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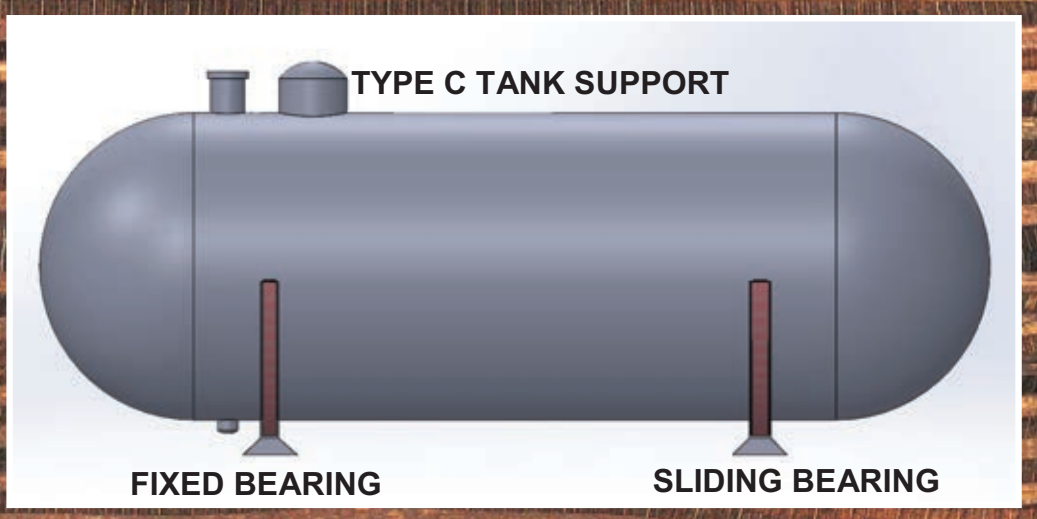

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32 pages essential LNG news!

October 2024

In this issue:

Hitting ice: Arctic LNG 2 in a sanctions-chilled climate

Russia's Arctic LNG 2 project faces challenges due to Western sanctions but has been compelled to begin operations anyway using a shadow fleet and convoluted cargo loadings. Despite initially supporting Russia's LNG export growth, the project is facing an uphill battle, our Markets Editor Dr Alexander Wilk reports.

Russia's ambitious Arctic LNG 2 project, once poised to cement the country's position as a leading global LNG provider, has faced significant challenges due to Western sanctions since Russia's invasion of Ukraine in early 2022. Initially determined – and successful – to overcome and circumvent their restrictions to get the massive project off the ground, its lead developer Novatek, Russia's leading independent gas producer, is now facing even stiffer headwinds trying to market produced LNG. Despite these hurdles, Novatek has pressed forward, seemingly determined to anchor the project in the international market at any cost.

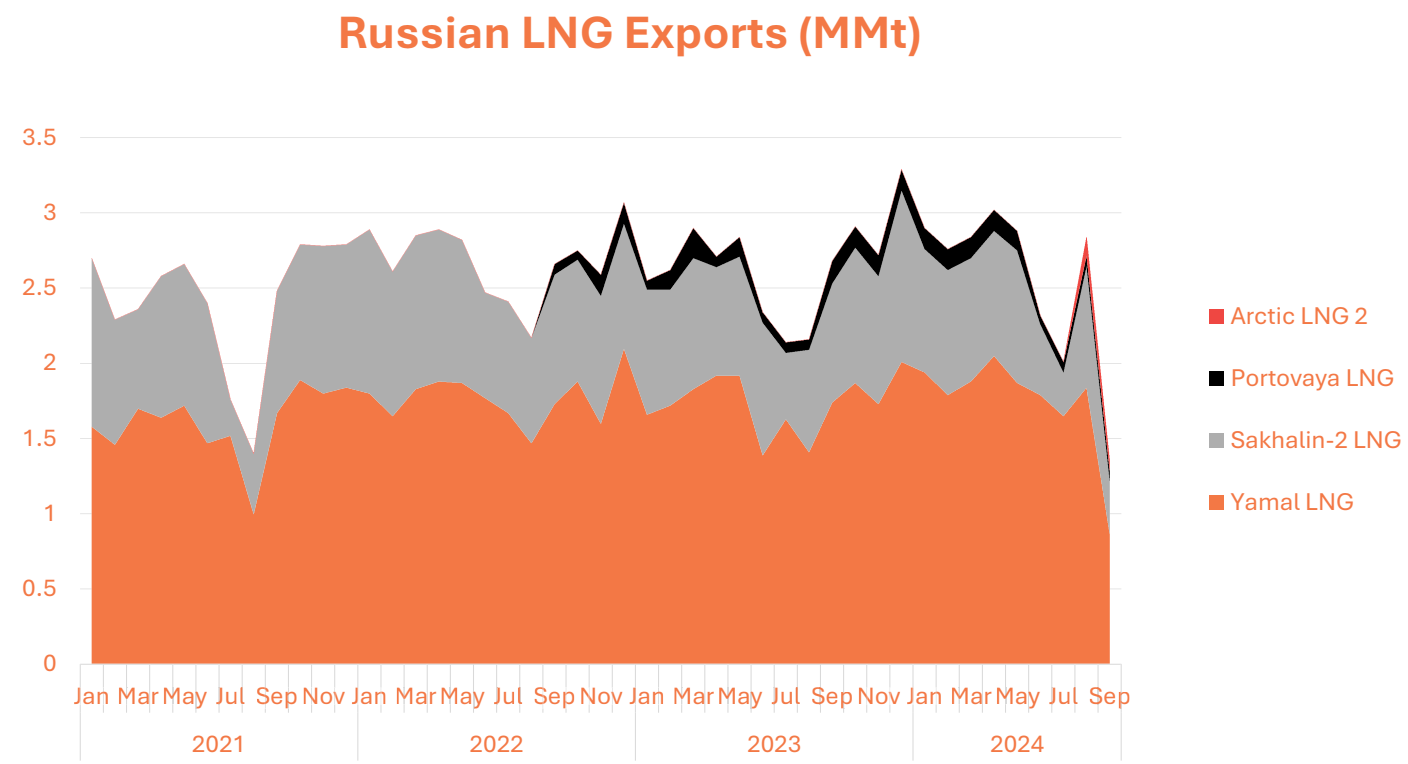
Russian LNG exports have shown significant growth in 2022, increasing from 28.99mmt in 2021 to 32.18mmt, but have broadly flatlined to 31.86mmt in 2023, according to LNG Journal data and calculations. Whilst in 1H 2024 exports increased again by 0.31mmt year-on-year to 16.27mmt, that figure is still trailing its 2022 equivalent of 16.53mmt. Yamal LNG accounts for approximately 65 percent of Russia's LNG exports. The plant's annual exports rose from 19.29mmt in 2021 to 21.25mmt in 2022, producing considerably above nameplate capacity (as it is designed to do). Sakhalin-2 LNG, Russia's only LNG production facility in Asia, also achieved notable growth, with exports increasing from 9.7mmt in 2021 to 10.52mmt in 2022.

However, our data also shows that apart from Yamal LNG's prowess, the introduction of new projects, was instrumental in preventing a sizeable drop in shipments. Portovaya LNG came online in September 2022, contributing 1.37mmt in 2023. More recently, Arctic LNG 2 began exports in August 2024, further expanding capacity.

For the year to mid-September, Russia thus exported 22.92mmt, including initial contributions from the new Arctic LNG 2 project. Prima facie, this figure suggests that full-year exports for 2024 may surpass output seen in previous years. However, the rollout of Arctic LNG 2 production has not progressed as project developer Novatek (and the Russian State) originally anticipated.

Sanctions

The project's origins date back to September 2019 when it received its go-ahead, with plans to begin exports in 2024 and reach full operational capacity of almost 20 million tonnes per annum by 2026. However, the project's trajectory changed dramatically following Russia's invasion of Ukraine. Western sanctions



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targeted Russia's oil and gas sector, leading to the suspension of participation by foreign partners, including TotalEnergies, China National Petroleum Corporation, CNOOC, and a Japanese consortium of Mitsui and JOGMEC.

Undeterred by these setbacks, Novatek devised questionable strategies to overcome the challenges posed by international sanctions. The company's approach involved utilising a 'shadow fleet' of LNG carriers to mimic the Russian oil sector's success in evading sanctions, employing chains of trading firms to obscure true sales prices, and building its own fleet of carriers after sanctions prevented the delivery of specially commissioned South Korea-built ice-breaking LNG vessels.

Pressing ahead

Our data indicates that Russia's sanctioned Arctic LNG 2 plant has begun operations, marking a significant milestone in Russia's ongoing efforts to expand its LNG export capabilities. The project has moved forward, aided by reportedly weak sanctions enforcement and by utilising a shadow fleet to circumvent restrictions introduced by the European Union's 14th Sanctions Package.

Notably, Le Monde, a French broadsheet, reported on weak sanctions enforcement at the beginning of the year. The newspaper highlighted the French government's ambiguous attitude when faced with conflicting commercial interests of French firms involved in the Arctic LNG 2 project and international sanction commitments. Le Monde raised questions concerning employed customs codes and noted discrepancies between export and import declarations of direct French equipment supplies to Russia. This ambiguity and these discrepancies potentially allowed for the continued supply of equipment to the Arctic LNG 2 project, despite international sanctions. The report further suggests this weak enforcement contributed to Novatek's ability to inaugurate at least part of the initial Arctic LNG 2 project.

Dodging and weaving

The first indication of the plant's commercial start-up came when the 138,000-cbm LNG carrier Pioneer, built in 2005, was observed berthing at the plant's gravity-based structure 1 (GBS1) on 1 August. This vessel's movements have drawn considerable attention due to apparent attempts to obscure its actual location. Analysis of the ship's AIS data by Norwegian advisory firm Eikland Energy indicated a computer-generated spoofed track in the Barents Sea. Synthetic-aperture radar imagery later commissioned by Eikland Energy revealed the Pioneer's true position at the Arctic LNG 2 plant.

According to our data, the Pioneer, now owned by Dubai-based Nur Global Shipping, loaded Arctic LNG 2's inaugural shipment and was idling offshore Egypt in the Mediterranean fully laden for a prolonged period. The Pioneer has since discharged the bulk of its cargo onto another sanctioned LNG carrier - the New Energy - via a ship-to-ship (STS) transfer.

The Pioneer's cargo loading behaviour at Arctic LNG 2 was not an isolated case but part of a larger pattern involving several vessels linked to a purported shadow fleet operation. The Asya Energy, formerly known as Trader IV and built in 2002, was observed idling in the Barents Sea before approaching the Arctic LNG 2 facility. Another vessel, the Everest Energy (previously Metagas Everett, built in 2003), lifted the third cargo from Arctic LNG 2. Before arriving in the Arctic, the vessel had made a notable transit through the Red Sea and Suez Canal – a rare move for LNG carriers given the current risks posed by Houthi attacks. Nevertheless, the Suez Canal promises to cut journey times by roughly two weeks compared to the safer route around South Africa's Cape of Good Hope.

According to reporting by TradeWinds and others, these vessels share several common characteristics that point to their involvement in the shadow fleet. They have all been recently acquired by Dubai-based companies, subsequently reflagged to countries like Palau (which has since moved to rescind these registrations), and have displayed unusual voyage patterns and suspected AIS manipulation. These tactics appear designed to obscure their activities and avoid scrutiny from international observers.

High North challenges

In addition to a tightening sanctions

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regime, there are logistical challenges faced by Arctic LNG 2. Although not unique – neighbouring Yamal LNG encountered similar challenges – it faces them under different circumstances. Both projects struggle to operate without STS transfer opportunities, primarily due to their location within the Arctic Circle. Except for a brief period between July and October, shipping lanes in this region are under constant threat of pack ice dense and strong enough to severely damage ordinary LNG carrier hulls.

To address these challenges, Novatek established the practice of routine ship-to-ship transfers from Arc7 class LNG carriers with reinforced, icebreaker-like bows onto conventional LNG tankers. Initially, a small fishing port named Honningsvåg on Magerøya Island in Norway became witness to 122 such STS LNG transfers amounting to 8.7 mmt between November 2018 and June 2019, after which the Norwegian permit allowing for these transfers expired.

Subsequent STS operations were relocated around Kildin Island close to Murmansk, which had on short notice been expressly included in a Russian 2019 law permitting foreign-registered LNG carriers to operate in certain Russian coastal waters. The island lies along the usual route Yamal's ice-breaking LNG fleet has hitherto taken when sailing for Europe, including previously the Sarnesfjord and the Kåfjord areas at Honningsvåg.

STS routine

In summer 2023, Novatek's new solution to these logistical challenges became apparent with the arrival of the Saam FSU (Floating Storage Unit) at Ura Guba, a bay on Russia's Barents Sea coast. After more than four months of towing from the Daewoo Shipping & Marine Engineering yard in South Korea, the 400-metre-long and 60-metre-wide Saam arrived on site in June 2023. Ura Guba is situated about 50 km northwest of Murmansk City and 100 km east of the border to Norway, near the closed Navy town of Vidyaevo and its submarine base.

The Saam FSU was built for permanent deployment at Ura Guba and is serving as a reloading point for LNG cargoes produced by Yamal LNG and Arctic LNG 2. With the start-up of Arctic LNG 2, the Asya Energy and the Everest Energy began shuttling from Arctic LNG 2 to Ura Guba, where they transferred their cargoes to the FSU, our data indicates. Conventional carriers were subsequently meant to pick up the natural gas and deliver it to buyers across the globe. This logistical scheme was planned to boost Novatek's market leverage.

Notably, the Saam's sister ship, the massive 361,600-cbm Koryak FSU has been waiting at its mooring site in Bechevinskaya Bay on Russia's Far Eastern coast. Prior to an extensive US and EU sanctions regime targeting a substantial portion of LNG carrier capacity available to Novatek, the two FSUs were intended as regular transshipment hubs. In February 2023, Russian financial news outlet FinMarket cited Novatek's Leonid Mikhelson that the two FSUs were intended to curb market speculation through "the presence of a constant, actual volume of LNG" in the High North; one each on Russia's Atlantic and Pacific coasts. Novatek's declared aim was to provide "price stabilisation".

Significant hurdles remain

Whilst unable to prevent the start of LNG production at Arctic LNG 2, Western sanctions are clearly hampering the new project's effective market entry. The first cargo aboard the Pioneer has yet to find a final buyer and remained at sea at the mouth of the Suez Canal before being transferred onto the New Energy and shipped back to Murmansk. At the time of writing, the New Energy was circling off Ura Guba bay. Meanwhile, the much larger Asya Energy and Everest Energy have taken the Northern Sea Route towards the Far East to buyers that had yet to be identified. Potentially, these cargoes may also just remain in the region for the time being – after all, that was the Koryak's original purpose.

Whilst initially not intended as tools to navigate sanctions, both FSUs have now gained prominence in Novatek's response to ever tighter restrictions on its new Arctic LNG 2 project. Both FSUs are already under US sanctions, and the risk of secondary sanctions may prove too great for most buyers to send carriers for STS transfers.

Advanced satellite technology and improved ship tracking led to the swift identification of Novatek's 'shadow' fleet, resulting in the United States imposing sanctions on seven of these vessels by the time the third cargo was loaded. Furthermore, Palau's International Ship Registry suspended the registration of three carriers involved in the project due to AIS signal manipulation.

Despite these setbacks, Novatek may have options to keep the first two Arctic LNG 2 trains operational. The company's close relations with Russian President Vladimir Putin could be leveraged to seek government intervention. One potential solution involves collaborating with state-controlled gas giant Gazprom to deliver gas to Russia's growing domestic market.

Arctic LNG 2 will need a steady outlet for its gas sooner than later. Like the neighbouring Yamal LNG project, it is fronting massive onshore gas fields. Reinjection back to the Russian domestic network would mean expensive LNG infrastructure built to supply international markets would sit idle. But at least produced gas could then mingle with domestic networked gas.

Nevertheless, Novatek might also be able to secure preferential terms with the Russian government. The company has previously been granted major tax and other concessions for its Yamal LNG and Arctic LNG 2 projects, including the cancellation of a heavy gas export duty on its LNG exports, according to reports by Platts and Reuters.

