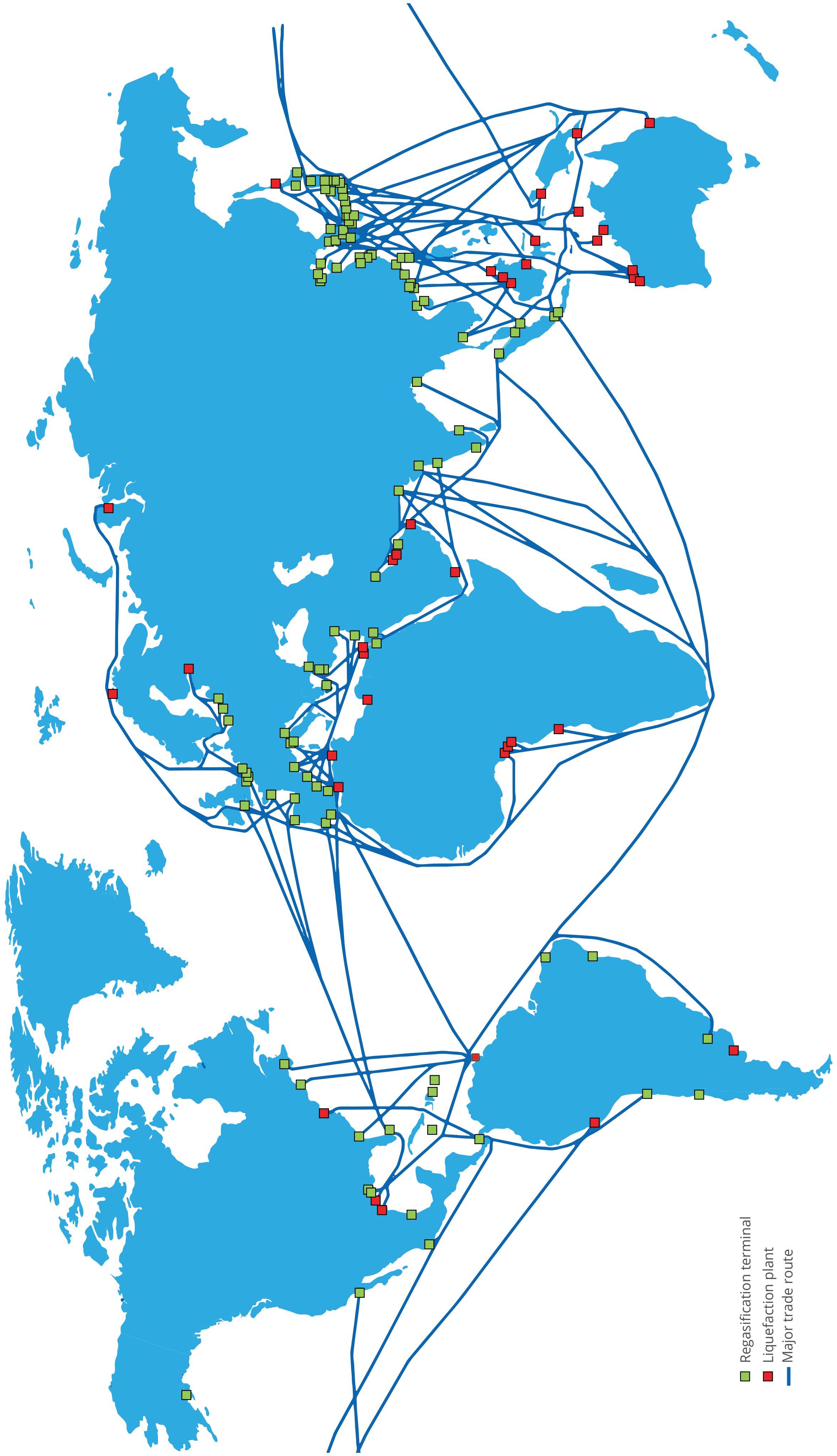


Figure 5.12: Major LNG Shipping Routes, 2020

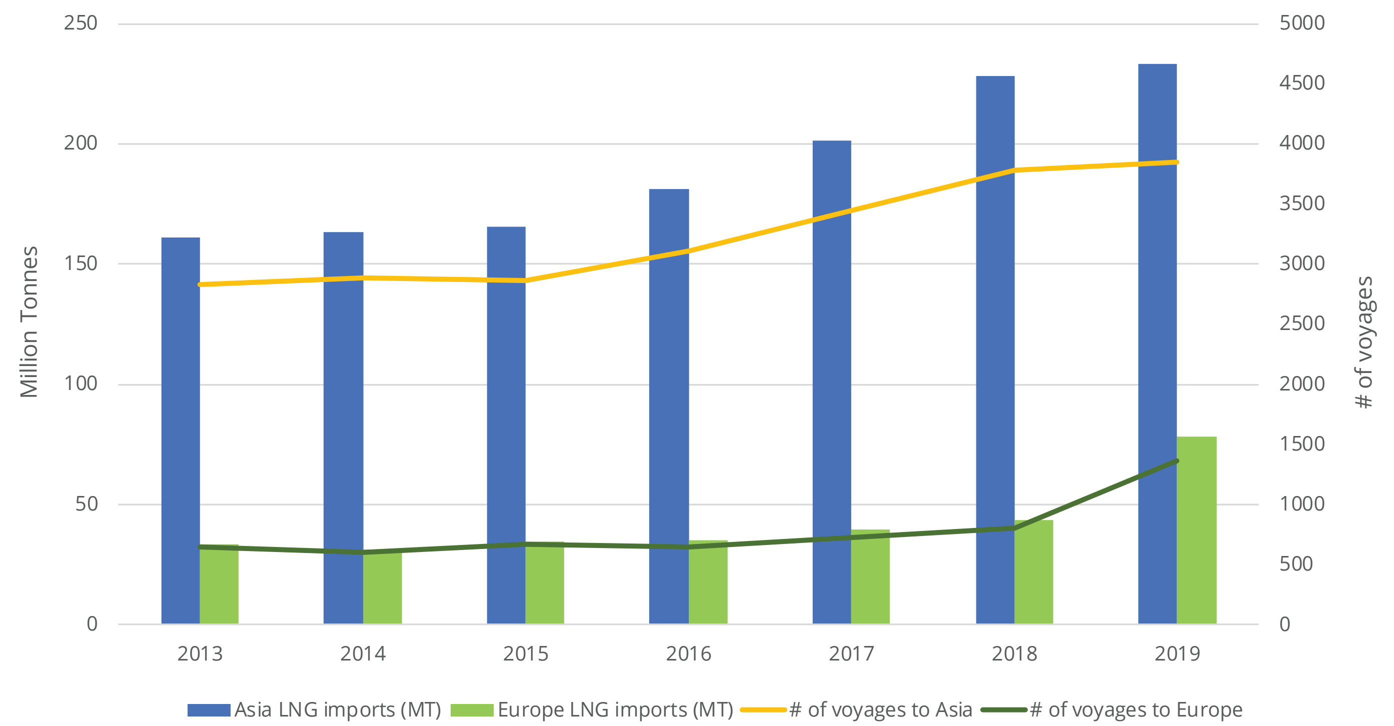
Source: Rystad Energy

5.7. FLEET VOYAGES AND VESSEL UTILISATION

5,701 LNG Trade Voyages in 2019

A total of 5,701 of LNG trade voyages were completed in 2019, an 11% increase compared to the 2018 level of 5,130 voyages, thanks to new supplies from the US and Australia, demand growth in Asia and the ability to absorb these extra volumes in European markets. The ramp-up from Sabine Pass T5 and Corpus Christi T1 in the US and Ichthys LNG and Wheatstone LNG in Australia contributed 18 MT of LNG in 2019, 11 MT more than in 2018. The start-ups of Cameron LNG T1, Elba Island and Freeport LNG T1 in the US and Prelude FLNG in Australia added another 2 MT to the market in 2019. The abundant new supplies, coupled with mild seasonality in Asia, have brought down gas prices to record lows on a global basis, reduced arbitrage spreads across continents and diverted more-than-expected LNG cargoes to Europe. 3,848 LNG trade voyages were completed for Asia in 2019, a slight 2% increase YoY. However, a record of 1,364 LNG voyages were for Europe in 2019, a 70% rise compared to 2018.

Figure 5.12: LNG Imports and Number of Voyages to Asia and Europe, 2013-2019



Source: Rystad Energy, Refinitiv Eikon

A project completed in 2016 widened and deepened the Panama Canal, which allows for more transits. The voyage distance and time from US's Sabine Pass terminal to Japan's Kawasaki LNG site can be reduced to 9,400 nautical miles (nm) and 29 days transiting Panama Canal, compared to 14,500 nm and 45 days through Suez Canal and close to 16,000 nm and 49 days via the Cape of Good Hope. The most common voyage globally in 2019 was from Australia to Japan, with 447 voyages within the year. The most common voyage to Europe in 2019 was from Russia, with 286 shipments