/05/2019	U.K.	ME-GI	GT NO 96 GW	4	Freeport	2446
Broog	137,529	Mitsui O.S.K. Lines	Mitsui E&S	27/04/1998	M. Islnds	Steam	Moss	5	Qatargas I	1412
Bu Samra	266,000	Nakilat Bu Samra Inc.	Samsung	06/12/2008	M. Islnds	–	TZ Mk. III	5	Qatargas II	1677
Bushu Maru	180,000	Mitsui O.S.K. Lines	Mitsubishi	08/07/2019	Bahamas	Reheat Steam Turbine	TZ Mk. III Flex	4	Sabine Pass	2327
BW Boston	138,059	Partrederiet BW Gas GDF Suez EMT DA	Daewoo	23/01/2003	Norway	Steam	GT NO 96	4	Atlantic LNG	2207
BW Brussels	162,400	Ines LNG	Daewoo	03/08/2009	Singapore	Diesel/Gas-Electric	GT NO 96	4	Balhaf	2259
BW Cassia	174,000	MP-SGP Pte Ltd	Daewoo	02/10/2022	Singapore	ME-GI	–	4	–	2510
BW Enn Snow Lotus	174,000	BW LNG II Pte Ltd	Daewoo	11/09/2022	Singapore	ME-GI	–	4	–	2509
BW Everett	138,028	BW Gas SLNG	Daewoo	16/06/2003	Singapore	Steam	GT NO 96	4	Atlantic LNG	2212
BW Helios	174,000	Selene Navigation Pte Ltd.	Daewoo	25/05/2021	Singapore	ME-GI	GT NO 96 GW	4	–	2497
BW Lesmes	174,000	BW Gas AS	Daewoo	26/03/2021	Singapore	ME-GI	GT NO 96 GW	4	Portfolio	2496
BW Lilac	173,400	BW Maritime	Daewoo	17/03/2018	Malta	ME-GI	GT NO 96 GW	4	–	2436
BW Magna	173,000	BW Group	Daewoo	11/03/2019	Singapore	ME-GI	GT NO 96	4	–	2488
BW Magnolia	173,400	Helen Navigation Pte Ltd.	Daewoo	28/02/2020	Singapore	–	GT NO 96 GW	–	–	2490
BW Pavilion Aranda	173,400	BW Group	Daewoo	10/09/2019	Singapore	ME-GI	GT NO 96 GW	4	Portfolio	2489
BW Pavilion Aranthera	173,400	BW Diamond LNG Pte Ltd	Daewoo	04/07/2020	Singapore	–	GT NO 96 GW	–	–	2491
BW Pavilion Leeara	158,629	BW LPG FPSOI	HHI	01/06/2015	Singapore	Diesel/Gas-Electric	TZ Mk. III Flex	4	Portfolio	2572
BW Pavilion Vanda	155,000	BW LPG FPSOI	HHI	12/02/2015	Singapore	–	TZ Mk. III Flex	4	Portfolio	2571
BW Tatiana	135,269	Shell Tankers Singapore	Mitsubishi	27/12/2002	Panama	Steam	Moss	5	Atlantic LNG	2173
BW Tulip	173,400	BW Maritime	Daewoo	01/12/2017	Singapore	ME-GI	GT NO 96 GW	4	–	2435
Cadiz Knutsen	138,826	Norspan LNG II AS	Navantia	13/04/2004	Spain	Steam	GT NO 96	4	Portfolio	103
Cape Ann	145,130	SRV Joint Gas Two Ltd.	Samsung	25/04/2010	Norway	Diesel/Gas-Electric	TZ Mk. III	4	Jaigarh LNG	1689
Castillo de Caldelas	176,300	Empresa Naviera Elcano	Imabari Shipbuilding	13/06/2018	Malta	ME-GI	TZ Mk. III Flex	–	Portfolio	8188
Castillo De Merida	176,300	Empresa Naviera Elcano	Imabari Shipbuilding	31/03/2018	Malta	ME-GI	TZ Mk. III Flex	4	Portfolio	8177
Castillo de Santisteban	170,000	Naviera Trans Gas AIE	STX	20/06/2010	Malta	Diesel Electric	GT NO 96	4	Portfolio	3008
Castillo de Villalba	138,000	Empresa Naviera Elcano	Navantia Cadiz	29/09/2003	Spain	Steam	GT NO 96	4	Portfolio	87
Celsius Canberra	180,000	Xiang CH27 HK International	Samsung	–	M. Islnds	X-DF	TZ Mk. III Flex	–	US Portfolio	2298
Celsius Carolina	180,000	Oriental Fleet LNG 03 Ltd.	Samsung	13/08/2021	M. Islnds	X-DF	TZ Mk. III Flex	4	US Portfolio	2314
Celsius Charlotte	180,000	Xiang CH28 HK International	Samsung	14/06/2021	M. Islnds	X-DF	TZ Mk. III Flex	4	US Portfolio	2313
Celsius Copenhagen	180,000	Greenheart Gas Shipco I LLC	Samsung	01/11/2020	M. Islnds	X-DF	TZ Mk. III Flex	4	Portfolio	2297
Celsius Geneva	176,400	Xiang H14 International	Samsung	15/07/2023	M. Islnds	ME-GI	TZ Mk. III Flex	4	Portfolio	2459
CESI Beihai	174,000	COSCO Shipping Energy Transportation Co.	Hudong Zhonghua	12/06/2017	H.K., China	–	GT NO 96	4	APLNG	1717A
CESI Gladstone	174,000	China Shipping Co.	Hudong Zhonghua	31/10/2016	H.K., China	–	GT NO 96	4	APLNG	1715A
CESI LianYungAng	174,000	COSCO Shipping Energy Transportation Co.	Hudong Zhonghua	07/06/2018	H.K., China	Diesel-Electric	GT NO 96	4	APLNG	1720A
CESI Qingdao	174,000	China Shipping Co.	Hudong Zhonghua	04/02/2017	H.K., China	–	GT NO 96	4	APLNG	1716A
CESI Tianjin	174,000	COSCO Shipping Energy Transportation Co.	Hudong Zhonghua	17/07/2017	H.K., China	TFDE	GT NO 96	4	APLNG	1718A
CESI Wenzhou	174,000	COSCO Shipping Energy Transportation Co.	Hudong Zhonghua	04/02/2018	H.K., China	Diesel-Electric	GT NO 96	4	APLNG	1719A

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Cheikh Bouamama	75,558	Skikda LNG Transport Corp.	Universal SB	19/07/2008	Bahamas	Steam	TZ Mk. III	4	Arzew/Skikda	88
Cheikh el Mokrani	75,759	Mediterranean LNG Transport Corp.	Japan Marine United	10/06/2007	Bahamas	Steam	TZ Mk. III	4	Skikda	55
Christophe De Margerie	170,000	DY Shipping Limited	Daewoo	09/11/2016	Panama	Diesel/Gas-Electric	GT NO 96 GW	–	Yamal	2418
Clean Cajun	180,000	Platia Shipping Ltd.	HHI	01/05/2022	Malta	X-DF	Membrane	4	–	3137
Clean Copano	180,000	Psili Shipping Ltd	HHI	30/07/2022	Malta	X-DF	Membrane	4	–	3138
Clean Energy	149,700	Pegasus Shipholding	HHI	02/03/2007	M. Islnds	Steam	TZ Mk. III	4	Portfolio	1748
Clean Horizon	162,000	Dynagas	HHI	10/04/2015	Malta	Diesel/Gas-Electric	TZ Mk. III Flex	4	Portfolio	2566
Clean Ocean	162,000	Dynagas	HHI	21/05/2014	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Sabine Pass	2558
Clean Planet	162,000	Dynacom Tankers Management	HHI	29/08/2014	M. Islnds	Diesel Electric	TZ Mk. III Flex	4	Yamal	H2565
Clean Vision	162,000	Olinda	HHI	11/08/2015	Malta	Diesel/Gas-Electric	TZ Mk. III Flex	4	Portfolio	2567
CNTIC VPower Energy	127,500	Shell Tankers Australia	Mitsubishi	01/01/1992	Liberia	Steam	Moss	4	North West Shelf	2041
Cobia LNG	174,000	Cardiff LNG ETA Owning LLC	HHI	28/02/2021	Malta	X-DF	TZ Mk. III Flex	4	–	3038
Cool Discoverer	174,000	Serendipity Maritime Ltd.	HHI	28/09/2020	Malta	X-DF	TZ Mk. III Flex	–	–	S970
Cool Explorer	160,000	Thenamaris Ships Management Inc.	Samsung	01/01/2015	Malta	–	TZ Mk. III Flex	4	Spot	2049
Cool Racer	174,000	Eloquent Shipping Ltd	HHI	10/02/2021	Malta	X-DF	TZ Mk. III Flex	4	–	3126
Cool Rider	155,000	RBSSAF (19) Ltd.	HHI	02/05/2007	Malta	–	TZ Mk. III	4	Portfolio	1777
Cool Rover	155,000	RBSSAF (19) Ltd.	HHI	20/06/2008	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	1779
Cool Runner	160,000	Thenamaris Ships Management Inc.	Samsung	27/03/2014	Malta	Diesel Electric	TZ Mk. III Flex	4	Wheatstone	H2046
Cool Voyager	160,000	Energy Shipping & Trading	Samsung	31/10/2013	Malta	TFDE	TZ Mk. III Flex	4	Wheatstone	–
Corcovado LNG	160,162	Drytank	Daewoo	03/04/2014	Malta	Diesel Electric	GT NO 96 L03	4	Spot	H2297
Cubal	160,276	Mint LNG IV	Samsung	12/01/2012	Bahamas	–	TZ Mk. III	4	Soyo	1813
Cygnus Passage	145,400	Cygnus LNG Shipping	Mitsubishi	06/01/2009	Bahamas	Steam	Moss	4	Sakhalin II	2235
Dapeng Moon	147,200	Yue Gang LNG Ship Management Co.	Hudong Zhonghua	17/07/2008	H.K., China	Steam	GT NO 96	4	Pluto	1309
Dapeng Princess	79,960	–	Hudong Zhonghua	19/02/2023	Singapore	DFDE	GTT 96	4	–	H1837A
Dapeng Star	147,210	Yue Peng LNG Shipping Co.	Hudong Zhonghua	04/11/2009	H.K., China	Steam	GT NO 96	4	Pluto	1379
Dapeng Sun	147,200	Yue Peng LNG Shipping Co.	Hudong Zhonghua	03/04/2008	H.K., China	Steam	GT NO 96	4	North West Shelf	1308
Diamond Gas Crystal	174,000	Diamond LNG Shipping 5 Pte Ltd.	Hyundai Samho	28/06/2021	Singapore	X-DF	TZ Mk. III Flex	4	–	8030
Diamond Gas Metropolis	174,000	Diamond LNG Shipping 4 Ltd.	HHI	03/11/2020	Bahamas	–	TZ Mk. III Flex	4	–	8029