The coming months will be crucial in determining whether the Russian State will extend support to the troubled Arctic LNG 2 project, and if Novatek is willing to compromise on its global ambitions. The outcome of this situation will have significant implications for Russia's position in the global LNG market. The Russian government has been pushing – unsuccessfully - for more than a decade to significantly expand its global LNG market share. ■

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POSCO keen to offtake low-cost US LNG via Mexico

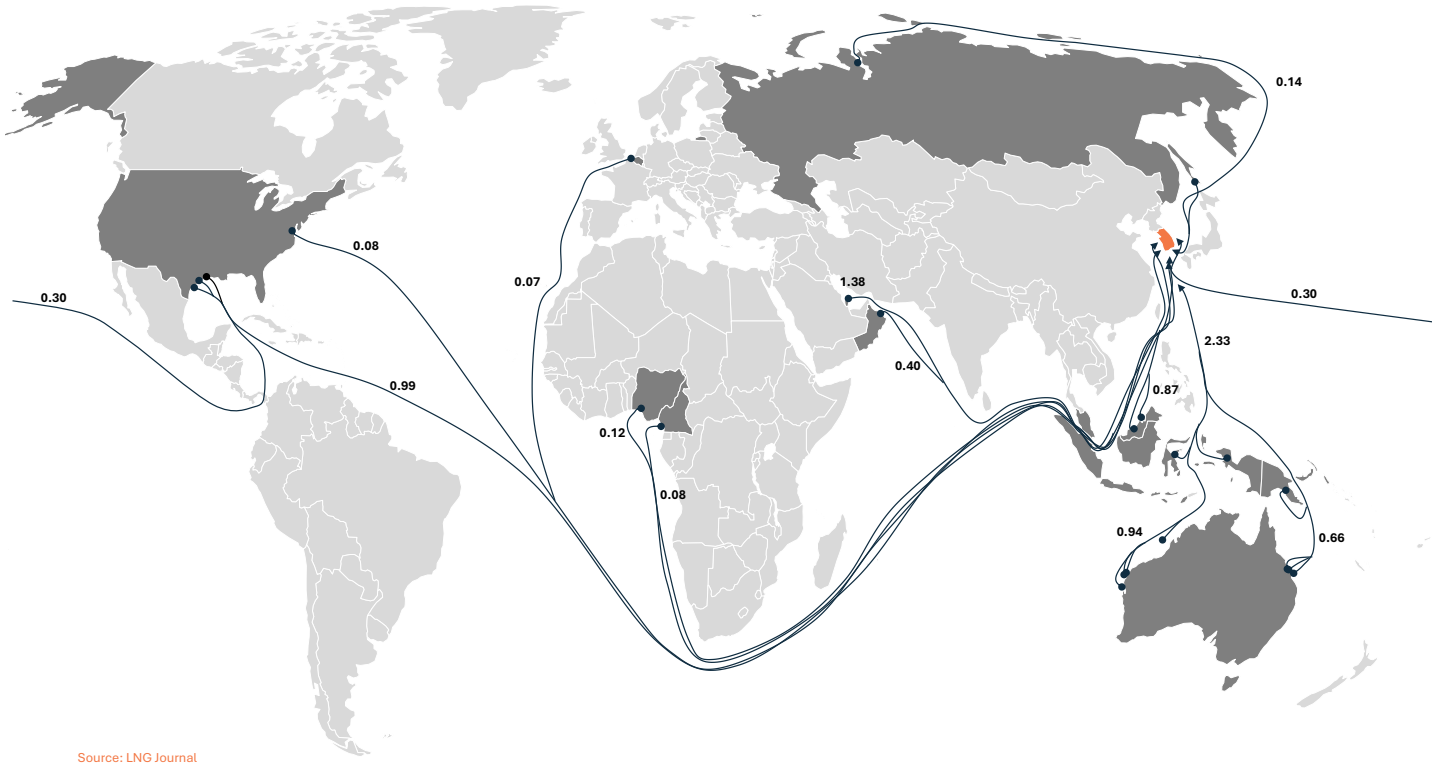
South Korea's POSCO has become the anchor customer for the Saguaro Energía LNG project, located at Mexico's Pacific Coast, allowing it to provide the lowest landed price of LNG into Asia. The 15 mtpa project liquifies shale gas from the Permian Basin – and with three trains now commercially contracted, developers are confident to reach FID before the end of this year; our Markets Editor Anja Karl has more.

Situated at Puerto Libertad, Sonora, the Saguaro Energía LNG terminal and Sierra Madre Pipeline is the most advanced, integrated LNG development on the West Coast of North America. This logistical advantage gives it a significantly shorter shipping route to Asian markets, avoiding risks to transit the Panama Canal.

To minimise feedgas costs, project developer Mexico Pacific Ltd. sealed a 20-year deal with state-run Comisión Federal de Electricidad (CFE) to source about 40 percent of its required supply via gas delivered from the Permian basin through CFE's pipelines in Mexico.

South Korean LNG Sources (MMt)

Past 8 Weeks



Source: LNG Journal

Map not to scale. For illustration only.

Train 1&2 sales closed

Scheduled to start operation in 2026, the first phase of Saguaro Energía LNG will comprise of three trains. Through further engineering with EPC contractors, Mexico Pacific claims to have been "unlocking incremental LNG volumes that are financeable across global debt markets."

"While Trains 1 and 2 sales are now closed, we remain committed to providing further LNG supply to meet global energy security and energy transition needs and will now turn to execute against the contracting momentum in place for a subsequent train 3 FID as quickly as possible," said Sarah Bairstow, President & Chief Commercial Officer at Mexico Pacific.

ExxonMobil LNG signed a third long-term sales and purchase agreement (SPA) in January for an additional 12 mtpa of LNG from Train 2. The US major already secured firm offtake from Trains 1 and 2 and has an option for another 1 mtpa from Train 4.

Australia's Woodside, meanwhile, in December 2023 signed a SPA for 1.3. mtpa – equivalent to approximately 18 cargoes per year over 20 years from Train 3 – with pricing linked to US gas indices.

ConocoPhillips in August last year signed a SPA to offtake some 2.2 mtpa of LNG across Trains 1, 2 and 3 – which together make up the first phase of the Saguaro Energia liquefaction project with a combined capacity of 15 mtpa.

Market visibility on future LNG deliveries to South Korea

Export Country	Export Facility	Vessel Name	IMO Number	Sailed Date	Import Facility	Arrival Date	MMt
Oman	Oman LNG	Hyundai Princepia	9761841	03/09/2024	Tongyeong	19/09/2024	0.07
Malaysia	Malaysia LNG	Seri Angkasa	9321665	10/09/2024	South Korea	19/09/2024	0.05
Qatar	Ras Laffan	SK Summit	9157624	30/08/2024	Pyeongtaek	19/09/2024	0.06
Australia	Gladstone LNG	Hyundai Ecopia	9372999	08/09/2024	Pyeongtaek	20/09/2024	0.06
Qatar	Ras Laffan	Bu Samra	9388833	03/09/2024	Incheon	21/09/2024	0.11
Australia	Gorgon LNG	Asia Energy	9606950	13/09/2024	Boryeong	22/09/2024	0.06
Qatar	Ras Laffan	SK Stellar	9180243	03/09/2024	Pyeongtaek	22/09/2024	0.06
USA	Calcasieu Pass LNG	Diamond Gas Victoria	9874466	30/08/2024	Incheon	25/09/2024	0.08
Oman	Oman LNG	Seapeak Methane	9336737	10/09/2024	South Korea	25/09/2024	0.07
Oman	Oman LNG	SK Supreme	9157739	12/09/2024	Samcheok	29/09/2024	0.06
USA	Sabine Pass LNG	GasLog Winchester	9876737	21/08/2024	Incheon	30/09/2024	0.08
Oman	Oman LNG	Hyundai Aquapia	9179581	15/09/2024	Pyeongtaek	01/10/2024	0.05
Qatar	Ras Laffan	Al Samriya	9388821	10/09/2024	Incheon	03/10/2024	0.11
USA	Sabine Pass LNG	Hyundai Peacepia	9761853	23/08/2024	Pyeongtaek	03/10/2024	0.07
Oman	Oman LNG	Pan Asia	9750220	25/08/2024	South Korea	03/10/2024	0.05
USA	Freeport LNG	Prism Diversity	9904651	19/08/2024	Incheon	03/10/2024	0.08
USA	Sabine Pass LNG	SM Eagle	9761827	22/08/2024	Incheon	04/10/2024	0.07
USA	Sabine Pass LNG	Emei	9958640	31/08/2024	Incheon	08/10/2024	0.08
USA	Sabine Pass LNG	Greenergy Ocean	9961477	24/08/2024	Boryeong	09/10/2024	0.08
Peru	Pampa Melchorita LNG	Methane Patricia Camila	9425277	14/09/2024	Incheon	11/10/2024	0.07
USA	Sabine Pass LNG	Patris	9766889	04/09/2024	Incheon	15/10/2024	0.07
Nigeria	Bonny Island	LNG River Orashi	9266982	14/09/2024	Incheon	21/10/2024	0.05
USA	Sabine Pass LNG	SM Seahawk	9761839	12/09/2024	Tongyeong	23/10/2024	0.07
Malaysia	Malaysia LNG	Seri Ayu	9329679	12/09/2024	Boryeong	30/11/2024	0.05

Source: LNG Journal

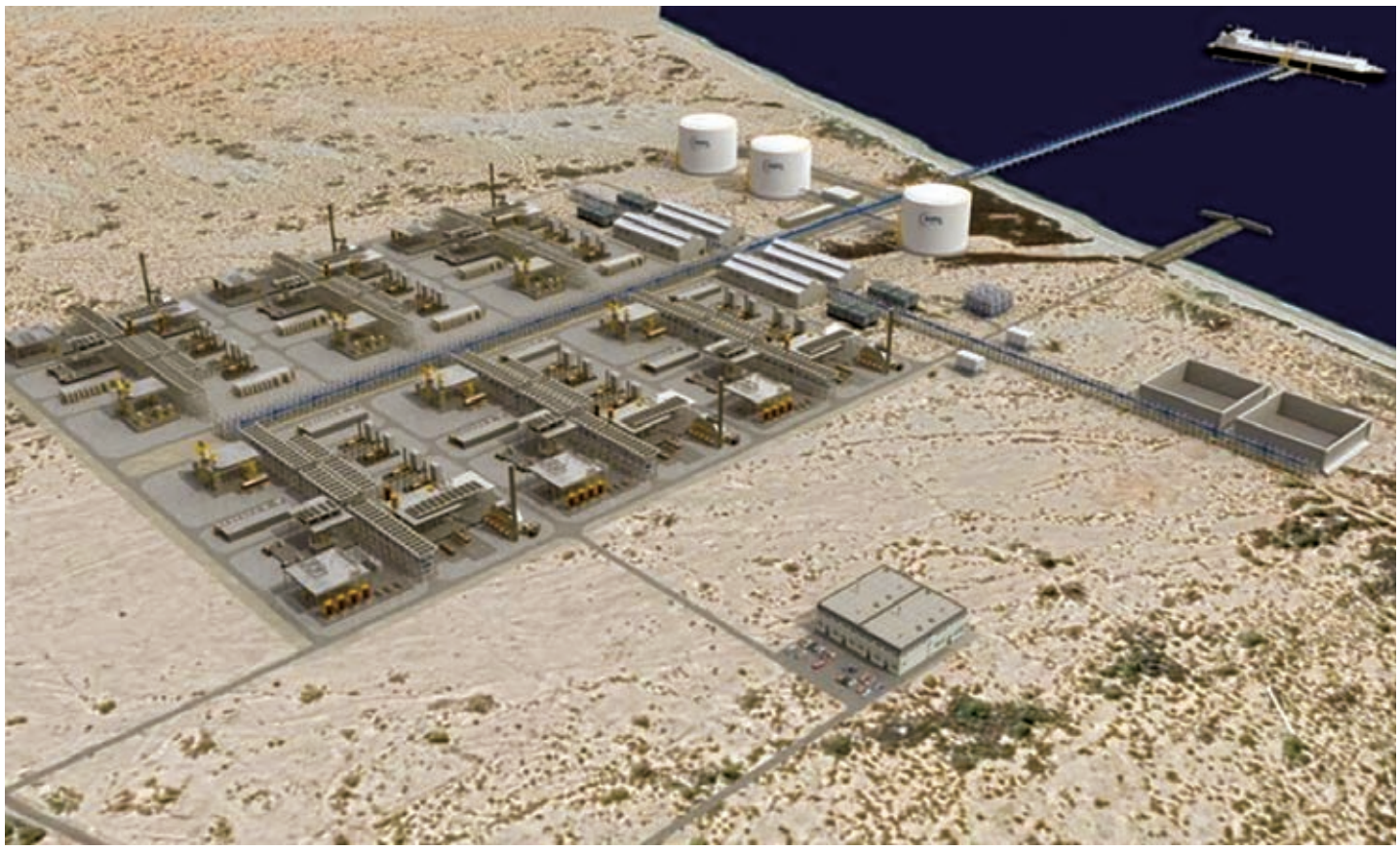
FTA gives Korea an edge

South Korea's POSCO – the anchor customer for Train 3 – in August agreed to offtake 0.7 mtpa on a free-on-board basis for 20 years and the SPA gives the buyer the option to source more low-cost gas for KEPCO and other utilities in the country.

South Korea is one of few major Asian economies that has a free trade agreement (FTA) with the US and the low landed price of LNG from Saguaro Energía terminal gives POSCO a cost advantage over rival Korean utilities.

Sungbok Park, chief marketing officer of Mexico Pacific welcomed POSCO as foundation customer which, as he put it, "validates the strategic value of west coast North American LNG for South Korea, one of the world's largest LNG importing market."

The Saguaro Energía LNG terminal is



Render of Saguaro Energía LNG terminal

jointly owned by AECOM Capital and DKRW Energy. All three LNG trains are commercially contracted and have "strong support from governments and capital markets," Park noted, expressing confidence that the 15 mtpa terminal will reach a positive final investment decision this year.

Risk of infrastructure overinvestment

Incumbent and some new LNG market participates proposed 11 regas terminal projects by 2031 in South Korea.

If built, combined costs are estimated to amount to ₩11.3 trillion (US$8.7 billion). Analysts at the Institute of Energy Economics and Financial Analysis (IEEFA) hence warn of "stranded asset risks," especially since some LNG import terminals and gas-fuelled power plants experience low utilization rates.

On the supply side, global markets will be awash with LNG from 2026 onwards due to massive capacity expansion in the US and Qatar. The world's nameplate liquefaction capacity is on track to reach 666.5 mtpa by 2028, meaning South Korea could cover its demand in a cheaper way by importing the fuel or turning to nuclear power for baseload electricity supply.

Analysts have cast doubt on the notion that burning LNG is the cheapest energy source for South Korea's rapidly expanding semiconductor clusters, data centre and AI-related industries. "Prioritising LNG and small modular reactors to power Korean chip makers and data centres is a high-cost, high-risk, and high-carbon strategy," IEEFA analyst Michelle (Chaewon) Kim warns and recommends renewables and energy storage instead.

SK E&S, Hanwha Energy, POSCO International, GS E&R and Hanyang are considering building new LNG-fuelled power plants for captive use with 4.7 GW capacity combined. The chipmaker SK Hynix, for instance, plans to procure electricity for new foundry facilities in the Yongin semiconductor cluster starting in 2027 from the Korean utility E&S, generated from an LNG-fuelled heat and power plant.

Semiconductors account for over 20 percent of South Korea's total exports so competitively-priced and sustainable energy is critical. "A semiconductor cluster powered by fossil fuels, such as LNG, could jeopardize SK Hynix's RE100 goal and market competitiveness, especially when American fabless customers prioritize manufacturers who use renewable energy," Kim said.

Tripling the renewables contribution from currently less than 10 percent of Korea's power mix could, on the other hand, generate 113,434 gigawatt-hours (GWh) of net increment electricity which exceeds the projected rise in demand increase of 53,168 GWh.

Pivot to domestic reserves

Upstream companies in South Korea have been striving to tap the country's domestic gas resources as a cheaper alternative to imported LNG.

Some 100 billion Won, equalling about US$73 million, have been designated for exploratory drilling at prospects holding up to 14 billion barrels of oil and gas off the east coast. Initial results are expected in early 2025.

Tighter decarbonisation targets, set up by the government in Seoul, aim for the share of LNG in the power mix to decline to 11.1 percent by 2038, a substantial drop from 26.8 percent last year. South Korea's 11th Basic Plan for Long-Term Electricity Supply and Demand (BPLE) stipulates that renewable electricity will increase to 21.6 percent of the power mix by 2030 and 32.9 percent by 2038, while the gas demand is forecast to fall to 37.66 mtpa by 2036, down 1.38 percent annually due to a shrinking population and slow economic growth rates.

Going forward, South Korean utilities face rising pressure to source cheap and sustainable fuels. The country's key buyer KOGAS hence seeks to re-negotiate existing long-term LNG contracts or source cargoes from new low-cost projects – just like POSCO's latest deal to offtake competitively-priced LNG that originates from America's oil-rich Permian basin. ■

Price of oil-linked and HH-linked LNG deals converge

Prices of delivered LNG into North-East Asia, the world's premium gas market, are converging for oil-linked contracts and those indexed to the US Henry Hub. Most of the recent long oil-linked deals for cargoes shipped to Asia have been in the 12.0 to 12.5 percent DES range, while volumes available earlier from post-FID projects are attracting a premium.

"Buyers are offering pre-FID suppliers that deliver volume towards the end of the decade slopes in low 12 percents," Wood Mackenzie noted.

Bifurcated market

Prices vary based on the terms, tenure and start date of new deals. The market is bifurcated with contracts starting before or after 2026, attracting premiums or discounts to this range.

Deals into South Asia have been agreed at lower slopes than deals to Northeast Asia, which follows an implied shipping delta for Middle Eastern and Northern African volumes.

Several price reviews have also been agreed. "The majority of these contracts have been agreed from 2023 to 2027, free-on-board (FOB), with oil linked slopes in the low-to-mid 13 percent range. However, some sellers with specific price review clauses have been able to conclude price reviews higher than this range," analysts noted.

Rise in US tariffs

US liquefaction tariffs in have risen significantly.

"Deals signed in 2022 and early 2023 for 20 years starting in 2026/27 were presumed to be priced between US$2.15-2.30 per million British thermal unit (mmbtu) and we understand from mid-2023 to June 2024, some projects are receiving tariffs in the US$2.40-2.50/mmbtu range," analysts said.

