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Global LNG Outlook 2024-2028

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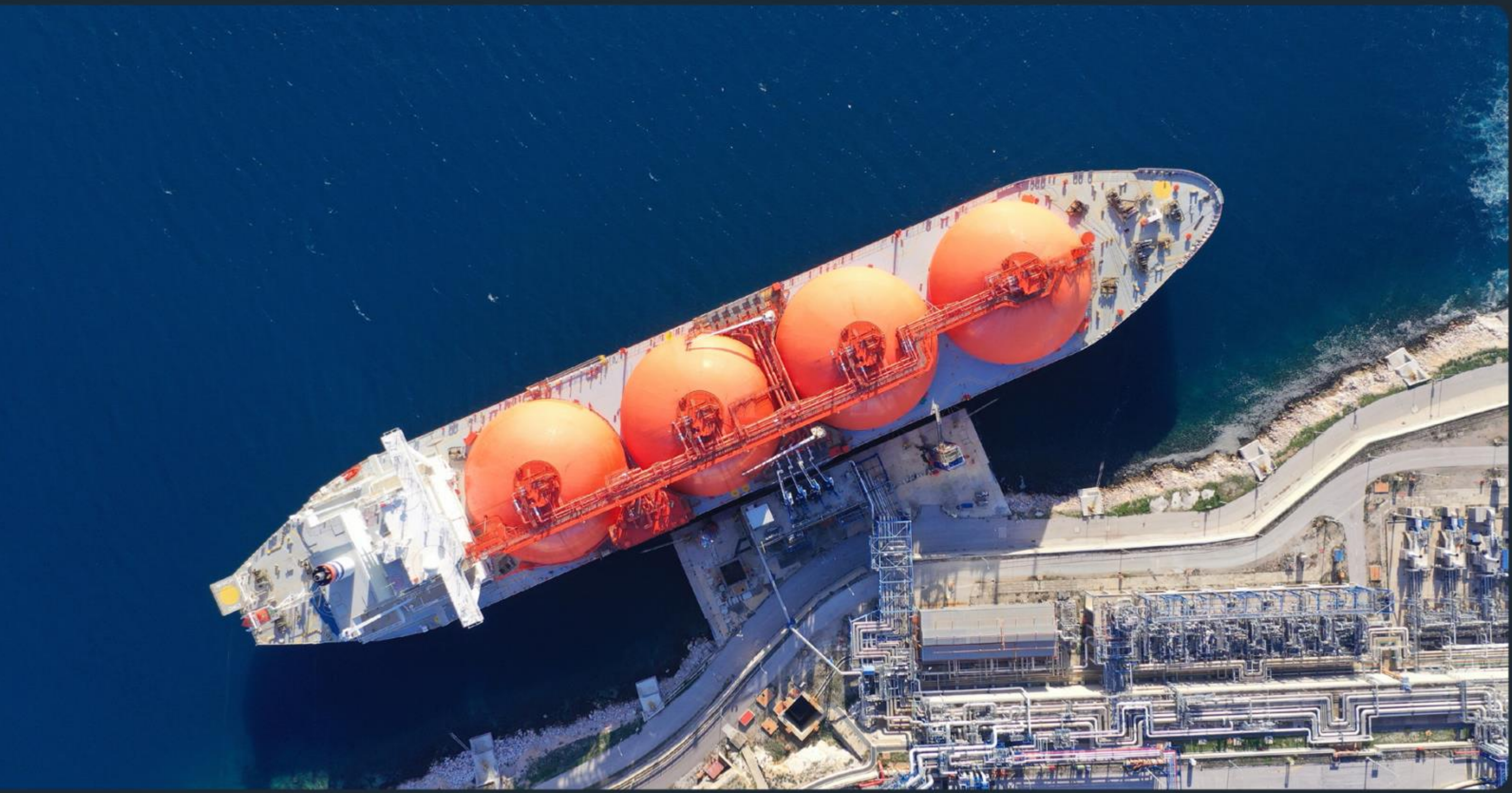

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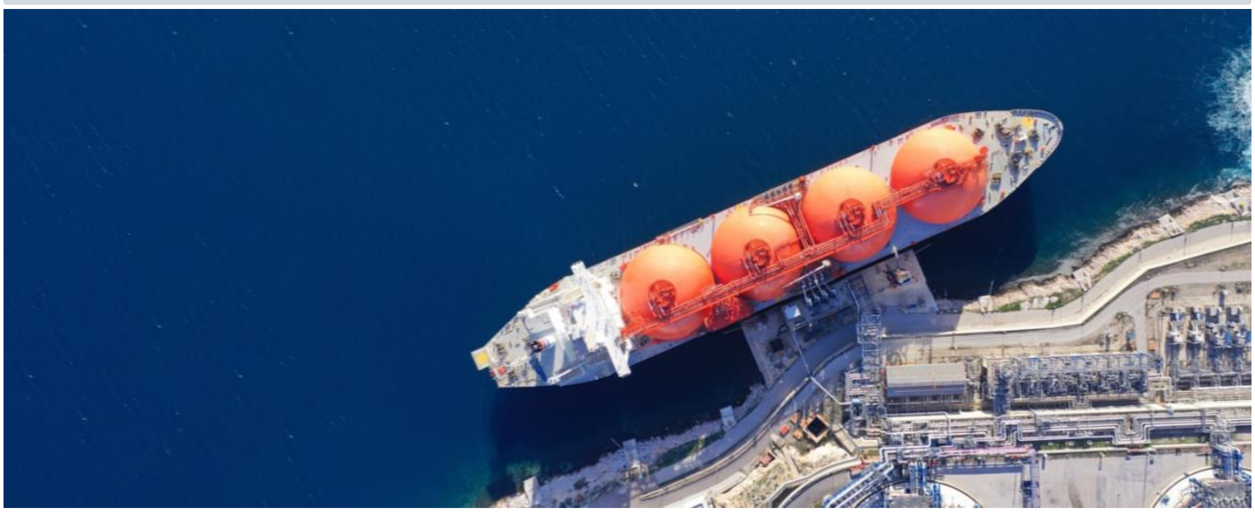
Key Findings

Lackluster demand growth combined with a massive wave of new export capacity is poised to send global liquefied natural gas (LNG) markets into oversupply within two years.

In Japan, South Korea, and Europe—which together account for more than half of the world's LNG demand—combined imports fell in 2023 and will likely continue falling through 2030.

In emerging Asian markets, structural LNG demand growth faces economic, political, financial, and logistical challenges that an oversupplied environment may not fully resolve.

IEEFA expects global LNG supply capacity to rise to 666.5 MTPA by the end of 2028, which exceeds International Energy Agency (IEA) demand scenarios through 2050.



Executive Summary

Lackluster demand growth and a massive wave of new export capacity are poised to send global liquefied natural gas (LNG) markets into oversupply within two years. These two trends are developing even faster than anticipated.[1]

Declining Russian gas supplies to Europe, driven by Russia's full-scale invasion of Ukraine, caused a spike in European LNG imports that sent global prices to record highs. But despite modest new LNG export capacity additions in the last two years, prices have retreated from 2022 levels, largely due to falling demand from developed economies.[2]

In Japan, South Korea and Europe—which account for more than half of the world's LNG demand—combined imports fell in 2023 and will likely continue falling.

- In **Japan**, formerly the world's largest LNG importer, demand fell 8% in 2023. Since 2018, Japan's annual LNG imports have fallen 20%. A planned increase in nuclear and renewables generation—spurred by climate and energy policies, along with years of high LNG prices—will likely send demand even lower.
- In **South Korea**, historically the largest buyer of U.S. LNG, imports fell almost 5% last year. Long-term climate and energy plans in South Korea envision LNG imports falling 20% through the mid-2030s, as solar, wind and nuclear plants come online.
- **Europe's** LNG imports stagnated in 2023, defying expectations of rising imports to replace lost Russian gas supplies. Europe's overall gas consumption fell 20% in the past two years due to high prices, energy security mandates and climate policies. IEEFA expects Europe's LNG demand to peak by 2025 and decline through 2030.

In emerging Asian markets, structural LNG demand growth faces a complex web of economic, political, fiscal, financial and logistical challenges. The global LNG crisis of the last several years heightened those challenges, spurring some Asian nations to reduce the role of LNG in their development plans and accelerate the development of alternative energy sources.

- In **Southeast Asia**, protracted timelines for new LNG infrastructure projects, plus the favorable economics of alternative energy sources, are likely to constrain LNG demand growth, particularly in Vietnam and the Philippines.
- In **South Asia**, LNG imports fell by 16% in 2022 but rebounded in 2023 as global spot prices fell. But two years of high prices and unreliable supplies triggered fiscal challenges and fuel switching. Pakistan, for example, announced last year that it would stop building new LNG-fired power plants. Price declines will likely boost the region's imports, but fiscal issues and competition from other power sources point to uneven growth in demand.

[1] IEEFA. Global LNG Outlook 2023-27. February 15, 2023.
[2] All prices in this report are in U.S. dollars (USD) unless otherwise specified.

- In **China**, imports will likely increase as prices fall, but domestic gas production, pipeline gas imports, and policies favoring domestic energy industries could constrain structural demand growth and leave Chinese LNG buyers with a surplus of contracted volumes.

Even as the LNG crisis undermined global demand growth, **high prices spurred an unprecedented flood of new supply**, with LNG developers more than doubling the previously planned buildout of export capacity. IEEFA anticipates that nameplate LNG liquefaction capacity from projects that have already begun construction, or that are approved by financially capable backers, could add 193 million metric tons per year (MTPA) of new supply capacity from 2024 through 2028—a 40% increase in five years.[3]

By the end of 2028, the world's total nameplate liquefaction capacity could reach 666.5 MTPA. For perspective, the International Energy Agency (IEA) projects total LNG trade in 2050 to reach 482 MTPA under its stated policies scenario.[4,5] **In other words, LNG liquefaction capacity coming online through 2028 exceeds IEA long-term demand scenarios.**

Robust supply growth will likely lead to lower prices, encouraging an uptick in short-term buying. Yet in South and Southeast Asia, ongoing fiscal challenges and lengthy delays for new gas and LNG infrastructure pose structural challenges to demand growth that a low-price environment does not fully resolve.

To overcome these challenges and cultivate new demand, LNG traders and portfolio players—the largest counterparties to new long-term LNG offtake contracts over the last three years—are investing in regasification, power, gas distribution and other infrastructure. Some LNG importers in Northeast Asia are investing in and trading with emerging market buyers to offload surplus contracted supplies. Similarly, European players justified new offshore regasification terminals partly by arguing that they could eventually be relocated to Asia.

For the LNG industry to thrive financially, emerging Asian nations must not only replace shrinking imports from developed markets, but also absorb the massive volume of new supplies coming online. This renders the LNG industry increasingly reliant on markets with less-creditworthy buyers, riskier business environments and greater sensitivity to high prices. If rapid and sustained demand growth does not materialize, LNG suppliers and traders—particularly those with higher costs and significant uncontracted supplies—will likely face an extended period of low prices and slim profits.

[3] One million metric tons of LNG is the equivalent of 1.36 billion cubic meters of gas.
[4] International Energy Agency (IEA). World Energy Outlook 2023. October 2023, p. 135.
[5] Note: The IEA's Stated Policies Scenario (STEPS) "provides an outlook based on the latest policy settings, including energy, climate and related industrial policies." *Ibid.*, p. 17.

I. Global LNG Supply

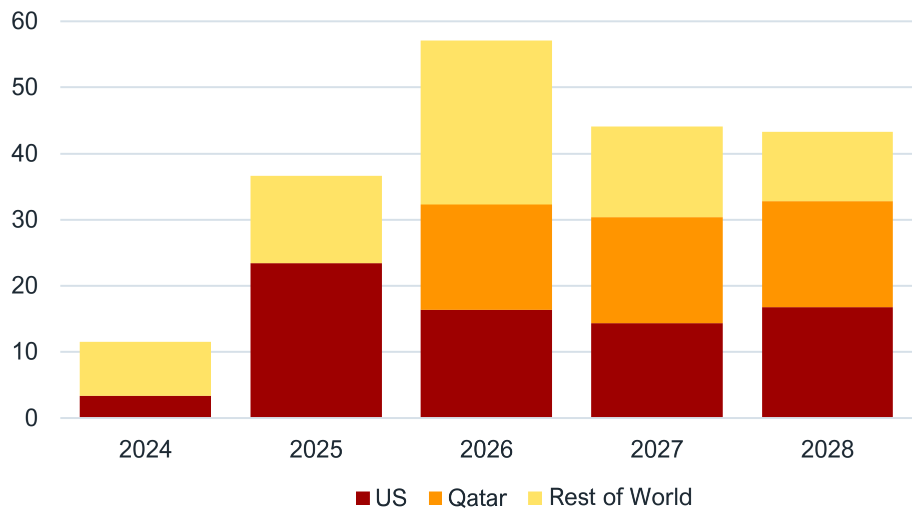
Starting in late 2024, the global LNG market will witness an unprecedented wave of new liquefaction projects coming online. Counting only projects that are under construction or approved by financially capable backers, IEEFA anticipates that global LNG production capacity will grow by roughly 193 MTPA from 2024 through 2028, rising from approximately 474 MTPA of nameplate capacity at the beginning of this year to 666.5 MTPA by the end of 2028.[6] This will be the fastest capacity growth in the global LNG industry's brief history, representing a 40% increase in just five years (see Appendix B for details on global LNG projects under construction).

The anticipated LNG supply boom won't start immediately. During 2024, a comparatively scant 12 MTPA of liquefaction capacity is slated to come online in the Republic of Congo, Mexico, Russia, Mauritania/Senegal, Australia and the United States. Two of these new projects shipped their first cargoes earlier this year.

By the end of 2024 or the beginning of 2025, a tidal wave of new LNG supply will start to take shape. IEEFA expects that roughly 37 MTPA of new LNG facilities will start operations in 2025, followed in 2026 with 57 MTPA of new capacity, the most ever built in a single year. IEEFA expects more LNG capacity additions of 44 MTPA in 2027 and 43 MTPA in 2028 (see Figure 1).[7]

[6] IEEFA estimates, based on data from the International Gas Union, the International Group of Liquefied Natural Gas Importers, Independent Commodity Intelligence Services, Kpler, Global Energy Monitor, company announcements and financial filings, and news reports.
[7] The precise dates of project completions may differ from these projections.

Figure 1: Global LNG Supply Additions 2024-2028 (MTPA)

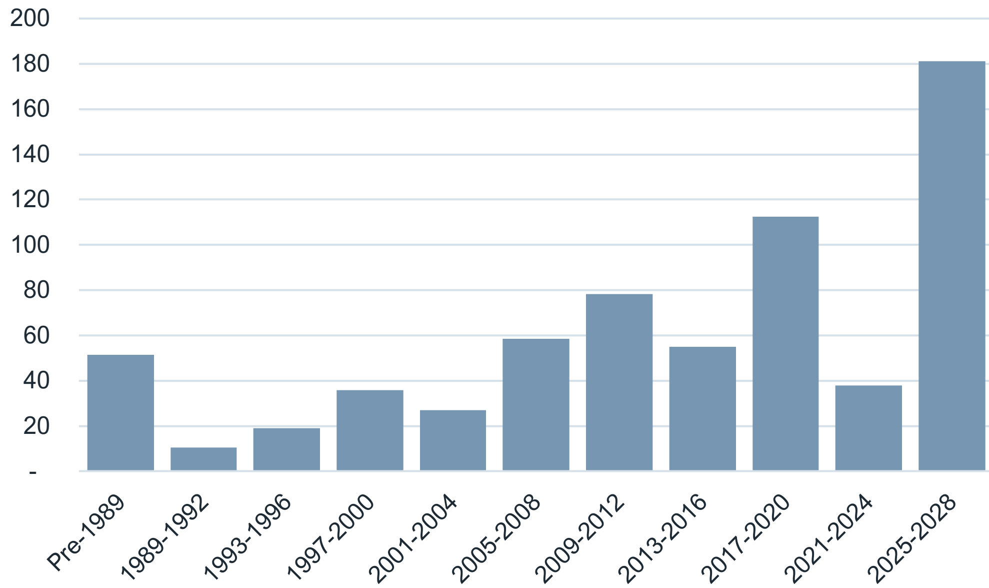


Source: IEEFA estimates, based on data from the International Gas Union, the International Group of Liquefied Natural Gas Importers, Independent Commodity Intelligence Services, Kpler, Global Energy Monitor, company announcements and financial filings, and news reports.