during the year, followed by 265 voyages from Qatar and 181 voyages from the US, respectively. The 5,701 LNG trade voyages were done by 541 vessels in 2019. The average number of voyages completed per vessel was 10.5 in 2019, a slight rise from the 2018 level of 10.3. The voyage time averaged at 12.8 days in 2019, remaining constant from 2018. It normally takes longer voyage time and fewer completed trips from the Atlantic basin to Asia, but since a significant number of LNG trades were diverted from Asia to Europe, the average voyage times for 2018 and 2019 were quite close.

The 2020 LNG shipping market will most likely be negatively affected by the COVID-19 virus outbreak, as demand for LNG is reduced due to lower activity in the industrial and commercial sectors. We have already seen a decline in Chinese LNG demand, and we expect the same thing to happen to other markets as the virus continues to spread. The lower demand will ultimately translate into fewer voyages for the LNG carriers.

5.8. NEAR TERM SHIPPING DEVELOPMENTS

92% of LNG Carrier Fleet
Uses Boil-Off Gas as Fuel

Since the International Maritime Organization (IMO) and other regulatory bodies have started to impose more stringent regulations to reduce pollution emissions, including air pollution, LNG has become the main alternative fuel in the maritime segment. However, boil-off gas has been used for fuel on board of LNG carriers for many years for technical reasons.

Nowadays around 92% of the LNG carrier fleet, including FSRU's and small scale carriers, use boil-off gas as fuel for propulsion and electricity generation on board. This has made the fleet cleaner than any other shipping segment in terms of sulphur oxides (SO_x), nitrogen oxides (NO_x) and carbon dioxide (CO_2) emissions. This gas fuel technology is mature and equipment is amply available to facilitate the use of cargo as fuel.