Shorter-term deals are "likely to charge a premium," they forecast – but "deals still appear to be somewhat below the US$2.75/mmbtu," that has been quoted by other analysts. ■

Global LNG supply down marginally, but rising demand

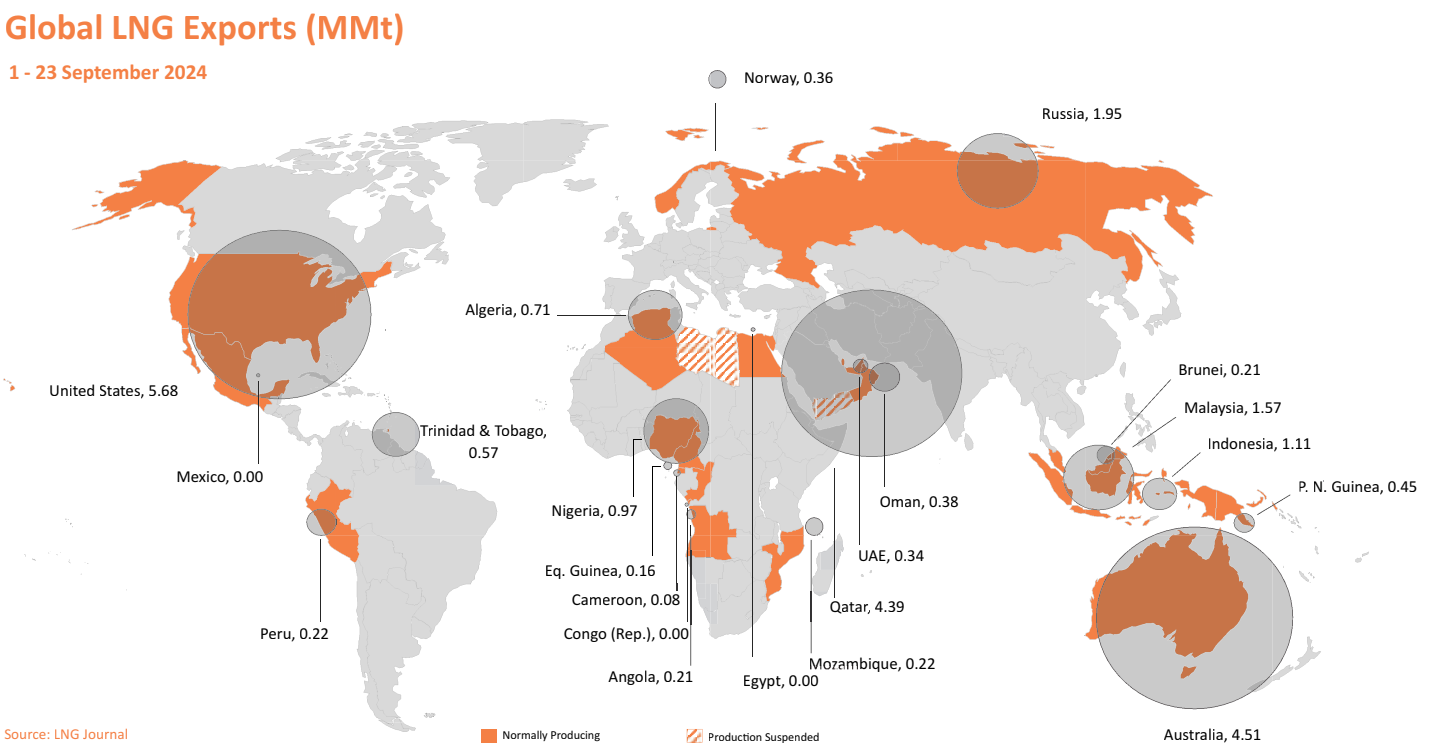
Our September data for the month-to-date showed a marginal LNG trade decrease globally. Meanwhile, demand was uplifted by increases in Asia, Europe and South America, our Market Editor Dr Alexander Wilk reports.

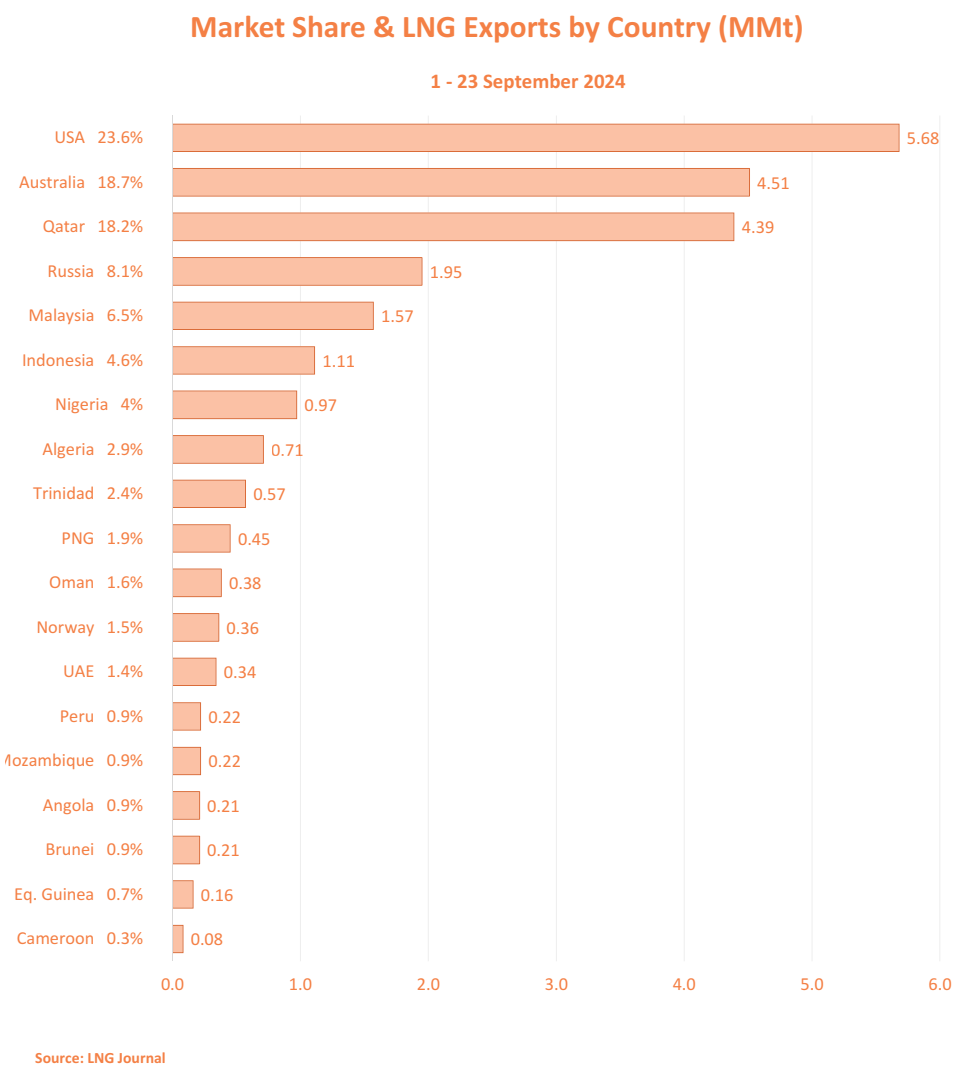
According to our data on 23 September, global LNG exports for the month-to-date amounted to 24.09mmt and were thus down marginally by 0.27mmt (-1 percent) from the 24.09mmt we recorded for the month to 23 August.

The lower month-to-date trade outcome was mainly driven by Qatar, Oman and Australia. Qatar cut exports by 0.41mmt (-9 percent) to 4.39mmt from 4.80mmt this time in August. Concurrently, Oman's capacity reduced shipments similarly steep by 0.37mmt (-49 percent) to 0.38mmt from 0.75mmt in August, with Oman LNG's annualised capacity utilisation at only 58 percent. Australia had also seen an exports gap to August by 0.23mmt (-5 percent) to 4.51mmt from 4.74mmt at the time of writing. Another notable trade reduction stemmed from Russia, which had cut shipments by 0.22mmt (-10 percent) to a total of 1.95mmt in the month-to-date. The resulting export reduction was cushioned, however, by growth elsewhere; led by Algeria, Trinidad & Tobago as well as Malaysia.

Global LNG demand, meanwhile, had increased by 0.37mmt (2 percent) month-on-month as of 23 September. Offtakes were still led by China with imports of 5.11mmt as they remained broadly steady. Alongside China's strong showing, Japan had seen demand growth of 0.38mmt (9 percent) to 4.58mmt at the time of writing. Other notable demand growth centres were India and the United Kingdom.

Although strong offtake growth by several larger-scale Pacific and Atlantic demand centres had led to a global net demand increase, that growth was limited by comparatively smaller decreases among a large roster of smaller importers. A particular negative impact, however, stemmed from a seasonal demand downturn in the Middle East, which had shaved off 0.40mmt (-21 percent) from global offtakes at the time of writing.





Export - Pacific Basin

For the month-to-date, Pacific exports had accrued to 8.83mmt and thus remained broadly steady compared to August's equivalent total of 8.84mmt. Consequently, annualised capacity utilisation stood at 57 percent. Exports were also down by 0.48mmt (-5 percent) year-on-year.

Australia: The Pacific Basin's most significant exporter by installed capacity – Australia – saw exports during the report period decrease by 0.23mmt (-5 percent), totalling 4.51mmt compared to 4.74mmt in the previous month.

Several LNG plants experienced a significant increase in shipments compared to the equivalent period in August. Gorgon LNG, for example, saw a 34 percent boost, shipping 1.14mmt compared to August's 0.85mmt. Meanwhile, Queensland Curtis LNG had an uptick of 25 percent, reaching 0.60mmt from 0.48mmt. Concurrently, Pluto LNG and Prelude FLNG both marked a 29 percent increase, shipping 0.36mmt and 0.27mmt respectively, up from August's figures of 0.28mmt and 0.21mmt.

However, this growth was tempered by a cumulative decrease of 0.50mmt in exports from other Australian LNG plants. NWS LNG, for instance, saw shipments drop by 7 percent, down to 0.77mmt from August's 0.83mmt. Moreover, Ichthys LNG decreased exports by 15 percent to 0.56mmt from 0.66mmt. Gladstone LNG saw a 25 percent decline, from 0.44mmt to 0.33mmt, while Wheatstone LNG experienced the most significant decrease of 31 percent, falling to 0.51mmt from 0.74mmt.

Australian exports in the month to 23 September were primarily directed to China, totalling 1.68mmt, though they

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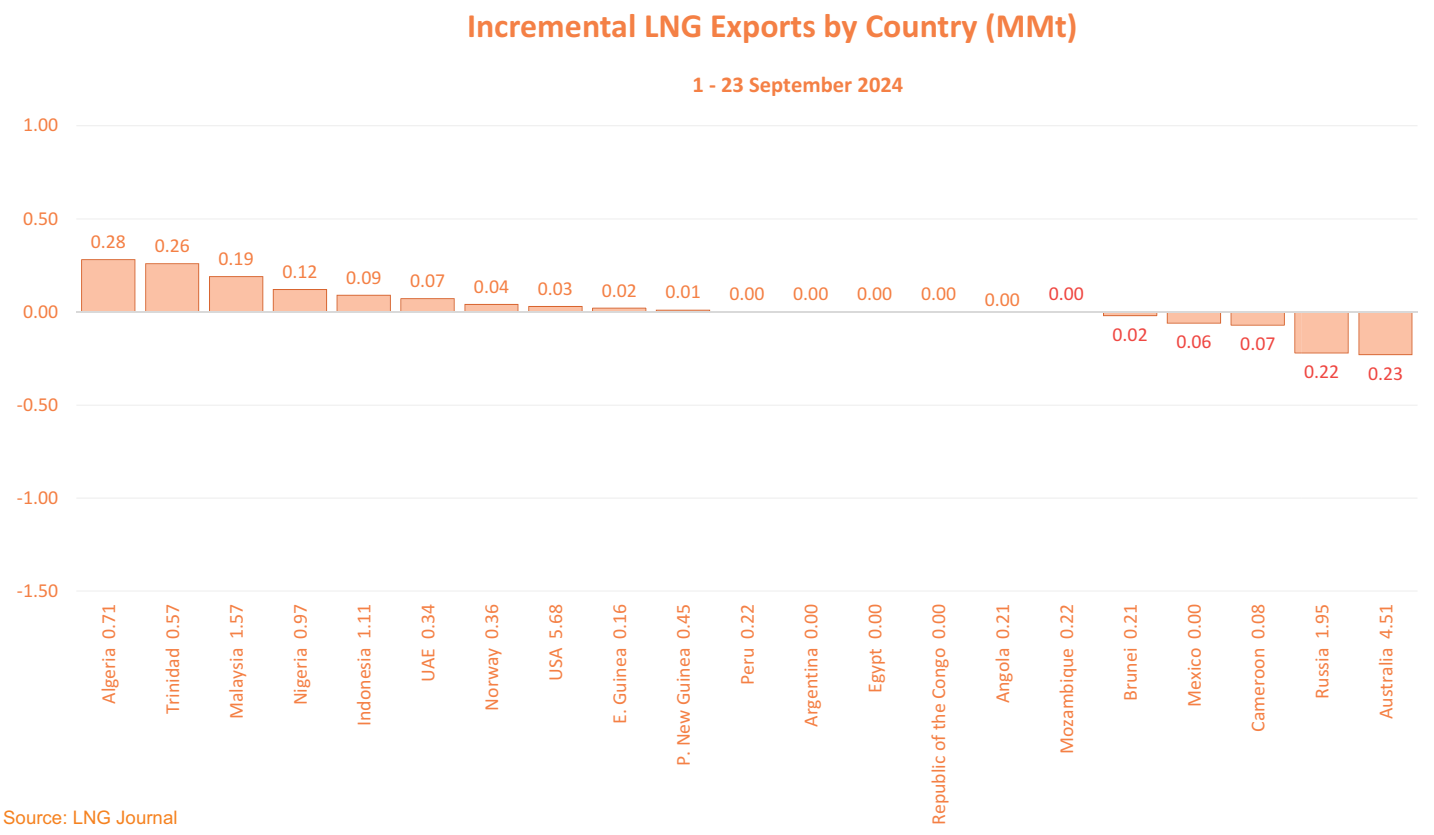
saw a 0.14mmt (-8 percent) decrease month-on-month. Japan's imports also saw a significant decrease of 0.39mmt (-25 percent) to 1.18mmt. In contrast, South Korea increased imports by 0.13mmt (30 percent) to 0.57mmt. Taiwan's imports decreased by 0.08mmt (-16 percent) to 0.43mmt, whilst Singapore saw an increase of 0.02mmt (40 percent) to 0.07mmt. Malaysia's imports saw a substantial decrease of 0.11mmt (-69 percent) to 0.05mmt. Indonesia received 0.06mmt, an increase of 0.01mmt (20 percent), and the Philippines returned to the market for 0.03mmt of Australian LNG, up by 0.03mmt. Thailand, however, had yet to take in an Australian cargo, an effective 0.14mmt decrease compared to August. We were also tracking cargoes amounting to 0.44mmt in the Pacific Basin that had yet to declare their specific destinations at the time of writing.



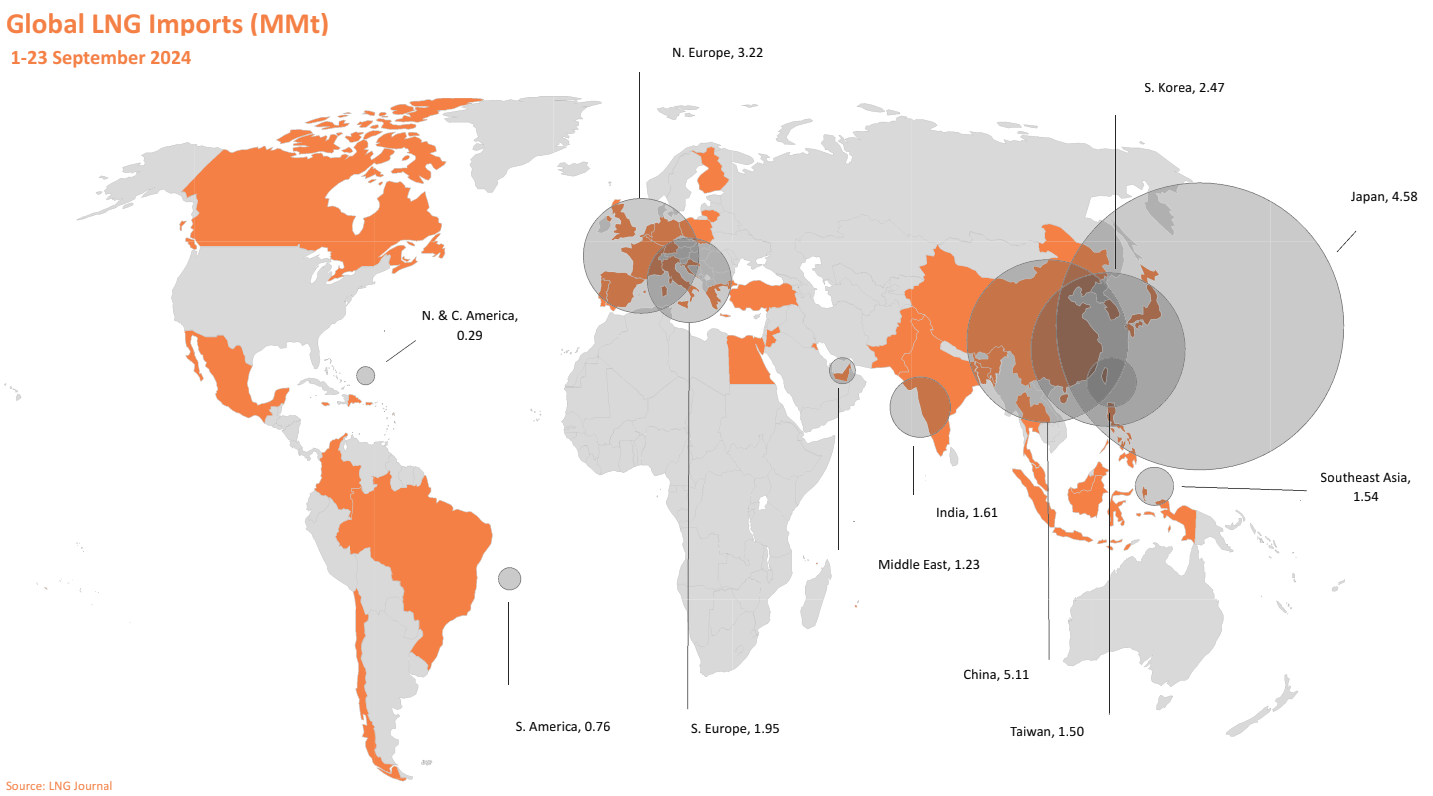
Southeast Asia: North of Australia, PNG LNG saw a minor increase in production during the report period. The facility's output rose by 0.01mmt (2 percent) to 0.45mmt, up from 0.44mmt during the equivalent period in August. This modest growth brought the plant's annualised capacity utilisation rate to 86 percent.