Diamond Gas Orchid	165,000	NYK Line	Mitsubishi	02/06/2018	Bahamas	STaGE	Sayaringo	4	Cameron	2325
Diamond Gas Rose	165,000	NYK Line	Mitsubishi	02/08/2018	Bahamas	STaGE	Sayaringo	4	Cameron	2325

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Diamond Gas Sakura	165,000	Tokyo Gas	Japan Marine United	17/05/2019	Singapore	STaGE	Sayaringo	4	Cameron	2332
Diamond Gas Victoria	174,000	Diamond LNG Shipping 6 Pte Ltd.	Hyundai Samho	30/06/2021	Singapore	X-DF	TZ Mk. III Flex	4	–	8031
Disha	136,025	India LNG Transport Company No.1 Ltd.	Daewoo	25/12/2003	Malta	Gas Turbine	GT NO 96	4	RasGas	2210
Doha	137,262	Mitsui O.S.K. Lines	Mitsubishi	03/06/1999	M. Islnds	Steam	Moss	5	Qatargas I	2091
Dorado LNG	174,000	Hai Kuo Shipping 2052G Ltd.	Samsung	25/12/2020	Malta	X-DF	TZ Mk. III Flex	–	–	2276
Duhail	210,150	Nauranto Schiffsbetriebsgesellschaft	Daewoo	04/12/2007	Bahamas	Diesel	GT NO 96	4	Qatargas II	2247
Dukhan	137,661	Qatar LNG Transport	Mitsui E&S	29/09/2004	Liberia	Steam	Moss	5	Qatargas II	1561
East Energy	122,255	Bonny Gas Transport	STX	11/08/1982	Bermuda	Steam	Membrane	4	NLNG	26B
Eduard Toll	172,410	Teekay Corp.	Daewoo	22/09/2017	Bahamas	TFDE - Azipod	GT NO 96 GW	4	Yamal	2423
Ejnan	145,000	Peninsula LNG Transport No. 3	Samsung	16/01/2007	Bahamas	Steam	TZ Mk. III	4	RasGas II	1594
Ekaputra 1	136,400	Cometco Shipping Inc.	Mitsubishi	01/01/1989	Indonesia	Steam	Moss	5	Bontang	2011
Elisa Aquila	174,000	Caroline 82 SASU	Hyundai Samho	04/03/2022	France	X-DF	TZ Mk. III Flex	4	Portfolio	S917
Elisa Larus	174,000	Caroline 77 SASU	Hyundai Samho	18/05/2020	France	X-DF	TZ Mk. III Flex	4	Portfolio	S970
Energos Grand	145,700	Golar Grand Corp.	Daewoo	01/01/2006	M. Islnds	Steam	GT NO 96	4	Gorgon	2226
Energy Advance	147,624	Tokyo LNG Tanker Co. & . Toho LNG Shipping Co	Kawasaki	20/03/2005	Japan	Steam	Moss	4	Portfolio	1521
Energy Atlantic	156,000	Alpha Tankers	STX	28/09/2015	Malta	TFDE	GT NO 96 L03	4	Sabine Pass	1670
Energy Confidence	153,000	Tokyo LNG Tanker Co. & NYK	Kawasaki	20/04/2009	Japan	Steam	Moss	4	Darwin LNG	1611
Energy Endeavour	173,400	Rossini Navigation SA	Daewoo	01/01/2021	M. Islnds	ME-GI	GT NO 96 GW	–	–	2484
Energy Fidelity	174,000	–	Hyundai Samho	13/04/2023	M. Islnds	X-DF	–	4	–	8105
Energy Frontier	147,599	Tokyo LNG Tanker Co.	Kawasaki	01/09/2003	Japan	Steam	Moss	4	Sakhalin II	1520
Energy Glory	165,000	NYK Line	Japan Marine United	21/03/2019	Japan	TFDE	TZ Mk. III Flex+	4	Cove Point	5071
Energy Horizon	177,000	Tokyo LNG Tanker Co. & NYK	Kawasaki	31/08/2011	Japan	Steam	Moss	4	Pluto	1664
Energy Innovator	165,000	Tokyo Gas	Japan Marine United	22/06/2019	Japan	TFDE	TZ Mk. III Flex+	4	Cove Point	5072
Energy Integrity	173,400	Mozart Navigation SA	Daewoo	14/05/2021	M. Islnds	ME-GI	GT NO 96 GW	4	–	2485
Energy Intelligence	173,400	Strauss Navigation SA	Daewoo	30/06/2021	M. Islnds	ME-GI	GT NO 96 GW	4	–	2500
Energy Liberty	165,000	Mitsui O.S.K. Lines	Japan Marine United	11/10/2018	Japan	TFDE	TZ Mk. III Flex+	4	Cove Point	5070
Energy Navigator	145,000	Tokyo LNG Tanker Co.	Kawasaki	22/05/2008	Japan	Steam	Moss	4	Sakhalin II	1600
Energy Pacific	173,400	Ravel Navigation SA	Daewoo	24/08/2020	M. Islnds	ME-GI	GT NO 96 GW	–	–	2483
Energy Progress	147,558	Jovial Shipping Navigation	Kawasaki	24/11/2006	Japan	Steam	Moss	4	Darwin LNG	1540
Energy Spirit	74,100	GDF Armateur 2	STX	23/01/2004	Singapore	Diesel/Gas-Electric	CS1	4	Portfolio	32M
Energy Universe	166,571	Tokyo LNG Tanker Co.	Japan Marine United	03/08/2019	Panama	TFDE	TZ Mk. III Flex	4	Cove Point	5073
Enshu Maru	164,700	Mitsui O.S.K. Lines	Kawasaki	12/08/2018	Panama	Reheat Steam Turbine	Moss	4	Wheatstone	1720
Esshu Maru	153,000	Mitsui O.S.K. Lines	Mitsubishi	16/12/2014	Bahamas	–	Sayaendo	4	Portfolio	–
Etyfa Prometheas	135,269	Shell Bermuda (Overseas) Ltd.	Mitsubishi	02/10/2002	Singapore	Steam	Moss	5	Peru LNG	2172
Excalibur	138,034	Exmar Excalibur Shipping Co.	Daewoo	22/05/2002	Belgium	Steam	GT NO 96	4	Portfolio	2206
Extremadura Knutsen	174,000	Caroline 86 SASU	Hyundai Samho	17/02/2023	France	X-DF	Mark III Flex	4	Portfolio	8096
Fedor Litke	172,410	Arctic LNG 2 Ltd.	Daewoo	18/05/2017	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal	2422
Ferrol Knutsen	174,000	Caroline 85 SASU	Hyundai Samho	01/01/2023	France	X-DF	Mark III Flex	4	Portfolio	8095
Flex Amber	174,000	Bund 10 Holding Ltd	HHI	17/10/2020	M. Islnds	X-DF	TZ Mk. III Flex	–	Wheatstone	8011
Flex Artemis	174,000	Flex LNG Rreliance Ltd.	Daewoo	20/08/2020	M. Islnds	ME-GI	NO-96-GW+FRS	–	Portfolio	2479
Flex Aurora	174,000	Flex LNG Aurora Ltd.	HHI	25/06/2020	M. Islnds	X-DF	TZ Mk. III Flex	–	Portfolio	8010
Flex Constellation	173,400	Frontline	Daewoo	10/06/2019	M. Islnds	ME-GI	NO-96-GW+PRS	4	Portfolio	H2470
Flex Courageous	173,400	Frontline	Daewoo	27/08/2019	M. Islnds	ME-GI	NO-96-GW+PRS	4	–	2471
Flex Endeavour	172,400	Flex LNG	Daewoo	14/01/2018	M. Islnds	ME-GI	NO-96-GW+PRS	4	Corpus Christi LNG	2447
Flex Enterprise	172,400	Flex LNG	Daewoo	01/01/2018	M. Islnds	ME-GI	NO-96-GW+PRS	4	Wheatstone	2448
Flex Freedom	173,400	Flex Freedom Ltd.	Daewoo	01/01/2021	M. Islnds	ME-GI	NO-96-GW+FRS	–	–	2492
Flex Rainbow	174,000	Flex LNG	Samsung	14/06/2018	M. Islnds	ME-GI	TZ Mk. III Flex	4	Portfolio	2108
Flex Ranger	174,101	Flex LNG	Samsung	24/06/2018	M. Islnds	ME-GI	TZ Mk. III Flex	4	–	2107
Flex Resolute	173,400	Flex LNG Resolute Ltd.	HHI	04/09/2020	M. Islnds	ME-GI	NO-96-GW+FRS	4	Portfolio	2480
Flex Vigilant	174,000	Flex Vigilant Ltd.	HHI	31/05/2021	M. Islnds	X-DF	TZ Mk. III Flex	4	Portfolio	8013
Flex Volunteer	174,000	Flex Volunteer Ltd.	HHI	20/01/2021	M. Islnds	X-DF	TZ Mk. III Flex	4	Portfolio	8012
Fraiha	210,100	J5 Nakilat No.6 Ltd.	Daewoo	20/08/2008	M. Islnds	Diesel	GT NO 96	18	RasGas III	2252
Fuji LNG	149,172	Aletheia Owning Co.	Kawasaki	31/03/2004	Malta	Steam	Moss	4	Sabine Pass	1527
Fuwairit	138,200	Camartina Shipping Co.	Samsung	13/01/2004	Bahamas	Steam	TZ Mk. III	4	RasGas II	1406
Gail Bhuwan	180,000	Primavera Montana SA	Daewoo	10/02/2021	Cyprus	X-DF	GT NO 96 GW	4	Portfolio	2499
GasLog Athens	145,000	BG Group	Samsung	28/08/2006	Greece	Steam	TZ Mk. III	4	Idku	1555
GasLog Galveston	174,000	Gas-Thirty Three Ltd.	Samsung	05/01/2021	Bermuda	X-DF	TZ Mk. III Flex+	4	US Portfolio	2301
GasLog Geneva	174,000	GasLog	Samsung	04/10/2016	Bermuda	TFDE	TZ Mk. III Flex	4	Portfolio	2102
GasLog Genoa	174,000	GasLog	Samsung	31/03/2018	Bermuda	X-DF	TZ Mk. III Flex	4	Portfolio	2130
GasLog Georgetown	174,000	Gas-Thirty Two Ltd.	Samsung	16/11/2020	Bermuda	–	TZ Mk. III Flex+	4	Portfolio	2300
GasLog Gibraltar	174,000	Gas-Fourteen Ltd.	Samsung	04/11/2016	Bermuda	TFDE	TZ Mk. III Flex	4	Portfolio	2103
GasLog Gladstone	174,000	GasLog	Samsung	14/03/2019	Bermuda	X-DF	TZ Mk. III Flex+	4	Portfolio	2131
GasLog Glasgow	174,000	GasLog	Samsung	25/07/2016	Bermuda	TFDE	TZ Mk. III Flex	4	Portfolio	2073
GasLog Greece	174,000	GasLog	Samsung	29/03/2016	Bermuda	TFDE	TZ Mk. III Flex	4	Portfolio	2072
GasLog Hong Kong	174,000	GasLog	HHI	25/03/2018	Bermuda	X-DF	TZ Mk. III Flex	4	Portfolio	2801
GasLog Houston	174,000	GasLog	HHI	01/12/2018	Bermuda	X-DF	TZ Mk. III Flex	4	GoM	2800