This forecast does not include any of the dozens of LNG projects around the world that have been proposed but have not yet received a final investment decision. It also does not count several projects that are moving forward but are not expected to be completed until 2029 or later. It does, however, include several projects, particularly in Russia and Africa, that face a heightened risk of delays and political setbacks.

The impending surge of new LNG capacity stands in stark contrast with the modest growth from 2021 through 2024 (see Figure 2). The global LNG industry is on track to add almost five times as much new liquefaction capacity from 2025 through 2028 compared to the previous four-year period.

Figure 2: Net Global LNG Supply Additions (MTPA)



Source: IEEFA estimates, based on data from the International Gas Union, the International Group of Liquefied Natural Gas Importers, Global Energy Monitor and news reports.

During the last major surge in new capacity, from 2017 through 2020, oversaturated LNG markets triggered sharp declines in global prices and weak profits for many LNG suppliers.[8] The addition of a massive amount of new LNG capacity by 2028, after several years of weak global demand growth, could prompt a return to oversupplied markets and weak economic fundamentals for global LNG suppliers.

The bulk of new LNG capacity to be completed by 2028 will be concentrated in the United States and Qatar, which will push Australia—the world's top LNG exporter in 2021 and 2022—to a distant third place among global suppliers. Meanwhile, substantial additional LNG capacity is under construction in Russia, Canada and African nations. Major LNG supply additions include:

- **United States: Five LNG projects totaling more than 71 MTPA in liquefaction capacity are currently under construction:** Plaquemines LNG (18 MTPA), Golden Pass LNG (16 MTPA), Rio Grande LNG (15 MTPA), Port Arthur LNG (12 MTPA) and an expansion at Corpus Christi LNG (10 MTPA). A 1.4-MTPA Mexican project sourced with U.S. gas recently shipped its first cargo and an additional 6 MTPA of U.S.-sourced LNG projects are moving forward in Mexico. All told, the LNG industry's capacity to export U.S. gas is on pace to grow from 94 MTPA today to 172 MTPA by 2028. Although the U.S. Department of Energy has temporarily paused new export authorizations, projects currently under construction will continue to move forward.

[8] See Section 2 for more details.

- **Qatar: The development of the North Field complex will boost Qatar's liquefaction capacity by 64 MTPA through 2030**. The first of the North Field trains is expected to come online in 2025 or 2026, with 48 MTPA likely to come online by 2028 and an additional 16 MTPA coming into service by 2030. Qatar's LNG industry boasts the cheapest LNG production costs in the world, due to its abundant, inexpensive and liquids-rich gas supplies.

- **Russia: The initial phase of the 20-MTPA Arctic LNG 2 project received its first gas in late 2023**. However, the project been slowed by international sanctions resulting from Russia's full-scale invasion of Ukraine and reportedly will remain offline through at least June. Later phases of the project may face additional delays.

- **Canada: Canada's first commercial-scale LNG plant is slated to start operations in 2025 or 2026.** However, Canada's expansive LNG ambitions have been thwarted by delays and cost blowouts. The 14-MTPA LNG Canada project, spearheaded by Shell, PetroChina, Mitsubishi Corporation and KOGAS, saw its pipeline costs more than double. A smaller project, Woodfibre LNG, has seen costs rise from CAD1.6 billion to CAD6.8 billion.[9]

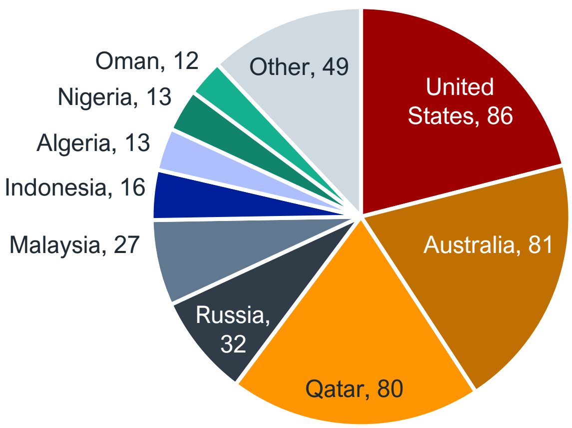
- **Africa: Five projects have reached final investment decision (FID) or are under construction in Africa**, totaling almost 14 MTPA of capacity. The projects include two floating LNG facilities off the coast of the Republic of Congo, a third floating facility off the coasts of Mauritania and Senegal, a new train for Nigeria LNG coupled with a modest capacity expansion for the six existing Nigerian LNG trains and a small project in Gabon. Additional LNG export facilities have been proposed for Mozambique, but the projects have been delayed by local opposition to the project, social unrest and concerns over security for the projects' workers.

[9] In this report, all prices are expressed in U.S. dollars unless otherwise indicated.

A. Global LNG Production and Reliability

Three countries—the U.S., Australia and Qatar—produced three-fifths of the world's LNG in 2023 (see Figure 3). For the first time, the U.S. edged out its two top rivals to claim the lead spot among global LNG exporters.

Figure 3: Global LNG Exports, 2023 (MTPA)



Source: IEEFA estimates based on Kpler data.

Although global LNG production capacity is slated to grow, total output will be constrained by operational challenges and declining feedstock gas production at many facilities. Roughly one-third of the world's LNG plants have suffered from significant mechanical reliability and gas supply challenges in recent years. Yemen's Balhaf LNG and Libya's Marsa El Brega LNG terminal have been mothballed amid ongoing political unrest and security concerns. After a series of safety lapses,[10] the Freeport LNG plant on the U.S. Gulf Coast suffered an explosion in June 2022, taking about 15% of U.S. LNG production capacity offline. The plant continued to face reliability issues after reopening in early 2023 and a winter storm led to a partial shutdown in January 2024.[11,12,13] Shell's Prelude floating LNG plant off the coast of western Australia has underperformed due to a series of fires, mechanical outages and strikes.[14,15,16] Gas supply challenges have trimmed output from LNG plants in Angola, Algeria, Indonesia, Australia, Nigeria and Malaysia.

[10] E&E News. LNG plant had history of safety issues before explosion. June 2022.
[11] S&P Global. Drop in feedgas flows to Freeport LNG weighs on US terminal utilization. September 2023.
[12] Gas Processing News. Freeport LNG's Texas (U.S.) facility faces problems with upstream gas. December 2023.
[13] Reuters. Texas Freeport LNG unit faces month-long outage after winter storm. January 2024.
[14] Maritime Executive. Strike on Shell's FLNG Prelude Ends After 76 Days. August 2022.
[15] Maritime Executive. Report: Shell Suspends LNG from Prelude After Another Small Fire. December 2022.
[16] Riviera Maritime. Shell restarts Prelude FLNG after fire. January 2023.

With these disruptions, the world's LNG fleet operated at only 87% of its rated capacity in 2023.[17] However, strong global LNG demand for two consecutive years created a powerful incentive for LNG producers to maximize output and several projects—including projects in Qatar, Oman, Russia and Australia—shipped more than their rated capacity in 2023.

Global LNG supply also faces risks from disruption of key maritime chokepoints. The Panama Canal saw reduced LNG transits in 2023 and early 2024 as an intense El Niño weather pattern restricted ship transits—an occurrence that may grow both more common and more extreme as climate change accelerates.[18,19] Meanwhile, attacks on vessels traversing the Red Sea have led many LNG shippers to route cargoes away from the Suez Canal.[20] Together, the Panama Canal and Suez Canal accounted for more than 10% of global LNG trade in 2023.[21] Shipping disruptions boosted LNG tanker rates last year and extended disruptions could trigger more permanent shifts in LNG shipping patterns.[22]

B. United States: Surging Exports Despite a Pause in New Approvals

Since the startup of the first U.S. LNG terminal on the Gulf Coast in early 2016, the country has grown to become the world's largest LNG supplier. Today there are seven operating LNG facilities in the continental U.S., with a combined nameplate capacity of 92.3 MTPA of LNG, about one-fifth of the world's total (see Table 1).

Table 1: U.S. LNG Terminals, Nameplate Capacity

Facility	U.S. State	Bcf/d	MTPA	Initial In-Service Date
Sabine Pass LNG	Louisiana	4.0	30.6	Feb-2016
Cove Point LNG	Maryland	0.7	5.3	Mar-2018
Corpus Christi LNG	Texas	2.0	15.4	Dec-2018
Elba Island LNG	Georgia	0.3	2.5	Sep-2019
Cameron LNG	Louisiana	1.8	13.5	May-2019
Freeport LNG	Texas	2.0	15.0	Sep-2019
Calcasieu Pass LNG	Louisiana	1.3	10.0	Mar-2022
TOTAL, all existing trains, all facilities		**10.8**	**92.3**	

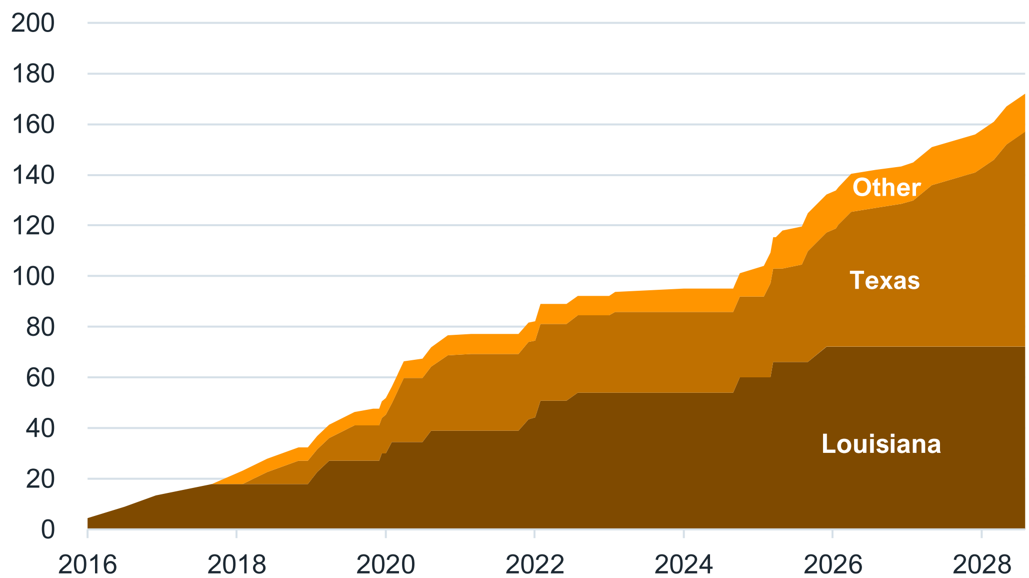
Source: U.S. Energy Information Administration.

[17] IEEFA estimates, based on data from the International Gas Union, the International Group of LNG Importers, Kpler and company reports.
[18] International Energy Agency. Gas Market Report, Q1-2024, p. 43.
[19] Yale Environment 360. Climate Change Now a Major Factor in Formation of El Niño. October 2023.
[20] Wood Mackenzie. LNG trade disrupted as Suez Canal transits stop. February 2024.
[21] Oxford Institute for Energy Studies. LNG Shipping Chokepoints: The Impact of Red Sea and Panama Canal Disruption. February 2024.
[22] LNG Prime. Spot LNG shipping rates rise for first time since November. February 2023.

Together, the seven plants shipped 86 million metric tons (MT) of LNG in 2023 and their demand for natural gas as both feedstock and fuel exceeded 11% of total U.S. production.[23] In late 2021 through the end of 2022, surging European demand for U.S. LNG strained North American gas markets, sending wholesale U.S. gas prices spiking to their highest level in more than a decade. The market dynamic was clear: As the U.S. exported more gas during the Ukraine crisis, it shortchanged domestic supplies and imported price volatility from the global LNG market.[24]

Prompted in part by concerns over spiking prices, the U.S. Department of Energy paused new authorizations for LNG exports to non-free trade agreement (NFTA) nations in January 2024 so that the agency could reevaluate the LNG industry's effects on natural gas prices, the climate and local communities. Yet the pause on new approvals won't alter the short-term trajectory of the U.S. LNG buildout. Five new U.S. liquefaction projects, as well as two Mexican projects sourced with U.S. gas, are under construction and have already been cleared to export to NFTA nations. The projects have a collective capacity of 78 MTPA, meaning—pause or no—the U.S. gas industry is preparing for 85% growth in LNG export capacity by 2028 (see Figure 4).

Figure 4: U.S.-Sourced LNG Capacity (MTPA)



Source: IEEFA estimates based on Energy Information Administration and company reports. Includes Mexican projects that rely on U.S. gas feedstock.

[23] U.S. Energy Information Administration. Liquefied U.S. Natural Gas Exports. Accessed March 2023. U.S. Energy Information Administration. U.S. Dry Natural Gas Production. Accessed March 2023.
[24] IEEFA. LNG exports have raised natural gas prices for U.S. households. November 2023.

U.S. LNG sales contracts are among the least restrictive in the global industry: Buyers can ship and resell cargoes anywhere in the world. But this flexibility also means that buyers can cancel LNG cargoes when it is economical for them. An extended period of low global LNG prices could leave the U.S. fleet underutilized—as happened in mid-2020, when collapsing LNG prices amid global oversupply led many LNG buyers to cancel their purchases, triggering declining output and temporary shutdowns at several plants.[25]

C. Australia: High Costs, Tight Gas Markets Limit Output

Australia exported an all-time high of 81 MT of LNG in 2023, with Japan, China, South Korea and Taiwan accounting for more than 85% of all sales. Yet Australia's LNG output rose by less than 1% year-over-year and the nation ceded its position as the world's largest LNG exporter to the United States.

Several Australian LNG plants have dramatically underperformed in recent years (see Table 2). In May 2023, Shell suspended production at its 3.6-MTPA Prelude facility due to mechanical problems,[26] leading to reduced output over the summer and no cargoes at all from September through November.[27] In 2022, two fires and a strike at Prelude had curtailed output even more sharply.[28] Similarly, Santos' Gladstone LNG plant in Queensland continues to operate well below capacity and a wind-down in production from the Bayu Undan field resulted in utilization rates of just 13% at the Darwin LNG plant last year.[29,30] Australian export volumes are expected to decline through 2025. Darwin LNG ceased production in late 2023 and Woodside plans to shutter one of its North West Shelf LNG trains in 2024, both because of declining feedstock supplies.[31,32]

Table 2: LNG Output as Share of Rated Capacity, Selected Australian Projects

Supply Project	Capacity (MTPA)	2021	2022	2023
Darwin	3.7	88%	36%	13%
Gladstone	7.8	80%	77%	74%
North West Shelf	16.7	90%	97%	88%
Prelude	3.6	59%	36%	56%

Source: IEEFA estimates based on data from Kpler, the International Gas Union and the International Group of Liquefied Natural Gas Importers.

[25] Reuters. Coronavirus demand destruction cuts U.S. LNG exports to over 20-month low. July 2020.
[26] Reuters. Shell halts production at Prelude floating LNG facility. May 2023.
[27] IEEFA estimates based on Kpler data.
[28] IEEFA. Global LNG Outlook 2023-27. February 2022, p. 12.
[29] Upstream Online. Australian LNG project could shut down within weeks. May 18, 2023.
[30] Santos. Investor Day Presentation, p. 16.
[31] LNG Prime. Australia's Santos ships final Bayu-Undan LNG cargo. December 2023.
[32] Argus Media. Train 2 likely to close at Woodside's NWS LNG in 2024. November 2023.