Recently the increased requirements for energy efficiency in shipping have triggered further innovation in the segment of LNG carriers. Fuel consumption is continuously being reduced due to two main factors; on one hand the energy efficiency design index (EEDI) introduced by IMO Marpol regulations and on the other hand the drive to reduce shipping OPEX of which fuel is a significant part.

In addition to the need to be highly efficient, the LNG carrier segment at the moment is also more flexible and dynamic than a few years ago. Many parameters are to be taken into consideration such as new routes and navigation patterns, destination changes, partial cargo deliveries, reloads, speed reduction, terminals compatibility, ship to ship LNG transfers, etc.

In order to respond to changing market demands many technologies have been developed recently, and there are evolutions and new equipment types that can be implemented in the near future, aiming to meet the evolving expectations of different stakeholders. These technologies are mainly around containment systems with lower boil-off rates, very efficient propulsion and electricity generation systems and new boil-off handling systems such as sub-cooling or re-liquefaction equipment.

Despite the fact that 174-180,000 m3 carriers are now the standard size, new designs of 200,000 m3 LNG carriers with four tanks have been proposed by relevant shipyards in an attempt to offer shipowners optimised transportation cost. These designs, categorised as Neo Panamax LNG carriers, are able to transit the Panama canal, and might be an alternative for exports from the US to the importing countries in the Far East, provided that terminals can accommodate such larger ships.

In order to further reduce consumption, other ideas involving power take-off systems on main propulsion engines, air lubrication and two-stroke engines to be used as electricity generators have been evocated. Compact COGES systems have also been proposed to optimise cargo volume while maintaining the same ship size.

Another interesting trend in the LNG carrier segment is the new Northern Sea Route. Following the commissioning of 15 icebreaking LNG carriers for the Yamal LNG terminal, new shipping capacity will be required for the Arctic LNG-2 project. Other projects have also been announced in the Arctic environment and those will also require similar capacity if sanctioned. Permanent transhipment points might also be developed at suitable locations. At these locations the icebreaking carriers will transfer their cargo into conventional carriers to make the transportation more efficient on ice-free segments to their final customers.

Other challenges in this segment have related to FSRU projects, where weather conditions on site have led to different mooring (or anchoring) arrangements, LNG transfer systems and gas offloading for instance. Operability window is key, especially in projects on open seas where hydrodynamic conditions may create difficulties for the LNG carriers to manoeuver, to be moored to the FSRU and to transfer the cargo. Cargo containment systems are also suitably reinforced in case of membrane technologies, depending on the site environment, which usually increases the boil-off rate. Since most of the FSRU projects look to be flexible, i.e. carriers are able to transport and/or regasify LNG, this is a technical aspect to be taken into consideration. The ability to relocate units is the prime advantage of these projects, considering that in some cases permanent import terminals will be installed after a few years of FSRU operations. In any case, FSRU's have proven to be a good way of opening new markets in a relatively short time.

Small scale LNG carriers also have challenges related to efficiency and flexibility. Newly developed carriers specifically designed for bunkering LNG will have to be equipped with suitable transfer systems, as LNG use for fuel grows in this fleet, and clients being of different ship size and type. In this segment, the development of inland or sheltered water bunkering units has been significant in the last couple of years with presently almost half of the fleet on the orderbook being units of reduced capacity for river, estuary or port operation only.

In fact this brand new fleet of LNG bunkering ships or barges is under continuous development to provide clean fuel to a growing fleet that uses LNG as fuel. Despite the fact that other factors are key for further growth of the use of LNG as fuel for both newbuilds and conversions, LNG is a proven fuel with many applications at present, and many alternative technologies. Compliance with the IMO low sulphur regulation, implemented globally in January 2020, can be also achieved through the use of low sulphur heavy fuel oil, marine diesel oil or exhaust cleaning systems like scrubber technologies. However there are also some technical challenges such as compatibility between different fuel suppliers or bans by local regulators on open loop scrubbers, among others. Price differentials between compliant fuels will also play a role in the consolidation of the use of LNG as fuel. LNG fuelled projects tend to copy technology already used on LNG carriers. Type C tanks for instance are the preferred types when the required autonomy is low and membrane, and prismatic tanks are proposed for ships with larger fuel volumes. The first membrane (GTT Mark III) gas fuelled and LNG bunkering ships are about to be delivered.

Containerised sea transportation of LNG is not new, but further developments and innovation are taking place. The lack of pipe and terminal infrastructure in some locations have led to the use of existing container routes to transport LNG in ISO containers, or to propose the implementation of specific ships for the purpose of small scale distribution of LNG instead of trucking LNG.

Last but not least, gas to power projects in some cases will involve floaters as an integrated solution in order to deliver electricity to consumers. For instance, conversions of LNG carriers and power ships are under development at the moment, mainly for emerging markets. FSRU projects in combination with gas, or dual fuel floating units (ship or barge type), will be deployed, thereby opening new import markets for LNG and replacing other more pollutant fuels such as coal or heavy fuel oil.