GasLog Salem	155,000	GasLog	Samsung	06/05/2015	Bermuda	TFDE	TZ Mk. III	4	Portfolio	2044



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GasLog Santiago	155,000	Gas-Four Ltd.	Samsung	28/03/2013	Bermuda	TFDE	TZ Mk. III	4	Portfolio	1947
GasLog Saratoga	155,000	GasLog	Samsung	19/12/2014	Bermuda	TFDE	TZ Mk. III	4	Spot	2043
GasLog Savannah	155,000	Gas-One Ltd.	Samsung	31/05/2010	Bermuda	TFDE	TZ Mk. III	4	Portfolio	1641
GasLog Seattle	155,000	Gas-Seven Ltd.	Samsung	28/10/2013	Bermuda	TFDE	TZ Mk. III	4	Portfolio	2041
GasLog Shanghai	155,000	Gas-Three Ltd.	Samsung	05/02/2013	Bermuda	TFDE	TZ Mk. III	4	Portfolio	1946
GasLog Singapore	155,000	Gas-Two Ltd.	Samsung	06/08/2010	Bermuda	TFDE	TZ Mk. III	4	Portfolio	1642
GasLog Skagen	155,000	Gas-Six Ltd.	Samsung	01/08/2013	Bermuda	TFDE	TZ Mk. III	4	Portfolio	2017
GasLog Sydney	155,000	Gas-Five Ltd.	Samsung	06/06/2013	Bermuda	–	TZ Mk. III	4	Portfolio	2016
GasLog Wales	180,000	GasLog	Samsung	11/05/2020	Bermuda	X-DF	TZ Mk. III Flex+	4	Portfolio	2274
GasLog Warsaw	180,000	GasLog	Samsung	31/07/2019	Greece	X-DF	TZ Mk. III Flex+	4	Portfolio	2212
GasLog Wellington	176,400	GAS-Thirty Four Ltd.	Samsung	15/06/2021	Bermuda	X-DF	TZ Mk. III Flex+	4	US Portfolio	2311
GasLog Westminster	180,000	Gas-Thirty Ltd.	Samsung	15/07/2020	Bermuda	X-DF	TZ Mk. III Flex	–	Portfolio	2262
GasLog Winchester	176,400	Gas-Thirty Five Ltd.	Samsung	24/08/2021	Bermuda	X-DF	TZ Mk. III Flex+	4	US Portfolio	2312
GasLog Windsor	180,000	GasLog	Samsung	02/04/2020	Bermuda	X-DF	TZ Mk. III Flex	4	Portfolio	2213
Georgiy Brusilov	172,410	Arctic LNG 3 Ltd.	Daewoo	11/11/2018	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal	2427
Georgiy Ushakov	172,652	Teekay Corp.	Daewoo	16/09/2019	Bahamas	ME-GI	GT NO 96 GW	4	Yamal	2433
Ghasha	137,000	Ghasha Inc.	Mitsui E&S	01/06/1995	Liberia	Steam	Moss	5	Das Island	1392
Gigira Laitebo	177,419	Cleopatra LNG Shipping Co.	HHI	09/02/2010	Bahamas	–	TZ Mk. III	4	RasGas	1876
Global Energy	173,400	–	Daewoo	22/05/2020	M. Islnds	ME-GI	GT NO 96 GW	–	Portfolio	2478
Global Sea Spirit	169,932	Global Sea Spirit Inc	Daewoo	20/10/2021	M. Islnds	ME-GI	GT NO 96 GW	4	US Portfolio	2502
Global Sealine	174,000	Jackar Shiptrade SA	Daewoo	27/12/2021	M. Islnds	ME-GI	–	–	US Portfolio	2503
Global Star	173,400	Hai Kuo Shipping 2119G Ltd.	Daewoo	06/01/2021	M. Islnds	ME-GI	GT NO 96 GW	4	Portfolio	2487
Golar Arctic	140,648	Golar LNG 2216 Corp.	Daewoo	16/10/2003	M. Islnds	Steam	GT NO 96	4	Jamaica LNG	2216
Golar Bear	160,000	Golar LNG	Samsung	15/09/2014	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Spot	2027
Golar Celsius	160,000	Golar Hull M2026 Corp.	Samsung	08/10/2013	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Spot	2026
Golar Crystal	159,800	Golar LNG	Samsung	22/09/2014	M. Islnds	–	TZ Mk. III Flex	4	Portfolio	2022
Golar Glacier	162,000	Golar LNG	Hyundai Samho	10/11/2014	M. Islnds	TFDE	TZ Mk. III Flex	4	Spot	–
Golar Kelvin	162,000	Golar LNG	Hyundai Samho	12/01/2015	M. Islnds	–	TZ Mk. III Flex	4	Spot	S659
Golar Maria	145,700	Golar LNG 2234 LLC	Daewoo	16/06/2006	M. Islnds	Steam	GT NO 96	4	Spot	2234
Golden Isaia	145,000	Lloyds TSB Leasing No.8 Ltd.	Samsung	26/02/2007	Indonesia	Steam	TZ Mk. III	4	Punta Europa	1585
Grace Acacia	149,700	Algawin Shipping Inc.	HHI	13/02/2007	Bahamas	Steam	TZ Mk. III	4	Spot	1728
Grace Barleria	149,700	NYK LNG Shipmanagement	HHI	05/04/2007	Japan	–	TZ Mk. III	4	Portfolio	1729
Grace Cosmos	150,000	Algahunt Shipping Inc.	HHI	13/02/2008	Bahamas	Steam	TZ Mk. III	4	Portfolio	1730
Grace Dahlia	177,000	NYK Line	Kawasaki	16/09/2013	Japan	Steam	Moss	4	Spot	1665
Grace Emilia	174,000	Akizuki Maritima SA	Hyundai Samho	31/10/2021	Bahamas	X-DF	TZ Mk. III	4	Portfolio	8032
Grace Freesia	174,000	Okusankichi Maritima SA	Hyundai Samho	27/03/2022	Bahamas	X-DF	–	4	Portfolio	8033
Grand Aniva	145,000	NYK-SCF LNG Shipping No. 1	Mitsubishi	04/01/2008	Cyprus	Steam	Moss	4	Sakhalin II	2230
Grand Elena	145,580	NYK-SCF LNG Shipping No. 1	Mitsubishi	17/10/2007	Cyprus	Steam	Moss	4	Sakhalin II	2229
Grand Mereya	147,000	Ice Gas LNG Shipping Co.	Mitsui E&S	16/03/2008	Cyprus	Steam	Moss	4	Sakhalin II	1681
Grazyna Gesicka	174,000	Knutsen OAS Shipping c/o SNC Diderot Financement 33	HHI	02/05/2023	France	X-DF	–	4	Portfolio	3244
Gui Ying	170,701	Fortune Power Shipping Ltd.	Hudong Zhonghua	08/10/2021	Singapore	X-DF	GT NO 96 L03+	4	–	H1828A
Hanjin Muscat	138,366	Pluto Lease Corp.	Hanjin (Busan)	30/07/1999	South Korea	Steam	GT NO 96	4	Oman LNG	54
Hanjin Pyeongtaek	130,636	Hanjin Shipping Co.	Hanjin (Busan)	26/09/1995	South Korea	Steam	GT NO 96	4	Bontang	16
Hanjin Ras Laffan	138,214	KSH International	Hanjin (Busan)	20/07/2000	South Korea	Steam	GT NO 96	4	RasGas I	62
Hanjin Sur	138,333	KSG International	Hanjin (Busan)	27/02/2000	South Korea	Steam	GT NO 96	4	Oman LNG	61
Hellas Athina	170,520	Kronos Shipping LLC	Hyundai Samho	01/09/2021	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	8040
Hellas Diana	174,000	Zeus Shipping LLC	Hyundai Samho	31/03/2021	Malta	X-DF	TZ Mk. III Flex	4	Portfolio	8039
Hoegh Gandria	160,000	Golar Hull M2021 Corp.	Samsung	13/09/2013	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Spot	2021
HongKong Energy	138,000	Chevron LNG Shipping Co.	Daewoo	20/02/2004	M. Islnds	Steam	GT NO 96	4	North West Shelf	2214
Huelva Knutsen	174,000	Sea 201 Leasing Co Ltd	Hyundai Samho	13/10/2022	Norway	X-DF	TZ Mk. III Flex+	4	Portfolio	8094
Hyundai Aquapia	137,415	H&S Shipping	HHI	04/05/2000	M. Islnds	Steam	Moss	4	Oman LNG	1156
Hyundai Cosmopia	137,415	H&B Shipping	HHI	08/02/2000	M. Islnds	Steam	Moss	4	RasGas I	1074
Hyundai Ecopia	149,745	KLT 1 International	HHI	30/11/2008	Panama	–	TZ Mk. III	4	Balhaf	1903
Hyundai Greenpia	125,000	Hyundai Merchant Marine	HHI	01/05/1996	South Korea	Steam	Moss	4	MLNG	853
Hyundai Oceanpia	135,000	H&T Shipping	HHI	19/06/2000	M. Islnds	Steam	Moss	4	Oman LNG	1157
Hyundai Peacepia	174,000	Hyundai LNG Shipping	Daewoo	08/06/2017	Panama	ME-GI	GT NO 96 GW	4	Sabine Pass	2452
Hyundai Princepia	174,000	Hyundai LNG Shipping	Daewoo	11/05/2017	Panama	ME-GI	GT NO 96 GW	4	Sabine Pass	2451
Hyundai Technopia	137,415	H&K Shipping	HHI	31/07/1999	M. Islnds	Steam	Moss	4	RasGas I	1073
Hyundai Utopia	125,182	Hyundai Merchant Marine	HHI	01/06/1994	South Korea	Steam	Moss	4	Donggi Senoro	760
Iberica Knutsen	138,000	Norspan LNG III AS	Daewoo	08/08/2006	Norway	Ultra Steam Turbine	GT NO 96	4	Portfolio	2236
Ibra LNG	147,000	SNC Corentin	Samsung	19/07/2006	Panama	Steam	TZ Mk. III	4	Oman LNG	1573
Ibri LNG	147,569	Dune LNG Carrier	Mitsubishi	01/07/2006	Panama	Steam	Moss	4	Oman LNG	2215
Isabella	169,932	Kasimia Marine Co.	Daewoo	22/07/2021	Greece	ME-GI	GT NO 96 GW	4	–	2495
Ish	137,000	Ish Inc.	Mitsubishi	10/11/1995	Liberia	Steam	Moss	5	Das Island	2067
John A Angelicoussis	174,000	Varta Shipping Ltd	Daewoo	31/03/2022	Greece	ME-GI	–	4	–	2508
K. Acacia	138,017	Horizon Maritime Shipholding	Daewoo	31/12/1999	South Korea	Steam	GT NO 96	4	Oman LNG	2203
K. Freesia	138,015	Meridian Maritime Shipholding	Daewoo	20/08/2000	South Korea	Steam	GT NO 96	4	RasGas I	2204
K. Jasmine	145,878	Kolt JV No. 1	Daewoo	09/05/2008	Panama	Steam	GT NO 96	4	Sakhalin II	2260