Australia has a new 5-MTPA train at Woodside's Pluto LNG plant in Western Australia under construction, as well as a small expansion at Ichthys LNG. Even so, tightening domestic gas markets could constrain Australia's LNG output. The Northern Territory government has already tapped LNG exporters for emergency gas supply due to declining production at the Blacktip field.[33] Western Australia could see gas shortfalls limit LNG exports over the next decade,[34] and Australia's east coast is forecast to see gas shortfalls from 2028,[35] with the Oxford Institute for Energy Studies noting that "it seems inevitable that Queensland LNG producers will be required to divert increasing volumes of gas to southern markets."[36] Preparing for such shortfalls, the Australian government recently gave the minister for resources the authority to impose LNG export controls on a quarterly basis.[37,38]

New Australian LNG projects are generally viewed as globally uncompetitive due to high costs for both construction and new gas supplies. The industry also faces challenges from stringent emissions obligations under Australia's Safeguards Mechanism, which will require any new gas fields to have zero emissions of reservoir CO_2.[39,40] These standards may affect proposed new gas fields intended to backfill existing LNG plants, including the Barossa and Browse fields, which have high reservoir CO_2 levels.[41] Development of these fields will likely require the use of carbon capture and storage (CCS), which has long history of underperformance and will likely add to LNG project costs.[42,43]

Increased competition, declining reserves, government gas market intervention and the potential for LNG buyers to seek alternative supply could lead to a decline in Australia's LNG exports in coming years. By some estimates, Australia's LNG exports could fall to less than 70 MTPA by 2030—well below current levels.[44] After an extended period of financial underperformance in Australia's LNG industry,[45] the prospect of declining output has raised concerns that Australia is "quietly quitting" the LNG business.[46]

[33] Australian Broadcasting Corporation. Blacktip supply issues to continue, forcing Power and Water to use emergency gas. June 2023.
[34] Australian Energy Market Operator. 2023 Western Australian Gas Statement of Opportunities. December 2023, p. 5.
[35] Australian Competition and Consumer Commission (ACCC). Gas Inquiry 2017-2030 December 2023 interim report, p. 9.
[36] *Ibid.*, p. 16.
[37] Australian Department of Industry, Science and Resources. Australian Domestic Gas Security Mechanism reforms. March 2023.
[38] Australian Department of Climate Change, Energy, the Environment and Water. Gas Market Code.
[39] Bethune, G. Is Australian quietly quitting the LNG business? The Oxford Institute for Energy Studies. June 2023, p. 1.
[40] Australian Department of Climate Change, Energy, the Environment and Water. Safeguards Mechanism Reforms Factsheet. May 2023, p. 3.
[41] Bethune, G. Is Australian quietly quitting the LNG business? The Oxford Institute for Energy Studies. June 2023, p. 18.
[42] Ueda, T. Speech to the Australian Parliament. March 2023.
[43] IEEFA. The Carbon Capture Crux: Lessons Learned. September 2022, p. 34.
[44] Bethune, G. Is Australian quietly quitting the LNG business? The Oxford Institute for Energy Studies. June 2023, p. 25.
[45] Australasian Center for Corporate Responsibility. Australia's LNG growth wave - did it wash for shareholders? November 2023.
[46] Bethune, G. Is Australian quietly quitting the LNG business? The Oxford Institute for Energy Studies. June 2023, p. 25.

D. Qatar: An Expanding Footprint for the Lowest-Cost LNG Producer

Qatar, the world's leading LNG exporter prior to 2020 and the third-largest exporter in 2023, has embarked on a massive LNG expansion program that will boost its liquefaction capacity by 64 MTPA over the next six years. Qatar Energy commenced construction of its four-train, 32-MTPA North Field East Expansion in October 2023, with the first gas expected as soon as 2025. In February 2024, Qatar announced that it would double the size of the project's second phase, the North Field West Expansion, from 16 MTPA to 32 MTPA, all of which is slated to come online by 2030. The company has signed 27-year LNG sales contracts with Sinopec, Eni, Shell, TotalEnergies and China National Petroleum Corporation (CNPC), with sales prices linked to the price of oil. Even so, much of the output from Qatar's expansion is uncontracted, potentially pointing to an oversupplied spot market in years to come.[47]

Qatar's LNG ambitions are underpinned by the favorable economics of the offshore North Field, which produces abundant volumes of both gas and liquid condensates, which are used as feedstock for gasoline (petrol), jet fuel and diesel. Revenues from liquids allow Qatari LNG projects to earn profits even at low LNG prices that would bankrupt most other producers.[48] Market observers have suggested that QatarEnergy has expanded its LNG footprint to signal its commitment to low long-term LNG prices—a strategy that could create financial challenges for the company's competitors.

E. Russia: Strains Amid Sanctions

Although Russia's pipeline gas exports slumped after the country invaded neighboring Ukraine, its LNG exports have remained robust, with 32 MT exported from the country's four operating facilities in 2023.[49] The European Union pledged in 2022 to end its dependence on Russian fossil fuels by 2027, yet EU nations imported more Russian LNG over the last two years than before the Ukraine invasion.[50,51]

With Russian pipeline gas exports expected to remain far below historic highs,[52] Russia hopes to monetize its gas reserves by expanding LNG exports. Central to this strategy is the 20 MTPA Arctic LNG 2 project in Siberia, spearheaded by Russian gas giant Novatek. But the project has been slowed by international sanctions. The first train of Arctic LNG 2 was partially completed late last year and gas was introduced to the plant in December,[53,54] but the pullout of western manufacturers left

[47] Bloomberg. Qatar's Gas Push Has a Hidden Motive — Murdering Coal. March 2024.
[48] Petroleum Economist. Liquids give Qatar LNG negative breakeven – Rystad. June 2021.
[49] IEEFA. European LNG Tracker. February 2024.
[50] European Commission. REPowerEU: A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition. May 2022.
[51] Russian LNG export volumes estimated by IEEFA from Kpler data.
[52] Bloomberg. Ukraine Slams the Door on Bringing Russian Gas to Europe. March 2024.
[53] Bloomberg. Russia's Novatek Starts Arctic LNG 2 Project Amid US Sanctions. December 2023.
[54] Upstream. Arctic LNG 2 readies first shipment to global markets. January 2024.

the project with only enough turbines to operate at half-capacity.[55,56] International sanctions also prevented Novatek from procuring the specialized ice-breaking LNG carriers built for the project by a Korean shipyard.[57] Novatek had also contracted a Russian shipbuilder to build LNG carriers for the project, but sanctions have prevented that firm from securing critical technology needed to complete the vessels.[58,59] Arctic LNG 2 still has not shipped any LNG cargoes and reportedly suspended operations from early April through at least the end of June due to a lack of ice-class LNG tankers.[60]

Late last year, Novatek signaled that the project would miss its 2024 delivery targets, reportedly sending *force majeure* notices to two contracted Chinese LNG buyers.[61] Prompted by a new round of sanctions imposed in September 2023,[62] French oil and gas supermajor TotalEnergies, which owns a 21.5% stake in Arctic LNG 2,[63] also initiated *force majeure* in early 2024, indicating that it would take no cargoes from the project during the year.[64] (TotalEnergies had already declared a USD4.1 billion impairment on the project in 2022.)[65] Other project partners, including Chinese oil majors China National Offshore Oil Co., CNPC and a Japanese consortium, have halted participation in Arctic LNG 2, further dimming the project's financial prospects.[66]

Novatek has claimed that it was still on track to start the second and third trains of Arctic LNG by the end of 2026 and has asked Chinese firms to provide substitutes for U.S. and European equipment.[67] Even so, the CEO of TotalEnergies has claimed that the project's third train has been put on hold,[68] and some gas market analysts suggest that Novatek may pivot to a different project, such as Murmansk LNG, which does not require specialized ice-breaking tankers.[69]

State-controlled gas giant Gazprom also hopes to move forward with its 13 MTPA Ust-Luga LNG project, with a government target to complete the project's two phases in 2027 and 2028.[70] But the project faces its own challenges. Last summer Gazprom failed to attract contractors to bid on a pipeline that would feed the plant,[71] and a new round of U.S. sanctions in February 2024 targeted two entities backing the project.[72]

[55] Polar Journal. Semi-mature start-up of Arctic LNG 2 production. January 2024.
[56] High North News. Undeterred by Sanctions Novatek Begins Production at Arctic LNG 2. January 2024.
[57] Bloomberg. Unclaimed Arctic Gas Carriers Threaten Russia's LNG Expansion. March 2024.
[58] The Barents Observer. Arctic tanker trouble for Novatek's new flagship project. December 2022.
[59] Reuters. Lack of Arctic tankers puts Russia's LNG development dreams on ice. December 2023.
[60] Reuters. Exclusive: Russia's Arctic LNG 2 suspends gas liquefaction amid sanctions, lack of tankers, sources say. April 2024.
[61] Reuters. Exclusive: Russia's Novatek issues force majeure notices over Arctic LNG 2 project -sources. December 2023.
[62] U.S. Department of State. Imposing Further Sanctions in Response to Russia's Illegal War Against Ukraine. September 2023.
[63] Total Energies. Russia: Total expands partnership with Novatek through Arctic LNG 2 project. May 2018.
[64] Reuters. TotalEnergies initiates force majeure on Russia's Arctic LNG 2. January 2023.
[65] TotalEnergies. Russia: TotalEnergies records a 4.1 BUSD impairment in its Q1 2022 accounts. April 27, 2022.
[66] The Moscow Times. Foreign Shareholders Suspend Participation in Russia's Arctic LNG 2 Project – Kommersant. December 2023.
[67] Upstream. Chinese yards told to dismantle Western equipment as work on Arctic LNG 2 modules resumes. January 2023.
[68] Reuters. Russia's Arctic LNG 2 last line is on hold, TotalEnergies CEO says. February 2024.
[69] Arctic Business Journal. No Shipments from Russia's Arctic LNG 2 Until March as Sanctions Block Delivery of LNG Carriers. February 2024.
[70] Interfax. Ust-Luga LNG plant should start up in 2027, NWF to provide 0.9 trln rubles in financing. February 2024.
[71] Upstream. Gazprom's Russian LNG plans hit by new setback as contractors give tenders cold shoulder. July 2023.
[72] U.S. Department of State. Responding to Two Years of Russia's Full-Scale War On Ukraine and Navalny's Death. February 2023.

F. Canada: Cost Blowouts Hamper New Plants

Shell and its partners expect to ramp up operations at Canada's first commercial-scale LNG plant, the 14-MTPA LNG Canada project in Kitimat, B.C., starting in 2025. Greenlit in October 2018, the remote, greenfield project faced high capital and construction costs, which its backers hoped to offset with inexpensive gas sourced from the Montney Basin in northeastern British Columbia. However, massive cost overruns in the controversial Coastal Gas Link pipeline supplying the project will likely undermine LNG Canada's economic competitiveness and the pipeline's parent company has already taken CAD4.5 billion in impairments on the project.[73,74]

A smaller project—the 2.1-MTPA Woodfibre LNG project in Squamish, B.C.—is also moving forward, with the project's backer starting on-site work and approving construction of 19 liquefaction modules in China.[75] However, the project's total price tag has exploded from an estimated CAD1.6 billion in 2019 to CAD6.9 billion by 2024, raising questions about the project's economics.[76,77]

Largely due to high construction and pipeline costs, Canada's once-lofty ambitions to become a major player in the global LNG market have faded. As just one example, Spanish energy firm Repsol abandoned plans last March for an LNG export project on Canada's east coast, citing the high cost of shipping gas from western Canada.[78] Several projects are still looking for financing, including Cedar LNG and Ksi Lisims LNG and FortisBC still hopes to expand its Tilbury LNG facility outside of Vancouver. Of roughly 20 LNG projects once proposed in Canada, most have now been shelved.[79]

G. Africa: Delays and Political Risk Constrain Growth Prospects

Africa produced 41 MT of LNG last year from projects in Algeria, Nigeria, Egypt, Angola, Equatorial Guinea, Mozambique and Cameroon. But African LNG shipments have fallen 10% from their 2019 peak. Africa's two top exporters, Algeria and Nigeria, have struggled for years with faltering gas production. And while Algeria's LNG output grew in 2023, growing domestic gas consumption and rising pipeline exports will likely squeeze the country's LNG feedstock supplies.[80,81]

Europe's energy crisis spurred interest in African LNG to diversify the continent's gas supplies. LNG developers—largely spearheaded by European oil and gas majors—are now targeting almost 14 MTPA of new African liquefaction capacity by 2028. However, pervasive project delays have heightened the financial risks of the African LNG buildout. In the Republic of Congo, Eni's 0.6-MTPA

[73] Financial Post. Coastal GasLink price tag climbs to USD14.5 billion and could go even higher. February 2023.
[74] TC Energy. 2023 Annual Report. February 2023, p. 22-23.
[75] Journal of Commerce. Woodfibre LNG greenlights Chinese construction of modules. August 2023.
[76] Financial Post. Woodfibre LNG poised to proceed with USD1.6-billion project within weeks. August 2019.
[77] Enbridge. Woodfibre LNG. Accessed March 2024. Exchange rate: 1.35 Canadian dollars per U.S. dollar.
[78] Bloomberg. Repsol Scraps Bid to Ship Canadian Gas to Europe, Citing Costs. March 2023.
[79] Sightline Institute. Report Update: Mapping BC's LNG Proposals. December 2019.
[80] IEEFA estimates from Kpler data.
[81] S&P Global. Algerian pipeline gas flows to Southern Europe remain robust in 2023. May 2023.

Tango Floating LNG facility shipped its first cargo in March 2024, six months behind schedule.[82] Eni is planning a second, 2.4-MTPA floating export facility in the republic. BP's 2.5-MTPA Greater Tortue Ahmeyim floating liquefaction project off Mauritania and Senegal is currently aiming for completion by summer 2024,[83] two years behind schedule.[84] Nigeria's 7.8-MTPA Train 7 expansion project was reportedly more than 50% complete as of November 2023,[85] but delays in deepwater gas production suggest that the expansion could face the same feedgas shortages that have plagued Trains 1-6.

Perenco, an Anglo-French firm, recently announced a final investment decision for a 0.7-MTPA floating LNG plant in Gabon, but most other proposed African LNG projects remain in limbo. TotalEnergies has kept its USD20 billion, 13-MTPA Mozambique LNG project on hold since 2021 due to public opposition to the project and an unstable political climate in Cabo Delgado province.[86] The company had hoped to restart construction of the project last year, but has delayed moving forward amid a surge of violence in the province and resistance from international lenders.[87,88] Security concerns in Cabo Delgado have also postponed ExxonMobil's proposed 18-MTPA Rovuma project.[89] Meanwhile, progress on a proposed USD42 billion onshore LNG development in Tanzania has slowed due to government delays in signing key agreements with Shell and Equinor, the project's backers.[90]

82 Offshore. Eni acquires Tango FLNG to produce and export LNG from Republic of Congo. August 2022.
83 Energy Intelligence. Greater Tortue FLNG Project Start Pushed Back Again. November 28, 2023.
84 NS Energy. Greater Tortue Ahmeyim LNG Project.
85 Hawilti. Nigeria LNG Train 7 hits 52% but concerns remain over future feedstock. November 8, 2023.
86 Reuters. TotalEnergies prepares for Mozambique LNG restart. May 23, 2023.
87 Upstream. TotalEnergies delays decisions on 17 LNG carriers amid surge in Mozambique attacks. February 2024.
88 Africa Intelligence. TotalEnergies pleads with US EXIM Bank to release promised Mozambique LNG. February 2024.
89 Upstream. ExxonMobil targets 2025 go-ahead for Mozambique liquefaction project. February 2024.
90 Bloomberg. Tanzania LNG Slows as State Delays on Signing Agreement With Equinor, Shell. February 2024.

II. LNG Portfolio Players: Linking Supply and Demand

Over the past two decades, LNG trading has evolved from a set of simple point-to-point exchanges to a complex web of contractual arrangements. Historically, creditworthy gas and power utilities purchased LNG directly from the owners of large export facilities, which shipped the fuel from liquefaction projects to end users. As the industry expanded, however, innovations in contracting and corporate structuring allowed intermediary companies to both buy LNG and re-sell it around the world.