LNG Vessel

6 LNG Receiving Terminals

23.4 MTPA of receiving capacity was added in 2019

+6 new terminals between 2019 – February 2020

+3 expansions at existing terminals between 2019 – February 2020

821 MTPA of global regasification capacity as of February 2020

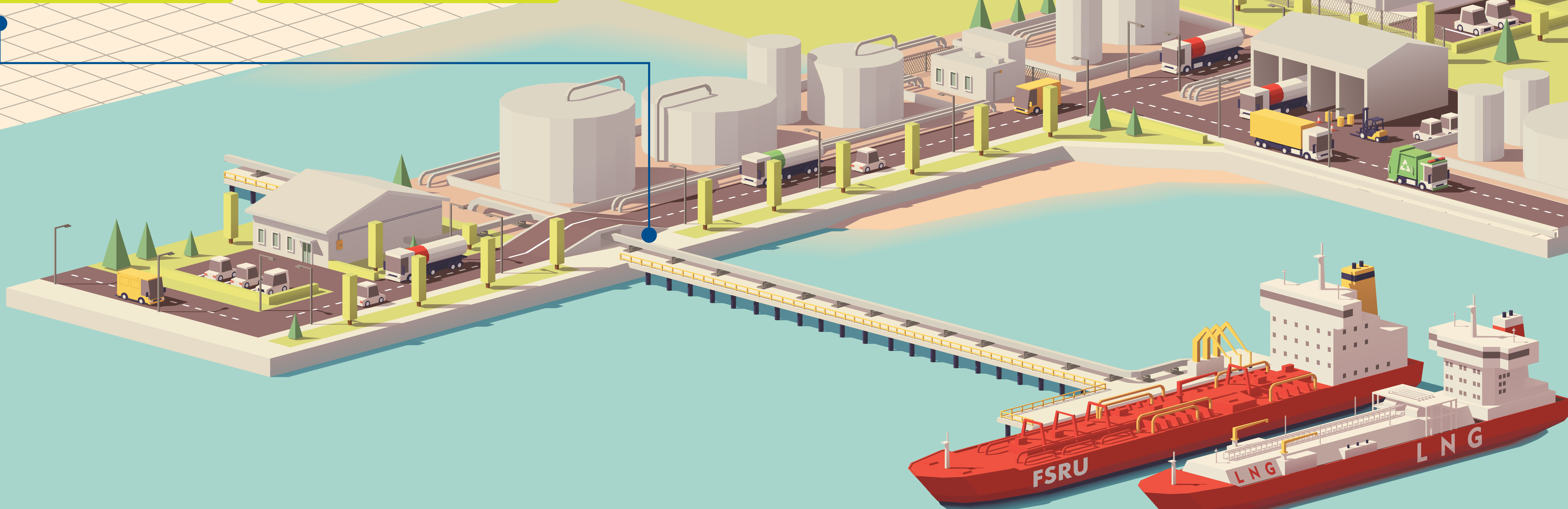
India and Thailand expanded existing LNG plants

Growth in **2019** was driven primarily by new-built terminals in existing LNG import markets: **Bangladesh, Brazil, China, India, and Jamaica**

3 new FSRUs

Bangladesh, Brazil, and Jamaica

120.4 MTPA of new regasification capacity under construction as of February 2020



6.0 LNG Receiving Terminals

Global LNG regasification capacity reached 821 MTPA as of February 2020 and is expected to continue its positive growth trajectory as liquefaction capacity gets added to meet growing demand. Growth in 2019 was driven primarily by new-built terminals in existing LNG import markets, including Bangladesh, Brazil, China, India, and Jamaica. As of February 2020, no new importer added regasification capacities[1] since new importers, Bangladesh and Panama, added regasification capabilities in 2018.

The majority of additions in global receiving terminal capacity in 2019 came from Asian markets, particularly India, affirming the region's stand-out growth. New built terminals in these areas remain primarily shore-based. However, floating regasification terminals are on the rise as well, with the startup of three new FSRUs in Bangladesh, Brazil, and Jamaica in 2019. Turkey's Etki terminal also expanded its regasification capacity by chartering a replacement FSRU with larger receiving capabilities.

In the near term, existing import markets are expected to see regasification capacity additions continue to increase, particularly in Asia, where the receiving capabilities in China and India are expected to expand to support growing LNG demand. A number of new LNG importers will also significantly contribute to regasification capacity growth, including the Philippines, El Salvador, Ghana, Cyprus, Croatia and Vietnam, all of which are in the process of constructing their first LNG import terminal to come online within the next two to three years. Several other new markets have proposed additional regasification capacity, including Myanmar, Cote d'Ivoire, Morocco and Germany. However, many of these markets have experienced delays in project development due to various challenges such as securing financing and navigating regulations related to infrastructure development.

Gibraltar LNG Regasification Terminal - Courtesy of Shell

[1] Excludes Russia's Kaliningrad terminal as it did not receive any cargoes after it was commissioned in January 2019. The terminal's FSRU was chartered out as an LNG carrier through December 2019. Bahrain's first LNG receiving terminal is also excluded as it has yet to discharge any cargoes following technical commissioning in January 2020.