During the report period, PNG exports were led by shipments to Japan, totalling 0.22mmt, a period-on-period increase of 0.08mmt (57 percent). Taiwan's imports from PNG LNG remained steady at 0.08mmt, showing no change. Imports by China, however, saw a decrease of 0.15mmt (-68 percent) to 0.07mmt. Concurrently, we were also tracking a 0.08mmt cargo that had yet to declare its destination in the Pacific Basin.

Indonesia's exports during the report period saw an overall increase of 0.09mmt (9 percent) to 1.11mmt compared to 1.02mmt in August. This growth was primarily driven by Tangguh LNG, which increased shipments by 0.13mmt (19 percent) to 0.82mmt. Bontang also contributed to the positive trend, with exports rising by 0.06mmt (38 percent) to 0.22mmt. However, this growth was partially offset by Donggi-Senoro LNG, which saw a decrease of 0.10mmt (-59 percent) to 0.07mmt. It follows that the annualised capacity utilisation rates for the plants varied significantly. Tangguh LNG operated at 114 percent of its annualised capacity, whilst Bontang and Donggi-Senoro LNG produced at 30 percent and 56 percent, respectively.

During the report period, neighbouring Malaysia saw overall shipments grow by 0.19mmt (14 percent) to 1.57mmt compared to 1.38mmt in August. This growth was primarily driven by Malaysia LNG, which increased exports by 0.13mmt (9 percent) to 1.51mmt. PFLNG 2 contributed to growth, with exports of 0.06mmt compared to no exports this time in August. Accordingly, Malaysia LNG operated at 82 percent of its annualised capacity, whilst PFLNG 2 produced at 79 percent of its capacity. PFLNG 1 had not yet been seen in the market at the time of writing.

During the report period, Brunei LNG saw a slight decrease in exports. The facility's shipments fell by 0.02mmt (-9 percent) to 0.21mmt, down from 0.23mmt in August. This modest decline brought the plant's annualised capacity utilisation rate to 46 percent. Japan remained the primary importer of Brunei LNG, maintaining steady imports of 0.14mmt. However, South Korea had yet to see an import from Brunei (but we were tracking a 0.07mmt cargo that had yet to declare its Pacific destination).



Russia, Peru & Mozambique: Elsewhere in the Pacific, Sakhalin-2 LNG saw an export decrease of 0.05mmt (-8 percent) to 0.54mmt during the report period from 0.59mmt in August. The plant's annualised capacity utilisation rate stood at 89 percent. LNG exports were led by shipments to Japan amounting to 0.30mmt, which represented a decrease of 0.05mmt (-14 percent). China's imports fell by 0.12mmt (-50 percent) to 0.12mmt. South Korea, however, returned to the plant with imports of 0.12mmt during the report period.

Concurrently, Peru's Pampa Melchorita LNG had maintained its month-to-date exports at 0.22mmt. The plant's annualised capacity utilisation rate thus also remained at 78 percent. LNG exports from Peru were led by 0.14mmt in shipments to China and South Korea.

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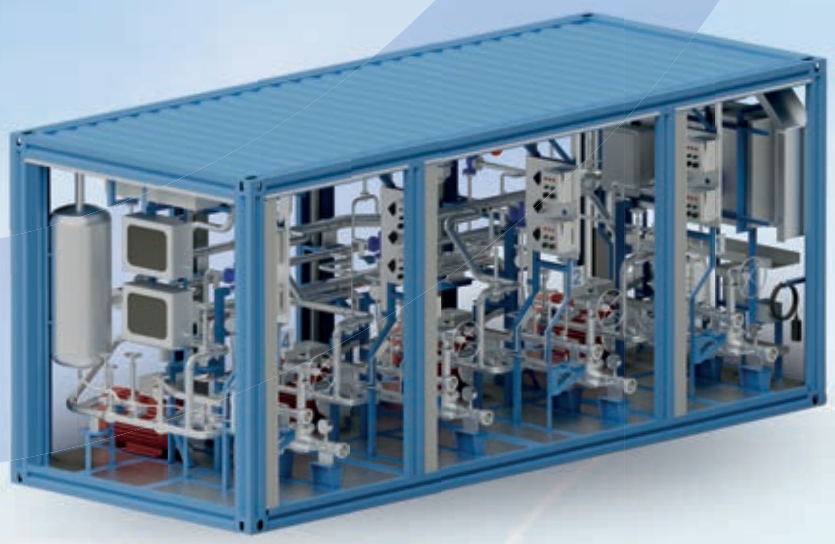

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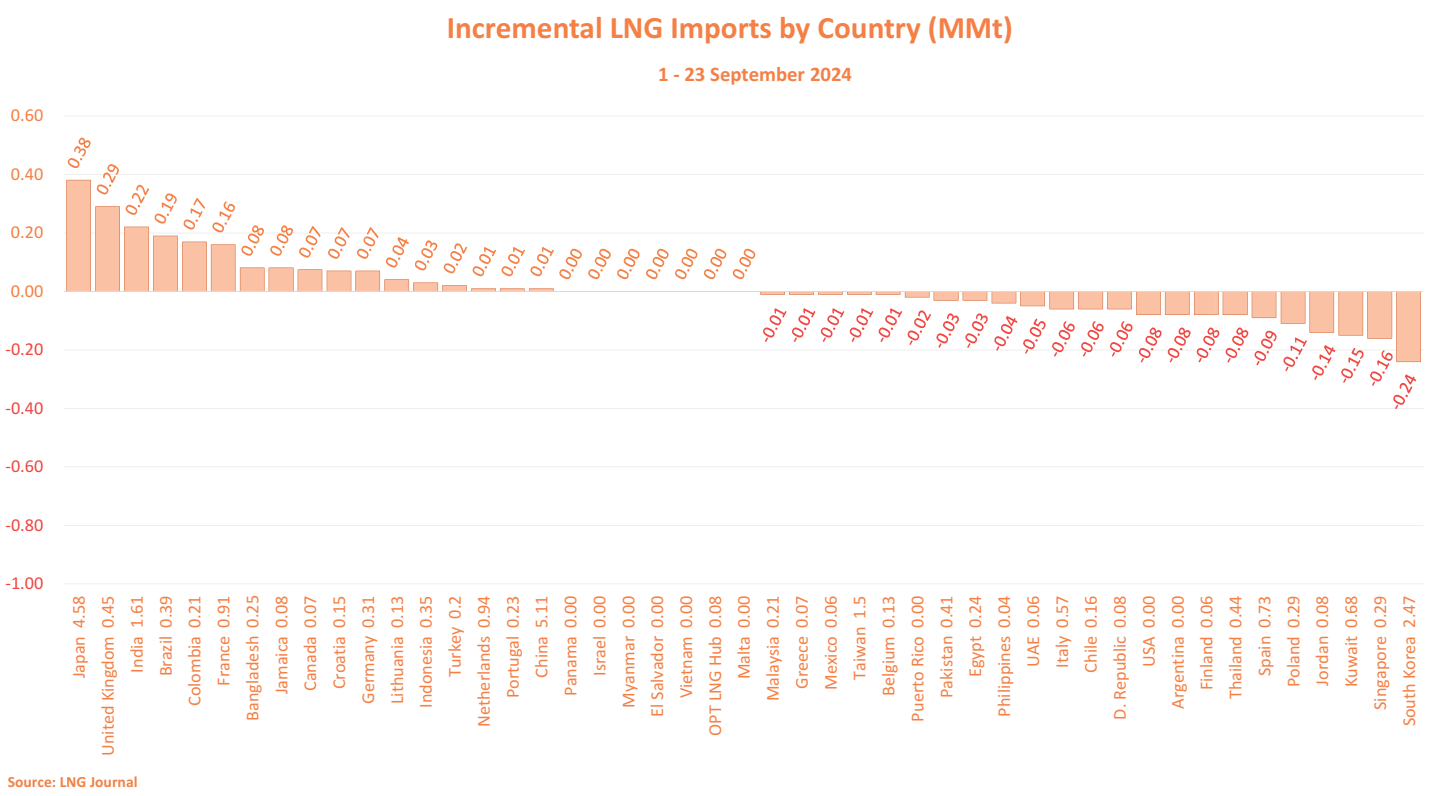


Finally, Mozambique's Coral Sul FLNG had also maintained exports at 0.22mmt for the month-to-date at the time of writing, which pegged the plant's annualised capacity utilisation rate at 103 percent.

Atlantic Basin

In contrast to negative growth in the Pacific, the Atlantic Basin's overall shipped LNG had increased by 0.45mmt (5 percent) to 10.14mmt at the time of writing from 9.70mmt this time in August. This translated into annualised export capacity utilisation of 58 percent for the Basin. Nevertheless, exports were up slightly by 0.10mmt (1 percent) year-on-year.

North Africa & Europe: The amount of LNG shipped from within its north-eastern part - comprising the EEA, Russia and North Africa (and not including re-exports) - amounted to 4.47mmt for the month-to-date and thus saw an increase of 0.42mmt (10 percent) from 4.05mmt this time in August.

The regional increase was mainly due to an Algerian export increase of 0.28mmt (65 percent) to 0.71mmt from 0.43mmt. Arzew increased shipments by 0.25mmt (81 percent) to 0.56mmt whilst Skikda raised its cargo loadings by 0.03mmt (25 percent) to 0.15mmt. The two plants thus operated at 43 and 30 percent of annualised capacity utilisation, respectively, during the report period.

According to the data, Norway's Snohvit LNG saw an increase in exports of 0.04mmt (13 percent) to 0.36mmt during the report period. The plant's annualised capacity utilisation rate stood at 136 percent.

Norway's LNG exports were led by shipments to the Netherlands, which had doubled to 0.12mmt at the time of writing. Finland's imports decreased by 0.06mmt (-50 percent) to 0.06mmt, while the United Kingdom received 0.06mmt. Poland imported 0.05mmt, and were tracking a 0.07mmt cargo en route to Europe at the time of writing. France and the United States, however, had not yet imported LNG from Norway, down 0.06mmt and 0.08mmt from this time in August respectively.

Russia's Atlantic Basin capacity saw a shipment decrease of 0.17mmt (-11 percent) to 1.41mmt from 1.58mmt this time in August. Notably, Yamal LNG reduced exports by 0.22mmt (-15 percent) to 1.22mmt. In contrast, Portovaya LNG increased exports by 0.06mmt (86 percent) to 0.13mmt. The new Arctic LNG 2 project saw a minor decrease of 0.01mmt (-14 percent) to 0.06mmt. As such, Yamal LNG continued to produce above nameplate capacity at 111 percent, while Portovaya's annualised capacity utilisation stood at 103 percent during the report period. The Arctic LNG 2 plant, meanwhile, operated at around 11 percent annualised utilisation, according to our estimate of installed capacity.

West Africa: Concurrently, West African LNG flows were up by 0.07mmt (5 percent) to 1.42mmt from 1.35mmt for the month-to-date on 23 September.

Bonny Island increased exports by 0.12mmt (14 percent) to 0.97mmt whilst EG LNG grew shipments by 0.02mmt (14 percent) to 0.16mmt. Angola LNG maintained exports at 0.21mmt. However, Cameroon's FLNG facility decreased exports by 0.07mmt (-47 percent) to 0.08mmt whilst we had not yet seen the Congo FLNG facility in the market at the time of writing.

The annualised capacity utilisation rates thus stood at 69 percent for Bonny Island and EG LNG, 64 percent for Angola LNG, and 75 percent for Cameroon FLNG.

West African exports for the month to date were led by shipments amounting to 0.63mmt that had yet to determine their destinations within the Pacific. As such, India was the most prominent known destination with 0.21mmt in imports at the time of writing.

Americas: Our US LNG export data for the report period showed a slight increase in shipments by 0.03mmt (1 percent) to 5.68mmt from 5.65mmt in August. Whilst Elba Island LNG was not seen in the market following exports of 0.16mmt by this time in August, Cameron LNG had increased exports by 0.10mmt (13 percent) to 0.88mmt. Concurrently, Cove Point LNG saw growth of 0.08mmt (25 percent) to 0.40mmt. Additionally, Calcasieu Pass LNG and Freeport LNG both increased exports moderately by 0.03mmt, reaching 0.56mmt and 0.99mmt respectively. This only left Corpus Christi LNG, which had seen a minor decrease of 0.01mmt (-1 percent) to 0.99mmt, and Sabine Pass LNG, which had reduced exports by 0.04mmt (-2 percent) to 1.86mmt. Annualised capacity utilisation varied across plants, with Cove Point LNG at 121 percent, Freeport LNG at 102 percent, and Corpus Christi LNG at 105 percent. Cameron LNG, Calcasieu Pass LNG, and Sabine Pass LNG operated at 93 percent, 79 percent, and 98 percent of capacity respectively.

In South America, Atlantic LNG had increased its month-to-date LNG exports by 0.26mmt (84 percent), according to our data, with shipments amounting to 0.57mm. The plant's utilisation rate thus stood at 59 percent.

Middle East

Middle Eastern LNG exports at the time of writing in September amounted to 5.11mmt and thus showed a significant decrease of 0.71mmt (-12 percent) from 5.82mmt in August. Our data thus showed the Basin's annualised utilisation of operational export capacity (i.e., excluding Yemen) at only 66 percent at the time of writing. The Middle East's exports were thus also down by 1.38mmt (-21 percent) year-on-year.

The Middle East's export cut was driven by Qatar's Ras Laffan LNG complex. Our month-to-date data indicated the facility had exported 4.39mmt, a decrease of 0.41mmt (-9 percent) from 4.80mmt in August. Accordingly, the plant's annualised capacity utilisation rate only stood at 90 percent. European demand for Qatari LNG remained subdued, with French offtakes down by 0.03mmt (-33 percent) and Italian imports decreased by 0.20mmt (-53 percent). The United Kingdom re-emerged as a destination, importing 0.12mmt in the month-to-date. Belgium increased imports by 0.03mmt (23 percent), whilst Spain saw a decrease of 0.02mmt (-33 percent). In Asia, Chinese demand for Middle Eastern LNG fell by 0.31mmt (-24 percent), whilst South Korea increased imports by 0.25mmt (36 percent). India, Pakistan, and Bangladesh saw changes of 0.03mmt (-6 percent), 0.04mmt (-10 percent), and 0.04mmt (21 percent) respectively. Japan's imports decreased significantly by 0.37mmt (-67 percent). Kuwait reduced imports by 0.18mmt (-43 percent), and Thailand's offtake fell by 0.16mmt (-64 percent). The UAE saw a decrease of 0.06mmt (-33 percent), while Poland returned to the market for Qatari deliveries, taking 0.10mmt. Notably, 0.52mmt of Qatari LNG were destined for the Pacific Basin but had yet to declare their destinations.

Meanwhile, an export decrease of 0.37mmt (-49 percent) to 0.38mmt in Oman was only partially compensated by a comparatively small increase in volume

terms of 0.07mmt (26 percent) to 0.34mmt by the UAE's Das Island plant. This meant annualised capacity utilisation at Das Island stood at 98 percent whilst at Oman LNG that figure stood at 58 percent.

Concurrently, Egypt had not yet made an appearance in the market in September, according to our data at the time of writing. The country had last shipped a cargo in April.

Imports & Domestic Trade

Global LNG imports at the time of writing had increased slightly by 0.37mmt (2 percent) to 24.71mmt from the 24.33mmt we recorded this time in August. Demand growth at the time of writing was led by the Atlantic Basin, but which was tempered by a significant decrease in the Middle East.