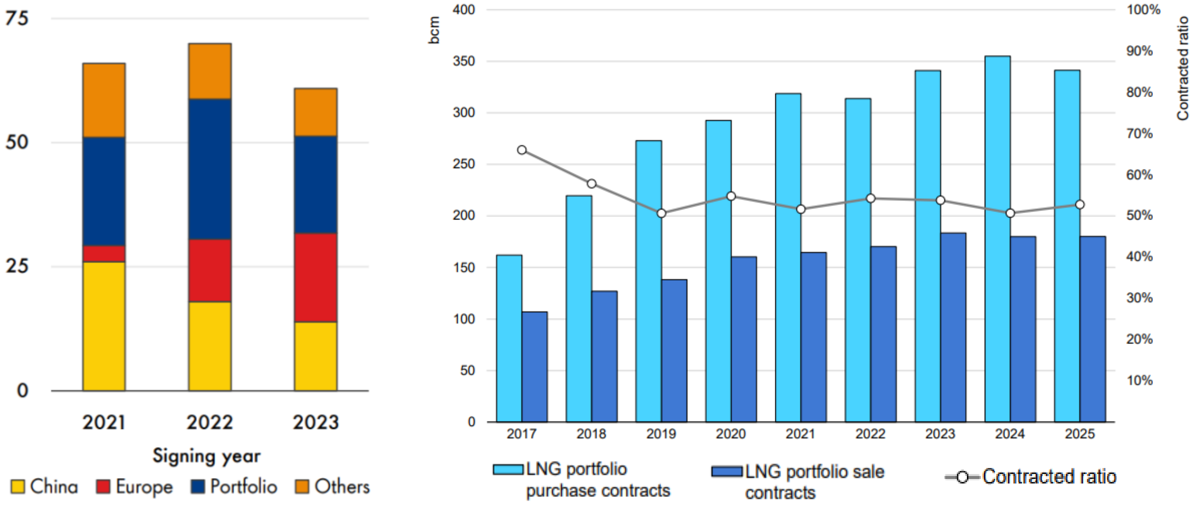
These companies—called portfolio players or LNG aggregators—have grown to account for a dominant share of LNG trades, signing long-term LNG purchase commitments from diverse sources and marketing volumes to regional buyers. To facilitate trade and industry growth, portfolio players have expanded vertically into all aspects of the value chain, from gas production to liquefaction, shipping, regasification and storage.

The largest LNG aggregators are Shell, TotalEnergies and BP. But a variety of smaller companies—including commodity traders, national oil companies (NOCs) and European and Asian utilities—are amassing LNG contracts, building new LNG infrastructure and establishing trading desks in target markets.[91]

Over the last three years, portfolio players have been the largest counterparties to new long-term LNG purchase contracts (Figure 5). In 2023, aggregators were reportedly committed to buying roughly two-thirds of the export capacity under construction in North America.[92] Meanwhile, the average length of purchase contracts concluded by portfolio players increased from five years in 2017 to more than 15 years in 2022, reflecting speculation about aggregators' ability to resell significant LNG volumes over longer time horizons.[93] In October 2023, Shell, TotalEnergies and Eni signed 27-year LNG procurement deals with Qatar Petroleum that extend beyond 2050 net-zero targets.

[91] Financial Times. Asian energy groups flock to London to set up LNG trading desks. August 5, 2023.
[92] Poten & Partners. Portfolio Players Take Two-Thirds of North American Capacity Build Out. December 6, 2023.
[93] IEA. Global Gas Security Review 2023. July 2023, p. 55.

Figure 5: Long-Term SPA Signings (left); LNG Portfolio Players' Contracted Ratio



Source: Shell LNG Outlook 2024, page 34; IEA.

Aggregators resell LNG to customers via long-term contracts or spot market sales, often at a premium.[94] The share of volumes resold on long-term contracts is called the contracted ratio. According to IEA figures, portfolio players' contracted ratios have declined almost 20% since 2017 (Figure 5 above), indicating that companies are taking on more market risk by selling LNG into spot markets rather than locking in price and volume formulas set by resale contracts. The IEA notes that portfolio players' contracted ratios are set to decline further through 2026.[95]

The portfolio model is designed to minimize costs, optimize deliveries and maximize margins determined by price differentials in various gas markets. During periods of price volatility, the business model and exposure to spot markets can be highly profitable. In the aftermath of the Russian invasion of Ukraine, for example, traders earned hundreds of millions of dollars on individual shipments sold in spot markets. Some even defaulted on deliveries to contracted customers to maximize spot sales. For example, estimates suggest Italian oil and gas major Eni made USD550 million by cancelling contractual shipments to Pakistan and reselling them to Europe.[96]

But during extended periods of low prices and limited demand, trading can be highly risky, particularly for smaller, more regionally focused players. In 2016, for example, when demand from major markets waned, LNG prices collapsed to below USD5 per million metric British thermal units (MMBtu) and large amounts of unsold volumes were labelled as "homeless LNG."[97] From 2018 to 2019, numerous European companies—including Denmark's Ørsted,[98] Spain's Iberdrola,[99] and

[94] IEA. Global Gas Security Review 2023, July 2023, p. 50.
[95] *Ibid.*, p. 55.
[96] Bloomberg. Italian Oil Giant Earned USD550 Million Reneging on Pakistan LNG, Nonprofit Says. April 28, 2023.
[97] Poten & Partners. Where will all the Homeless LNG go? February 18-19, 2016.
[98] Hart Energy. Ørsted To Exit LNG Business In Sale With Glencore. December 19, 2019.
[99] TradeWinds. Pavilion expands into Europe with Iberdrola LNG portfolio acquisition. June 20, 2019.

France's Engie[100]—sold their LNG portfolios.[101] Following the outbreak of COVID-19, Malaysia's Petronas found itself highly exposed to collapsing prices in global spot markets and recorded one of its worst financial performances ever.[102,103]

Importantly, LNG aggregators have bridged a gap between buyers and sellers. Buyers in Europe and Asia have increasingly demanded shorter-term contracts at prices linked to various non-oil benchmarks. Sellers, however, typically require long-term, oil-linked contracts with creditworthy counterparties to secure multibillion-dollar project financing loans for new export projects. Aggregators balance these diverging needs by signing high-volume, multi-decade LNG purchase contracts and re-selling to buyers on shorter, more flexible terms. In other words, portfolio players are assuming greater LNG marketing risk from liquefaction companies in exchange for the ability to resell LNG at a markup.

These marketing risks are becoming increasingly precarious. Demand centers for LNG are shifting from mature markets in Europe and Northeast Asia to emerging markets that are characterized by less-creditworthy buyers and greater sensitivities to high energy prices. But rapid, sustained demand growth in prospective markets is not guaranteed, due to high LNG fuel and infrastructure costs, along with the relative affordability of other energy sources. To ensure LNG can be resold, portfolio players are attempting to stimulate demand by moving further downstream, developing LNG regasification infrastructure and extending credit lines to buyers in developing countries.

Ultimately, the emergence of LNG middlemen implies a fundamental disconnect between supply and final demand. On the supply side, new export projects are largely financed and sanctioned based on contracts with companies aiming to re-sell LNG, rather than end users. In some cases, new liquefaction projects have been sanctioned by selling their entire capacity to portfolio players. For example, the Greater Tortue Ahmeyim LNG project off the coast of Mauritania and Senegal reached FID in December 2018 by selling 100% of its volumes to a marketing arm of BP.

If record increases in global LNG supply (discussed in Section 1) result in a medium-term glut, margins for portfolio players—especially those with high spot market exposure—could fall once again. Meanwhile, risks on the demand side (discussed in Section 3) could leave aggregators with significant volumes of unsold LNG, exacerbating downward pressure on prices and financial risks for portfolio players.

The growth of the global LNG industry is increasingly defined by how much long-term risk LNG portfolio players are willing to bear. By taking long positions on capital-intensive infrastructure and LNG offtake, aggregators are betting on sustained, long-term LNG market growth that may not materialize.

[100] Journal of Petroleum Technology. Total Acquires Engie's LNG Assets, Becomes No. 2 in Global Market. July 16, 2018.
[101] The UK's Centrica was also reportedly considering the sale of its LNG portfolio in 2020. Wall Street Journal. U.K.'s Centrica Seeks to Sell Liquefied Natural Gas Portfolio. November 26, 2020.
[102] S&P Global. Analysis: Malaysia's LNG supply cuts tighten market but upstream challenges persist. July 2, 2020.
[103] Malaysian Reserve. Petronas posts RM21 billion net loss for FY20. February 26, 2021.

III. Global LNG Demand

Global LNG demand growth through 2028 will likely disappoint optimistic industry expectations. Demand fundamentals in Europe, Japan and South Korea—which together accounted for more than half of global LNG consumption in 2023—point to long-term declines in LNG imports. Instead, outlooks from the LNG industry expect rapid, sustained demand growth in emerging markets through 2040. However, years of high and volatile LNG prices, along with extensive delays for new LNG import infrastructure projects, have slowed structural demand growth in emerging Asia.

While oversupplied markets and lower prices this decade will likely elicit some demand response in various regions, structural barriers to LNG uptake—including long-term energy and climate plans in Europe and Northeast Asia, as well as infrastructure and financing challenges in emerging Asia—are likely to undermine expectations for rapid, sustained growth over the medium term. Each LNG importing region will face different demand dynamics:

- **Europe.** Europe's LNG demand spiked in 2022 as Russian pipeline gas shipments fell. But LNG imports were flat in 2023 and are expected to decline from 2025 as overall European gas consumption dips, driven by both climate policies and energy security concerns.
- **Japan, South Korea and Taiwan.** Japan, the world's second-largest LNG importer in 2023, has already seen a 20% decline in LNG demand since 2018. Energy and climate plans aiming to boost renewables and nuclear-fired power generation could cause LNG demand to fall by one-third from 2019 levels. South Korean demand is also likely to fall as the share of LNG in power generation falls, while Taiwan's policy to achieve a nuclear-free power sector could boost LNG imports.
- **China.** Domestic gas production, pipeline gas imports and policies designed to bolster energy security will likely constrain China's LNG imports. If prices fall, LNG consumption could rise. However, weaker-than-expected demand growth in the short term could leave buyers with a surplus of contracted volumes.
- **South Asia.** Low LNG prices are likely to encourage some rebound in demand from India, Bangladesh and Pakistan, after imports fell by a combined 16% in 2022. However, sensitivity to volatile LNG prices, fiscal challenges and competing energy resources in the power sector suggest that the region's medium-term demand growth could be uneven.
- **Southeast Asia.** Extensive project development timelines for new LNG infrastructure projects, along with volatile LNG prices and the relatively favorable economics of alternative energy sources, are likely to restrain Southeast Asia's LNG demand growth potential.

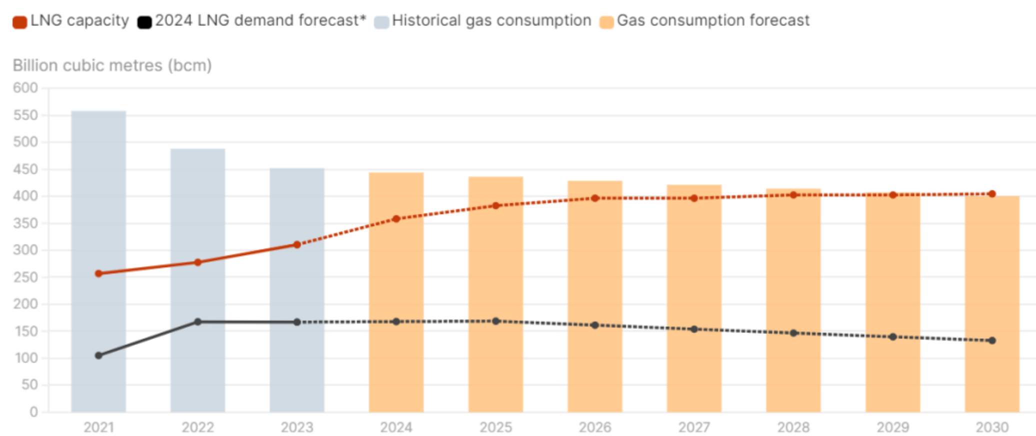
A. Demand Outlook: Europe

Gas and LNG demand is forecast to decline through 2030. IEEFA expects European gas demand to fall by 11% between 2023 and 2030.[104] LNG imports are forecasted to peak in 2025.[105]

Europe's ongoing buildout of LNG infrastructure is likely to result in significant excess capacity. Since the beginning of 2022, Europe has added 52 billion cubic meters (bcm) of LNG regasification capacity,[106] including new terminal and expansion projects. An additional 94 bcm of proposed import projects could bring Europe's total to 405 bcm by 2030. IEEFA forecasts that Europe's LNG demand will not exceed 133 bcm in 2030, leaving potentially 272 bcm of unused capacity (Figure 6 below).[107]

European gas prices have stabilized amidst declining demand and high storage levels. Natural gas prices in Europe have retreated from 2022 highs due largely to mild winters, weak demand, increased hydroelectric and nuclear generation and strong renewables performance. Gas storage levels remain at record highs. Although lower prices may encourage some gas demand recovery, structural trends point to declining gas and LNG demand through 2030.

Figure 6: Europe's LNG Regasification Capacity and Demand Outlook



Source: Gas Infrastructure Europe, Kpler, IEEFA. Note: Includes EU27, UK, Türkiye, Norway. Gas and LNG demand forecasts based on IEEFA analysis.

[104] IEEFA's analysis of Europe includes EU27, UK, Türkiye and Norway.
[105] IEEFA. European LNG Tracker. February 2024.
[106] 1.36 billion cubic meters of gas is the equivalent of one million metric tons of LNG.
[107] IEEFA. European LNG Tracker. February 2024.

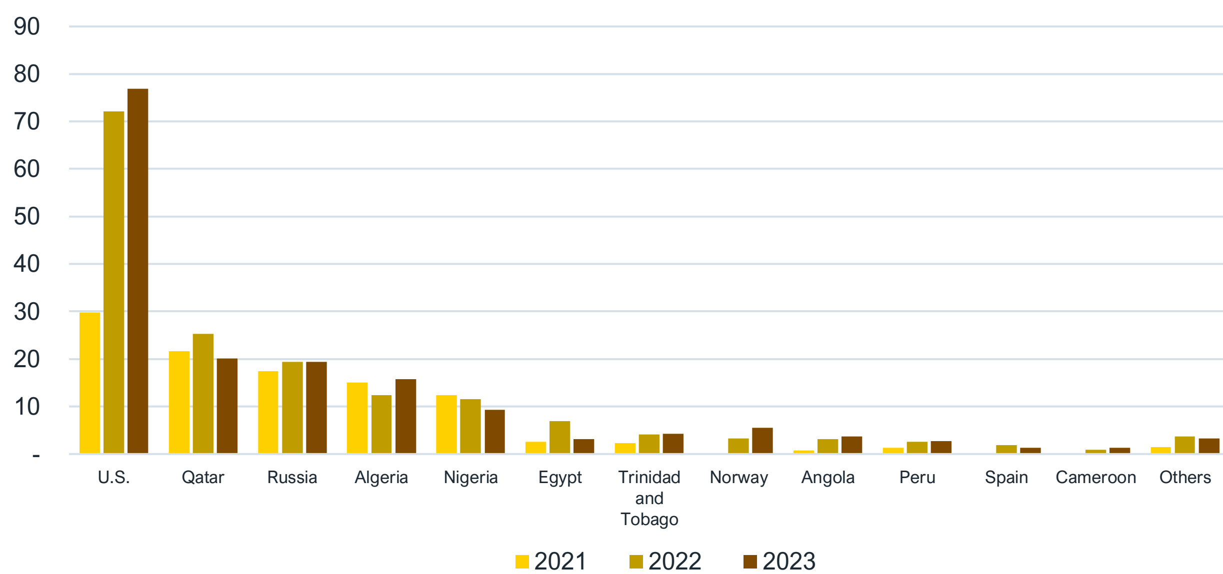
Recent Developments

Europe imported a record amount of LNG in 2022 to replace lost Russian pipeline gas supplies and curb dependence on Russian gas. Overall gas demand, however, has fallen 20% in the last two years—to its lowest level in a decade—due to fuel switching, increased nuclear and hydropower generation, mild weather and energy efficiency measures. European Union member states have agreed to continue reducing gas demand to reinforce security of energy supply and contain price volatility.

In 2023, European LNG imports remained flat at 167 bcm. Europe's total natural gas demand fell 7.4%. EU countries that reduced gas consumption the most from 2021 to 2023 include Germany (-17.6 bcm), Italy (-14.4 bcm), the Netherlands, (-10.9 bcm), France (-8.6 bcm) and Spain (-4.8 bcm). EU member states committed to voluntarily reducing their gas use between August 2022 and March 2023 by at least 15% compared to their average consumption in the preceding five years.[108]

LNG accounted for 37% of Europe's total gas demand in 2023, up from 34% in 2022 and 19% in 2021.[109] Last year, Europe imported LNG primarily from the U.S. (46%), Qatar (12.1%), Russia (11.7%) and Algeria (9.5%). EU member states spent EUR 60.97 billion on LNG imports in 2023 and EUR 110.57 billion in 2022.

Figure 7: European LNG Imports by Origin Country (bcm)



Source: Kpler.

[108] Council of the European Union. Security of gas supply: member states agree on recommendation to continue voluntary demand reduction measures. March 4, 2024.
[109] IEEFA. European LNG Tracker. February 2024.