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K. Mugungwha	151,812	Kolt JV No. 2	Daewoo	20/11/2008	Panama	Steam	GT NO 96	4	Oman LNG	2261
Kinisis	173,400	Chandris Group	Daewoo	01/10/2018	Liberia	ME-GI	GT NO 96 GW	4	Portfolio	2464
Kita LNG	147,895	Cardiff LNG	Daewoo	29/05/2014	Malta	Diesel Electric	GT NO 96 L03	4	Spot	H2298
Kmarin Diamond	155,000	RBSSAF (19) Ltd.	Hyundai Samho	28/07/2008	U.K.	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	S297
Kool Baltic	170,200	Sovcomflot	STX	03/01/2015	Liberia	Diesel Electric	GT NO 96 GW	4	Portfolio	1912
Kool Blizzard	160,000	Golar LNG	Samsung	12/01/2015	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Spot	2047
Kool Boreas	170,200	Sovcomflot	STX	23/04/2015	Liberia	Diesel Electric	GT NO 96 GW	4	Portfolio	1913
Kool Firn	174,000	Heliconia Maritime SA	HHI	18/09/2020	Liberia	DFDS	TZ Mk. III Flex	4	Portfolio	8007
Kool Frost	160,000	Golar LNG	Samsung	01/10/2014	M. Islnds	Diesel/Gas-Electric	TZ Mk. III Flex	4	Portfolio	2055
Kool Ice	160,000	Golar LNG	Samsung	31/01/2015	M. Islnds	Diesel Electric	TZ Mk. III Flex	4	Spot	2048
Kool Orca	174,000	Headliner Maritime SA	HHI	15/01/2021	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio	8008
KPS LNG Anatolia	154,472	GDF Armateur 2	STX	21/11/2006	Liberia	Diesel/Gas-Electric	CS1	4	Portfolio	32N
Kumul	170,000	Mitsui O.S.K. Lines	Hudong Zhonghua	05/12/2015	H.K., China	Diesel	GT NO 96	4	PNG LNG	1673A
Kun Lun	174,400	–	Hudong Zhonghua	05/04/2023	China	X-DF	–	4	Portfolio	H1833A
La Mancha Knutsen	176,300	Norspan LNG IX	HHI	21/09/2016	Spain	ME-GI	TZ Mk. III Flex	4	Portfolio	2733
La Seine	174,000	Xiang CH16 HK International	HHI	29/02/2020	Malta	X-DF	TZ Mk. III Flex	–	Portfolio	3020
Lagenda Serenity	79,960	Kawasaki Kisen Kaisha	Hudong Zhonghua	10/06/2022	Singapore	LP-DF	–	3	Malaysia LNG	H1789A
Lagenda Suria	79,960	Silk LNG Transport No 1 Pte Ltd	Hudong Zhonghua	27/05/2022	Singapore	LP-DF	–	3	Malaysia LNG	H1788A
Lalla Fatma N'Soumer	145,000	Algerian Nippon Gas Transport Corp.	Kawasaki	18/10/2004	Bahamas	Steam	Moss	4	Arzew	1534
Lech Kaczynski	174,000	SNC Martin	HHI	09/12/2022	France	X-DF	–	4	Portfolio	3243
Lena River	155,000	Solana Holdings	HHI	24/09/2013	M. Islnds	–	TZ Mk. III	4	Portfolio	H2557
Lerici	65,000	LNG Shipping S.p.A.	Sestri Ponente	03/04/1998	Singapore	Steam	GT NO 96	4	Portfolio	5911
Lijmiliya	263,300	Nakilat Lijmiliya Inc.	Daewoo	11/12/2008	M. Islnds	Diesel	GT NO 96	5	Qatargas II	2256
LNG Abalamabie	162,000	Bonny Gas Transport	Samsung	23/07/2016	Bermuda	–	TZ Mk. III Flex	4	NLNG	2079
LNG Abuja II	162,000	Bonny Gas Transport	Samsung	02/03/2016	Bermuda	–	TZ Mk. III Flex	4	NLNG	2078
LNG Adamawa	141,000	Bonny Gas Transport	HHI	25/04/2005	Bermuda	Steam	Moss	4	NLNG	1470
LNG Adventure	174,000	Diderot Financement 28 SNC	Samsung	31/03/2021	France	X-DF	TZ Mk. III Flex	4	–	2302
LNG Akwa Ibom	141,000	Bonny Gas Transport	HHI	11/10/2004	Bermuda	Steam	Moss	4	NLNG	1469
LNG Alliance	154,472	NYK Armateur	STX	30/03/2007	France	Diesel/Gas-Electric	CS1	4	Portfolio	32P
LNG Aquarius	126,300	P.T. Hanochem Shipping	General Dynamics	01/01/1977	Indonesia	Steam	Moss	5	Bontang	41
LNG Barka	155,982	Lloyd's TSB General Leasing (No. 3)	Kawasaki	29/12/2008	Bahamas	Steam	Moss	4	Oman LNG	1591
LNG Bayelsa	137,500	Bonny Gas Transport	HHI	08/03/2003	Bermuda	–	Moss	4	NLNG	1429
LNG Benue	145,952	BW Gas LNG Carriers	Daewoo	05/04/2006	Bermuda	Steam	GT NO 96	4	NLNG	2224
LNG Bonny II	174,000	Nigeria LNG	HHI	02/12/2015	Bermuda	Diesel/Gas-Electric	TZ Mk. III Flex	4	NLNG	2636
LNG Borno	149,600	Okra Shipping No. 1	Samsung	16/08/2007	Bermuda	Steam	TZ Mk. III	4	NLNG	1563
LNG Cross River	141,000	Bonny Gas Transport	HHI	22/08/2005	Bermuda	Steam	Moss	4	NLNG	1471
LNG Dream	145,000	Osaka Gas Consortium	Kawasaki	02/09/2006	Bahamas	Steam	Moss	4	North West Shelf	1545
LNG Dubhe	174,000	Mitsui O.S.K. Lines	Hudong Zhonghua	07/11/2019	H.K., China	ME-GI	GT NO 96 L03+	4	Yamal	1810A
LNG Ebisu	147,546	LNG Ebisu Shipping Corp.	Kawasaki	12/07/2008	Bahamas	–	Moss	4	Pluto	1588
LNG Endeavour	170,520	Fortune Great Shipping Ltd.	Samsung	20/10/2021	France	X-DF	TZ Mk. III Flex	4	Portfolio	2355
LNG Endurance	174,000	DuPlessis Bail SNC	Samsung	01/12/2021	France	X-DF	TZ Mk. III Flex	4	Portfolio	2370
LNG Enterprise	170,520	Hanovre Financement 20 SASU	Samsung	03/10/2021	France	–	TZ Mk. III Flex	4	–	2360
LNG Enugu	145,926	BW Gas LNG Carriers	Daewoo	05/10/2005	Bermuda	Steam	GT NO 96	4	NLNG	2222
LNG Finima II	162,000	Bonny Gas Transport	Samsung	02/12/2015	Bermuda	–	TZ Mk. III Flex	4	NLNG	2076
LNG Fukurokuju	164,700	Mitsui O.S.K. Lines	Kawasaki	18/07/2016	Bahamas	–	Moss	4	APLNG	1712
LNG Harmony	174,000	Jupiter 5 Ltd.	HHI	21/07/2023	Liberia	X-DF	TZ Mk. III Flex	4	Portfolio	3190
LNG Imo	148,452	Bergesen LNG XI Ltd.	Daewoo	25/06/2008	Bermuda	–	GT NO 96	4	NLNG	2232
LNG Jamal	135,333	Osaka Gas Consortium	Mitsubishi	31/10/2000	Japan	Steam	Moss	5	Oman LNG	2157
LNG Juno	180,000	Mitsui O.S.K. Lines	Mitsubishi	18/10/2018	Bahamas	STaGE	Moss	–	Freeport	2323
LNG Jupiter	153,000	Osaka Gas Consortium	Kawasaki	01/07/2009	Bahamas	Steam	Moss	4	PNG LNG	1592
LNG Jurojin	160,000	LNG Jurojin Shipping Corp.	Mitsubishi	30/11/2015	Bahamas	–	Moss	4	Portfolio	2299
LNG Kano	148,565	Bergesen LNG IX Ltd.	Daewoo	26/01/2007	Bermuda	Steam	GT NO 96	4	NLNG	2230
LNG Kolt	153,595	KLT 5 International	Hanjin (Busan)	24/12/2008	Panama	Steam	TZ Mk. III	4	Portfolio	192
LNG Lagos II	174,000	Nigeria LNG	HHI	22/01/2016	Bermuda	–	TZ Mk. III Flex	4	NLNG	2637
LNG Lokoja	148,471	Bergesen LNG VIII Ltd.	Daewoo	28/11/2006	Bermuda	Steam	GT NO 96	4	NLNG	2229
LNG Maleo	127,544	Mitsui O.S.K. Lines	Mitsui E&S	01/01/1989	Japan	Steam	Moss	4	North West Shelf	1351
LNG Mars	155,693	Osaka Gas Consortium	Mitsubishi	14/10/2016	Japan	Steam	Moss	4	PNG LNG	2296
LNG Megrez	174,000	Mitsui O.S.K. Lines	Hudong Zhonghua	01/11/2020	H.K., China	ME-GI	GT NO 96 L03+	4	Yamal	1813A
LNG Merak	174,000	Mitsui O.S.K. Lines	Hudong Zhonghua	08/01/2020	H.K., China	ME-GI	GT NO 96 L03+	4	Yamal	1811A
LNG Ogun	149,000	Okra Shipping No. 1	Samsung	07/07/2007	Bermuda	Steam	TZ Mk. III	4	NLNG	1564
LNG Ondo	148,478	Bergesen LNG X Ltd.	Daewoo	21/09/2007	Bermuda	Steam	GT NO 96	4	NLNG	2231
LNG Oyo	145,842	BW Gas LNG Carriers	Daewoo	06/01/2006	Bermuda	Steam	GT NO 96	4	NLNG	2223
LNG Phecda	174,000	Mitsui O.S.K. Lines	Hudong Zhonghua	02/09/2020	H.K., China	ME-GI	GT NO 96 L03+	4	Yamal	1812A
LNG Port Harcourt II	162,000	Bonny Gas Transport	Samsung	14/12/2015	Bermuda	–	TZ Mk. III Flex	4	NLNG	2077
LNG Prima Carrier	137,000	Pacific Eurus Shipping	Mitsubishi	14/03/2006	Indonesia	Steam	Moss	4	Das Island	2187
LNG Prosperity	174,000	Hai Kuo Shipping 2001G Ltd (c/o Oconix Services)	HHI	07/01/2023	Liberia	X-DF	TZ Mk. III Flex+	4	Portfolio	3188
LNG River Niger	141,000	Bonny Gas Transport	HHI	06/07/2006	Bermuda	Steam	Moss	4	NLNG	1472

MINIMIZED OPERATING COSTS IN BOG MANAGEMENT

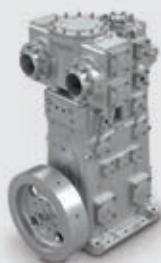
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LNG River Orashi	145,914	BW Gas LNG Carriers	Daewoo	04/11/2004	Bermuda	Steam	GT NO 96	4	NLNG	2221