6.1. OVERVIEW

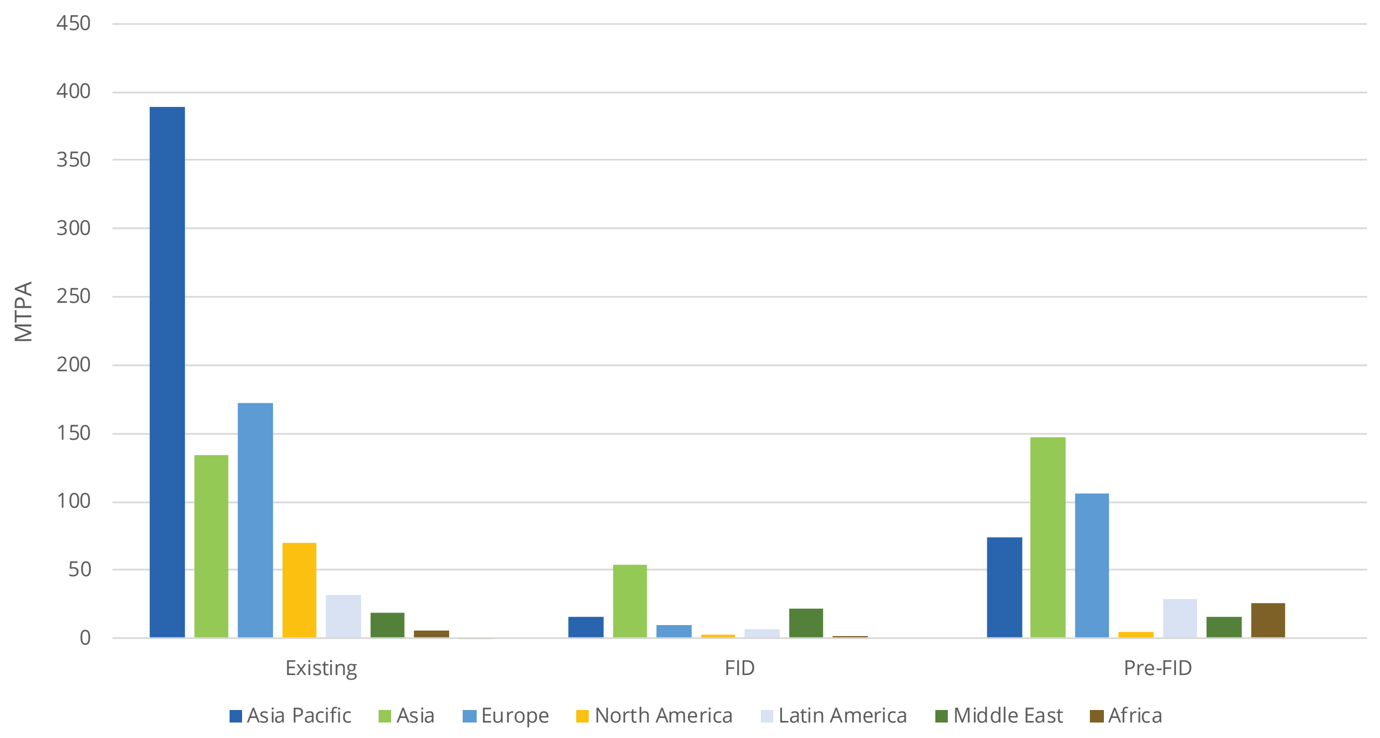
821 MTPA

Total LNG Regasification Capacity Across 37 Markets, Feb 2020

As of February 2020, total LNG regasification capacity in the global market was 821 MTPA across 37 markets[2], thanks to the addition of six new terminals and three expansions at existing terminals between 2019 and February 2020. Of the existing LNG markets, Bangladesh, Brazil, China, India, and Jamaica together built seven new terminals. Also, both India and Thailand successfully expanded existing LNG receiving plants, contributing to additional growth in global regasification capacity. 23.4 MTPA of receiving capacity was added in 2019, with the greatest addition of 5.0 MTPA from a new onshore terminal in India. Floating regasification projects also added slightly more capacity to the global LNG market than onshore regasification facilities despite having fewer terminals constructed.

The Asia and Asia Pacific[3] regions contributed the greatest amount of regasification capacity to the global market and are anticipated to continue to post positive growth through capacity expansions in both existing and new markets. The expansion of regasification capacity in North America has been limited as domestic gas production has accelerated in recent years. In addition to Sabine Pass and Cove Point, which have been operating notionally as bi-directional import/export facilities, a number of other North American import terminals have been or are currently being converted to liquefaction export facilities, including Elba Island, Freeport, and Cameron. FSRUs have continued to play an important role in equipping new markets with regasification capacity, as seen in Asia and Latin America. Following the addition of its first floating regasification terminal last year, Bangladesh successfully expanded its capacity by commissioning another FSRU project in 2019. FSRUs have proven to be a quick approach for new markets to access the global LNG trade, given the availability of pipeline and offloading capabilities. On the other hand, established LNG importers, such as China and South Korea, have expanded their regasification capacities through the construction of onshore regasification terminals, which is a stable long-term solution and allows for future storage expansion.

Figure 6.1: LNG Regasification Capacity by Status and Region, as of February 2020



Source: Rystad Energy

[2] The total number of markets excludes those with only small-scale (<0.5 MTPA) regasification capacity such as Finland, Malta, Norway, and Sweden. It includes markets with large regasification capacity that only consume domestically-produced cargoes, such as Indonesia.
[3] Please refer to Chapter 8: References for an exact definition of each region.