Russia was Europe's third-largest LNG trading partner behind the U.S. and Qatar, despite efforts to reduce dependence on Russian gas. In 2023, Europe imported similar volumes of LNG from the country (19.47 bcm) compared to 2022 (19.44 bcm), according to Kpler. The largest European buyers of Russian LNG last year were Spain (accounting for 34% of Europe's total), France (24%) Belgium (21%). Spain and Belgium increased their Russian LNG purchases in 2023 by 34% and 42%, respectively, while France reduced its purchases by 35%. Terminals in Belgium and France also continue transshipping Russian LNG volumes from the Yamal project.

In November 2023, the United States imposed sanctions on the operator of the Arctic LNG 2 project in Siberia that is majority-owned by Russia's Novatek (with a 60% stake).[110] France's TotalEnergies, Japan's Mitsui and Chinese corporations CNPC and CNOOC, which each hold a 10% share of the Arctic LNG 2 joint venture, have all agreed to comply with U.S. sanctions. A lack of tankers due to sanctions against Russia could limit LNG exports from the project.

Reductions in the EU's overall gas demand have contributed to high storage levels. The EU exceeded its gas storage targets set in June 2022 by the Gas Storage Regulation,[111] which required storage facilities to be at least 80% full before the winter of 2022/23 and 90% full before subsequent winters. In 2022, the 80% goal was reached by August. In 2023, the filling level was more than 80% in July, more than 90% in August and reached 100% by November.

In the power sector, continued growth in renewables generation has offset fossil fuel generation. Based on Eurostat data, renewables generated 41% of Europe's electricity in 2023, including 18.5% from wind, 9% from solar and 13.5% from hydro. Meanwhile, total gas generation fell 16% in 2023 and accounted for just 17% of the EU's electricity mix.[112] The EU also added 56 gigawatts (GW) of new solar capacity, up 40%, while EU and UK rooftop solar deployment increased by 54% and almost 30%, respectively.[113,114] Also in 2023, the European Union raised its binding renewable energy target for 2030 to a minimum of 42.5%, up from a previous target of 32%.[115]

Industrial gas demand has not returned to pre-2022 volumes, suggesting that falling gas prices have yet to hit levels that might encourage a resurgence of industrial activity. Meanwhile, demand in the commercial and residential sectors has remained weak despite lower gas prices, due to mild weather, energy efficiency measures and the deployment of electric heat pumps. In 2022, heat pump sales reached almost 3 million units, a 40% increase from 2021.[116] Sales in 14 European countries

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[110] Euractiv. US and EU have all the means to derail Russia's Arctic LNG expansion plans. February 7, 2024.
[111] European Commission. Gas storage.
[112] Eurostat. Net Electricity Generation. 2024.
[113] SolarPower Europe. New report: EU solar reaches record heights of 56 GW in 2023 but warns of clouds on the horizon. December 12, 2023.
[114] Carbon Brief. Analysis: Surge in heat pumps and solar drives record for UK homes in 2023. January 12, 2024.
[115] European Commission. Renewable energy targets.
[116] IEA. Global heat pump sales continue double-digit growth. March 31, 2023.

fell by 5% in 2023 but remain well above levels in 2021, while UK heat pump installations have grown 20% compared to 2022.[117]

IEEFA expects that declining overall gas demand in Europe through 2030 is likely to reduce LNG imports after a peak in 2025.[118] Already, the addition of new import infrastructure in 2023 caused utilization rates of EU LNG terminals to decline to 58.5% from 63% in 2022. An additional 94 bcm of proposed import projects could bring Europe's total regasification capacity to 405 bcm by 2030. As a result, the continent's ongoing buildout of import terminals could cause utilization rates to fall over the remainder of the decade.

B. Demand Outlook: Japan, South Korea and Taiwan

Increasing nuclear and renewables generation will continue to reduce power sector LNG demand. Japan is set to continue restarting idled nuclear facilities, with an additional 4.4 GW targeting operations in the next two years. South Korea aims to add 7 GW of new nuclear capacity through 2033 that could reduce the share of LNG in the country's power mix.

Long-term climate and energy plans see lower demand for LNG. Japan's national power targets could reduce LNG-fired power generation by 50% through 2030. IEEFA estimates this plan could cut Japan's LNG imports between 25.7 MTPA and 31.6 MTPA. South Korea's plans envision a 20% reduction in LNG generation by 2036, which could reduce power sector LNG demand by 11.8 MTPA. On the other hand, Taiwan's policy to achieve a nuclear-free power sector may lift LNG imports.

Fewer growth opportunities in domestic markets prompt shift into LNG trading by major Japanese importers. Rather than importing more LNG, Japan's LNG sales to other countries have almost tripled since 2018; Japanese companies may be contributing to a looming oversupply of LNG rather than absorbing cargoes from the global market.

Recent Developments

Combined LNG demand in the major Northeast Asian markets of Japan, South Korea and Taiwan fell 5.4% in 2023, after dropping 1% in 2022.[119] Long-term climate and energy plans in Japan and South Korea could cause LNG demand to decline rapidly in the coming decade, as both countries attempt to increase generation from nuclear, renewables and other energy sources.

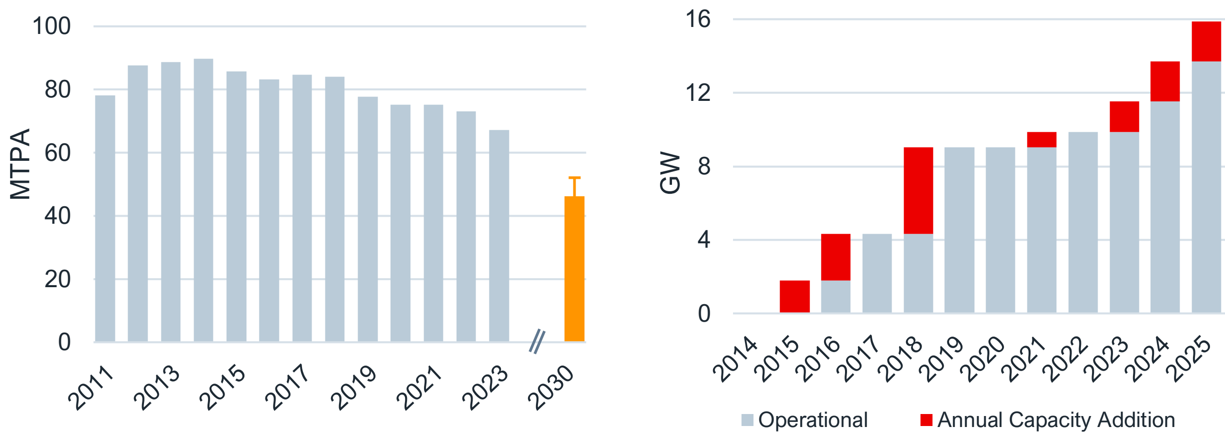
Japan's LNG imports fell 8% in 2023 to their lowest levels since 2009 (67 MTPA). This was primarily due to lower demand in the power sector, where rising nuclear availability, declining power demand and higher generation from renewable resources reduced the call on gas-fired generation. In 2023,

[117] *Ibid.*
[118] IEEFA. European LNG Tracker. February 2024.
[119] Kpler.

gas generation fell 9% and city gas sales fell 4.4%.[120] Renewables generation increased 5%. The government's Sixth Strategic Energy Plan calls for a reduction in LNG-fired generation from 394 terawatt-hours (TWh) in 2019 to 187 TWh (-53%) by 2030.[121] IEEFA estimates that realizing this plan could decrease LNG imports by between 25.7 MTPA and 31.6 MTPA from 2019 levels (Figure 8).[122]

Nuclear restarts were the largest driver of Japan's lower LNG requirements in 2023 and could continue to reduce LNG demand. The restart of two units in 2023 increased operating nuclear capacity from 10 GW to 11.5 GW.[123] The restart, along with higher utilization of the active fleet, potentially reduced LNG imports by 3.9 MTPA.[124] By 2025, restarts at the Shimane Unit 2 facility and Kashiwazaki-Kariwa Units 6 and 7 would bring operable capacity to 15.9 GW in 2025.[125] IEEFA estimates that the restarts alone could reduce LNG imports by 5.3 MTPA. Eleven remaining reactors are undergoing review for future restarts.[126] In the unlikely case that all are brought back online, IEEFA estimates LNG demand could fall by an additional 12.5 MTPA. Regulatory changes in 2023 have also aimed to extend the life of nuclear plants from 40 to 60 years.[127]

Figure 8: Estimated LNG Demand in 2030 Under Japan's Sixth Strategic Energy Plan (left) and Operable Nuclear Capacity (right)



Sources: IEEFA calculations based on Kpler data and METI Strategic Energy Plan; Nuclear Regulation Authority, company statements, media reports (right).

[120] METI. Gas business production trend statistical survey.
[121] IEEFA calculations based on: METI. Outline of Strategic Energy Plan. October 2021.
[122] Estimates are calculated based on a range of heat rates for Japan's combined cycle gas turbine fleet of 6,500 British thermal units per kilowatt-hour (BTU/kWh) and 8,000 BTU/kWh.
[123] The Kansai Electric Power Co. (KEPCO) restarted Takahama units 1 and 2 in late summer 2023, bringing the total number of operable reactors to 12. Reuters. Japanese nuclear power operator Kansai Elec restarts seventh reactor. September 15, 2023.
[124] This assumes that the restarted nuclear facilities operate at 80% capacity factors.
[125] Nuclear Engineering International. Unit 2 of Japan's Shimane NPP to restart in 2024. September 13, 2023.
[126] Four of these reactors have advanced past the initial review process of Japan's Nuclear Regulation Authority (NRA) and plan to restart by the end of the decade. World Nuclear Association. Nuclear Power in Japan. January 2024.
[127] Kyushu Electric Power Co. units Sendai-1 and Sendai-2, which were subject for retirement in 2024 and 2025, have been extended to operate for an additional 20 years. Other units are expected to apply for similar extensions. JAIF. NRA Approves New System for Beyond 60 Years of NPP Operation. February 15, 2023.

The structural decline in Japan's LNG demand has caused buyers to question the need for new long-term contracts. In 2023, 5.4 MTPA of long-term contracts expired and a recent survey of Japanese importers suggests that the annual contracted quantity of fixed-term LNG contracts could fall from 79 MTPA in 2022 to 55 MTPA in 2030.[128] At the same time, however, Japan's New International Resource Strategy for Enhancing LNG Security sets a 2030 LNG handling target of 100 MTPA for Japanese companies.[129] As a result of this strategy, combined with declining demand at home, Japanese companies are likely to continue cultivating LNG demand elsewhere in Asia by investing in downstream infrastructure and pursuing trading and resale opportunities.

South Korea's LNG imports declined 4.9% in 2023, as high and volatile LNG prices placed downward pressure on demand in power and city gas sectors. According to customs data, South Korea imported 44.12 MTPA in 2023 at a total cost of USD36.1 billion.[130]

In the power sector, gas usage slumped 4.9% in 2023,[131] mainly due to high LNG fuel costs.[132] Higher power generation costs have placed significant financial strain on the state-run power utility, Korea Electric Power Corporation (KEPCO), which recorded losses of more than KRW44 trillion from 2021 to Q3 2023.[133] These challenges, along with political pressure to maintain low power tariffs for consumers, led to higher nuclear and renewable generation in 2023.[134]

The trend is expected to persist in the coming years.[135] The Yoon Seok-Ryul administration aims to raise the share of nuclear in Korea's power mix to 34.6% by 2036.[136] Five new reactors with a combined 7,000 megawatts (MW) of capacity are expected to come online between 2024 and 2033, bringing total nuclear capacity to 31.65 GW.[137] In addition, South Korea aims to construct an additional 23.65 GW of renewables by 2033,[138] raising the country's total renewables capacity to 54.16 GW.[139] The planned startup of new coal-fired power plants will likely erode LNG demand further.[140]

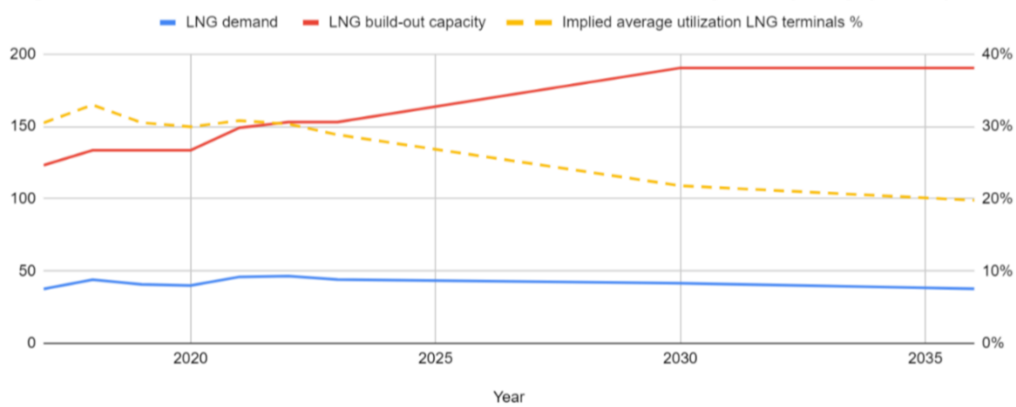
[128] JOGMEC. Results of FY2023 Survey on Destination Clauses and Price Indices in Fixed-term LNG Sales and Purchase Agreements concluded by Japanese companies. November 10, 2023.
[129] METI. Japan's New International Resource Strategy for Enhancing LNG Security. July 22, 2020.
[130] KITA. K-Stat Homepage.
[131] Korea Energy Economics Institute (KEEI). Website.
[132] Prices from LNG-fired power generation hit the second highest ever at an average of KRW182.54/kWh in 2023, following 2022's unprecedented KRW204.72/kWh. Electric Power Statistics Information System (EPSIS). Website.
[133] Yonhap infomax. KEPCO, 2 trillion net profits in Q3 after hiking power tariffs, additional hikes needed. December 11, 2023.
[134] KEPCO. Monthly Power Statistics Update. November 10, 2023.
[135] MOTIE. 10th Power Market Supply-Demand Plan (PSDP). January 12, 2023, p.7.
[136] MOTIE. 10th PSDP. January 12, 2023, p. 7.
[137] The 1,400MW Shin Hanul #1 nuclear power plant started Dec. 7, 2022, after 12 years of delays since construction began in 2010, while Shin Hanul #2 (1,400 MW) is anticipated to complete construction in April 2024. Saewul #3 (1,400 MW) and #4 (1,400 MW) are projected to come online by October 2025, and Shin-Hanul #3 (1,400 MW) and #4 (1,400 MW) are expected to be operational by 2032 and 2033, respectively.
[138] KEPCO. Monthly Power Statistics Update. November 10, 2023.
[139] KPX. Construction of power plants update. November 2023, p. 7.
[140] Samcheok Bluepower #1 and #2, with a combined capacity of 2,100 MW, are planned to start commercial operations in 2024. KPX. Website.

By contrast, the share of LNG in the power mix is projected to fall to 9.3% in 2036, from 27.2% in 2023.[141,142] MOTIE estimates that natural gas demand in power will decline from 22.89 MTPA in 2023 to 11.09 MTPA in 2036 at an average annual decline of 5.4%.[143] The role of LNG in South Korea's power mix is expected to diminish further with accelerated net-zero targets. At COP28, South Korea backed pledges to triple global renewable energy capacity by 2030,[144] and triple nuclear energy capacity by 2050.[145]

In the city gas sector, South Korean gas demand declined 7.4% in 2023, representing the steepest contraction in five years. Since 2022, the government has raised city gas tariffs for residential and commercial segments four times due to soaring LNG prices.[146] Due to higher city gas tariffs, many petrochemical, metal and cement companies switched to the cheaper energy resources, such as liquefied petroleum gas (LPG).[147]

Despite the negative outlook for LNG demand, South Korean companies have proposed 37 MTPA of new regasification capacity, which would increase the country's total to 190 MTPA. Assuming the projects are completed, and South Korea meets its climate and energy targets, IEEFA expects that fleetwide utilization of import terminals could fall from 30% in 2023 to 20% in 2036.[148] The country already has some of the lowest utilization rates for existing LNG terminals compared to other major LNG-importing economies.