Pacific Basin

Month-on-month Pacific Basin imports were up by 0.11mmt (1 percent) net to 17.70mmt from 16.96mmt this time in August. The roster of larger-scale importers comprising China, India, Taiwan, South Korea and Japan collectively increased their offtakes by 0.36mmt (2 percent) to 15.27mmt from 14.91mmt this time in August.

Concurrently, the roster of smaller Pacific buyers collectively saw imports decrease by 0.25mmt (-12 percent) to 1.80mmt during the report period. This decrease was primarily due to negative demand growth in Singapore, where offtakes were down by 0.16mmt (-36 percent) to 0.29mmt. Thailand also saw a significant reduction of 0.08mmt (-15 percent) to 0.44mmt.

Chile and the Philippines experienced decreases of 0.06mmt (-27 percent) and 0.04mmt (-50 percent) respectively, reaching 0.16mmt and 0.04mmt. Malaysia saw a minor reduction of 0.01mmt (-5 percent) to 0.21mmt, whilst Mexico's imports fell by 0.01mmt (-14 percent) to 0.06mmt.

The roster's overall demand reduction was partially offset by increases in Bangladesh and Indonesia. Bangladesh increased imports by 0.08mmt (47 percent) to 0.25mmt, whilst Indonesia saw growth of 0.03mmt (9 percent) to 0.35mmt.

Atlantic Basin

LNG demand in the Atlantic Basin increased by 0.66mmt (12 percent) to 6.16mmt, with annualised utilisation of installed capacity at 22 percent.

European demand saw a net increase of 0.19mmt. Strong positive import growth in the United Kingdom by 0.29mmt (181 percent) to 0.45mmt and in France by 0.16mmt (21 percent) to 0.91mmt overshadowed decreases elsewhere in Europe. Spain and Italy saw reductions of 0.09mmt (-11 percent) and 0.06mmt (-10 percent) respectively. Germany increased imports by 0.07mmt (29 percent) to 0.31mmt, whilst Poland saw a decrease of 0.11mmt (-28 percent) to 0.29mmt.

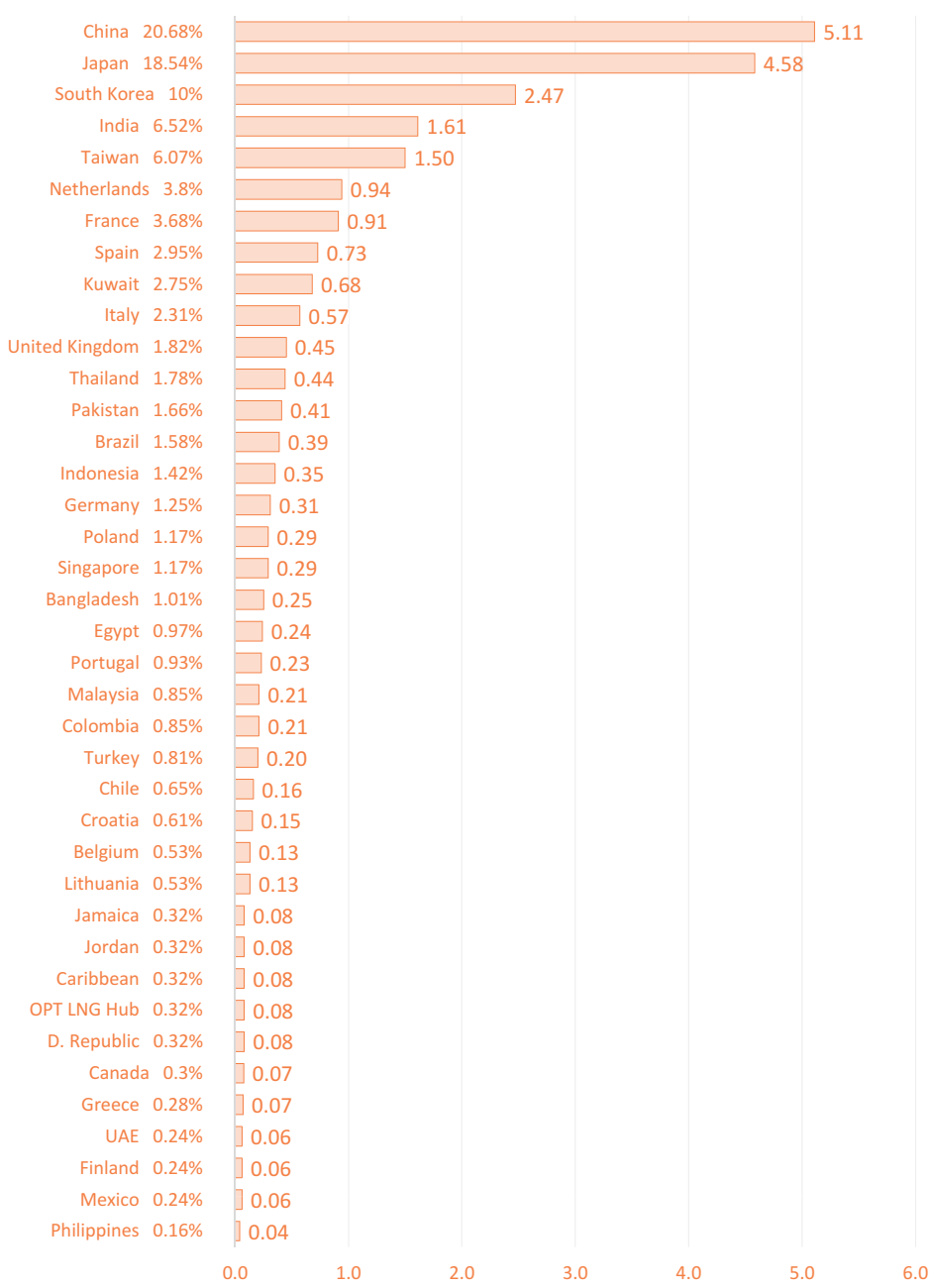
The data also showed significant demand increases in the Americas. Brazil increased offtakes by 0.19mmt (95 percent) to 0.39mmt, whilst Colombia saw growth of 0.17mmt (425 percent) to 0.21mmt. However, the Dominican Republic reduced imports by 0.06mmt (-43 percent) to 0.08mmt. Argentina and the United States ceased imports entirely, both thereby removing 0.08mmt of demand. Canada and Jamaica maintained their imports at 0.07mmt and 0.08mmt respectively.

Middle East

Meanwhile, overall Middle Eastern LNG demand of 1.47mmt during the report period was down by 0.40mmt (-21 percent) from 1.87mmt in August. Kuwait's imports decreased by 0.15mmt (-18 percent) to 0.68mmt, whilst Pakistan reduced offtakes by 0.03mmt (-7 percent) to 0.41mmt. Egypt saw a decrease of 0.03mmt (-11 percent) to 0.24mmt. Jordan's imports fell by 0.14mmt (-64 percent) to 0.08mmt, and the UAE cut imports by 0.05mmt (-45 percent) to 0.06mmt. The Middle East's annualised import capacity utilisation stood at 28 percent during the report period. ■

Market Share & LNG Imports by Country (MMt)

1 - 23 September 2024



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Specific power re-defined

- A technology neutral definition for commercial alignment

By Xun Jin, Staff Process Engineer, ConocoPhillips

Specific power has historically been used to report and compare LNG liquefaction process efficiencies. The generally accepted definition of specific power is the amount of power required to liquefy a unit quantity of LNG, as expressed by this generic formula:

$$\text{Specific Power} = \frac{\text{Consumed Power}}{\text{Produced LNG}}$$

Specific power measures the power demand from liquefaction without consideration of how that demand is met, which varies with each project based on a number of factors.

This paper examines different methodologies in defining and calculating specific power, from which the author contends that a proper method for calculation cannot be selected without appreciating the underlying differences among liquefaction processes.

For this exact reason, some 'conventional' approaches fail to provide a level playing field when comparing different liquefaction technologies. Therefore, this paper proposes a new universal definition for specific power, which is neutral across technologies and aligns better with LNG projects' commercial objectives (eg, Net Present Value, Internal Rate of Return, Payback Period, etc).

Existing disparities

Though straightforward in concept, application of specific power in practice presents some tremendous disparities with respect to how it is defined and calculated. In the past, different people selected different numerators and denominators without acknowledging that large discrepancies could result. Table 1 lists common variations in selecting the numerator and denominator for specific power calculations.

Table 1 - Specific Power Numerator and Denominator Options

$$\text{Specific Power} = \frac{\text{Consumed Power}}{\text{Produced LNG}}$$

Numerator	Denominator
Refrigerant compressor power only vs. Refrigerant compressor power + Other compressor powers • Boil-Off Gas Compressor • End Flash Gas Compressor • Fuel Compressor • Booster Compressor • NRU Compressor	Rundown LNG vs. In-tank LNG

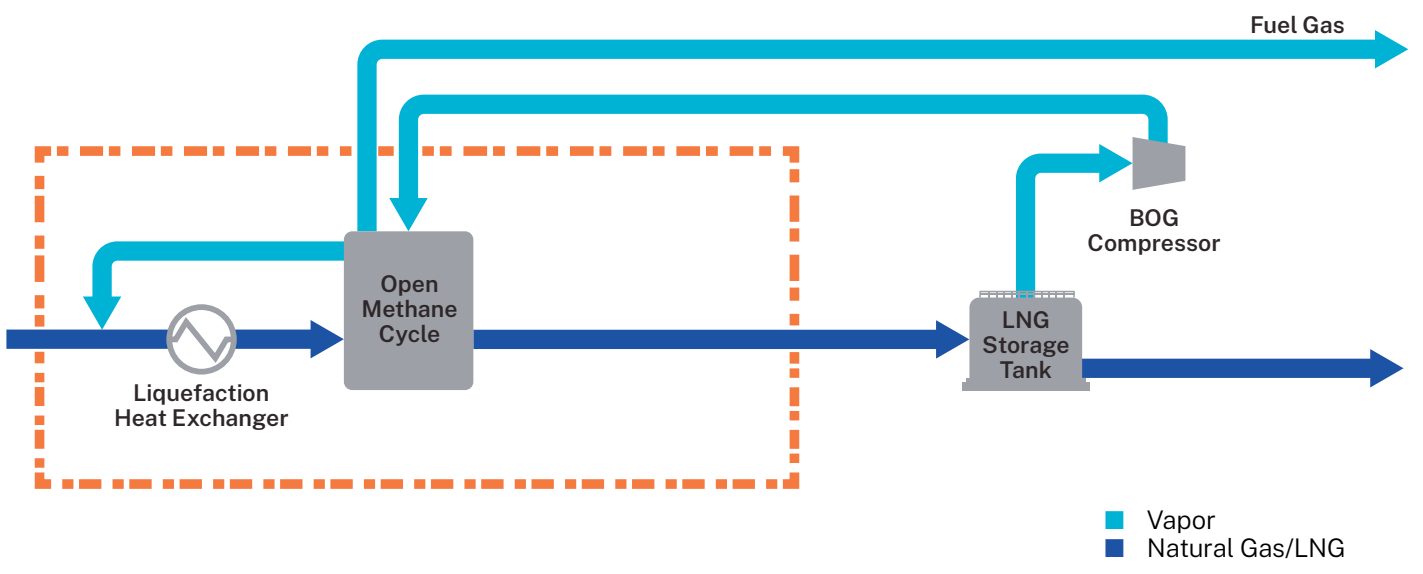
Many of the above-listed disparities in specific power calculations are rooted from fundamental design differences, most notably in the back-end design of a liquefaction process, ie, from liquefaction exchanger(s) to LNG storage tank(s).

To help explain these differences, let's look at the two processes leading the natural gas liquefaction market, namely the Optimized Cascade® Process (OCP®) technology and propane pre-cooled mixed refrigerant (C3MR) processes.[1] The dashed block represents a liquefaction train that should include the Heavies Removal Unit (HRU) and Nitrogen Removal Unit (NRU) when applicable but, sometimes, are neglected.

Figure 1A shows a typical back-end design in the OCP technology, in which the final cooling of LNG is achieved through self-refrigeration as well as cold recovery from vapours, all integrated in an open methane loop.

Most mixed refrigerant liquefaction processes, including the C3MR process, share a typical back-end design as seen in Figure 1B. LNG in the C3MR process is sub-cooled significantly using external refrigeration. As such, vapour is not produced until final pressure letdowns.

Figure 1A: **Typical OCP Design**



The numerator

To calculate specific power, one must first determine the amount of power consumed for LNG liquefaction. Liquefaction power includes, but is not limited to, the power consumed by refrigerant compressors. Additionally, the power consumed by several other compressors should also be considered, because:

First, a significant amount of power is consumed in handling the vapour co-produced during LNG liquefaction, which is an inevitable operation for all liquefaction processes, albeit sometimes performed differently.

In C3MR processes, several compressors, eg, End Flash Gas (EFG), Boil-Off Gas (BOG), and fuel gas compressors are usually utilised for compressing vapour. Vapour handling in the OCP technology is largely integrated within its open methane cycle. As a result, only a small size BOG compressor is required along with the methane compressors.

[1] Optimized Cascade® and OCP® are registered trademarks of ConocoPhillips Company in the US and certain other counties.

For both technologies, there are techniques known in the industry that shift power from refrigerant compressors to vapour compressors, and vice versa.

Second, nitrogen content can be impactful on LNG liquefaction efficiency. An increase in the nitrogen level generally causes efficiency to deteriorate.

Some plants are furnished with a Nitrogen Removal Unit (NRU) which, depending on the situation, comes in various forms and sizes, and is either integrated with liquefaction or a stand-alone unit.

More importantly, the addition of an NRU will impact the overall liquefaction power demand. The NRU in the OCP technology is fully integrated within the methane cycle and is capable of producing a > 99 mol% nitrogen stream for atmospheric release or disposal.

For the C3MR process, different process schemes exist to concentrate nitrogen before disposal. If any additional NRU compressor is ever required for either process, it is important to include it in specific power calculations.

Third, high pressure in feed gas promotes liquefaction efficiency, as it allows for more auto refrigeration, hence reducing the need for external refrigeration. From this perspective, any incremental feed gas boosting compression power, as found in plants with an upfront Heavies Removal Unit (HRU), should be included as liquefaction power.

The power utilised for compressing vapour and feed gas are an integral part of the overall power consumption necessary for completing an LNG liquefaction process. The exclusion of such power will likely lead to severe undercounting of liquefaction power demand particularly for the C3MR process.

To perform an 'apples-to-apples' objective comparison, an all-inclusive liquefaction power calculation is needed, which should include the power consumed by the following compressors:

- Refrigerant compressor (with bearing loss, gear loss and API margins)
- Any compressor involved in vapour compression (including EFG compressor, BOG compressor, fuel gas compressor)
- Feed gas booster compressor, if applicable
- NRU compressor, if applicable

The denominator

The denominator for specific power is the quantity of LNG product produced. Unfortunately, a commonly held standard is lacking with regard to where and how LNG product is measured and in what quantity.

Some parties use rundown LNG to calculate specific power, which is often done for the C3MR process. This can be problematic as rundown LNG is not a final product. Additionally, rundown LNG could deviate significantly, both in quantity and quality, from in-tank LNG, which is the true product as desired by designers, operators, and off-takers alike.

For instance, in a C3MR process where LNG runs down directly to the LNG storage tank (ie, without the EFG system), the rundown LNG will encompass the full amount of fuel gas, plus the recycled gas. Neither fuel gas nor recycled gas are LNG products. With such a rundown flow, the value of specific power calculated will be significantly lower due to unsuitably inflated 'product' quantity.

For the OCP technology, the gap between the rundown and in-tank LNG flows tends to be much smaller. In-tank LNG, instead of rundown LNG, should always be used for all specific power calculations, regardless of the LNG technology selected. The same LNG storage tank pressure should also be used to ensure an objective comparison.

Some parties use rundown LNG to calculate specific power... This can be problematic as rundown LNG is not a final product.

Heating value basis

Specific power is conventionally calculated on a basis of per unit mass flowrate, eg, kW-h per tonne or MW per MTPA. Such a calculation accounts for the quantity of LNG product but does not differentiate its quality. As a matter of course, LNG products do differ in quality, especially in terms of nitrogen, helium, and other inerts.

These constituents contribute little to none to the LNG product heating value. Their presence downgrades the LNG product, but occupies precious volume in storage and shipping, also creates more BOG to be managed further down the value chain.

For example, it is quite common for a C3MR process to produce in-tank LNG containing up to 1 mol% nitrogen, as allowed by product specifications. In contrast, in-tank LNG from the OCP technology typically contains less than 0.3 mol% nitrogen even with high nitrogen feed gas, in part, as a result of its open methane cycle with an integrated NRU.

Tariffs or sales contracts in the LNG industry are always based on High Heating Value (HHV). In other words, LNG with a higher HHV has higher commercial value. It is therefore appropriate to modify specific power from being mass flow (kW-h per tonne) based to heating value based (kW-h per MMBtu).

Such a shift not only bridges the gap in the LNG qualities produced from different technologies, it also lends itself to a better alignment with the commercial goals of maximising project values shared by all LNG projects.

Proposed definition

As a best practice, the following definition for specific power is proposed.

$$\textit{Specific Power (kWh/MMBtu)} = \frac{\textit{All inclusive Liquefaction Power (kW)}}{\textit{In-tank LNG HHV (MMBtu/h)}}$$

Such a definition is universally applicable to any liquefaction technology even though they contain vastly different configurations.