6.2. RECEIVING TERMINAL CAPACITY AND GLOBAL UTILISATION

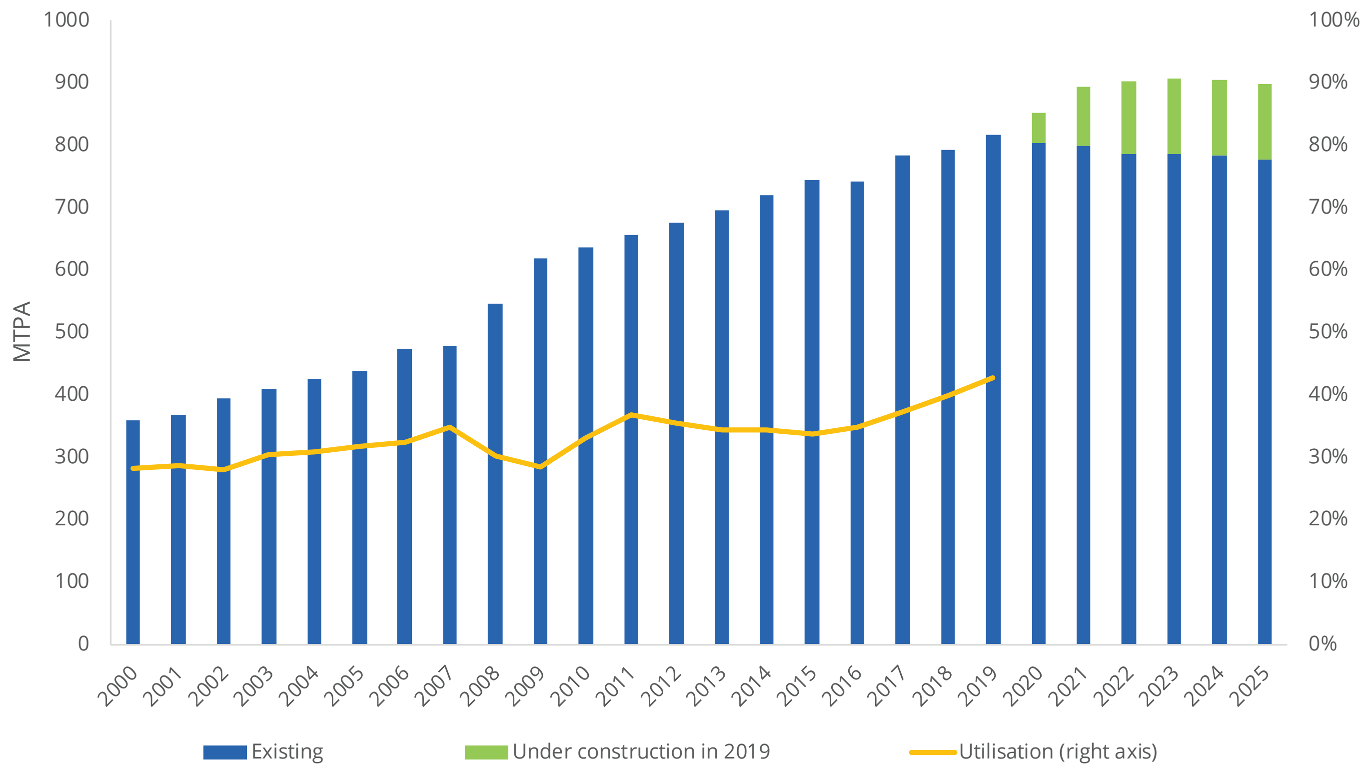
23.4 MTPA

Net Regasification Capacity, Added in 2019

In 2019, 23.4 MTPA[4] of net regasification capacity was added globally. Compared to 2018, when net global LNG receiving capacity grew by 8.0 MTPA, this is a considerably higher growth rate. The number of global LNG importers has grown steadily in the past decade, adding one to two new markets most years. As seen in Egypt in 2015 and in Bangladesh in 2018, FSRUs are playing an increasingly important role in enabling new importers to access LNG supply at a faster rate, driving larger trade flows.

Six new regasification terminals commenced operations in 2019, representing 17.4 MTPA of regasification capacity. Three of these terminals are onshore facilities completed in Asia, with two in China (Fangchenggang and Shenzhen Gas), and the other in India (Ennore). The remaining three new terminals are floating storage and regasification units (FSRUs) located in Bangladesh (Moheshkhali (Summit Corp)), Brazil (Sergipe) and Jamaica (Old Harbour, previously only had a small-scale FSU). Jamaica's new floating terminal — the first of its kind in the Caribbean — was officially commissioned in July 2019 as an import facility to supply new gas-fired power plants in the region. Russia — the world's second largest natural gas producer – commissioned its first LNG import facility in Kaliningrad in early 2019. However, it has yet to reach commercial operations as of early 2020. The send-out capacity of Kaliningrad terminal was excluded from global regasification capacity in 2019 as the terminal had not received any cargoes since its commissioning and was chartered out as an LNG carrier through December 2019.

Figure 6.2: Global Receiving Terminal Capacity, 2000-2020[5]



Source: Rystad Energy

[4] Some individual capacity numbers have been restated over the past year owing to improved data availability and a methodological change in accounting for mothballed and available floating capacity. This may cause global capacity totals to differ compared to IGU World LNG Report – 2019 Edition.
[5] The above forecast only includes projects sanctioned as of February 2020. Regasification utilisation figures are calculated using regasification capacity prorated based on terminal start dates. Owing to short construction timelines for regasification terminals, additional projects that have not yet been sanctioned may still come online in the forecast period. Capacity declines over the forecast period as FSRU charters conclude, although new charters may be signed during this time.