Figure 9: Forecasted South Korea Demand for LNG vs. LNG Import Capacity (MTPA)



Source: IEEFA, MOTIE, KITA (Korean International Trade Association). Note: LNG demand in 2021-2023 was based on LNG imports data from KITA, while those from 2024-2030 are estimation from MOTIE.

[141] MOTIE. 15th Natural Gas Supply-Demand Plan. April 27, 2023.
[142] Korea Energy Statistical Information System (KESIS). Monthly Energy Statistics Update. October 2023.
[143] MOTIE. 15th Natural Gas Supply-Demand Plan. April 27, 2023, p. 8.
[144] Nikkei. What COP28 vow to triple renewable energy means for Asia. December 4, 2023.
[145] New York Times. 22 Countries Pledge to Triple Nuclear Capacity in Push to Cut Fossil Fuels. December 2, 2023.
[146] Residential tariffs surged 34.3% in 2022, while commercial tariffs increased by 33.5% to 35.8%, according to MOTIE.
[147] Gas News. 'Exodus LNG' by industries amid hikes in gas tariffs. September 15, 2023.
[148] IEEFA. South Korea's LNG Overbuild. November 2023, p. 5.

Taiwan's LNG imports rose 1% in 2023 to 20.6 MTPA, as lower electricity demand and higher renewable generation limited the gas requirements needed to offset for declining nuclear output, which fell 25%.[149,150] A reduction in electricity demand of 1.3%, paired with solar generation growth of 21% and a 75% increase in wind output following the commissioning of the 376MW Formosa 2 offshore wind development, helped limit LNG demand growth.[151,152,153]

Taiwan's plan to achieve a nuclear-free power sector by 2025 and lower coal-fired generation may lift LNG imports this decade, but new LNG infrastructure developments have faced setbacks. The Ministry of Economic Affairs (MOEA) aims to increase the share of gas in the power mix to 50%, up from the current 40%. However, Taiwan's two existing LNG terminals—with a combined 16 MTPA of import capacity—already operate at utilization rates that exceed 100%, meaning MOEA plans will likely require additional capacity.[154] Proposed projects from state-owned utilities would increase regasification capacity to 34 MTPA. However, new projects have hit environmental and legal challenges and are not expected online until 2025 at the earliest, limiting short-term LNG demand growth.

Taiwan's commitment to grow renewable capacity could help reduce LNG requirements, as it did in 2023. Large electricity consumers are required to meet 10% of their contracted power capacity with renewable energy by 2025.[155] Total renewable capacity hit 15 GW in 2023.[156] While this is an increase from 12 GW in 2022, the pace will need to accelerate to hit Taiwan's 2025 target of 27 GW.[157,158]

Higher imported fuel prices in recent years have strained utilities and put upward pressure on consumer power bills. State-owned power company Taipower continues to suffer losses of TWD227 billion (USD7.2 billion) in 2022 and TWD158 billion (USD5 billion) due to its inability to fully pass rising costs onto consumers,[159,160] despite recent changes to electricity pricing designed to mitigate mounting losses. Meanwhile, state-owned gas supplier CPC is not authorized to raise prices for power buyers by more than 6% per quarter and continues to absorb higher fuel costs, resulting in cumulative losses of at least TWD300 billion (USD9.5 billion) over the past two years.[161]

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[149] This was due to the decommissioning of Unit 2 of the Kuosheng nuclear plant. Taipower. Kuosheng Nuclear Power Plant Unit No. 2 Decommissioned.
[150] S&P Global. Taiwan's CPC seeks 14 LNG cargoes for one year amid worsening drought. March 13, 2023.
[151] ESIST. Electricity Consumption, March 5, 2024.
[152] ESIST. Power generation. March 5, 2024.
[153] Formosa. About Formosa 2.
[154] MOEW. Energy Transition Promotion Scheme.
[155] Taipei Times. Rules to tie heavy electricity use to renewable power. January 2, 2021.
[156] ESIST, Power generation unit capacity. March 5, 2024
[157] 27 GW of renewable capacity by 2025, including 5.6 GW of offshore wind and 20 GW of solar, and 13.1 GW of offshore wind and 31 GW of solar by 2030; MOEA. Key Strategies for Taiwan's 2050 Net-Zero Transition (Draft).
[158] Energypedia, Energy Transition in Taiwan.
[159] Taipower. Policy Burden.
[160] Taipower. General Shareholders Meeting Reviews 2022. 2022.
[161] CPC. 2023 Annual Report. 2023.

C. Demand Outlook: China

Domestic production and pipeline imports are likely to continue to constrain LNG demand growth. China's domestic natural gas production is likely to grow rapidly as economics, policy directives and investment trends support development of unconventional resources. Pipeline imports may also increase in the short term through the existing infrastructure, potentially limiting LNG imports.

Unprecedented increases in renewable energy are outcompeting natural gas use for power. As renewable energy capacity and generation skyrocket, the share of natural gas in the generation mix has stagnated. Renewables and coal are likely to continue to take precedence in the power sector, limiting penetration of natural gas and LNG.

Demand is unlikely to surpass pre-invasion levels until 2025. Due to a rapid uptick in long-term contracts that begin delivery in 2024, Chinese companies are likely to increase LNG trading activity with buyers in other regions. In the medium-term, IEEFA expects a growing surplus of contracted LNG volumes to emerge, as new contracts beginning delivery outpace LNG demand growth. Similar to Japanese companies, Chinese LNG players are investing heavily in LNG infrastructure in emerging Asian markets to cultivate demand.

Recent Developments

China reclaimed its position as the world's largest LNG importer in 2023. Imports increased 12.4% to 72.1 MTPA. However, LNG purchases have not fully recovered to levels before the Russian invasion of Ukraine and remain 10% below 2021 imports.

Overall gas demand in 2023 is projected to rise almost 4% to 390 bcm after declining 1.2% in 2022.[162] Although gas demand grew at an average annual rate of 8% over the last decade, estimates from PipeChina imply that demand could grow at a slower rate of 4.3% per year, with a peak in 2035.[163] The IEA, meanwhile, expects just 2% annual growth through 2030.[164]

Recent government plans point to lower gas demand growth forecasts. China's draft Gas Utilization Policy released in September 2023, for example, aims to slow coal-to-gas switching in low-income areas; constrain gas-fired expansion, particularly in coal producing regions; and limit the production of chemicals from gas feedstocks, among other measures. PetroChina's gas sales unit also reportedly cut peak gas demand by as much as 31%—from 700 bcm to 535 bcm—after China announced its 2060 carbon neutrality pledge in September 2020.[165]

[162] S&P Global. China's natural gas consumption to grow 5.5%-7% in 2023, reverse 2022 decline: NEA. July 26, 2023.
[163] Energy Voice. China's gas demand to peak by 2035. June 28, 2021.
[164] IEA. World Energy Outlook 2022. October 2022, p. 366.
[165] Energy Voice. China's gas demand to peak by 2035. June 28, 2021.

The share of LNG in China's natural gas supply has increased to 26% in 2023, up from 15% a decade earlier. LNG procured from long-term contracts has also increased. Due to recent volatility in spot markets, Chinese companies signed more than 50 MTPA of new contracts in 2021 and 2022.[166] As a result, the share of China's spot and short-term volumes declined from 46% in 2021 to 18% in 2023 and could decline even more as new contracts begin deliveries.[167,168]

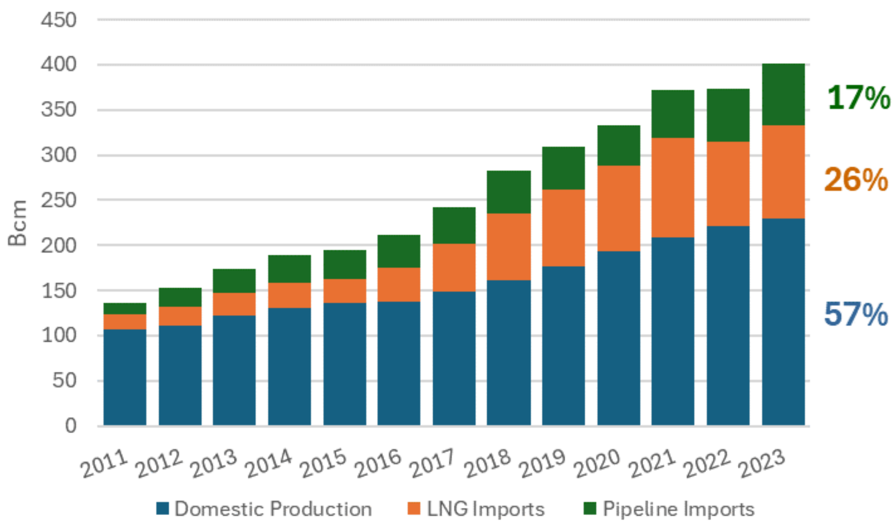
China's role as a balancing buyer in global gas markets is set to increase in the coming years, clouding the outlook for LNG demand growth. As the country's overall gas demand rises, domestic gas production and pipeline imports may limit LNG imports until prices fall to more competitive levels. At that point, China may increase LNG purchases from spot and short-term markets. Due to rapid increases in long-term contracts, however, China may seek to mitigate a growing surplus of term volumes by selling excess supplies abroad.

Piped gas imports: China increased its pipeline gas imports by 6.2% in 2023, from 64.8 bcm in 2022 to 69.2 bcm.[169,170] Pipeline imports from Russia increased to 22.5 bcm, up from 16 bcm in 2022.[171] Gazprom expects the Power of Siberia pipeline to reach peak capacity of 38 bcm by 2025, a 70% increase from last year's levels.[172] In the long-term, China has plans to expand pipeline import capacity by 70 bcm with Russia and 30 bcm with Turkmenistan.[173] These projects are not expected online this decade, but could negatively affect China's longer-term LNG demand.

IEEFA estimates that LNG prices would have to fall below USD8-USD9/MMBtu to compete with the cost of China's pipeline gas imports and below USD6/MMBtu to compete with domestically produced gas. Until then, China will continue to have an economic incentive to favor pipeline gas imports over imported LNG.

[166] Based on ICIS contract data.
[167] Center on Global Energy Policy. Implications of China's Unprecedented LNG-Contracting Activity. October 7, 2022.
[168] ICIS. 2024 LNG Global Supply & Demand Outlook. February 2024.
[169] Pipeline imports accounted for 40% of China's total gas imports in 2023. LNG Prime. China's LNG imports increased 12.6 percent in 2023. January 18, 2024.
[170] China imports gas through three major pipelines, including the Power of Siberia 1 from Russia, Central Asia-China gas pipeline from Turkmenistan and the Sino-Myanmar Pipeline.
[171] The Interpreter. Beijing digs in for the Central Asia-China gas pipeline. December 13, 2023.
[172] Reuters. Russian pipeline gas exports to China to exceed 22.5 bcm in 2023 – Gazprom. December 28, 2023.
[173] Reuters. Russia's weaker hand undermines case for Power of Siberia 2 gas link to China. October 30, 2023.

Figure 10: China Gas Supply by Source



Source: Energy Institute. Statistical Review of World Energy. 2023; 2023 figures compiled from China's General Administration of Customs, LNG Prime, Kpler.

Domestic gas production: China is the world's fourth-largest gas producer and output has increased by an average of 13.2 bcm per year since 2017.[174] In 2023, domestic gas production grew 5.6% to 230 bcm.[175,176] IEEFA expects production to reach 250 bcm by 2025. In 2022, China's total domestic upstream investment reached a record USD51.2 billion, a 19% annual increase.[177] China's 2023 Natural Gas Development Report, which provides insights into the government's view on domestic and international gas developments, also has a goal of meeting 50% of China's demand with domestically produced gas.

Domestic coal output growth and renewables: China's domestic coal output rose 3% to 4.66 billion metric tons in 2023.[178] Meanwhile, coal imports surged 61.8% to 474.4 MT due to falling prices, among other reasons.[179,180] The country has also approved 260 MT of new annual coal production capacity, which would increase total capacity to 5.05 billion metric tons. Coal production and imports are likely to limit the role for LNG, particularly in the power sector.

Renewable power deployment also accelerated in 2023, as China added 293 GW of wind and solar capacity. Meanwhile, gas capacity additions have averaged just 10 GW annually in recent years. As a

[174] IEEFA calculation based on data from: Energy Institute. Statistical Review of World Energy. 2023; S&P Global. China's 2023 oil and gas output hits record high 390 mil mt oil equivalent. January 10, 2024.
[175] Increases came largely from the Sichuan, Ordos and Tarim basins. S&P Global. China's 2023 oil and gas output hits record high 390 mil mt oil equivalent. January 10, 2024.
[176] Roughly 43% of gas production was from unconventional sources such as tight gas, shale gas and coal bed methane. China Daily. Domestic oil, gas production hits record in 2023. January 10, 2024.
[177] Center on Global Energy Policy. Inside China's 2023 Natural Gas Development Report. September 11, 2023.
[178] Reuters. China's 2023 coal output hits record high. January 16, 2024.
[179] This compares to a decline in coal imports of 9.2% in 2022. Reuters. China's 2023 coal imports hit record on rising demand, high domestic prices. January 11, 2024.
[180] Reuters. China boosts coal output, eases Australia ban to bolster energy security. January 9, 2023.

share of generation, renewables have quadrupled from 4% market share in 2015 to 16% in 2023, according to Ember data. Over that time, the share of gas has remained at roughly 3%.

LNG contracts: Despite policies designed to limit dependence on LNG imports, the 2023 Natural Gas Development report also emphasizes the importance of long-term LNG procurement contracts to ensure energy security. According to BNEF data, contracts with a combined volume of 12.3 MTPA are expected to begin delivery in 2024,[181] up from 6.8 MTPA of contracts that began in 2023.[182] Long-term contract volumes are set to increase from 72.7 MTPA in 2023 to more than 112 MTPA in 2028, before to falling to 105 MTPA in 2030.

Despite the start of new contracts, LNG demand in 2024 is still not expected to surpass levels before the Russian invasion of Ukraine.[183] This suggests that China will have a growing surplus of contracted LNG to resell to other markets.[184] According to Kpler data, Chinese buyers sold 6.8 MTPA in 2023, up from 4.3 MTPA sold in 2022. By some estimates, buyers could have an excess of 8 MTPA by 2026.[185] Under lower gas demand scenarios, the IEA states that China could face a natural gas surplus of 80 bcm (58.8 MTPA) by 2030.[186]

As surplus contract volumes increase, Chinese companies are likely to become increasingly active traders, putting them in more direct competition with large portfolio players.[187] Chinese companies also are likely to play a more active role creating LNG demand in emerging markets by investing in midstream and downstream assets.

D. Demand Outlook: India, Bangladesh and Pakistan

Sustained demand growth will be challenged by LNG volatility. LNG prices below USD10/MMBtu will likely encourage some rebound of demand in the region. However, price volatility may continue to challenge sustained demand growth in price-sensitive South Asian countries, particularly during periods of heightened buying activity by other regions. New sales and purchase agreements (SPAs) in Bangladesh and India do not begin until 2026, adding uncertainty to rapid demand growth forecasts in the short term.

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[181] A large share of these volumes is expected to come from Russia's Artic LNG 2 project, which could face unexpected delays.
[182] Note that while estimates for China's long-term contract volumes vary widely, BNEF figures align closely with data from the state-owned China National Petroleum Corporation's Economics & Technology Research Institute. S&P Global. China 2024 LNG imports expected to rise 8.1% on year to 77 mil mt: CNPC ETRI. February 29, 2024.
[183] For example, the state-owned China National Petroleum Corporation's Economics & Technology Research Institute expects LNG demand to reach 77.1 MTPA in 2024. Similarly, ICIS expects LNG demand to rise to 78 MTPA in 2024. Both estimates remain below 2021 imports of 79.6 MTPA. S&P Global. China 2024 LNG imports expected to rise 8.1% on year to 77 mil mt: CNPC ETRI. February 29, 2024; ICIS. 2024 LNG Global Supply & Demand Outlook. February 2024.
[184] In 2023, Chinese companies expanded trading desks in London and Singapore to manage excess supply. Natural Gas Intelligence. China Moving More Aggressively to Trade Surplus LNG on Global Market. August 31, 2023.
[185] Reuters. China LNG buyers expand trading after adding more US, Qatari contracts. August 21, 2023.
[186] IEA. World Energy Outlook 2023. October 2023, p. 238.
[187] For more discussion of portfolio players, please see Section 2.