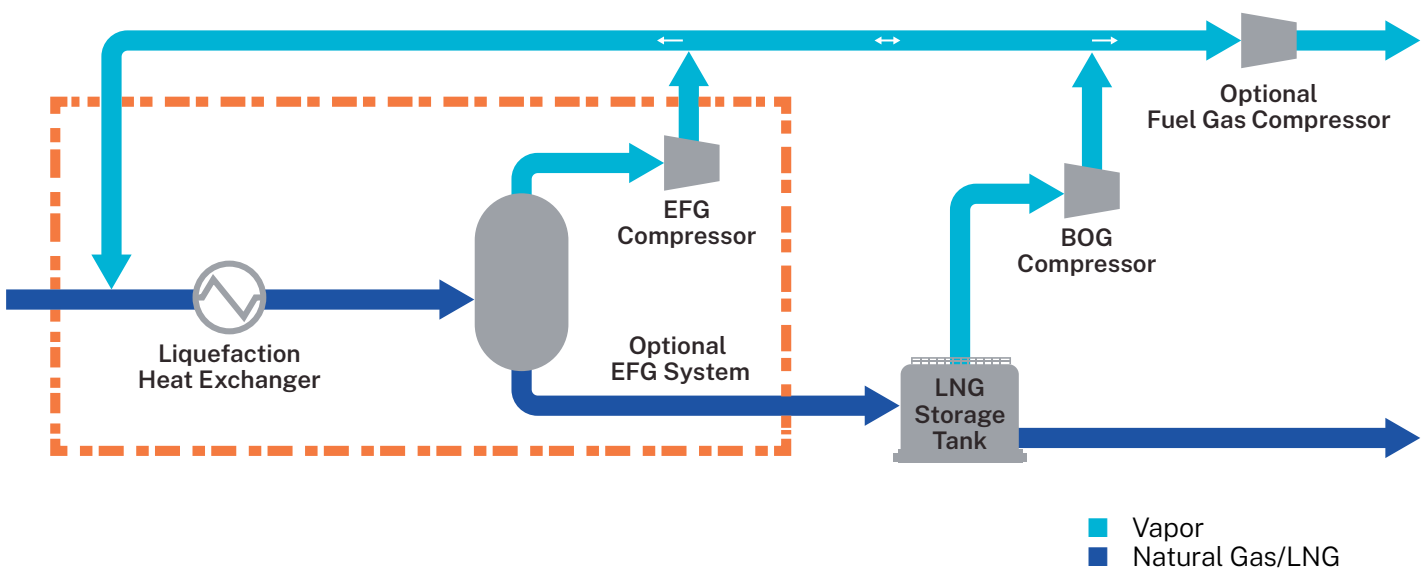
The newly proposed heating value basis accurately reflects the potential differences in LNG product quality. With this definition, specific power can be consistently interpreted without controversy, making it a powerful tool for efficiency comparison as part of technology selection.

Conclusion

This paper analyses the two most popular liquefaction technologies used in the LNG industry by demonstrating and highlighting the shortcomings in current specific power definitions and their consequences when used across different liquefaction technologies.

A new universal definition is then proposed, by which specific power is plainly defined as 'the amount of all-inclusive liquefaction power (in kW) consumed for a unit HHV (in MMBtu) of in-tank LNG produced'. ■

Figure 1B: **Typical C3MR Process**



New digital solution set to bridge the LNGC efficiency gap

The LNG shipping sector is facing mounting pressure to improve efficiency and reduce emissions, while managing complex cargo condition requirements with evolving on board systems. Technical Editor Ian Cochran has more.

This sector's transition to a cleaner and more transparent operational model presents numerous technical and organisational challenges, such as managing boil-off gas (BOG) most efficiently, and bridging the gap between charterers and owners.

As the market shifts toward sustainability, these challenges have come under scrutiny.

Efficiently managing the temperature and pressure of LNG cargoes over long voyages poses significant hurdles for vessel operators, and the balance of reliquefying BOG and using it as fuel for propulsion complicates the equation further.

Poor management of the cargo condition can reduce the volume of cargo delivered and drive-up operational costs. Despite this, LNG operations teams often still do not leverage their available on board performance and cargo data effectively to meet their goals.

This results in higher emissions and lower profit margins, which in today's market, is a less than sustainable approach.

Danelec, a maritime technology company, known for its ship Voyage Data Recorder (VDR) hardware and maritime IT solutions, has launched a new system aimed at tackling these challenges.

By focusing on digital transformation and data-driven insights, it aims to improve performance and transparency in LNG shipping, addressing long-standing fuel consumption and cargo handling problems.

Based on a new suite of LNGC voyage simulation tools, the company's solutions seek to change how teams throughout the LNG value chain plan and execute their voyages.

It is designed to empower marine teams within energy majors, as well as vessel owners and operators, by providing access to high-fidelity digital twins of their specific vessels and cargoes.

With accurate simulations and analytics, commercial and operations teams are able to unlock new insights into the trade-offs between different voyage plans and operational decisions, both pre-voyage and mid-voyage.

LNGC operations

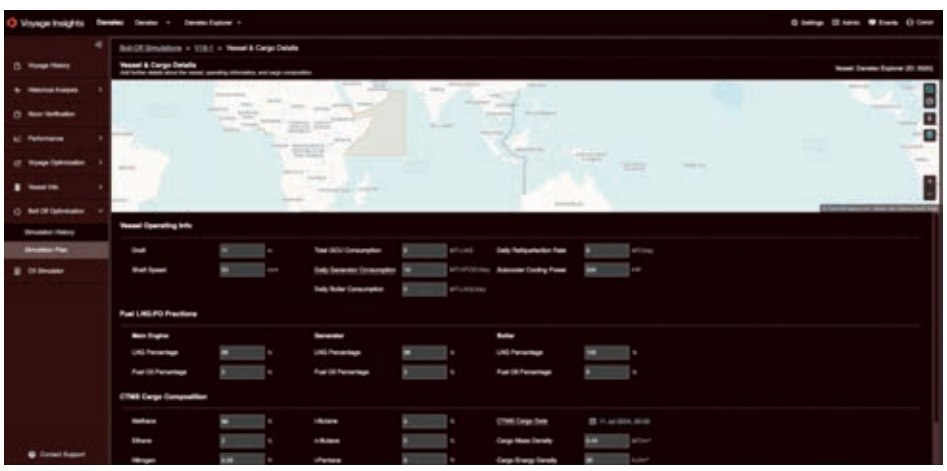
While traditional approaches to LNG transportation often rely on rudimentary estimations, fragmented data from various on board systems, and rule-of-thumb operational practices, Danelec's solution centralises and processes operational data to create detailed, predictive insights that can produce gains when both planning and executing LNGC voyages.

The simulation capabilities allow operators to predict changes in cargo condition, including temperature, pressure, and composition, over the course of a journey. The machine-learning performance and thermophysical models leveraged by the toolset integrates multiple variables, including forecast weather and sea patterns, vessel speed and consumption, and BOG utilisation.

A key feature of Danelec's suite of tools is real-time recommendation of on board operational setpoints for propulsion and cargo management systems. This enables vessel Masters and engineers to make informed decisions about how to best manage the BOG and reduce unnecessary fuel consumption and maximising cargo delivery, while ensuring that the vessel arrives at its destination on-time and meets charterparty and arrival terminal requirements.

BOG occurs as a natural by product of transporting LNG at such low temperatures and if improperly managed, it can lead to higher emissions, reduced fuel efficiency, and even safety risks.

Simulation history database



Voyage plan setpoint and cargo setup

Traditionally, BOG management has relied on manual observation and fixed setpoints for reliquefaction or combustion. However, these methods often lack the real-time responsiveness required for ideal performance.

With the system's predictive capabilities, vessel operators can adjust BOG usage as fuel or re-liquefy it when necessary, achieving a more balanced and sustainable voyage.

The solution will integrate seamlessly with existing on board systems, including propulsion and tank monitoring platforms, opening the door for more granular control over cargo conditions and reduced fuel consumption and CO2 emissions.

By taking control of how and when BOG is used, the solution claims to offer a performance improvement of up to 4.7%, resulting in the potential to save more than 100 tonnes of LNG per voyage, with an estimated saving of $360,000 per vessel per year.

Navigating the future

Danelec's focus on collaborative optimisation between shipowners and charterers is another key feature. The LNG shipping industry often struggles with a lack of transparency between these stakeholders, leading to inefficiencies in decision-making and missed opportunities to unlock savings.

By providing a unified platform for data sharing and closer alignment between parties, Danelec's solution suite ensures that all decisions – from setting charterparty restrictions to voyage planning through cargo delivery – are supported with the highest-quality simulation results to collaborate around.

The broader impact of such solutions extends beyond just improving voyaging and LNG operations. With rising global scrutiny on emissions and the maritime sector's commitment to sustainability goals, improving BOG management and fuel usage directly contributes to lowering the environmental footprint of LNG carriers.

This is particularly crucial as the IMO tightens regulations around greenhouse gas emissions, forcing shipowners to adopt new technologies for sustainable shipping.

LNGCs are not immune to these changes, and the pressure to cut down emissions, while maintaining profitability is driving many to invest in digital solutions. In particular, Danelec's focus on predictive analytics aligns well with the industry's push toward greater digitalisation, as the ability to look ahead is a key enabler for meeting operational and environmental challenges.

As the LNG industry continues to navigate operational complexities and sustainability pressures, Danelec's voyage and BOG insights are a new platform for augmenting operations at sea and in the office.

By using advanced data models and real-time monitoring, key pain points, from cargo management to fuel efficiency, can be managed.

LNG shipping, like many other sectors, is experiencing a digital transformation, and solutions that embrace this shift will become integral to the future of maritime operations.

As regulatory demands increase and profit margins tighten, the ability to simulate and predict voyage outcomes will be crucial for developing a more sustainable LNG shipping value chain and ensuring that carrier owners and operators stay competitive in this hard-fought market.■

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ISO 8943: 2007,
G.I.I.G.N.L. 6th edition: 2021
ISO 6978-2: 2003,
EN 12838: 2000,
ISO 10715: 2022

Phazer 1.1 for LNG Custody Transfer

Phazer 4.1 for Boil-Off Gas

Intermittent LNG Sampler with Flow Skid

Bio-LNG and LCO_2

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EN 16723-2,
ISO 27913: 2016
ISBT,
EIGA

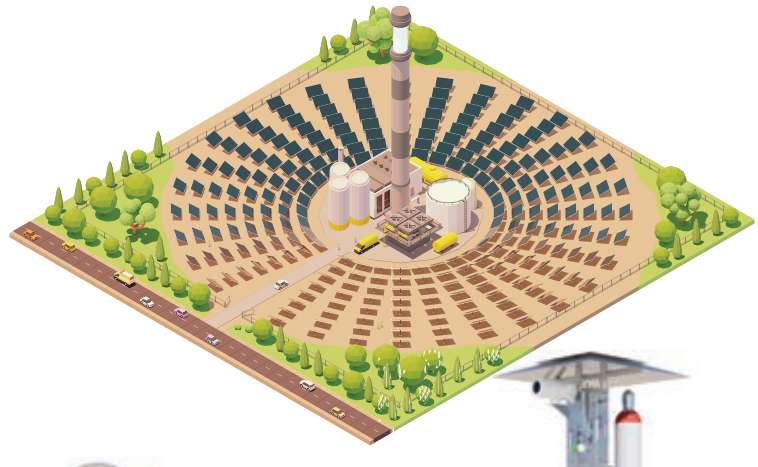
MicroPhazer 2.0, and 6.0 for LNG and LCO_2

Sampling systems for bio-LNG and LCO_2

Blue and Green Hydrogen

COMPOSITION, TRACE CONTAMINANTS, **HYDROGEN FUEL QUALITY,** FUELLING STATIONS, **FUEL CELL RESEARCH**

ISO 19880-8: 2019,
ISO 14687: 2019,
IEST STD CC1246E,
NREL



Phazer 5.1 for LH_2

Automated Sampling Systems for (L)H_2

LNG designs lead new dual-fuel shipping innovation

While LNG has a long history in dual-fuel vessels it is now at the forefront of a new wave of innovation, as naval architects explore more experimental combinations of fuel and propulsion technologies. Fuelling Editor Malcolm Ramsay has more.

Once paired mainly with heavy fuel oil (HFO) or Marine Gas Oil (MGO) in dual fuel solutions, LNG is now emerging as a primary choice in a range of new dual-fuel vessels where gas engines are combined with more sustainable power systems, from wind power to hydrogen solutions.

One example of this innovation is the recently announced *MOL Encean,* an LNG tanker featuring the Wind Challenger, wind-assisted propulsion system. Developed by Mitsui O.S.K. Lines (MOL) and Oshima Shipbuilding, this newbuild LNG carrier will feature telescopic sails to reduce fuel consumption and emissions.

"We're proud to partner with MOL in Wind Challenger's industry-first LNG installation," Barbara Pickering, President of Chevron Shipping says. "This is another example of using novel approaches in hard-to-abate sectors to reduce carbon intensity in our LNG fleet."

World first AiP

The unique design is based around a hard sail wind-assisted ship propulsion system, the first of its kind, that was first deployed in 2022 on the cargo vessel *Shofu Maru*. Since then, the first bulk carrier featuring the system - the *Green Winds,* a 63,896 deadweight-tonne Ultramax bulk carrier - was delivered to MOL in August 2024. It was the second of a total of nine MOL Group vessels that have been or will be equipped with the system.

The *MOL Encean* received approval in principle (AiP) from classification society Nippon Kaiji Kyokai (Class NK) in August, making it the first LNG carrier with a wind-assisted ship propulsion system to be certified.

"With the understanding and cooperation of Chevron, we are delighted to be able to extend the Wind Challenger project to LNG carriers in addition to the two delivered Wind Challenger-equipped bulkers and other ongoing projects," Takeshi Hashimoto, CEO of MOL explains. "This project will undoubtedly be a significant milestone towards achieving 'net zero GHG emissions by 2050', a medium to long-term goal of MOL."

Measuring 286 meters in length with a breadth of 46 meters, the *MOL Encean* is currently under construction at the Geoje Shipyard of Hanwha Ocean. Once complete it will boast a cargo tank capacity of approximately 174,000 cubic metres. The ship will be equipped with two fibre-reinforced plastic sails that form the basis of the Wind Challenger system, each reaching up to 49 meters in height and 15 meters in width.

***MOL Encean* equipped with Wind Challenger system**

These sails enhance fuel efficiency by utilizing wind power as a supplementary energy source, reflecting the industry's shift toward greener technologies. The ship also includes additional safety measures such as a fully enclosed navigation bridge and a lookout station on the vessel's fore deck to further enhances visibility.

Samskip Kvitnos

Operational sustainability

Rotterdam-based shipping group Samskip is another group experimenting with new fuel options. It recently announced the retrofit of its LNG-powered multipurpose vessel *Samskip Kvitnos* to accommodate hydrogen fuel cell technology.

Developed as part of the HyEkoTank project, an initiative supported by the European Union's Horizon Europe program, this project will see the shipping line retrofit the vessel with fuel cells from TECO 2030 and hydrogen storage from Umoe Advanced Composites in 2025.

"We have spent years actively pursuing sustainable solutions across our fleet, and this retrofit of the *Samskip Kvitnos* aligns perfectly with our vision for the future of shipping," Erik Hofmeester, Head of Vessel Management at Samskip, comments. "Working alongside TECO 2030 and the HyEkoTank consortium, we are ensuring that the *Kvitnos* not only meets but stays ahead of the zero-emission targets set by the EU and Norwegian authorities, all while continuing to provide reliable service for our customers."

The *Kvitnos* currently operates on a fixed route, weekly multipurpose service from Rotterdam, along the Norwegian west coast, north to Hammerfest. The addition of hydrogen fuel cells is expected to make it compliant with FuelEU Maritime and EU ETS regulations for the remainder of its expected lifetime.

The HyEkoTank project is an industry wide initiative that aims to bring hydrogen technology to maturity for short sea and inland waterway shipping. It is based around a 2.4 MW fuel cell system and a swappable, 350 bar, 4000 kg hydrogen storage.

As the industry explores pathways to decarbonization, shipowners and operators are increasingly clear that no single solution will dominate in the race toward sustainability. As such, a mix of fuels and technologies will be necessary with combinations of technologies and fuel much more targeted to individual vessel demands, regional requirements and local bunkering costs.

"It's a pros and cons situation," Hashimoto of MOL concludes. "We cannot judge which one will turn out better but as of right now I want to keep all options open; methanol, ammonia, LNG to the synthetic methane or bio-methane or so on." ■

For the Record

ARA PETROLEUM (18/09/24): Omani upstream energy company, ARA Petroleum has been formally awarded a license for the development of Tanzania's Ntorya gas discovery – the largest onshore gas project in the country to date.

This award followed a decision by Tanzanian authorities to name ARA Petroleum's wholly-owned local subsidiary, ARA Petroleum Tanzania (APT), as the winner of the Ntorya license in May this year.

The gas field lies within the Tanzanian onshore Ruvuma joint venture licence area, operated by APT, which has a 75% interest in the project.

Its production will help ramp up supplies to the domestic Tanzanian market, potentially transforming the country into a regional energy hub in the future, the company said.