LNG Rivers	137,200	Bonny Gas Transport	HHI	20/06/2002	Bermuda	–	Moss	4	NLNG	1295
LNG Rosenrot	176,523	Fair Wind Navigation SA	Daewoo	25/01/2021	M. Islnds	X-DF	GT NO 96 GW	4	Portfolio	2498
LNG Sakura	177,000	Mitsui O.S.K. Lines	Kawasaki	26/02/2018	Bahamas	TFDE	Moss	–	Freeport	1731
LNG Saturn	155,300	Mitsui O.S.K. Lines	Mitsubishi	03/02/2016	Bahamas	Ultra Steam Turbine	Moss	4	Gorgon	2311
LNG Schneeweisschen	180,000	Mitsui O.S.K. Lines	Daewoo	01/09/2018	Panama	TFDE	GT NO 96 GW	–	Freeport	2462
LNG Sokoto	137,425	Bonny Gas Transport	HHI	28/09/2002	Bermuda	–	Moss	4	NLNG	1296
LNG Venus	153,000	Mitsui O.S.K. Lines	Mitsubishi	14/11/2014	Japan	–	Sayaendo	4	North West Shelf	2295
LNG Vesta	127,386	Tokyo LNG Tanker Co.	Mitsubishi	30/06/1994	Japan	Steam	Moss	4	–	2061
LNGShips Athena	170,618	Cardiff LNG Iota Owning LLC	HHI	29/03/2021	Malta	X-DF	TZ Mk. III Flex	4	QCLNG	112
LNGShips Empress	174,000	Cardiff LNG Kappa Owning LLC	Samsung	31/03/2021	Malta	X-DF	TZ Mk. III Flex	4	QCLNG	2380
LNGShips Manhattan	174,000	Cardiff LNG Theta Owning LLC	HHI	07/05/2021	Malta	X-DF-HPSCR	NO-96-GW+PRS	4	QCLNG	3039
Lobito	160,276	Mint LNG III	Samsung	08/11/2011	Bahamas	–	TZ Mk. III	4	Soyo	1812
Lusail	145,000	Peninsula LNG Transport No. 1	Samsung	02/05/2005	Bahamas	–	TZ Mk. III	4	RasGas II	1440
Macoma	145,400	Teekay LNG Partners	Daewoo	16/09/2017	Bahamas	ME-GI	GT NO 96 GW	4	Portfolio	2417
Magdala	173,400	Teekay Corp.	Daewoo	13/02/2018	Bahamas	ME-GI	GT NO 96 GW	4	Portfolio	2453
Malaga Knutsen	174,000	Millenaire Financement 17 SASU	Hyundai Samho	29/07/2022	France	X-DF	TZ Mk. III Flex+	4	Portfolio	8092
Malanje	160,276	Mint LNG II	Samsung	05/10/2011	Bahamas	–	TZ Mk. III	4	Soyo	1811
Maran Gas Achilles	174,000	Maran Gas Maritime	Hyundai Samho	21/01/2016	Greece	–	TZ Mk. III Flex	4	Portfolio	S689
Maran Gas Agamemnon	174,000	Maran Gas Maritime	Hyundai Samho	11/05/2016	Greece	–	TZ Mk. III Flex	4	Portfolio	S690
Maran Gas Alexandria	161,870	Maran Gas Maritime	Hyundai Samho	02/10/2015	Greece	–	TZ Mk. III Flex	4	QCLNG	S627
Maran Gas Amorgos	169,932	Vero Maritime Inc	Daewoo	19/11/2021	Greece	ME-GI	GT NO 96	4	–	2506
Maran Gas Amphipolis	174,000	Maran Gas Maritime	Daewoo	01/08/2016	Greece	–	GT NO 96 L03	4	Portfolio	2412
Maran Gas Andros	173,400	Maran Gas Maritime	Daewoo	01/11/2019	Greece	ME-GI	GT NO 96 GW	4	Freeport	2467
Maran Gas Apollonia	161,870	Maran Gas Maritime	Hyundai Samho	08/01/2014	Greece	Diesel Electric	TZ Mk. III Flex	4	Punta Europa	S624
Maran Gas Asclepius	145,000	Sea Satin Corp.	Daewoo	29/07/2005	Greece	Steam	GT NO 96	4	RasGas II	H2227
Maran Gas Chios	170,000	Maran Gas Maritime	Daewoo	26/03/2019	Greece	ME-GI	GT NO 96 GW	4	–	2456
Maran Gas Coronis	145,700	Jopica Shipping Company	Daewoo	27/07/2007	Greece	Steam	GT NO 96	4	RasGas II	2244
Maran Gas Delphi	159,800	Maran Gas Maritime	Daewoo	06/02/2014	Greece	Diesel Electric	GT NO 96 L03	4	Portfolio	2296
Maran Gas Efessos	159,800	Maran Gas Maritime	Daewoo	12/06/2014	Greece	–	GT NO 96 L03	4	Portfolio	H-2291
Maran Gas Hector	174,000	Maran Gas Maritime	Hyundai Samho	08/11/2016	Greece	Diesel/Gas-Electric	TZ Mk. III Flex	–	Portfolio	S691
Maran Gas Hydra	173,400	Maran Gas Maritime	Daewoo	14/02/2019	Greece	ME-GI	GT NO 96 GW	4	Sabine Pass	2459
Maran Gas Ithaca	174,000	Arona Maritime Inc.	Daewoo	26/10/2021	Greece	X-DF	GT NO 96 GW	4	–	2507
Maran Gas Kalymnos	169,932	Hai Kuo Shipping 2028G Ltd	Daewoo	15/09/2021	Greece	ME-GI	Membrane	4	–	2504
Maran Gas Leto	174,000	Maran Gas Maritime	Hyundai Samho	29/03/2016	Greece	–	TZ Mk. III	4	Portfolio	S688
Maran Gas Lindos	161,870	Maran Gas Maritime	Daewoo	02/07/2015	Greece	–	GT NO 96 L03	4	Punta Europa	2292
Maran Gas Mystras	155,900	Maran Gas Maritime	Daewoo	03/08/2015	Greece	–	GT NO 96 L03	4	QCLNG	2405
Maran Gas Olympias	174,000	Maran Gas Maritime	Daewoo	04/02/2017	Greece	ME-GI	GT NO 96 L03	–	Portfolio	2415
Maran Gas Pericles	173,400	Maran Gas Maritime	Hyundai Samho	24/08/2016	Greece	–	TZ Mk. III Flex	4	Portfolio	S734
Maran Gas Posidonia	161,870	Maran Gas Maritime	Hyundai Samho	27/05/2014	Greece	–	TZ Mk. III Flex	4	Punta Europa	S625
Maran Gas Psara	173,595	Highseas Shiptrade Co.	Daewoo	07/05/2020	Greece	ME-GI	GT NO 96 GW	4	Portfolio	2469
Maran Gas Roxana	174,000	Maran Gas Maritime	Daewoo	12/01/2017	Greece	ME-GI	GT NO 96 L03	4	Portfolio	2413
Maran Gas Sparta	159,800	Maran Gas Maritime	Hyundai Samho	22/04/2015	Greece	–	TZ Mk. III Flex	4	QCLNG	S626
Maran Gas Spetses	173,400	Maran Gas Maritime	Daewoo	03/07/2018	Greece	ME-GI	GT NO 96 GW	4	GoM	2458
Maran Gas Troy	155,000	Maran Gas Maritime	Daewoo	24/09/2015	Greece	–	GT NO 96 L03	4	–	2406
Maran Gas Ulysses	173,400	Maran Gas Maritime	Hyundai Samho	23/01/2017	Greece	Diesel/Gas-Electric	TZ Mk. III Flex	–	Portfolio	S735
Maran Gas Vergina	174,000	Santa Lucia Enterprises Inc.	Daewoo	07/12/2016	Greece	ME-GI	GT NO 96	–	Portfolio	2414
Maria Energy	174,000	Tsakos Energy Navigation	HHI	01/09/2016	Liberia	Diesel/Gas-Electric	TZ Mk. III Flex	4	–	2612
Marshal Vasilevskiy	170,520	Gazprom	HHI	10/01/2019	Russia	Diesel/Gas-Electric	TZ Mk. III Flex	4	Kaliningrad LNG	2854
Marvel Crane	177,000	NYK Line	Mitsubishi	28/03/2019	Singapore	STaGE	Moss	–	Cameron	2321
Marvel Eagle	155,000	Mitsui O.S.K. Lines	Kawasaki	19/10/2018	Panama	Reheat Steam Turbine	Moss	–	Cameron	1728
Marvel Falcon	174,000	Mitsui O.S.K. Lines	Samsung	20/04/2018	Singapore	TFDE	TZ Mk. III Flex	4	Cameron	2148
Marvel Hawk	177,000	Mitsui O.S.K. Lines	Samsung	01/12/2018	Singapore	TFDE	TZ Mk. III Flex	4	Cameron	2149
Marvel Heron	177,000	Mitsui O.S.K. Lines	Mitsubishi	28/09/2019	Panama	STaGE	Moss	–	Cameron	2322
Marvel Kite	177,000	Mitsui O.S.K. Lines	Samsung	31/01/2019	Singapore	TFDE	TZ Mk. III	4	Cameron	2150
Marvel Pelican	156,265	Mitsui O.S.K. Lines	Kawasaki	13/12/2019	Panama	Reheat Steam Turbine	Moss	4	Cameron	1729
Marvel Swan	174,000	MIF I NO 20 K/S	Samsung	08/04/2021	Denmark	X-DF	TZ Mk. III Flex	4	–	2310
Megara	173,400	Teekay LNG Partners	Daewoo	19/07/2018	Bahamas	ME-GI	GT NO 96 GW	4	Portfolio	2455
Mekaines	266,000	Nakilat SHI 1695 Inc.	Samsung	03/04/2009	M. Islnds	–	TZ Mk. III	5	Qatargas III	1695
Merchant	138,000	Sea Breeze Leasing	Samsung	23/07/2003	M. Islnds	Steam	TZ Mk. III	4	Portfolio	1381
Mesaimeer	216,312	Nakilat HHI 1908 Inc.	HHI	12/03/2009	M. Islnds	Diesel	TZ Mk. III	4	Qatargas III	1908
Methane Alison Victoria	145,000	Lloyds TSB Leasing No.8 Ltd.	Samsung	27/04/2007	Bermuda	Steam	TZ Mk. III	4	Punta Europa	1587
Methane Becki Anne	170,000	Methane Services (Shell)	Samsung	14/09/2010	Bermuda	–	TZ Mk. III	4	Singapore	1858
Methane Heather Sally	145,000	Lloyds TSB Leasing No.8 Ltd.	Samsung	08/01/2007	Bermuda	Steam	TZ Mk. III	4	Punta Europa	1586
Methane Jane Elizabeth	145,000	British Gas Asia Pacific	Samsung	05/06/2006	Bermuda	Steam	TZ Mk. III	4	Idku	1554
Methane Julia Louise	170,000	Methane Services (Shell)	Samsung	19/04/2010	Bermuda	–	TZ Mk. III	9	Singapore	1745
Methane Mickie Harper	170,000	Methane Services (Shell)	Samsung	28/12/2010	Panama	Diesel/Gas-Electric	TZ Mk. III	4	Singapore	1859
Methane Nile Eagle	145,000	Egypt LNG Shipping	Samsung	05/12/2007	Bermuda	Steam	TZ Mk. III	4	Idku	1588