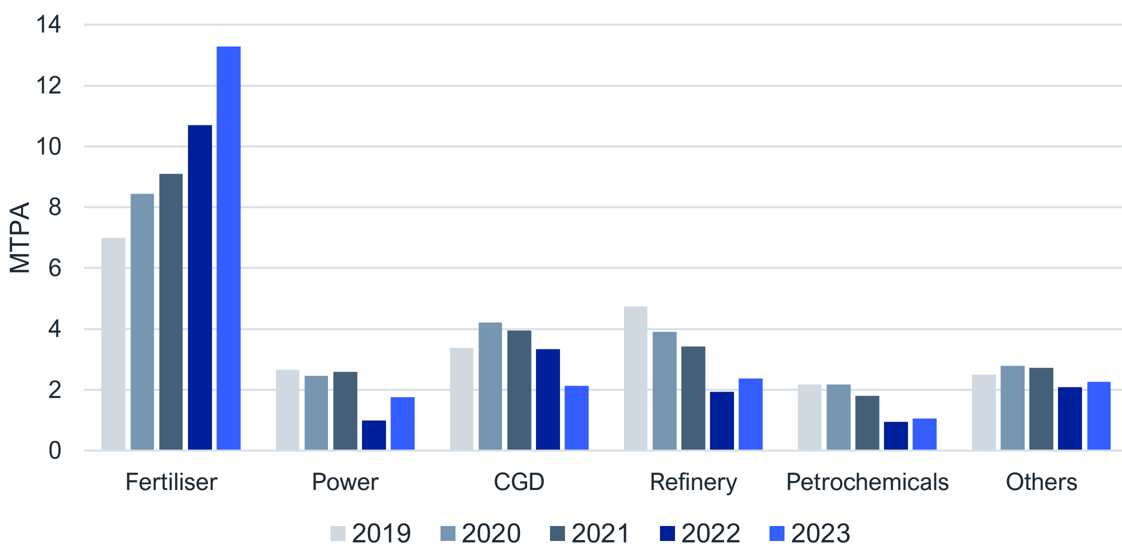
The role of LNG in power generation is likely to remain low. The share of gas-fired generation in India's power mix remains at just 2% and the country has no plans to build more gas-fired power plants. Pakistan announced in 2023 it would no longer build any new LNG-fired power plants. In Bangladesh, new nuclear facilities and coal-fired power plants may reduce the capacity utilization of gas-fired power plants.

Persistent fiscal challenges could limit near-term demand growth. Bangladesh currently faces outstanding energy payments of USD5 billion, due to a high reliance on imported fossil fuels, including LNG. Meanwhile, LNG suppliers have charged Pakistan high premiums to spot market rates to compensate for ongoing credit risks. Although lower prices may alleviate some of these issues, fiscal challenges will likely continue to undermine rapid LNG demand growth.

Recent Developments

The government of **India** has set ambitious targets to increase the country's overall natural gas consumption from 51.3 MTPA to 139 MTPA by 2030,[188] with the majority of growth expected to be met by LNG imports. In 2022, however, LNG imports fell 17% due to LNG price spikes, demonstrating the country's sensitivity to volatile prices. As markets eased in 2023, India's LNG demand rebounded by 9% to 22 MTPA. However, demand remains well below levels seen before the Russian invasion of Ukraine.

Figure 11: India's LNG Consumption by Sector, 2019 to 2023



Source: IEEFA analysis based on PPAC's Natural Gas Production, Availability and Consumption reports. Note: "CGD" stands for City Gas Distribution.

[188] Or 185 million metric standard cubic meters per day (mmscmd) to 500 mmscmd.

The fertilizer sector accounts for the largest share of India's LNG demand (Figure 11), due largely to government subsidies that help the sector absorb price shocks in global markets. In 2023, demand in the fertilizer sector increased 24%. The government has budgeted USD22.7 billion for subsidies in the fertilizer sector for the 2024 fiscal year.[189] However, gas usage in the fertilizer sector could increasingly compete with hydrogen technologies, which are being piloted at scale. About 5.8 MTPA of green ammonia capacity is under construction, with first production likely in 2027.[190]

Power sector consumption of LNG has been low due to the high costs of gas-based power. From 2022 to 2023, at least half India's 62 gas-based power plants did not generate any electricity, although the government will continue to use gas plants for peak demand requirements in 2024.[191] Gas-based power currently accounts for 1.8% of the generation mix while renewable energy has grown to a 15.6% market share. According to government officials, gas-based power costs INR13-14 (USD0.16-0.17), while renewable electricity costs just INR2.4 (USD0.029).[192]

In the longer term, the government does not intend to build any new gas-based power plants. Meanwhile, renewables capacity is rapidly expanding and targeted to reach 500 GW by 2030. Renewables generation, including hydropower, is expected to increase to 40% of the generation mix by 2029-30.[193] Over that time, gas-based generation may be limited to a peaking role as a tool for grid flexibility, rather than for baseload power.

Regarding gas supply, India is investing in new pipeline and import terminal infrastructure. As of September 2023, roughly 10,009 kilometers (km) of gas pipelines were under construction,[194] along with 24 MTPA of proposed new LNG regasification capacity.[195] If built, new terminals would bring total import capacity to 71.7 MTPA. Notably, however, utilization rates for pipeline and gas infrastructure have remained low. From April to November 2023, all but one regasification terminal operated at rates below 35%.[196] City gas demand also is increasing at a slower rate than distribution network connections,[197] indicating that the utilization of distribution infrastructure could fall. For example, the number of city gas distribution network connections increased 38% in 2022 and 2023, but gas consumption increased just 0.1% over the same period.

As a result of spot market volatility in recent years, Indian LNG buyers aim to increase volumes sourced from long-term contracts. In February 2024, for example, Petronet renewed a 20-year

[189] Note: India's fiscal year runs from April 2023 to March 2024. IEEFA. Volatile global LNG market: Impact on India. February 12, 2024.
[190] ET Energy. India set to add 5.8 million tonne of green ammonia manufacturing capacity. 2 November 2023.
[191] Money Control. Exclusive: No plan to increase gas-based power generation, says RK Singh. January 4, 2024.
[192] *Ibid.*
[193] Central Electricity Authority. Report on Optimal Generation Capacity Mix for 2029-30. April 2023.
[194] Ministry of Petroleum & Natural Gas (India). Snapshot of India's Oil & Gas Data. December 2023.
[195] Gas Exporting Countries Forum. Global Gas Outlook 2050. March 2024.
[196] The Dahej terminal operated at 94% and was the only one to operate above 35%.
[197] India is aiming to expand the city gas distribution network to the entire country by 2032.

contract to buy 7.5 MTPA starting in 2028.[198] GAIL also recently signed a 10-year contract to buy 1 MTPA from Vitol Asia beginning in 2026.[199]

In 2022, **Bangladesh** reduced LNG imports by 14.4% due to skyrocketing prices. In 2023, however, the country's LNG purchases rebounded by 17.9% year-over-year to 4.97 MTPA (238.72 billion cubic feet) as prices retreated.[200]

Rising LNG imports are driven largely by lower domestic gas production. In FY23, local gas production fell 4.6%, following a 5.7% decline in FY22.[201,202] Due to gas shortages, Bangladesh aims to increase LNG regasification capacity from its existing 7.6 MTPA (1 billion cubic feet per day). The average annual utilization rate of the existing regasification fleet is roughly 65.4%.[203]

The government recently approved a proposal to build the country's third LNG terminal with a 4.6 MTPA (600 million cubic feet per day, or mmcfd) capacity,[204] as well as a 0.75 MTPA (100 mmcfd) expansion of an existing terminal.[205] The government also signed a term sheet with Excelerate Energy for another terminal of 3.8 MTPA (500 mmcfd).[206] The country has signed new contracts with Oman and Qatar for 1.5 MTPA each, as well as a 0.8-MTPA contract with Excelerate, which all begin in 2026. Bangladesh currently has three long-term LNG contracts with Oman and Qatar for a combined capacity of 4.75 MTPA.[207]

Until new contracts begin, imports may increase only marginally in the coming years due to tight fiscal conditions. Bangladesh has recently struggled to clear USD5 billion of energy payments.[208] The Bangladeshi taka depreciated 28.8% between December 2021 and September 2023,[209] adding to the cost of LNG in local currency terms. To alleviate import dependence and find cheaper alternative gas sources, the government recently invited international companies to bid for offshore gas exploration licenses.[210]

The power sector is the largest gas-consuming sector, accounting for 41.8% of total demand in FY2023. The industrial sector, captive power generation and households account for a combined 47.6% of consumption.[211] In the power sector, natural gas has been used mostly to provide baseload

[198] Bloomberg. India Gets Cheaper LNG From Qatar in Landmark New Supply Deal. February 7, 2024.
[199] SP Global. India's GAIL and Vitol Asia sign 1 million mt/year LNG supply contract. January 5, 2024
[200] Imported LNG contributed to 23.57% of total gas consumption in 2023. Hydrocarbon Unit, Energy & Mineral Resources Division. Monthly Reports on Gas and Coal Reserve & Production January 2023 - December 2023. June 2023 – March 2024.
[201] Bangladesh's fiscal year runs from July to June.
[202] Hydrocarbon Unit, Energy & Mineral Resources Division. Annual Reports on Gas Production and Consumption, 2015 – 2023. February 2016 – October 2023.
[203] Based on IEEFA calculations.
[204] The Daily Star. Summit Gets Govt Nod to Set up Country's 3rd Floating LNG Terminal. June 14, 2023.
[205] The Daily Star. Govt to Buy LNG from Excelerate under 15-year Pact. October 26, 2023.
[206] Energy & Power. Gas Guesstimates Offer Fluffy Hope. February 6, 2024.
[207] The Daily Star. Govt to Buy LNG from Excelerate under 15-year Pact. October 26, 2023.
[208] United News of Bangladesh. Power, Energy Sectors are Saddled with USD5 Billion Outstanding Payment Amid Dollar Crisis: Sources. December 24, 2023.
[209] IEEFA. Towards a Rooftop Solar Transition in Bangladesh. December 18, 2023.
[210] The Business Standard. Offshore bidding opens today with 'attractive' PSC. March 10, 2024.
[211] Hydrocarbon Unit, Energy & Mineral Resources Division. Annual Report on Gas Production, Distribution and Consumption FY 2022-23. 26 November 2023.

power. The government also aims to bolster baseload generation by commissioning two units at the Rooppur nuclear power facility in the next two years.[212]

On the other hand, the government has also recently signed contracts for several gigawatts of new renewable energy projects. IEEFA also believes that instead of increasing only baseload capacity, Bangladesh may opt for higher gas-fired peaking capacity to accommodate increasing renewables generation. Bangladesh may also seek to limit the growth of LNG imports by frontloading demand-side energy efficiency in industrial processes and captive power generation.

Pakistan's LNG imports increased marginally in 2023 to 7.2 MTPA, up from 6.9 MTPA in 2022. However, imports remain 13% below 2021 levels, and the country has largely been excluded from spot markets due to high prices and fiscal concerns. In June 2023, for example, state-owned Pakistan LNG Limited (PLL) issued a tender for six LNG cargoes for winter delivery that did not receive a single bid.[213]

High prices and supplier defaults in 2022 devastated the Pakistani economy, causing blackouts and fuel shortages for key sectors.[214,215] As a result, the country announced in February 2023 that it would no longer build new LNG-fired power plants.[216] Although Pakistan was once expected to be among the largest LNG demand growth markets globally,[217] the policy reversal demonstrates clearly how volatility in LNG markets can alienate new demand creation. Although Shell announced in 2019 plans to build five LNG import terminals in Pakistan, the company exited the country altogether in June 2023.[218]

More recently, suppliers have demanded a premium on spot cargo shipments to Pakistan to compensate for the country's high credit risk. In September 2023, PLL procured one cargo for December delivery at a 13% premium to the Japan-Korea Marker (JKM) price, after receiving bids that were almost 40% higher than spot market rates.[219] IEEFA expects that the country will continue to pay a premium for individual cargoes, likely limiting draws on the spot market.

Instead, Pakistan has looked to sign long-term contracts for new LNG supplies, albeit with limited success. In June 2023, the government signed a year-long "framework agreement" with Azerbaijan state-owned oil company SOCAR for the delivery of 12 cargoes on flexible terms and concessionary pricing.[220] Under the agreement, however, SOCAR is not obligated to sell cargoes and Pakistan is

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[212] World Nuclear Association. Nuclear Power in Bangladesh. March 2024.
[213] Profit. Pakistan receives zero bids in latest LNG tender, signaling continued energy crisis. June 20, 2023.
[214] The News International. Energy crisis feared in July as gas supplier defaults again. June 25, 2022.
[215] The Express Tribune. Gas shortage paralyses textile industry in Sindh, Balochistan. May 24, 2023.
[216] Bloomberg. Pakistan Plans U-Turn on Fuel Imports After Prices Surge. February 14, 2023.
[217] Deloitte. Remodel, reinvent – How technology and changing business models are impacting the future of LNG. 2018.
[218] Pakistan Today. Shell is exiting Pakistan. What does it mean and what could the transaction look like? June 15, 2023.
[219] Bloomberg. Pakistan Buys Spot LNG Shipment for First Time in Over a Year. October 4, 2023.
[220] Arab News. Pakistan signs framework agreement with Azerbaijan for LNG procurement on flexible terms. July 24, 2023.

not required to purchase them, suggesting that the contract does little to alleviate supply uncertainties, especially during winter months when the supply-demand deficit widens.[221]

New LNG import projects in Pakistan have also remained at a standstill. The USD200 million Energas LNG terminal, for example, continues to face bureaucratic hurdles despite ongoing government engagement.[222] In September 2023, Japan's Mitsubishi Corp. sold its 100% stake in the proposed Tabeer LNG project.[223] The new project owner, the United Arab Emirates' Bison Energy, now aims to expand the project but could face similar administrative hurdles.

E. Demand Outlook: Southeast Asia

Access to affordable LNG supplies will remain challenging in the near-term, despite new import terminals. The Philippines and Vietnam began importing LNG in 2023, but neither country has secured a long-term contract to purchase LNG. Falling spot prices will likely support additional buying activity, but volatility in spot markets—due to seasonal price swings, weather, geopolitical risks, supply outages and trade route disruptions, among other factors—may limit short-term demand growth.

Risk allocation in power purchase agreements (PPAs) remains a holdup for new LNG-to-power projects. For new LNG importers in Southeast Asia, contracting disputes and prolonged PPA negotiations have undermined international project financing for large LNG-to-power projects. Delays to anchor LNG projects, along with the acceleration of lower-cost power alternatives, are likely to constrain the role for LNG in the region's electricity generation.

High and volatile LNG costs have added financial and political pressure to find alternative energy sources. The growth of LNG imports has incurred financial challenges at state-owned utilities. High LNG costs in recent years have strengthened political incentives to shift to cheaper alternative energy sources, including renewables and domestic gas. New policies to support renewables deployment, along with renewed domestic gas exploration efforts, may rein in long-term LNG demand growth.

Recent Developments

Southeast Asia's macroeconomic growth forecasts and gas production declines have created outsized industry expectations for LNG demand growth. LNG suppliers and traders are counting on rapid growth in the region to absorb new supply and are heavily investing in mid- and downstream LNG infrastructure—including regasification terminals, power plants and city gas distribution companies, among other assets—to cultivate new demand.

[221] The deficit can reach 360-470 million cubic feet per day.
[222] The News International. Govt pushes for Qatari LNG project amid pipeline bottleneck. September 22, 2023.
[223] Pakistan Today. CCP approves two mergers; allows takeover of LNG terminal operators. September 30, 2023.

However, case-by-case negotiations and multi-year development timelines for LNG supply infrastructure in prospective markets, as well as the relatively favorable economics of alternative energy sources, may restrain the region's LNG growth potential. And while a potentially oversupplied market and lower prices may encourage some increased demand from established buyers, longer-term structural demand growth could face challenges due to infrastructure delays, financing challenges and economic competition with alternative energy sources.