In addition, three expansion projects were completed at existing regasification terminals in 2019. One expansion project, adding 1.5 MTPA at Thailand's Map Ta Phut terminal, came online in January 2019. India's Dahej terminal added 2.5 MTPA of capacity with the second expansion project at the terminal, increasing its total regasification capacity to 17.5 MTPA. Meanwhile, Turkey's Etki terminal added 2 MTPA of capacity. This was achieved through the replacement of a 3.7 MTPA capacity FSRU with a larger vessel, increasing the terminal's regasification capacity to 5.7 MTPA. Combining the 17.4 MTPA added via new terminals and the 6.0 MTPA added through expansion projects, total regasification capacity added globally in 2019 reached 23.4 MTPA.

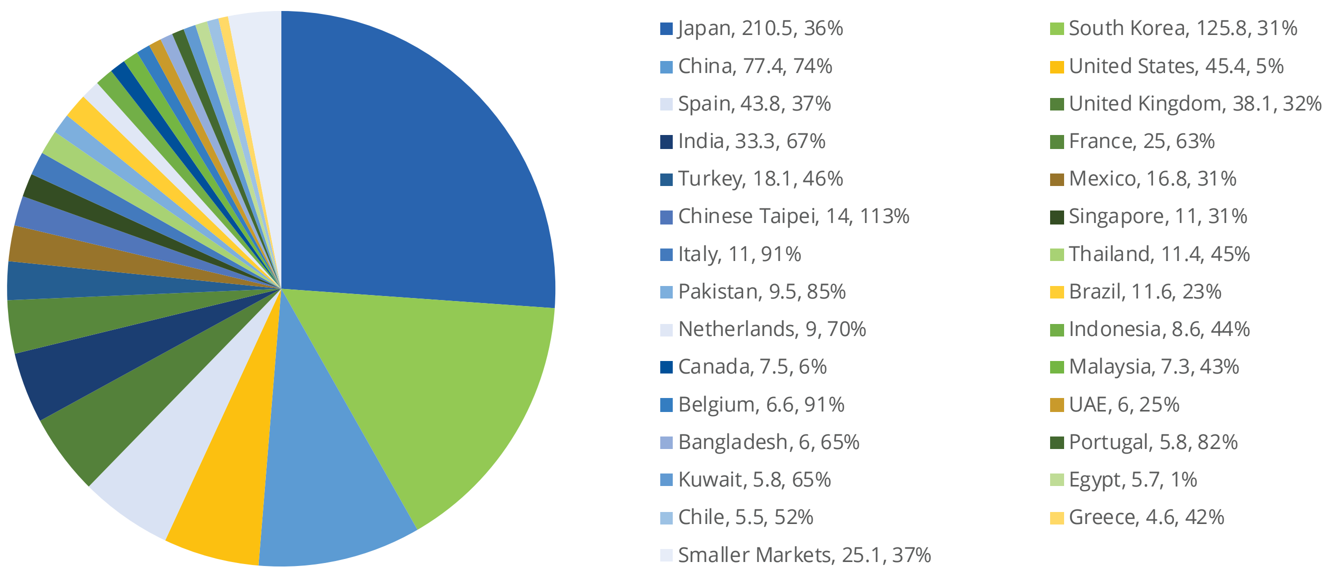
Kuwait's Mina Al-Ahmadi terminal ended the charter of the Golar Igloo FSRU in 2019, after extending it to November. Kuwait National Petroleum Company (KNPC) has since awarded Golar Partners another two-year charter of the Golar Igloo, to provide continued LNG storage and regasification at Mina Al-Ahmadi beginning in March 2020.

One new terminal came online in January 2020, adding 5.0 MTPA at India's Mundra terminal. Apart from this newly operational project, 120.4 MTPA of new regasification capacity was under construction as of February 2020. This includes 14 new onshore terminals, 12 FSRUs, and seven expansion projects at existing receiving terminals. Notably, six out of seven capacity expansion projects are being carried out at onshore terminals located in Asia and Asia Pacific regions. Eight out of 33 terminals under construction (including terminals with expansion projects) will be built in new markets without existing regasification capacity, such as Ghana, the Philippines, El Salvador, Cyprus, Croatia and Vietnam. In October 2019, construction commenced on the Thi Vai LNG terminal after funding was secured for the first phase of the project to import natural gas into Vietnam. In December 2019, Cyprus signed a contract with a Chinese consortium for the construction of the market's first LNG regasification terminal. Through the construction of six floating and two onshore terminals, these eight new markets will add 17.7 MTPA of regasification capacity to the global LNG market. China has six new onshore terminals under construction, in addition to four expansion projects, while India is building four new terminals and executing one expansion project at an onshore terminal. Additional terminal construction and regasification capacity expansion projects are underway in Brazil, Chinese Taipei, Indonesia, Japan, Kuwait, Mexico, Poland, Turkey and the United States (Puerto Rico).

Average regasification utilisation levels across global LNG markets reached 43%[6] in 2019, a 3% jump from 2018. Regasification terminal capacity generally exceeds liquefaction capacity in order to meet peak seasonal demand and secure supply. Growing natural gas demand has supported the steady growth seen in the average global regasification utilisation, in spite of the 23.4 MTPA net regasification capacity addition in 2019. On a monthly basis, utilisation rates across global regasification terminals fluctuated throughout the year, reaching the highest utilisation during the peak period between November to January. The cyclical fluctuation in utilisation rates is likely a result of seasonality in LNG demand, as well as the geographical distribution of LNG importers, since winter months in the Northern Hemisphere drive the greatest demand for LNG regasification.