Methane Patricia Camila	170,000	Methane Services (Shell)	Samsung	29/10/2010	Panama	–	TZ Mk. III	4	Singapore	1746

Methane Princess	138,000	Golar LNG	Daewoo	29/08/2003	M. Islnds	Steam	GT NO 96	4	Portfolio	2215
Methane Rita Andrea	145,000	British Gas Asia Pacific	Samsung	07/04/2006	Bermuda	Steam	TZ Mk. III	4	Idku	1553
Milaha Qatar	145,500	Qatar Shipping Co.	Samsung	15/04/2006	Malta	Steam	TZ Mk. III	4	RasGas II	1562
Milaha Ras Laffan	138,270	Milaha Ras Laffan GmbH & Co. KG	Samsung	06/04/2004	Malta	Steam	TZ Mk. III	4	RasGas II	1425
Min Lu	147,100	Minlu LNG Shipping Co.	Hudong Zhonghua	29/08/2009	H.K., China	–	GT NO 96	4	Tangguh	1378
Min Rong	145,000	Min Rong LNG Shipping Co.	Hudong Zhonghua	24/02/2009	H.K., China	–	GT NO 96	4	Tangguh	1320
Minerva Amorgos	170,520	Vitamin Shipping SA	Samsung	21/09/2022	Malta	X-DF	TZ Mk. III Flex+	4	–	2332
Minerva Chios	170,520	Peninsula Shipping SA	Samsung	02/08/2021	Malta	X-DF	TZ Mk. III Flex+	4	–	2305
Minerva Kalymnos	174,000	Koje Shipping SA	Samsung	28/02/2021	Malta	X-DF	TZ Mk. III Flex+	4	–	2304
Minerva Limnos	173,400	Roland Shipping SA	Daewoo	30/06/2021	Malta	ME-GI	TZ Mk. III Flex+	4	–	2482
Minerva Psara	173,400	Wimbledon Shipping SA	Daewoo	04/01/2021	Malta	–	GT NO 96 GW	4	–	2481
MOL Hestia	173,400	LNG Harmonia Shipping Corp	Daewoo	26/07/2021	M. Islnds	X-DF	GT NO 96 GW	4	–	2505
Mozah	266,000	Nakilat Haloul Inc.	Samsung	11/08/2009	M. Islnds	Diesel	TZ Mk. III	5	Qatargas II	1675
Mraweh	137,000	Mraweh Ltd.	STX	30/04/1996	Liberia	Steam	Moss	4	Das Island	1331
Mu Lan	174,400	Fortune Great Shipping Ltd.	Hudong Zhonghua	31/08/2021	Liberia	X-DF	GT NO 96 L03+	4	–	1827A
Mubaraz	137,000	Mubaraz Ltd.	STX	14/12/1995	Liberia	Steam	Moss	4	Das Island	1330
Murex	173,400	Teekay LNG Partners	Daewoo	18/07/2017	Bahamas	ME-GI	GT NO 96 GW	4	Portfolio	2416
Murwab	210,100	J5 Nakilat No. 4 Ltd.	Daewoo	30/06/2008	M. Islnds	Diesel	GT NO 96	18	RasGas III	251
Myrina	173,400	Teekay Corp.	Daewoo	10/05/2018	Bahamas	ME-GI	GT NO 96 GW	4	Portfolio	2454
Neo Energy	150,000	Sea Optima	HHI	01/01/2007	Liberia	Steam	TZ Mk. III	4	Portfolio	1754
Neptune	145,130	SRV Joint Gas Ltd.	Samsung	30/11/2009	Norway	–	TZ Mk. III	4	Portfolio	1688
New Apex	174,000	POS Maritime AF SA	Samsung	26/01/2023	Panama	X-DF	–	4	Portfolio	2426
NFE Penguin	160,000	Golar LNG	Samsung	15/09/2014	M. Islnds	–	TZ Mk. III Flex	4	Spot	2023
Nikolay Urvantsev	172,658	China Shipping Development Co.	Daewoo	31/07/2019	H.K., China	ME-GI	GT NO 96 GW	4	Yamal	2432
Nikolay Yevgenov	172,410	Teekay Corp.	Daewoo	19/04/2019	Bahamas	ME-GI	GT NO 96 GW	4	Yamal	2430
Nikolay Zubov	172,410	Arctic LNG 5 Ltd.	Daewoo	20/11/2018	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal	2429
Nizwa LNG	147,684	Oryx LNG Carrier	Kawasaki	19/12/2005	Panama	Steam	Moss	4	Oman LNG	1562
Nohshu Maru	180,000	Mitsui O.S.K. Lines	Mitsubishi	27/02/2019	Bahamas	Reheat Steam Turbine	Moss	4	–	2326
Northwest Sanderling	127,525	Shell Tankers Australia	Mitsubishi	01/01/1989	Australia	Steam	Moss	4	North West Shelf	1996
Northwest Sandpiper	125,042	Shell Tankers Australia	Mitsui E&S	01/01/1993	Australia	Steam	Moss	4	North West Shelf	1370
Northwest Snipe	127,500	International Gas Transportation Co., Ltd.	Mitsui E&S	01/01/1990	Australia	Steam	Moss	4	North West Shelf	1352
Northwest Stormpetrel	127,500	Shell Tankers Australia	Mitsubishi	11/12/1994	Australia	Steam	Moss	4	North West Shelf	2074
Ob River	149,700	Lance Shipping	HHI	29/05/2007	M. Islnds	Steam	TZ Mk. III	4	Sakhalin II	1719
Oceanic Breeze	155,300	"K" Line - Kawasaki Kisen Kaisha	Mitsubishi	21/04/2018	M. Islnds	Reheat Steam Turbine	Moss	4	Ichthys	2310
Onaiza	210,150	Nakilat DSME 2266 Inc.	Daewoo	30/04/2009	M. Islnds	Diesel	GT NO 96	12	Qatargas III	2266
Orion Bohemia	174,000	SNC Cantica Lease	HHI	24/11/2022	Malta	X-DF	TZ Mk. III Flex+	4	Portfolio	3187
Orion Jessica	174,000	–	HHI	23/06/2023	Malta	X-DF	–	4	Portfolio	3189
Orion Monet	174,000	Jupiter 3 Ltd	Samsung	01/04/2022	Malta	X-DF	–	4	–	2319
Orion Sea	170,852	Meridian 23 Ltd.	Samsung	04/01/2022	Malta	X-DF	–	4	–	2336
Orion Sun	174,000	Meridian 24 Ltd.	Samsung	01/07/2022	Malta	X-DF	–	4	Portfolio	2337
Ougarta	170,000	Hyproc Shipping Co.	HHI	31/03/2017	Algeria	–	TZ Mk. III Flex	4	Arzew	2814
Pacific Arcadia	145,400	Bahamas LNG Shipping	Mitsubishi	20/10/2014	Bahamas	–	Moss	4	PNG LNG	MHISB 2289
Pacific Breeze	180,000	"K" Line - Kawasaki Kisen Kaisha	Kawasaki	10/03/2018	M. Islnds	TFDE	Moss	4	Ichthys	1718
Pacific Enlighten	145,400	Pacific Hope Shipping	Mitsubishi	16/03/2009	Bahamas	Steam	Moss	4	North West Shelf	2236
Pacific Mimosa	155,300	NYK Line	Mitsubishi	31/03/2018	Japan	Reheat Steam Turbine	Moss	–	Wheatstone	2316
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi	08/09/2003	Bahamas	Steam	Moss	5	Darwin LNG	2176
Palu LNG	159,800	Cardiff LNG	Daewoo	06/11/2014	Malta	TFDE	GT NO 96 L03	4	Spot	2400
Pan Africa	174,000	Teekay LNG Partners	Hudong Zhonghua	12/01/2019	H.K., China	TFDE	GT NO 96	4	QCLNG	1666A
Pan Americas	174,000	Teekay LNG Partners	Hudong Zhonghua	15/01/2018	H.K., China	TFDE	GT NO 96	4	QCLNG	H1664A
Pan Asia	174,000	Teekay LNG Partners	Hudong Zhonghua	22/09/2017	H.K., China	TFDE	GT NO 96	4	QCLNG	1663A
Pan Europe	174,000	Teekay LNG Partners	Hudong Zhonghua	12/07/2018	H.K., China	TFDE	GT NO 96	4	QCLNG	H1665A
Papua	170,000	Mitsui O.S.K. Lines	Hudong Zhonghua	27/11/2014	H.K., China	–	GT NO 96	4	PNG LNG	H1670A
Patris	174,000	Chandris Group	Daewoo	01/01/2018	Liberia	ME-GI	GT NO 96 GW	4	Freeport	2460
Pearl LNG	174,000	Cardiff LNG Delta Owning LLC	Samsung	01/08/2020	Malta	X-DF	NO-96-GW+PRS	–	Portfolio	2275
Pioneer Spirit	138,121	M & S Shipping 3 S.A.	Daewoo	29/07/2005	Singapore	Steam	GT NO 96	4	Das Island	2219
Point Fortin	154,200	Los Halillos Shipping Co.	Koyo Dockyard	12/01/2010	Panama	Steam	TZ Mk. III	4	Portfolio	2263
Portovenere	65,000	LNG Shipping S.p.A.	Sestri Ponente	21/04/1997	Singapore	Steam	GT NO 96	4	Portfolio	5910
Portovyy	138,107	Monteriggioni Inc.	Daewoo	20/08/2003	Russia	Steam	GT NO 96	4	Portfolio	2213
Prachi	162,000	India LNG Transport Company No. 4 Ltd.	HHI	30/11/2016	Singapore	Diesel/Gas-Electric	TZ Mk. III Flex	–	Gorgon	2633
Prima Concord	138,267	BG Group	Samsung	24/05/2004	Indonesia	Steam	TZ Mk. III	4	Singapore	1428
Prism Agility	180,000	SK Shipping	HHI	17/05/2019	Panama	X-DF	TZ Mk. III Flex	4	Portfolio	2937
Prism Brilliance	180,000	SK Shipping	HHI	31/05/2019	Panama	X-DF	TZ Mk. III Flex	4	Portfolio	2938
Prism Courage	176,462	Millenaire Financement 12 SASU	HHI	19/10/2021	Panama	X-DF	TZ Mk. III Flex	4	–	2939
Prism Diversity	180,000	HHIENS4 Shipholding SA	HHI	21/06/2022	Panama	X-DF	–	4	–	3145
Pskov	170,200	Sovcomflot	STX	01/09/2014	Liberia	–	GT NO 96	4	Portfolio	1911
Puteri Delima	130,400	Puteri Delima S.Bhd.	STX	12/01/1995	Malaysia	Steam	GT NO 96	4	MLNG II	30F
Puteri Delima Satu	137,100	MISC	Mitsui E&S	31/10/2002	Malaysia	Steam	GT NO 96	4	MLNG III	1506

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Puteri Firus Satu	137,100	Puteri Firus S.Bhd.	Mitsubishi	23/08/2004	Malaysia	Steam	GT NO 96	4	MLNG III	2177