Under a gas sales agreement signed with the Tanzanian Petroleum Development Corp earlier this year, APT was anticipated to produce 40 mill cu ft per day of gas in the first year, to increase to 140 mill cu ft per day within a few years.

"We were honoured to receive this licence from Deputy Prime Minister, Doto Biteko at such a prestigious event. This ceremony marks a significant milestone in our commitment to harness Tanzania's gas resources for the benefit of its people. Our ambition for this serious endeavour is that it results in boosting economic development, alleviating energy poverty and supporting the country's energy transition," ARA Petroleum Tanzania's General Manager, Erhan Saygi said.

Based on seismic data, Ntorya is said to hold a matured unaudited contingent resource estimate of 3.45 trill cu ft of gas initially in place (GIIP), with a mean unrisked GIIP potential of 16.4 trill and a risked mean potential of 6.9 trill cu ft for the wider Ruvuma joint venture area.

First gas is expected to flow next year.

ASIAN (16/09/24): Spot prices fell last week in Asia, due to limited November cargo demand and the effect of hurricane 'Francine' on the US Gulf production sites easing.

The average LNG price for October delivery into northeast Asia stood at $13.20 per MMBtu at the end of last week, industry sources told newswires, down from $13.40 per MMBtu the week before.

For November delivery, the price was said to be $13.05 per MMBtu.

"Supply concerns in both the Atlantic and Pacific basins have eased, Hurricane 'Francine' did not pass directly over any LNG export terminals on the US Gulf Coast and has only noticeably impacted one terminal - the 15 mill tonnes per year Cameron facility," said Martin Senior, deputy head of LNG pricing at commodity pricing agency Argus.

However, despite dropping a little from the mid-August highs, global gas prices are still strong, according to ICIS senior LNG analyst, Alex Froley.

"The market is balancing at a high level due to continued strong demand with little additional supply coming into the market. Asia has been buying more this year, and there is some renewed interest in spot cargoes from China ahead of winter and Egypt has put out a large tender for winter cargoes," Froley said.

Senior added that some companies held back uncommitted cargoes to participate in Egypt's 20-cargo tender, which was fully awarded late last week.

More supply could be offered in the coming weeks, now that the tender has concluded.

In Europe, the market remained in a comfortable position, with high underground gas storage levels ahead of this winter and no significant extensions to the ongoing Norwegian maintenance programme.

"German company Uniper's tanker, the 'LNG Rosenrot ' has diverted its course away from Gate temrinal in the Netherlands to head for Tangshan in China instead, turning south in mid-Atlantic.

This could be an indicator that Europe remains relatively comfortable at present, " Froley added.

On 12th September, S&P Global Commodities Insights assessed its daily North West Europe LNG Marker price benchmark for cargoes delivered in October on an ex-ship (DES) basis at $11.204 per MMBtu, a $0.20 discount to the Dutch TTF hub gas price.

Spark Commodities assessed the price at $11.211 per MMBtu, while Argus assessed it at $11.250 per MMBtu.

Atlantic and Pacific LNGC freight rates fell for the fifth week running as the Atlantic rate dropped to $57,750 per day last Friday, while the Pacific rate was down to $73,500 per day, according to Spark Commodities.

CROWN LNG (12/09/24): Oslo-based Crown LNG has turned its sights to the US Gulf.

The fledgling LNG plant developer, specialising in harsh conditions offshore, plans to start a new US LNG export project offshore in the Gulf of Mexico, CEO Swapan Kataria revealed in an interview with Bloomberg.

Crown is currently working on plans to develop LNG plants in Scotland and India.

The project - still in its conception - would join a forthcoming wave of new supply from Qatar and the US that would put pressure on prices globally.

While lower prices would help open up price-sensitive markets, such as India, BloombergNEF said it expected global LNG supply to exceed demand by 2030.

Kataria claimed that Crown's concept is unique because the export project would be directly tied to its planned import terminals in India and Scotland, both of which remain at the feasibility stage.

"Most of our customers, they do not have ability to go to the US to buy on their own - they depend on traders," Kataria said. "They will then have access to better rates and more capacities coming to us."

A location for the US project hasn't been finalised thus far, and permitting hasn't yet been filed.

Kataria said the project could cost just under $10 bill for two production units (trains) that would each have up to 5 mill tonnes per year capacity.

US LNG developers have faced multiple challenges in recent years, with only a handful of projects reaching final investment decisions (FIDs).

The permitting pause by the Biden administration was a major setback for both expansions and new projects, while a recent court ruling has revoked a key US federal permit for NextDecade's Rio Grande LNG, Bloomberg said.

CROWN LNG (13/09/24): Following news of a possible expansion into the US, Oslo-based Crown LNG has published a corporate update, including news of possible final investment decisions (FIDs).

This outlines the company's focus to capitalise on growing customer demand, emerging market conditions and continued commercial progress towards its previously announced projects worldwide, Crown said.

CEO Swapan Kataria explained: "We have multiple near-term projects progressing toward FID, including our already approved gravity-based structure (GBS) project in Kakinada, India, and our planned floating LNG import terminal in the Firth of Forth, Scotland, for which we recently announced the appointment of a design and engineering partner.

"We are now targeting FID of the second quarter 2025 for our project on the Firth of Forth, Scotland, and we re-affirm our target of the third quarter of next year for our project in Kakinada, India.

"As energy demand increases across world economies, LNG use is projected to expand dramatically. Crown LNG is well-positioned to capitalise on the strong market tailwinds of rising energy security concerns and the increasing use of natural gas as a transition fuel.

"As this demand grows, the need for weather-resistant, critical infrastructure will also increase.

"We are also actively exploring and evaluating opportunities for strategic acquisitions and inorganic growth, which would enable near term revenue generation and an expansion of our capabilities to include elements of the LNG value chain beyond regasification and liquefaction.

"As part of our ongoing discussions with production partners, Crown is also exploring the development of building export facilities in key production markets like the US and Canada.

"This approach would complement our existing access to pipeline networks in key growth markets for LNG consumption," he said.

DNV (19/09/24): At Gastech, DNV awarded a General Approval for Ship Application (GASA) to HD Hyundai Heavy Industries (HHI) for a new LNGC design.

This new design was developed to offer enhanced cargo capacity, improved operational efficiency, and reduced maintenance costs.

One of the key design innovations was a streamlined configuration with three instead of four cargo tanks.

This is intended to maximise cargo capacity and reduce the number of pump towers and associated cryogenic equipment, such as liquid and gas domes, valves, and piping.

As a result, maintenance costs are expected to be minimised, offering substantial savings over the vessel's operational life.

Jae Jun Jung, HHI's Head of Initial Design Office, Executive Vice President, said: "The approved design leverages cutting-edge technology solutions aimed at enhancing profitability and operational efficiency.

"By expanding the application of proven technologies, HHI has successfully maximised cargo capacity while maintaining the traditional hull design, ensuring vessels remain highly competitive," he said.

Vidar Dolonen, DNV's Regional Manager for South Korea and Japan,

added: "We are very pleased to be working with HHI to approve this design.

"The GASA reflects HHI's dedication to finding solutions that drive towards improved sustainability and efficiency and their commitment to delivering innovations that are built on the strongest expertise, rigorous class rules and the relevant industry standards," he said.

Thomas Klenum, Executive Vice President of the Liberian International Ship & Corporate Registry, commented: "This multi-stakeholder project demonstrates that international collaboration can pave the way for approval of innovative design solutions and thereby lead to improved efficiency and cost reduction. Congratulations to HHI for this excellent achievement. The Liberian Registry is proud to have contributed to this successful project."

In addition, HHI's implementation of GTT's Mark III Flex technology can reduce the daily boil-off (BOG) rate from 0.085% to 0.08%, which is anticipated to result in a decrease in electricity consumption of the cargo handling system, including the reliquefaction plant, thereby contributing to reducing OPEX.

Furthermore, it is expected that cargo unloading operation time will be unchanged by maintaining an arrangement of two cargo pumps with increased capacity per pump tower, DNV said.

EGYPT (17/09/24): Forecasts for Egypt's LNG imports have been revised higher by the London-based consultancy Energy Aspects, lowering Europe's availability to import the super-chilled fuel and burn it to generate electricity this autumn. Analysts are bullish on TTF winter prices, calling them "slightly undervalued" as they started to rebound towards €39/MWh.

"We have lifted our forecast for Egyptian net LNG imports to 2.4 million tons (Mt), or 3.3 billion cubic metres (bcm) this winter, having lowered our Egyptian production forecast, and we expect Egypt to tender for 1.2 Mt of additional winter LNG supply (16–17 cargoes) on top of the 20 it is already seeking for delivery in Q4-24 to offset faltering production," analysts said in a market note.

Analysts consequently tightened their winter 2024–25 European gas balance, arguing as more cargo deliveries to Egypt would tighten the availability of LNG in the Atlantic basin.

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Analysts consequently tightened their winter 2024–25 European gas balance, arguing as more cargo deliveries to Egypt would tighten the availability of LNG in the Atlantic basin.

Higher prices than the current market consensus are deemed "necessary" to keep Europe's physical gas market in balance across the winter. "If actual TTF prices stay where are traded at the curve, this would draw end-March 2025 lower by an additional 2 bcm versus the base case of 43.8 bcm, which is already 19.8 bcm lower y/y," Energy Aspects reckons.

Near-curve gas prices at the Dutch Title Transfer Facility (TTF) have retreated somewhat over the past days, but analysts believe this price volatility reflects changes in paper positioning rather than a shift in European gas fundamentals.

"Our quant paper balance indicates that several CTA trading strategies flipped from long to short on 4 September," they explained, pointing to a "follow-on trade from trend-following funds could further pressure near-curve prices in the coming sessions – but we also see some risk that short strategies flip to long if prices rise above €38/MWh."

According to Energy Aspects, TTF prices around €40/MWh are required to commit sufficient gas to storage to fill end-October stocks above the EU's mandated 90 bcm aggregate storage target on November 1 (including a typical UK storage fill). To this end, natural gas needs to be priced less competitively versus coal in Europe's power sector and versus liquids in Asia.

EGYPTIAN GENERAL PETROLEUM CORP (EGPC) (16/09/24): Egyptian General Petroleum Corp has awarded the country's second largest LNG tender late last week for 20 cargoes.

The prices agreed ranged between TTF plus $1.5 per MMBtu and $1.6 per MMBtu, sources told S&P Global, which included extended payment terms, allowing for a 180-day delay in payment, accounting for around 50-60 cents per MMBtu of the total cost.

Pricing without the extended payment terms was reported to be between TTF, plus 90 cents per MMBtu and $1.2 per MMBtu.

For standard 3.5 TBtu cargoes, the purchase would cost Egypt around $45 mill per cargo, or $907 mill in total, sources said.

Most of the cargoes were awarded on a floating price on a TTF basis given the competitive nature of the offered TTF premiums.

More than 15 companies participated in the tender.

Aramco, Glencore, Gunvor, Total, BP, Hartree, BB Energy, and Shell were awarded the cargoes, according to multiple market participants.

Aramco was said to have won the most number of cargoes, around six to seven, with the others winning between one to three cargoes.

The 20 cargoes will be split across three months - seven deliveries in October, six in November, and seven in December.

Of these, 17 are scheduled for delivery to the FSRU 'Hoegh Galleon' moored at the Ain Sukhna import terminal, while the remaining three will be delivered to Jordan's Aqaba terminal, with one cargo to be delivered each month.

GLENFARNE (13/09/24): Glenfarne's Texas LNG Brownsville, a 4 mill tonnes per annum LNG export terminal to be built at Brownsville, Texas has signed another heads of agreement (HoA) with an undisclosed global LNG player for a long term LNG sale and purchase agreement (SPA).

Texas LNG claimed that it had now secured enough customer offtake commitments to achieve a final investment decision (FID) on the project.

This new agreement added to existing deals with EQT Corp, Gunvor Group, and Macquarie Group.

"We are grateful that our customers have chosen Texas LNG, designed to be the lowest emitting LNG facility in the US, to make a significant investment in the global energy transition," said Brendan Duval, CEO and Founder, Glenfarne Energy Transition and Co-President of Texas LNG.

"Our strong and diversified customer base, which fortifies Texas LNG's FID financeability, now includes the largest producer of natural gas in America, a leading global financial institution, one of the world's largest independent commodities traders, and a major global LNG player.

"We look forward to advancing Texas LNG alongside our world-class project partners," he said.

Glenfarne Energy Transition, a developer, owner, and operator of energy transition infrastructure, is the majority owner and managing member of Texas LNG.

The company's LNG portfolio also includes the 8.8 mill tonnes per annum Magnolia LNG export facility under development in Lake Charles, Louisiana.

GOLAR LNG (18/09/24): Golar LNG Limited has signed an engineering, procurement and construction (EPC) agreement with CIMC Raffles (CIMC) to develop its MK II FLNG design with an annual liquefaction capacity of 3.5 mill tonnes of LNG per annum.

Under the agreement, Black & Veatch will provide its licensed PRICO® technology, perform detailed engineering and process design, specify and procure topside equipment and provide commissioning support for the FLNG's topsides and liquefaction process, similar to its role in the construction of Golar's existing FLNGs - 'Hilli' and 'Gimi'.

The MK II design is an evolution of the MK I design illustrated by the two FLNGs currently in service and is also based on the conversion of an existing LNGC.

It allows for a modularisation of the construction process, as well as further efficiency and operability advances based on the previous experience of constructing and operating the existing FLNGs, Golar said.

The project will utilise Golar's LNGC 'Fuji LNG' with a storage capacity of 148,500 cu m, which will be converted into the FLNG.

Golar said that the total EPC price was $1.6 bill, while the total budget for the MK II FLNG conversion project stood at $2.2 bill, inclusive of the LNGC, yard supervision, spares, crew, training, contingencies, initial bunker supply and voyage related costs to deliver the FLNG to its operational site, but excluding financing costs.

The latest converted FLNG is expected to be delivered in the fourth quarter of 2027.

Of the total conversion price, Golar had already spent $0.3 bill to date, inclusive of the conversion vessel, engineering and long lead items, which are now 63% complete.

As part of the EPC agreement, Golar has also secured an option for a second MK II FLNG conversion slot at CIMC for delivery within 2028.

The 2027 delivery date makes the MK II FLNG the earliest available floating liquefaction capacity globally, the company claimed.

Based on potential charter terms in line with the most recent long term FLNG charter agreements, the MK II FLNG has an earnings potential of about $0.5 bill of adjusted annual EBITDA, before commodity exposure.

HOEGH LNG (17/09/24): Höegh LNG has changed its name to Höegh Evi.

Standing for 'energy vector infrastructure,' the name Evi reflects the

recent expansion of the company's focus beyond LNG import terminals to encompass clean energy solutions, Höegh said.

As an expert in liquefied gas handling, Höegh Evi will accelerate the energy transition with floating infrastructure for ammonia and hydrogen, as well as carbon transport and storage (CCS), in addition to its LNG interests.

"In a world of rapid change and evolving energy demands, customers need a partner to help them balance today's energy security needs with tomorrow's clean energy ambitions.

"Höegh Evi will continue to be a leading provider of floating LNG infrastructure while we are also applying our skills and experience to bring marine infrastructure for clean molecules into operation by the end of this decade," explained Erik Nyheim, Höegh Evi President and CEO.

Höegh has been a pioneer in liquefied gas solutions for more than 50 years and will continue to be a market leader in LNG with one of the world's largest fleets of FSRUs and LNGCs.

Also now being developed is marine infrastructure, including floating ammonia and H2 import terminals, ammonia cracking technology and CCS.

"The name Höegh Evi continues to speak to our heritage and our strong reputation within the LNG industry, while capturing the expansion of our focus in response to new demands and the energy transition.

"Together, the Höegh Evi team both at sea and onshore is very excited to develop clean and efficient solutions to the benefit of people and planet in the future," added Morten W Høegh, Höegh Evi's Board Chairman.

Höegh LNG Holdings Ltd will also change its name to Höegh Evi Ltd.

JAPAN (19/09/24): The second largest LNG importer after China, Japan, saw imports rise slightly during August by 1% year-on-year to total 5.7 mill tonnes.

This was some 2% higher than July's figure.

During August, imports from Russia jumped by 49% to 0.59 mill tonnes, while US supplies fell by 41% to 0.38 mill tonnes, according to provisional data released by Japan's Ministry of Finance yesterday.

Sources said that the Russian import hike was due to the timing of cargo arrivals and not to extra demand.

In July, Russian imports had plunged by 64% to just 0.09 mill tonnes year-on-year, which was caused by maintenance at the Sakhalin 2 export plant.

August imports from the Middle East climbed by 11.4% to 0.78 mill tonnes.

In contrast, China's August imports totalled 6.5 mill tonnes, a rise of 5.1% year-on-year, while for the January to August period, customs data showed that the country imported 50.29 mill tonnes, an increase of 10.7% year-on-year.

In the January/August period, China's pipeline gas imports went up by 14.4% year-on-year to 36.84 mill tonnes.

LNG BUYERS (12/09/24): At the recent Singapore APPEC conference, LNG buyers expressed concern about purchasing US cargoes.

This followed the US administration's pause in granting LNG export permits to non-Free Trade Agreement (FTA) countries.

In response to a question regarding the impact of the pause, officials from Taiwan's CPC Corp and Germany's SEFE, who trade and sell LNG cargoes in Asia, said that the problem was reliability of supply.

CPC Vice President Jane Liao said that she trusted the traditional LNG providers more than the US LNG companies.