Vietnam received its first shipment of LNG in July 2023—a commissioning cargo for the new Thi Vai terminal. The inaugural cargo was reportedly delivered by Shell at a per-unit price of ~USD13.90/MMBtu, or almost USD56 million for the full cargo. As of March 2024, the country had not imported another LNG shipment, although state-owned oil and gas company PetroVietnam released a tender for two additional cargoes in 2024.[224]

Despite the completion of the country's first LNG terminal, LNG demand growth faces significant hurdles. LNG-fired power plants, which serve as anchor customers for LNG infrastructure, have been repeatedly delayed. For example, the Nhon Trach 3 facility is aiming to become the country's first LNG-fired power plant by the end of 2024,[225] but completion could be delayed beyond 2027.[226] PPAs have still not been reached between the plant developer and the state-owned electric utility EVN despite more than two years of negotiations and there is still no clear legal guidance governing the passthrough of LNG fuel costs.[227, 228]

EVN has also expressed concerns about LNG prices, which have been significantly higher than domestic gas costs. Pricing risks are especially stark considering the country does not currently have any long-term LNG supply contracts. In discussions with Novatek and ExxonMobil for long-term supplies, the state-owned gas utility PV Gas reportedly sought "unrealistically low prices."[229]

Meanwhile, renewable energy has cut the role of gas in Vietnam's power mix. Since 2019, gas-fired power generation has fallen 34%, according to Ember data.[230] This is due largely to the more than doubling of renewable energy generation.[231]

Similarly, **the Philippines** began importing LNG in 2023 following the commercial startup of the country's first two LNG import terminals. According to customs data, the country imported 0.76

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[224] LNG Prime. PetroVietnam Gas seeks spot LNG cargoes. February 28, 2024.
[225] An additional unit, Nhon Trach 4, is targeting completion by the end of 2025.
[226] Reuters. Vietnam's big bet on LNG may not ease its power crisis. July 17, 2023.
[227] Viet Nam News. Experts and economists seek ways to ensure fuel security. November 11, 2023.
[228] One sticking point is that PV Power is aiming to sell 90% of the power generated from LNG-fired facilities to EVN at a set price for 15 years, but EVN is seeking a lower commitment. According to Nguyen Duy Giang, deputy director general of PV Power, "The most challenging aspect at present is the protracted PPA negotiations between PV Power and EVN." Vietnam Investment Review. Vietnam's LNG power projects face contractual hurdles and rising import costs. August 29, 2023.
[229] Reuters. Vietnam's big bet on LNG may not ease its power crisis. July 17, 2023.
[230] Ember. Viet Nam. May 2023.
[231] S&P Global Commodity Insights. Sluggish LNG imports expected in the Philippines and Vietnam. July 10, 2023.

million metric tons of LNG from April 2023 to February 2024, at a total cost of USD577 million. IEEFA calculates that the average price per unit of LNG was USD13.91/MMBtu.

As in Vietnam, offtake contracts for LNG-to-power facilities have faced complications. In 2023, subsidiaries of San Miguel Global Power Holdings (SMGPH) cancelled two agreements to supply power from existing and proposed gas-fired power plants.[232] Both plants were recently awarded new, 15-year contracts with the Manila Electric Company (Meralco) in auctions to replace the nullified contracts, subject to regulatory approval. And in March 2024, SMGPH announced the sale of a 67% stake in both gas plants to Meralco and Aboitiz Power, although the merger also remains subject to regulatory approval.

Meanwhile, First Gen—another LNG buyer in the Philippines—has said it will not pursue the delivery of an additional LNG cargo with a firm commitment from Meralco to recover all fuel-related costs. Meralco has said that fuel cost recovery would also require regulatory clearance.[233]

As LNG facilities face regulatory hurdles, the Philippines government has advanced policies to accelerate renewable energy deployment. Over the past two years, roughly 5.6 GW of renewable energy projects have been awarded offtake contracts in centralized auctions. The country announced another auction set for August 2024 for an additional 4.4 GW of renewables capacity.[234] In November 2023, Bloomberg ranked the Philippines the fourth-most attractive emerging market for renewables investment.[235] Deployment of low-marginal-cost renewable energy threatens the dispatch of LNG-fired power plants in the country's wholesale power market. As a result, long-term power offtake contracts are essential for new LNG-fired power facilities to avoid merchant risk in the wholesale market.

LNG imports in **Thailand** increased 34% to 11.7 MTPA in 2023 to compensate for declining domestic gas production and lower pipeline imports from Myanmar. Meanwhile, gas demand increased due to the start of two units at Gulf PD's combined cycle plant in Rayong province. Two more units at the facility are targeting completion in 2024. However, the Ministry of Energy plans to minimize LNG imports in 2024, leading to expectations that Thailand's imports could remain flat this year compared to 2023.[236]

LNG imports in recent years have led to higher power costs, adding financial pressure on the state-owned utility, the Electricity Generating Authority of Thailand (EGAT). In July 2022, EGAT said it was facing a severe liquidity crunch after losing THB150 billion (USD4.3 billion) between September 2021 and December 2022 because of higher fuel costs.[237] EGAT has said it is unable to shoulder

[232] IEEFA. Contracting debacles underscore long-term LNG risks in the Philippines. April 11, 2023.
[233] Manila Standard. First Gen reviewing fourth LNG shipment. February 29, 2024.
[234] Enerdata. The Philippines will offer 4.4 GW of renewables in its 3rd Green Energy Auction. February 14, 2024.
[235] BNEF. India, China, Chile, the Philippines, and Brazil Top Ranking as the Most Attractive Developing Economies for Clean Energy Investment According to Report. November 29, 2023.
[236] S&P Global. State policies, domestic gas output may curb Thailand's LNG import growth in 2024. January 12, 2024.
[237] Bangkok Post. Power bills set to stay put amid Egat losses. April 26, 2023.

more fuel subsidies until 2025, meaning power prices could remain elevated for several years.[238] But due to political pressure to maintain lower rates, Thailand Prime Minister Srettha Thavisin rejected a tariff hike proposed for January 2024.[239,240]

Financial pressures on EGAT and political pressure to lower power rates could ultimately cause policymakers to explore alternatives to LNG. For example, the country hopes to double domestic production from its largest gas field in early 2024. In April 2023, the government announced winners of a feed-in tariff plan for 5 GW of new renewables capacity by 2030, with an additional 3.6 GW to be procured in a second phase.[241] The government has emphasized the role of clean energy in mitigating economic crises.[242]

In **Singapore,** LNG imports rose 30% year-over-year through November 2023 to offset declining pipeline imports from Indonesia and Malaysia. The country is planning a second import terminal to rely completely on LNG if pipeline supplies are disrupted or halted altogether. In the long-term, gas price volatility and supply disruptions are prompting a search for alternative supplies. In 2023, Singapore conditionally approved 4.2 GW of renewable electricity imports from Cambodia,[243] Vietnam and Indonesia. [244,245]

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[238] *Ibid.*
[239] Thai PBS World. Price of electricity from January-April to rise. November 29, 2023.
[240] The Nation Thailand. PM rejects electricity tariff hike proposal. December 3, 2023.
[241] Bloomberg. Energy Crisis Prompts Thailand to Accelerate Shift to Renewables. May 3, 2023.
[242] Vietnam Plus. Thailand's economy in crisis: PM Srettha Thavisin. December 14, 2023.
[243] Energy Market Authority (EMA). EMA Grants Conditional Approval for 1 Gigawatt (GW) of Electricity Imports from Cambodia. March 16, 2023.
[244] EMA. EMA Grants Conditional Approval for 1.2 Gigawatt (GW) of Electricity Imports from Vietnam. October 24, 2023.
[245] EMA. EMA Grants Conditional Approvals for 2 Gigawatt of Electricity Imports from Indonesia. September 8, 2023.

Appendix A: Global LNG Supply Facilities in Operation, 2023

Country	Project / Train	Start Year	Capacity (MTPA)
Brunei	Brunei LNG T1-T2	1972	2.9
Brunei	Brunei LNG T3-T4	1973	2.9
Brunei	Brunei LNG T5	1974	1.4
UAE	Das Island T1	1977	1.9
UAE	Das Island T2	1977	1.9
Algeria	Arzew GL1Z T1 - T6	1978	7.9
Algeria	Arzew GL2Z T1 - T6	1981	8.2
Malaysia	Malaysia LNG 1 Satu	1983	8.4
Australia	North West Shelf T1	1989	2.5
Australia	North West Shelf T2	1989	2.5
Indonesia	Bontang Train E	1990	2.9
Australia	North West Shelf T3	1992	2.5
UAE	Das Island T3	1994	3.2
Indonesia	Bontang Train F	1994	2.9
Malaysia	Malaysia LNG Dua T4-T5	1995	6.4
Malaysia	Malaysia LNG Dua T6	1995	3.2
Qatar	Qatargas I T1	1996	3.2
Qatar	Qatargas I T2	1997	3.2
Qatar	Qatargas I T3	1998	3.2
Indonesia	Bontang Train G	1998	2.8
Indonesia	Bontang Train H	1999	3.0
Qatar	Rasgas I T1	1999	3.3
Nigeria	Nigeria LNG T1	1999	3.3
Nigeria	Nigeria LNG T2	2000	3.3
Oman	Oman T1 - T2	2000	7.1
Qatar	Rasgas I T2	2000	3.3
Nigeria	Nigeria LNG T3	2002	3.3
Trinidad & Tobago	Atlantic LNG T2	2002	3.4
Trinidad & Tobago	Atlantic LNG T3	2003	3.4
Malaysia	Malaysia LNG 3 Tiga	2003	7.7
Qatar	Rasgas II T1	2004	4.7
Australia	North West Shelf T4	2004	4.6
Egypt	Damietta	2005	5.0
Egypt	Idku T1	2005	3.6

Egypt	Idku T2	2005	3.6
Oman	Qalhat	2005	3.3
Qatar	Rasgas II T2	2005	4.7
Nigeria	Nigeria LNG T4	2005	4.1
Nigeria	Nigeria LNG T5	2006	4.1
Trinidad & Tobago	Atlantic LNG T4	2006	5.2
Australia	Darwin LNG	2006	3.7
Equatorial Guinea	EG LNG	2007	3.7
Norway	Snohvit	2007	4.2
Qatar	Rasgas II T3	2007	4.7
Nigeria	Nigeria LNG T6	2008	4.1
Australia	North West Shelf T5	2008	4.6
Qatar	Qatargas II T1	2009	7.8
Qatar	Qatargas II T2	2009	7.8
Qatar	Rasgas III T1	2009	7.8
Indonesia	Tangguh LNG T1	2009	3.8
Russia	Sakhalin-2 T1 - T2	2009	10.8
Qatar	Rasgas III T2	2010	7.8
Indonesia	Tangguh LNG T2	2010	3.8
Norway	Stavanger	2010	0.3
Qatar	Qatargas III	2010	7.8
Peru	Peru LNG	2010	4.5
Qatar	Qatargas IV	2011	7.8
Australia	Pluto T1	2012	4.9
Algeria	Skikda GL1K	2013	4.5
Angola	Angola LNG	2013	5.2
Algeria	Arzew GL3Z	2014	4.7
Papua New Guinea	PNG LNG	2014	8.3
Australia	Queensland Curtis T1	2015	4.3
Australia	Queensland Curtis T2	2015	4.3
Australia	Gladstone LNG T1	2015	3.9
Indonesia	Donggi-Senoro	2015	2.0
USA	Sabine Pass T1	2016	5.1
USA	Sabine Pass T2	2016	5.1
Australia	Gladstone LNG T2	2016	3.9
Australia	Australia Pacific LNG T1	2016	4.5
Australia	Australia Pacific LNG T2	2016	4.5
Australia	Gorgon T1	2016	5.2
Australia	Gorgon T2	2016	5.2

Malaysia	MLNG T9	2016	3.6
Russia	Yamal T1	2017	5.5
USA	Sabine Pass T3	2017	5.1
USA	Sabine Pass T4	2017	5.1
Australia	Gorgon T3	2017	5.2
Australia	Wheatstone T1	2017	4.5
Malaysia	PFLNG Satu	2017	1.2
Cameroon	Kribi	2018	2.4
Russia	Yamal T2	2018	5.5
USA	Corpus Christi T1	2018	5.1
USA	Cove Point	2018	5.3
Australia	Wheatstone T2	2018	4.5
Australia	Ichthys T1	2018	4.5
USA	Corpus Christi T2	2018	5.1
Australia	Ichthys T2	2019	4.5
Russia	Yamal T3	2019	5.5
USA	Sabine Pass T5	2019	5.1
Russia	Vysotsk LNG	2019	0.7
USA	Cameron T1	2019	4.5
USA	Elba Island T1-T3	2019	0.8
Australia	Prelude FLNG	2019	3.6
USA	Freeport T1	2019	5.5
USA	Elba Island T4-T10	2020	1.8
USA	Cameron T2	2020	4.5
USA	Cameron T3	2020	4.5
USA	Freeport T2	2020	5.5
USA	Freeport T3	2020	5.5
USA	Corpus Christi T3	2020	5.1
Russia	Yamal T4	2021	0.9
USA	Sabine Pass T6	2021	5.1
Malaysia	PFLNG Dua	2021	1.5
Russia	Portovaya LNG	2022	1.5
USA	Calcasieu Pass	2022	10.0
Mozambique	Coral South	2022	3.4
Indonesia	Tangguh LNG T3	2023	3.8

Source: IEEFA, based on data from the International Gas Union, the International Group of LNG Importers, Kpler, news reports and company filings. Listed capacity may be different from actual output. Excludes projects and facilities that were not in operation for any portion of 2023.

Appendix B: Anticipated Global LNG Supply Additions, 2024-2028

Country/Region	Liquefaction Train	Start Year	Capacity (MTPA)
Congo (Republic)	Congo-Brazzaville FLNG 1	2024*	0.6
Mexico	Altamira FLNG 1	2024*	1.4
Russia	Arctic LNG 2 T1, first half	2024	3.3
Mauritania - Senegal	Greater Tortue FLNG 1	2024	2.5
Australia	Ichthys LNG (debottleneck)	2024	0.4
USA	Plaquemines LNG T1-6	2024	3.3
Russia	Arctic LNG 2 T1, second half	2025	3.3
USA	Golden Pass LNG T1	2025	5.2
USA	Golden Pass LNG T2	2025	5.2
US/Louisiana	Plaquemines LNG T7-12	2025	3.3
Canada	LNG Canada T1	2025	7.0
Mexico	Energía Costa Azul LNG T1	2025	3.0
USA	Corpus Christi LNG Stage 3 T1	2025	1.5
USA	Corpus Christi LNG Stage 3 T2	2025	1.5
USA	Plaquemines LNG T13-18	2025	3.3
USA	Plaquemines LNG T19-24	2025	3.3
Mexico	Altamira FLNG 2	2026	1.4
Mexico	Altamira FLNG 3	2026	1.4
USA	Golden Pass LNG T3	2026	5.2
Canada	LNG Canada T2	2026	7.0
Congo (Republic)	Congo-Brazzaville FLNG 2	2026	2.4
Nigeria	Nigeria LNG T7	2026	4.2
Nigeria	Nigeria LNG T1-6 - (debottleneck)	2026	3.4
Qatar	North Field East T1	2026	8.0
Qatar	North Field East T2	2026	8.0
USA	Plaquemines LNG T25-36	2026	6.7
USA	Corpus Christi LNG Stage 3 T3	2026	1.5
Australia	Pluto LNG T2	2026	5.0
USA	Corpus Christi LNG Stage 3 T4	2026	1.5
USA	Corpus Christi LNG Stage 3 T5	2026	1.5
Russia	Arctic LNG 2 T2	2027	6.6
Gabon	Cap de Lopez LNG	2027	0.7
USA	Corpus Christi LNG Stage 3 T6	2027	1.5
USA	Corpus Christi LNG Stage 3 T7	2027	1.5

Qatar	North Field East T3	2027	8.0
Qatar	North Field East T4	2027	8.0
USA	Rio Grande LNG T1	2027	5.4
USA	Port Arthur LNG T1	2027	6.0
Russia	Ust-Luga T1	2027	6.4
USA	Rio Grande LNG T2	2028	5.4
Canada	Woodfibre LNG T1	2028	2.1
Malaysia	PFLNG Tiga (T3)	2028	2.0
USA	Port Arthur LNG T2	2028	6.0
USA	Rio Grande LNG T3	2028	5.4
Qatar	North Field South T1	2028	8.0
Qatar	North Field South T2	2028	8.0
Russia	Ust-Luga T2	2028	6.4

Source: IEEFA, based on data from the International Gas Union, the International Group of LNG Importers, Kpler, news reports and company filings. Listed capacity may be different from actual output. Actual completion dates may differ from IEEFA estimates. Excludes projects expected after 2028.

** Project has already shipped its first LNG cargo.*

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The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

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