Puteri Intan	137,100	Puteri Intan S.Bhd.	STX	24/08/1994	Malaysia	Steam	GT NO 96	4	MLNG II	30E
Puteri Mutiara Satu	137,100	MISC	Mitsui E&S	06/04/2005	Malaysia	Steam	GT NO 96	4	MLNG III	1562
Puteri Nilam	130,400	Puteri Nilam S.Bhd.	STX	17/07/1995	Malaysia	Steam	GT NO 96	4	MLNG II	30G
Puteri Nilam Satu	137,100	Puteri Nilam S.Bhd.	Mitsubishi	30/07/2003	Malaysia	Steam	GT NO 96	4	MLNG III	2169
Puteri Zamrud	130,400	Puteri Zamrud S.Bhd.	STX	02/06/1996	Malaysia	Steam	GT NO 96	4	MLNG II	30H
Puteri Zamrud Satu	137,100	MISC	Mitsui E&S	04/02/2004	Malaysia	–	GT NO 96	4	MLNG III	1507
Qogir	174,000	LNGShips	Samsung	01/06/2020	Malta	X-DF	TZ Mk. III Flex	–	Portfolio	2271
Raahi	138,076	India LNG Transport Company No.2 Ltd.	Daewoo	18/10/2004	Malta	Steam	GT NO 96	4	RasGas	2211
Rasheeda	266,000	Nakilat SHI 1754 Inc.	Samsung	12/08/2010	M. Islnds	Diesel	TZ Mk. III	10	Qatargas IV	1754
Rias Baixas Knutsen	180,000	Knutsen OAS Shipping	HHI	04/09/2019	Spain	ME-GI	TZ Mk. III Flex	4	Corpus Christi	2964
Ribera del Duero Knutsen	173,400	Norspan LNG VIII AS	Daewoo	02/12/2010	Norway	–	GT NO 96	4	Portfolio	2275
Rioja Knutsen	170,000	Norspan LNG X	HHI	02/12/2016	Spain	ME-GI	TZ Mk. III Flex	4	Portfolio	2734
Rudolf Samoylovich	172,410	Teekay Corp.	Daewoo	22/08/2018	Bahamas	ME-GI	GT NO 96 GW	4	Yamal	2425
Salalah LNG	147,000	Tiwi LNG Carrier S.A.	Samsung	14/12/2005	Panama	Steam	TZ Mk. III	4	Oman LNG	1536
Santander Knutsen	174,000	Sea 194 Leasing Co Ltd.	Hyundai Samho	16/06/2022	Norway	X-DF	TZ Mk. III Flex+	4	Portfolio	8091
SCF La Perouse	174,000	Albus Shipping Ltd.	HHI	10/02/2020	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio	8006
Seapeak Arctic	89,800	Artic Spirit LLC	Ishikawajima	17/12/1993	Saint Kitts & Nevis	Steam	IHI SPB	4	Atlantic LNG	3016
Seapeak Arwa	165,500	Membrane Shipping	Samsung	13/08/2008	M. Islnds	Diesel/Gas-Electric	TZ Mk. III	4	Balhaf	1625
Seapeak Catalunya	138,000	Teekay Shipping Spain S.L.	Izar	19/06/2003	Spain	Steam	GT NO 96	4	Atlantic LNG	319
Seapeak Creole	173,400	Teekay LNG Partners	Daewoo	18/02/2016	Bahamas	ME-GI	GT NO 96 GW	–	Sabine Pass	2407
Seapeak Galicia	140,624	Teekay Gas II	Daewoo	01/07/2004	Spain	Steam	GT NO 96	4	Portfolio	2209
Seapeak Glasgow	174,162	Teekay LNG Partners	Hyundai Samho	10/12/2018	Bahamas	ME-GI	TZ Mk. III Flex	–	Freeport	S856
Seapeak Hispania	145,500	Teekay Gas Naviera SL	Daewoo	21/08/2002	Spain	Steam	GT NO 96	4	Peru LNG	2205
Seapeak Madrid	138,000	Teekay Shipping Spain S.L.	Navantia	30/12/2004	Spain	Steam	GT NO 96	4	Atlantic LNG	105
Seapeak Magellan	165,500	Magellan Spirit ApS	Samsung	10/04/2009	Denmark	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	1626
Seapeak Marib	165,500	Membrane Shipping	Samsung	10/04/2008	M. Islnds	Diesel/Gas-Electric	TZ Mk. III	4	Balhaf	1608
Seapeak Meridian	165,500	Meridian Spirit Aps	Samsung	15/01/2010	Denmark	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	1633
Seapeak Methane	165,500	Malt Singapore Pvt. Ltd.	Samsung	13/02/2008	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Atlantic LNG	1607
Seapeak Oak	173,400	Teekay LNG Partners	Daewoo	03/03/2016	Bahamas	ME-GI	GT NO 96 GW	–	Sabine Pass	2408
Seapeak Polar	89,800	Polar Spirit LLC	Ishikawajima	04/06/1993	Bahamas	Steam	IHI SPB	4	Atlantic LNG	3015
Seapeak Vancouver	173,400	Teekay LNG Partners	Daewoo	02/11/2016	Bahamas	ME-GI	GT NO 96 GW	–	Portfolio	2411
Seapeak Yamal	174,000	Teekay LNG Partners	Hyundai Samho	31/01/2019	Bahamas	ME-GI	TZ Mk. III Flex	–	Freeport	S857
Seishu Maru	138,000	Mitsui O.S.K. Lines	Mitsubishi	09/09/2014	Bahamas	–	Moss	4	PNG LNG	2297
Seri Alam	145,572	MISC	Samsung	22/07/2005	Malaysia	–	TZ Mk. III	4	Bintulu	1502
Seri Amanah	145,709	MISC	Samsung	15/03/2006	Malaysia	Steam	TZ Mk. III	4	Bintulu	1503
Seri Anggun	145,731	MISC	Samsung	30/10/2006	Malaysia	Steam	TZ Mk. III	4	North West Shelf	1589
Seri Angkasa	145,130	MISC	Samsung	23/12/2006	Malaysia	Steam	TZ Mk. III	4	Bintulu	1590
Seri Ayu	145,894	MISC	Samsung	01/10/2007	Malaysia	Steam	TZ Mk. III	4	Bintulu	1591
Seri Bakti	152,944	MISC	Mitsubishi	14/04/2007	Malaysia	Steam	GT NO 96	4	Gladstone	2220
Seri Balhaf	152,000	MISC	Mitsubishi	01/01/2009	Malaysia	Steam	GT NO 96	4	Bontang	2223
Seri Balqis	152,000	MISC	Mitsubishi	02/03/2009	Malaysia	Steam	GT NO 96	4	NLNG	2224
Seri Begawan	152,900	MISC	Mitsubishi	14/11/2007	Malaysia	Steam	GT NO 96	4	Bintulu	2221
Seri Bijaksana	152,300	MISC	Mitsubishi	28/04/2008	Malaysia	Steam	GT NO 96	4	Bintulu	2222
Seri Camar	150,000	MISC	HHI	13/02/2018	Malaysia	Ultra Steam Turbine	Moss	4	Pacific Northwest	2732
Seri Camellia	159,800	MISC	HHI	30/09/2016	Malaysia	–	TZ Mk. III Flex	4	Pacific Northwest	2729
Seri Cemara	150,200	MISC	HHI	09/04/2018	Malaysia	Reheat Steam Turbine	Moss	4	Portfolio	2735
Seri Cempaka	162,000	MISC	HHI	01/08/2017	Malaysia	–	TZ Mk. III Flex	4	Pacific Northwest	2731
Seri Cenderawasih	162,000	MISC	HHI	08/02/2017	Malaysia	–	Moss	4	Pacific Northwest	2730
Seri Damai	174,000	Polaris LNG One Pte Ltd	Samsung	03/02/2023	Singapore	X-DF	Mark III Flex Plus	4	Portfolio	2364
Seri Daya	174,000	Polaris LNG Two Pte Ltd	Samsung	02/04/2023	Singapore	X-DF	Mark III Flex Plus	4	Portfolio	2365
Sestao Knutsen	136,947	Norspan LNG IV AS	Navantia Cadiz	11/10/2007	Spain	Steam	GT NO 96	4	Portfolio	331
Sevilla Knutsen	173,400	Norspan LNG VI AS	Daewoo	31/05/2010	Spain	Diesel/Gas-Electric	GT NO 96	4	Portfolio	2269
Shagra	268,000	Nakilat SHI 1751 Inc.	Samsung	23/11/2009	M. Islnds	Diesel	TZ Mk. III	10	Qatargas IV	1751
Shahamah	135,496	Shahamah Inc.	Kawasaki	01/10/1994	Liberia	Steam	Moss	5	Das Island	1438
Shandong Juniper	135,269	Shell Bermuda (Overseas) Ltd.	Mitsubishi	05/02/2004	Singapore	Steam	Moss	5	Peru LNG	2183
Shaolin	174,400	United Prosperity LNG Shipping Co Ltd	Hudong Zhonghua	31/10/2022	H.K., China	X-DF	–	4	Portfolio	H1831A
Shen Hai	147,200	Shanghai LNG Shipping Co.	Hudong Zhonghua	10/12/2012	H.K., China	Steam	GT NO 96	4	Bintulu	H1621A
Shinshu Maru	180,000	Mitsui O.S.K. Lines	Kawasaki	15/02/2019	Bahamas	DERST (aka STaGE)	Moss	4	Freeport	1734
Simaisma	145,889	Greenwell Corporation	Daewoo	24/07/2006	Greece	Steam	GT NO 96	8	RasGas II	2235
Singapore Energy	138,000	Sea Breeze Leasing	Samsung	21/02/2003	M. Islnds	Steam	TZ Mk. III	4	Portfolio	1416
SK Audace	174,000	Milestone LNG Transport	Samsung	03/08/2017	Panama	–	TZ Mk. III Flex	4	Portfolio	2080
SK Resolute	180,000	Milestone LNG Transport	Samsung	01/11/2017	Panama	X-DF	TZ Mk. III Flex	4	Ichthys	2081
SK Serenity	174,000	SK Shipping	Samsung	14/02/2018	South Korea	TFDE	KC-1	4	Sabine Pass	2153
SK Spica	174,117	SK Shipping	Samsung	12/03/2018	Panama	TFDE	KC-1	–	Sabine Pass	2154
SK Splendor	138,370	Optima Leasing	Samsung	01/05/2000	South Korea	Steam	TZ Mk. III	4	Oman LNG	1258
SK Stellar	138,375	Stellar Shipholding	Samsung	31/12/2000	South Korea	Steam	TZ Mk. III	4	RasGas I	1259

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SK Summit	138,003	Omnia Enterprises	Daewoo	04/08/1999	South Korea	Steam	GT NO 96	4	RasGas I	2202
SK Sunrise	138,306	Methane Navigation S.A.	Samsung	27/08/2003	Panama	Steam	TZ Mk. III	4	RasGas II	1405