"Most Asian buyers rely on our traditional LNG suppliers who value long-term relationships more. When you have problems with the implementation of your agreement, people will come and talk to you," she said.

Fabian Kor, SEFE's Asian Executive Vice President added that energy security was the company's top priority for this year. SEFE might even "slightly" overcontract to ensure availability, he advised.

He said: "We won't focus on the supply just because it's the cheapest. We prefer a little geographical diversification in our supply.

"In terms of the US we are quite ambivalent, which means we prefer something more firm," he said.

Liao added that Chinese and Indian purchases would help to maintain the balance of the market.

She said: "Let's assume that the Chinese or Indian companies continue to buy from Russia. They won't be able to compete with us on the rest of the markets."

MIDOCEAN (18/09/24): LNG developer, MidOcean Energy is to acquire another 15% of Peru LNG (PLNG) from Hunt Oil.

MidOcean is managed by energy institutional investor, EIG.

Following the closing of the transaction, MidOcean's interest in PLNG will increase from 20% to 35%.

Aramco played a pivotal role in the transaction, including undertaking key technical and commercial due diligence, as well as engaging with the main stakeholders for the transaction's approval.

The Saudi energy giant will fund the transaction, which will bring Aramco's interest in MidOcean to 49%, further strengthening both company's position in the global LNG market and will also provide both parties with further exposure to the only LNG export project in South America.

Aramco's indirect stake in PLNG will equate to 17.2%, once the transaction goes through.

In addition to EIG and Aramco, Mitsubishi Corp has a stake in MidOcean, among other interests.

As a result of the deal, Hunt's interest in PLNG will drop from 50% to 35%, however, the company is to remain its operator.

Hunt also own a 25.2% interest in Peru's Camisea upstream project having invested in the country since 2000 and said it was committed to continuing its long history of investment in Peru and its operational excellence in the PLNG project.

PLNG owns and operates the facility, which is located in Pampa Melchorita, 170 km south of Peru's capital, Lima.

The natural gas liquefaction plant and export terminal has a 4.45 mill tonnes per annum processing capacity; a fully-owned 408 km long pipeline with a 1,290 mill cu ft per day capacity; two 130,000 cu m storage tanks; a wholly-owned 1.4 km marine terminal; and a truck loading facility with a capacity to handle up to 19.2 mill cu ft per day.

De la Rey Venter, MidOcean's CEO, said: "We are pleased to increase our stake in PLNG, a strategic asset that aligns with MidOcean's vision of creating a global, diversified, and resilient LNG portfolio.

"Our belief in the long-term fundamentals of the LNG market and in the strength of PLNG's unique position as the only LNG export facility in South America remains steadfast.

"We look forward to strengthening our partnership with Hunt Oil and the other PLNG co-venturers and continuing to support the project's positive impact on the Peruvian energy market," he said.

Mark Gunnin, Hunt's CEO, added: "We are focused on positioning the PLNG project for the future, and the opportunity to bring in MidOcean as a partner was a great strategic fit to make that happen."

Morgan Stanley acted as exclusive financial advisor to MidOcean on the transaction and Latham & Watkins acted as legal advisor. Bracewell served as legal advisor to Hunt.

MOL (13/09/24): Mitsui OSK Lines (MOL) and Chevron Shipping Co, a subsidiary of energy major Chevron USA, are to install a wind-assisted propulsion system on an LNGC.

The system is a Wind Challenger, a hard sail wind-assisted ship propulsion system developed by MOL and Oshima Shipbuilding.

The LNGC is being built on the back of a long-term charter from MOL Encean (MOL's 100% indirectly owned subsidiary) to Chevron Asia Pacific Shipping.

She will be the world's first LNGC equipped with a wind-assisted ship propulsion system when delivered and is being built at the Geoje Shipyard of Hanwha Ocean for delivery in 2026.

Last month, MOL obtained an approval in principle (AiP) from Nippon Kaiji Kyokai (ClassNK), again a first for an LNGC fitted with such a system.

Wind Challenger will help reduce fuel consumption and GHG emissions by using its unique telescopic sails.

In addition to the wind system's robust design, additional safety measures on board the LNGC will include a fully enclosed navigation bridge and a lookout station on the vessel's fore deck to further enhance visibility.

Operationally, the system's installation position is aimed at minimising the impact on the existing design of membrane type LNGCs.

For example, it will enable the existing mooring arrangement to be unchanged and thereby minimise impacts on ship/shore compatibility, together with limited impact on the vessel's windage area.

"We're proud of partner with MOL in Wind Challenger's industry-first LNG installation," said Barbara Pickering, Chevron Shipping Co President. "This is another example of using novel approaches in hard-to-abate sectors to reduce carbon intensity in our LNG fleet."

Takeshi Hashimoto, MOL's President and CEO, added, "With the understanding and co-operation of Chevron, we are delighted to be able to extend the Wind Challenger Project to LNG carriers in addition to the two delivered Wind Challenger-equipped bulkers and other ongoing projects.

"Achieving GHG reduction in the maritime transport of LNG, which is increasingly in demand worldwide as a transition fuel, is a very important mission for us.

"This project will undoubtedly be a significant milestone towards achieving 'net zero GHG emissions by 2050', a medium to long-term goal of the Mitsui OSK Lines Group," he said.

The Wind Challenger technology will be on show at MOL's booth at next week's Gastech Exhibition & Conference 2024 in Houston, Texas.

Information sessions on how the technology can be applied to both LNGCs and to other vessels will also be available.

PTT (13/09/24): PTT International Trading, a subsidiary of Thai energy company, PTT, has secured a five-year contract to buy 300,000 tonnes of LNG from Oman LNG.

This long-term procurement strategy helps ease the impact of short-term LNG purchases on the spot market, which exposes Thailand to gas price fluctuations and subsequent surges in the price of electricity bills, PTT explained.

Deliveries will commence in 2025 and continue through 2029.

Pongpun Amornvivat, PTT's Senior Executive Vice President for international business said that this agreement was aimed at supporting the growth of the LNG market in Thailand and making the country an LNG trading centre in ASEAN.

It will also enhance PTT's international trade potential, he added.

According to local media reports, PTT is also in talks with Oman LNG to buy another 800,000 tonnes annually in a nine-year contract, commencing in 2026.

PTT said it had played a key role in securing energy resources for Thailand, especially when gas production at the Erawan gas field in the Gulf of Thailand was suspended, due to a legal conflict between the Thai Department of Mineral Fuels and Chevron, whose concession expired in 2022.

PTT Exploration and Production, a subsidiary of PTT, won an auction in 2018 to become the successor to Chevron, but it has been unable to enter the site due to the ongoing dispute.

The suspension of production led to a drop in the percentage of domestic gas supply to less than 40%, down from 50% of the total amount, between 2020 and 2023. This caused Thailand to import more costly LNG, local media reported.

SINOPEC (12/09/24): Chinese giant petrochemical company, Sinopec, has announced the start of operations at its 6 mill tonnes per year Huaying LNG regasification terminal, located in Guangdong, southern China.

The announcement was made after the terminal handled its first cargo, which came from Australia, delivering 72,000 tonnes of LNG.

Huaying LNG is a joint venture between Sinopec and Huaying Investment Holding Group.

The terminal has three LNG storage tanks with capacity of 200,000 cu m each and an LNGC berth.

A second phase of the terminal is planned, which would double its capacity to 12 mill tonnes per year.

SUMMIT LNG (12/09/24): Bangladesh's Summit LNG has announced that its LNG terminal is now ready for ship-to-ship (STS) transfers and LNG regasification.

The FSRU would send out 500 mill cu ft per day of gas to the country's national grid.

During more than three months when Summit's FSRU was initially damaged by cyclone 'Remal', the company has spent millions of dollars in repair related costs.

On 23rd May, 2024, STS operations were halted, due to the onset of the cyclone. Four days later, during the cyclone's peak, a broken floating pontoon, weighing hundreds of tonnes, repeatedly hit the FSRU causing damage to its ballast water tank.

After a damage assessment by international surveyors, the FSRU sailed to Singapore for drydocking.

Upon repairs on 10th July, 2024, the FSRU returned to Moheshkhali, Cox's Bazar. On the following day, during the preparation for mooring, the FSRU, which is fitted with with a disconnectable turret mooring (DTM) system in the subsea landing pad, an unexpected entanglement and damage to the DTM buoy messenger line halted proceedings.

Summit then appointed MacGregor and CAN System, and Shelf Subsea, a Singapore-based company, to safely moor the FSRU.

At that time, eastern Bangladesh was experiencing its worst floods in 34 years, making underwater repairs and connections difficult.

TOTALENERGIES (19/09/24): TotalEnergies has announced the signing of a five-year extension of its sales and purchase agreement (SPA) with CNOOC, for the delivery of 1.25 mill tonnes of LNG per year to China until 2034.

This is in line with the French energy giant's strategy to grow its LNG sales portfolio, the company said.

Thanks to this agreement, TotalEnergies has strengthened its long-term positions in the growing Chinese market.

In China, natural gas serves as a crucial transition energy, mitigating the intermittency of renewable energy sources and reducing emissions when used as a substitute for coal in electricity generation, the company said.

"We are pleased to strengthen our ties with CNOOC, a key partner for the company in the world's largest LNG importing country.

"This agreement allows us to continue securing long-term sales in Asia and reduce our exposure to spot market gas prices," explained Gregory Joffroy, TotalEnergies' Senior Vice President, LNG.

In addition, at Gastech, TotalEnergies confirmed the signing of a Heads of Agreement (HoA) with Turkish state-owned energy company, BOTAŞ.

This HoA calls for the delivery of 1.1 mill tonnes of LNG per year for 10 years starting in 2027.

It also allows TotalEnergies to strengthen its long-term presence in the Turkish LNG market, the company said.

"We are pleased to initiate a new long-term collaboration with BOTAŞ, a key partner for the company in Türkiye. This agreement enables us to secure long-term sales and reduce our exposure to spot market gas price fluctuations," Joffroy said.

TotalEnergies is the world's third largest LNG player having a global portfolio of 44 mill tonnes per year in 2023 thanks to its interests in liquefaction plants worldwide.

The company said that it benefited from an integrated position across the LNG value chain, including production, transportation, access to more than 20 mill tonnes per year of regasification capacity in Europe, trading, and LNG bunkering.

It also said that its ambition was to increase its share of natural gas in its sales mix to nearly 50% by 2030, to reduce carbon emissions and eliminate methane emissions associated with the gas value chain, and to work with local partners to promote the transition from coal to natural gas.

VENTURE GLOBAL (18/09/24): Under fire US LNG developer, Venture Global has signed a binding long-term terminal use agreement (TUA) with Greek energy firm GASTRADE.

This will enable the regasification and sale of LNG from Venture Global's terminals in Louisiana to markets in Central and Eastern Europe.

Under the terms of the agreement, Venture Global has secured about 1 mill tonnes per annum of LNG regasification capacity at the new Alexandroupolis LNG receiving terminal in Greece for five years, beginning in 2025.

Venture Global's volume will account for around 25% of the total terminal capacity, or about 12 cargoes per annum.

The new Alexandroupolis LNG FSRU receiving terminal and South/North 'Vertical Corridor' will be essential to enhancing Central and Eastern European energy security by providing a new route to bring alternative supplies of natural gas into the region, Venture Global claimed.

Critical energy infrastructure projects in Greece have been supported in part by European co-funding, as well as the US Government through its Development Finance Corp (DFC).

"Venture Global is thrilled to expand our European regasification capacity at Greece's new Alexandroupolis LNG terminal," said CEO, Mike Sabel. "This move further integrates our business by growing our assets across the LNG supply chain including LNG production, shipping and regasification.

"As a major point of entry for LNG into Central and Eastern Europe, this strategically important infrastructure will be a game changer for the region's ability to diversify their energy and access a secure and reliable energy supply. Venture Global is proud to support these efforts as a strategic partner with volumes from both Plaquemines LNG and the future CP2 LNG," he said.

WOODSIDE ENERGY (18/09/24): Australian oil and gas developer, Woodside Energy has signed a sale and purchase agreement (SPA) with large Japanese importer JERA to ship LNG to Japan.

Under the SPA, Woodside will supply around 0.4 mill tonnes (six cargoes) of LNG per year over 10 years on a delivered basis (DES), commencing in April, 2026.

The LNG will be sourced from across Woodside's global portfolio.

This follows the announcement last February whereby Woodside reached agreement for the sale of a 15.1% non-operating participating interest in the Scarborough Joint Venture to JERA.

Woodside Executive Vice President and Chief Commercial Officer, Mark Abbotsford said the execution of the SPA strengthened the commitment to explore business opportunities alongside JERA. "This LNG offtake agreement is Woodside's first long-term sale to JERA from our global portfolio and delivers on one of the core elements of our strategic relationship outlined earlier this year.

"We understand the demand from our customers in the Asian region for reliable energy. LNG continues to be an important energy source for Japan, one which can support the country's efforts to decarbonise," he said. ■

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	2014	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 Hangjiaxin 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
	Tianjin Binhai LNG	Beijing Gas	2023	5	10	–
	Wenzhou LNG	Zhejiang Energy, Sinopec	2023	3.0	4	–
	Yancheng LNG	CNOOC	2022	3.0	4	880,000
	Zhangzhou LNG	PipeChina	2024	3.0	3	
	Zhejiang LNG	CNOOC	2018	6.0	6	960,000
	Zhoushan LNG	ENN	2018	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 Clipton	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
	Dhamra LNG	Adani, TotalEnergies	2023	6.5	2	360,000
	Chhara LNG	HPLNG	2024	5.0	2	400,000
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

Conventional LNG Terminals (Continued)

Country	Location (Project)	Owners	Start up	Nom. Capacity (MTPA)	Storage Tanks	Storage Capacity
Japan (continued)	Ogishima	JERA	1998	3.0	4	850,000
	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
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
	Korea Energy Terminal	SK Gas, KNOC	2024	2.4	–	–
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	EgeGaz	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
	Terminal Gás Sul	New Fortress Energy	2024
	Barcarena FSRU	NFE	2024
	GNL de Sao Paulo	edge	2024
	KARMOL LNGT Sepetiba	Karpowership	2024
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
France	Le Havre	TotalEnergies	2023
Germany	Wilhelmshaven FSRU	Uniper	2022
	Lubmin FSRU	Deutsche ReGas	2022
	Brunsbüttel	RWE	2023
Ghana	Tema LNG	Helios/GNPC	2021
Greece	Revithoussa FSU	DESFA	2022
	Alexandroupolis	Gastrade	2024
Hong Kong, China	FSRU Bauhinia	CLP Power	2023
India	Jaigarh (Mothballed)	H-Energy	2022
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertimana	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	PHLNG	AG&P International	2023
	FGEN Batangas LNG	First Gen Corp.	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

Future LNG Import Projects

Country	Location/Project	Owners	Start up	Nom. Capacity (MTPA)	Storage Tanks	Storage Capacity	Status
Albania	Port of Vlora FSRU	Excelerate Energy, ExxonMobil	–	3.5	–	–	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	2026	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.	2024+	1.5	–	–	Speculative
	Yangjiang LNG	Guangdong Yangjiang Hailing Bay LNG Co., Ltd.	2024+	2.8	2	–	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.	2024	3	–	–	U. Construction
	Huizhou LNG	Guangdong Huizhou LNG Co., Ltd.	2024	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	2024	3	–	1,620,000	U. Construction
	Yantai LNG	China Urban Rural Energy	–	5.9	5	1,000,000	U. Construction
Colombia	Buenaventura FSRU	Unidad de Planeación Minero Energética (UPME)	2024	–	–	–	Speculative
Cyprus	Vasilikos FSRU	DEFA	2024	0.6	–	–	U. Construction
Ecuador	Jambelí FSRU	Sycar LLC	2025	0.38	–	–	Proposed
Estonia	Paldiski LNG	Espa	2024	1.8	–	–	Proposed
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	2024	3.5	–	–	U. Construction
Greece	Dioriga FSRU	Motor Oil	2024	1.91	–	–	Proposed
	Argo FSRU	Mediterranean Gas	2024	3.38	–	–	Proposed
	Thessaloniki FSRU	Edison, Hellenic Petroleum	2025	5.37	–	–	Proposed
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	2024	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	2025+	–	–	–	Speculative
	Ahlone LNG	TTCL	2025+	–	–	–	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

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	2008-2023	3	11.4	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
Mexico	Altamira Fast LNG	New Fortress Energy	2024	1	1.4	–	–
Mozambique	Coral Sul FLNG	Eni, ExxonMobil, CNPC, GALP, KOGAS, ENH	2022	1	3.4	8	227,840
Nigeria	Bonny Island	NNPC, Shell, TotalEnegies, 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
Republic of the Congo	Congo FLNG Ph. I	Eni	2024	1	0.6	1	177,000
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	17.4	4	640,000
	Portovaya LNG	Gazprom	2022	1	1.5	-	-
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
Malaysia	ZLNG FLNG	Petronas	2027	1	2
Mauritania	Greater Tortue Ahmeyim FLNG	BP, Kosmos Energy	2024	–	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	2027	2	13
	Arctic LNG 2 T1	Novatek et al	2024+	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

Future 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	Epcilon 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 Ph. II	Eni Congo	2025	1	2.4
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
	Obsky LNG	Novatek	2026	–	6.6
	Chernomorsky 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

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