SK Supreme	138,225	SK Shipping Co Ltd	Samsung	05/02/2000	South Korea	Steam	TZ Mk. III	4	RasGas I	1207
SM Albatross	174,000	SMKLC LNG3 SA	HHI	25/07/2022	Panama	X-DF	TZ Mk. III Flex+	4	Portfolio	3185
SM Bluebird	174,000	SMKLC LNG4 SA	HHI	30/09/2022	Panama	X-DF	TZ Mk. III Flex+	4	Portfolio	3186
SM Eagle	174,000	Korea Line Corp.	Daewoo	04/05/2017	Panama	ME-GI	GT NO 96 GW	4	Sabine Pass	2449
SM Seahawk	174,000	Korea Line Corp.	Daewoo	05/06/2017	Panama	ME-GI	GT NO 96 GW	4	Sabine Pass	2450
Sohar LNG	137,248	Energy Spring LNG Carriers	Mitsubishi	29/10/2001	Panama	Steam	Moss	5	Oman LNG	2162
Sohshu Maru	177,000	Mitsui O.S.K. Lines	Kawasaki	24/07/2019	Bahamas	DERST (aka STaGE)	Moss	4	Freeport	1735
Solaris	155,000	GasLog	Samsung	19/07/2014	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	2042
Sonangol Benguela	160,500	Sonangol Benguela Ltd.	Daewoo	08/12/2011	Bahamas	–	GT NO 96	4	Soyo	2282
Sonangol Etosha	160,500	Sonangol Etosha Ltd.	Daewoo	17/09/2011	Bahamas	–	GT NO 96	4	Soyo	2281
Sonangol Sambizanga	160,500	Sonangol Sambizanga Ltd.	Daewoo	10/08/2011	Bahamas	–	GT NO 96	4	Soyo	2280
Southern Cross	172,000	Mitsui O.S.K. Lines	Hudong Zhonghua	07/07/2015	H.K., China	–	GT NO 96	4	PNG LNG	H1671A
Soyo	160,276	Mint LNG I	Samsung	01/08/2011	Bahamas	–	TZ Mk. III	4	Soyo	1810
Spirit of Hela	177,000	Nefertiti LNG Shipping Co.	Hyundai Samho	05/11/2010	Bahamas	Diesel Electric	TZ Mk. III	4	PNG LNG	S324
Stena Blue Sky	145,700	Blue Sky LNG	Daewoo	01/08/2006	U.K.	Steam	GT NO 96	4	Spot	2233
Stena Clear Sky	171,800	Clear Sky LNG Shipping	Daewoo	31/05/2011	U.K.	Diesel/Gas-Electric	GT NO 96	4	Portfolio	2278
Stena Crystal Sky	171,800	Stena Drilling Cyprus	Daewoo	27/05/2011	U.K.	Diesel/Gas-Electric	GT NO 96	4	Portfolio	2268
Symphonic Breeze	145,394	Reborn Maritime	Kawasaki	14/12/2007	Bahamas	Steam	Moss	4	Portfolio	H1587
Taitar No 1	145,000	NiMic No 1 S.A.	Mitsubishi	08/10/2009	Panama	–	Moss	4	RasGas	2241
Taitar No 2	145,000	NiMic No 2 S.A.	Kawasaki	18/12/2009	Panama	–	Moss	4	RasGas	1625
Taitar No 3	145,000	NiMic No 3 S.A.	Mitsubishi	16/12/2009	Panama	–	Moss	4	RasGas	2242
Taitar No 4	147,000	NiMic No 4 S.A.	Kawasaki	04/08/2010	Panama	–	Moss	4	RasGas	1626
Tangguh Batur	145,700	LNG North-South Shipping Co.	Daewoo	15/12/2008	Singapore	Steam	GT NO 96	4	Tangguh	2242
Tangguh Foja	155,000	Ocean 1919 Shipping No. 1	Samsung	25/11/2008	Panama	–	TZ Mk. III	4	Tangguh	1619
Tangguh Hiri	155,000	Tangguh Hiri Finance Ltd.	HHI	05/12/2008	Bahamas	–	TZ Mk. III	4	Tangguh	1780
Tangguh Jaya	155,000	Ocean 1919 Shipping No. 2	Samsung	31/12/2008	Panama	–	TZ Mk. III	4	Tangguh	1620
Tangguh Palung	155,000	Ocean 1919 Shipping No. 3	Samsung	09/03/2009	Panama	–	TZ Mk. III	4	Tangguh	1634
Tangguh Sago	155,000	Teekay Shipping (Canada) Limited	Hyundai Samho	28/12/2008	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Tangguh	S298
Tangguh Towuti	145,700	LNG East-West Shipping Co.	Daewoo	15/10/2008	Singapore	Steam	GT NO 96	4	Tangguh	2241
Tembek	216,200	Overseas LNG S1 Corp.	Samsung	19/11/2007	M. Islnds	Diesel	TZ Mk. III	4	Qatargas II	1605
Tenergy	170,520	Briety Shipping Inc	HHI	21/01/2022	Greece	X-DF	TZ Mk. III	4	–	3157
Tessala	170,000	Hyproc Shipping Co.	HHI	07/02/2017	Algeria	Diesel/Gas-Electric	TZ Mk. III Flex	–	Arzew	2813
Trader II	138,000	K Line LNG Shipping (UK) Ltd	Samsung	07/11/2002	U.K.	Steam	TZ Mk. III	4	Portfolio	1380
Trader III	137,100	MISC	Mitsubishi	09/08/2002	Liberia	Steam	GT NO 96	4	MLNG III	2165
Traiano Knutsen	180,000	Hai Kuo Shipping 1901 G Ltd.	HHI	01/07/2020	Norway	ME-GI	TZ Mk. III Flex	4	–	3086
Trinity Glory	154,000	Cypress Maritime Consortium	Koyo Dockyard	26/11/2008	Panama	Steam	TZ Mk. III	4	Bontang	2260
Tristar Ruby	155,000	RBSSAF (19) Ltd.	HHI	14/04/2008	Liberia	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio	1778
Umm Al Amad	210,200	J5 Nakilat No. 7 Ltd.	Daewoo	12/09/2008	M. Islnds	Diesel	GT NO 96	18	RasGas III	2253
Umm Al Ashtan	137,000	Umm Al Ashtan Ltd.	STX	29/05/1997	Liberia	Steam	Moss	4	Das Island	1333
Umm Bab	145,000	Sea Trade International Inc.	Daewoo	01/11/2005	Greece	Steam	GT NO 96	4	RasGas II	2228
Umm Slal	266,000	Nakilat Umm Slal Inc.	Samsung	26/11/2008	M. Islnds	–	TZ Mk. III	5	Qatargas II	1676
Valencia Knutsen	173,400	Norspan LNG VII AS	Daewoo	30/09/2010	Spain	–	GT NO 96	4	Portfolio	2274
Velikiy Novgorod	170,200	Sovcomflot	STX	20/12/2013	Liberia	–	GT NO 96	4	Portfolio	1910
Vivit Americas LNG	174,000	Cardiff LNG Zeta Owning LLC	HHI	17/10/2020	Malta	X-DF	TZ Mk. III Flex	–	Portfolio	3037
Vivit Arabia LNG	174,000	Kaiser 2 SA	Hyundai Samho	10/06/2022	Liberia	X-DF	TZ Mk. III Flex	4	Portfolio	8026
Vivit City LNG	174,103	Kaiser SA	Hyundai Samho	06/12/2021	Liberia	X-DF	TZ Mk. III Flex	4	Portfolio	8025
Vladimir Rusanov	174,000	Mitsui O.S.K. Lines	Daewoo	01/01/2018	H.K., China	ME-GI	GT NO 96 GW	4	Yamal	2424
Vladimir Vize	172,000	China Shipping Development Co.	Daewoo	30/09/2018	H.K., China	ME-GI	GT NO 96 GW	4	Yamal	2426
Vladimir Voronin	172,652	Teekay Corp.	Daewoo	19/07/2019	Bahamas	ME-GI	GT NO 96 GW	4	Yamal	2431
WilForce	155,900	Wilforce LLC	Daewoo	18/09/2013	Malta	–	GT NO 96	4	–	H2289
WilPride	155,900	Wilpride LLC	Daewoo	29/11/2013	Malta	–	GT NO 96	4	–	H2290
Woodside Chaney	174,000	Maran Gas Maritime	Daewoo	02/07/2019	Greece	ME-GI	GT NO 96 GW	4	Portfolio	2457
Woodside Charles Allen	173,400	Hai Kuo Shipping 2027G Ltd.	Daewoo	31/10/2020	Greece	ME-GI	GT NO 96 GW	–	–	2486
Woodside Donaldson	165,500	Malt Singapore Pvt. Ltd.	Samsung	19/10/2009	Singapore	Diesel/Gas-Electric	TZ Mk. III	4	Pluto	1632
Woodside Goode	159,800	Armour Company Ltd.	Daewoo	04/11/2013	Greece	Diesel Electric	GT NO 96 GW	4	RasGas	H2295
Woodside Rees Withers	173,400	Maran Gas Maritime	Daewoo	01/10/2019	Greece	ME-GI	GT NO 96 GW	4	–	2466
Woodside Rogers	159,800	Margie Seaway Corp.	Daewoo	01/07/2013	Greece	Diesel/Gas-Electric	GT NO 96 GW	4	Pluto	H2288
Wudang	174,400	United Glory LNG Shipping Co Ltd	Hudong Zhonghua	07/10/2022	H.K., China	X-DF	–	4	Portfolio	H1832A
Yakov Gakkel	172,658	DSME Hull No.2434 LLC	Daewoo	12/11/2019	Bahamas	ME-GI	GT NO 96 GW	4	Yamal	2434
Yari LNG	159,800	Cardiff LNG	Daewoo	03/11/2014	Malta	TFDE	GT NO 96 L03	4	Spot	2401
Yenisei River	155,000	Navajo Marine	HHI	31/07/2013	M. Islnds	–	TZ Mk. III	4	Yamal	2556
Yiannis	169,932	Onerato Marine SA	Daewoo	29/09/2021	Greece	ME-GI	GT NO 96 GW	4	–	2501
YK Sovereign	127,125	SK Shipping	HHI	01/12/1994	South Korea	Steam	Moss	4	MLNG	761
Zarga	268,000	Nakilat SHI 1752 Inc.	Samsung	23/01/2010	M. Islnds	–	TZ Mk. III	5	Qatargas IV	1752
Zekreet	137,482	Mitsui O.S.K. Lines	Mitsui E&S	01/12/1998	M. Islnds	Steam	Moss	5	Qatargas I	1432

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Value from maritime data



- Meets the IMO MEPC76 regulations requirements
- Integrates with any Shaft Power Meters
- 100% engine power remains accessible if needed

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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



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A handwritten signature in black ink, appearing to read "Jill".

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