6.3. RECEIVING TERMINAL CAPACITY AND UTILISATION BY MARKET

Figure 6.3: LNG Regasification Capacity by Market (MTPA) and Annual Regasification Utilisation, 2019[7]



Source: Rystad Energy

[6] Based on Rystad Energy trade data.
[7] "Smaller Markets" includes (in order of size): Argentina, Jordan, Poland, Lithuania, Colombia, Israel, Dominican Republic, Russia, Jamaica, Panama. Regasification utilisation figures are based on 2019 Rystad Energy trade data and prorated regasification capacity based on terminal start dates in 2019. Prorated capacity in 2018 is displayed in this graph.

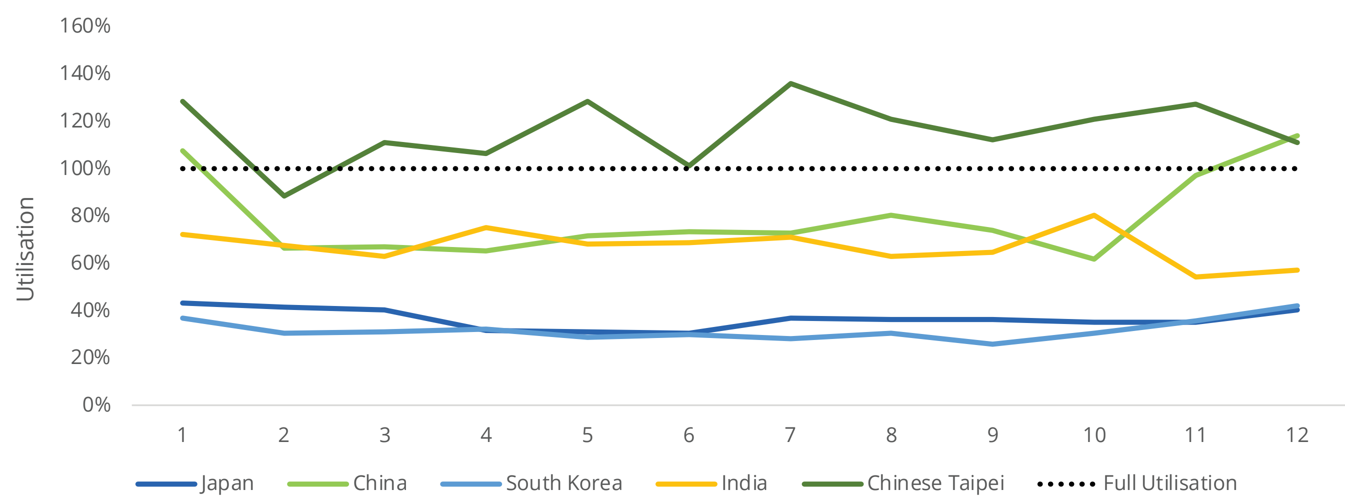
Japan 210.5 MTPA
World's Largest
Regasification Capacity

Japan has the world's largest regasification capacity of 210.5 MTPA as of February 2020, representing 25% of global regasification capacity. Despite not adding any regasification capacity in 2019, Japan is anticipated to continue expanding its importing abilities through new terminals and expansion projects. Construction of a new 0.5 MTPA receiving terminal at Niihama on the northern coast of Shikoku in western Japan has begun and is due for completion in February 2022. At year-end 2019, Japan's regasification utilisation reached 36%[8], slightly down from 39% in 2018.

As the world's third largest LNG importer behind Japan and China, South Korea held its position as the second largest regasification capacity market globally in 2019. With six existing import terminals, South Korea contributed 125.8 MTPA of regasification capacity to the global LNG market in 2019. South Korea's utilisation rate also dipped slightly to 31%[9], as LNG import is set to temporarily decrease owing to the start-up of new long-planned nuclear and coal-fired power plants.

The growth rate of China's regasification capacity is one of the most rapid among global LNG import markets, driven by increased use of natural gas for power generation. Since China became the world's second largest LNG importer in 2017, China has built nine new terminals between 2017 and 2019, adding a total of 24.1 MTPA of import capacity. In 2019, two new onshore terminals were commissioned, one in January (Fangchenggang LNG) and one in August (Shenzhen Gas LNG), accounting for 1.4 MTPA of regasification capacity combined. In terms of total regasification capacity, China is the third largest market in the world with 77.4 MTPA of nameplate capacity by the end of 2019. With six new onshore projects under construction and four existing terminals undergoing expansion, China is set to add up to 28.9 MTPA of regasification capacity by 2023. China's strong regasification growth rate is expected to continue, closing the gap with South Korea and Japan. China's regasification utilisation rate was 74%[10] in 2019, a steady increase since 2016. While relatively high spare capacity above 30% was experienced in summer months, utilisation rates at China's import terminals were exceptionally high during winter periods, peaking at 114% in December 2019 (see Figure 4). China's capacity expansion projects are likely to ease the tightness in its import value chain during peak periods, provided that newly-built terminals are sufficiently connected to the local grid to support send-outs. As a temporary measure, some LNG buyers have started trucking LNG from the regasification terminals to key demand centers, as they wait for infrastructure to be built or become accessible. However, while LNG demand in China is set to rise on the back of strong governmental support for increased consumption of the relatively cleaner fuel, LNG imports may fluctuate in response to economic conditions, coal use, pipeline imports and domestic gas production.

Figure 6.4: Monthly 2019 Regasification Utilisation by Top Five LNG Importers



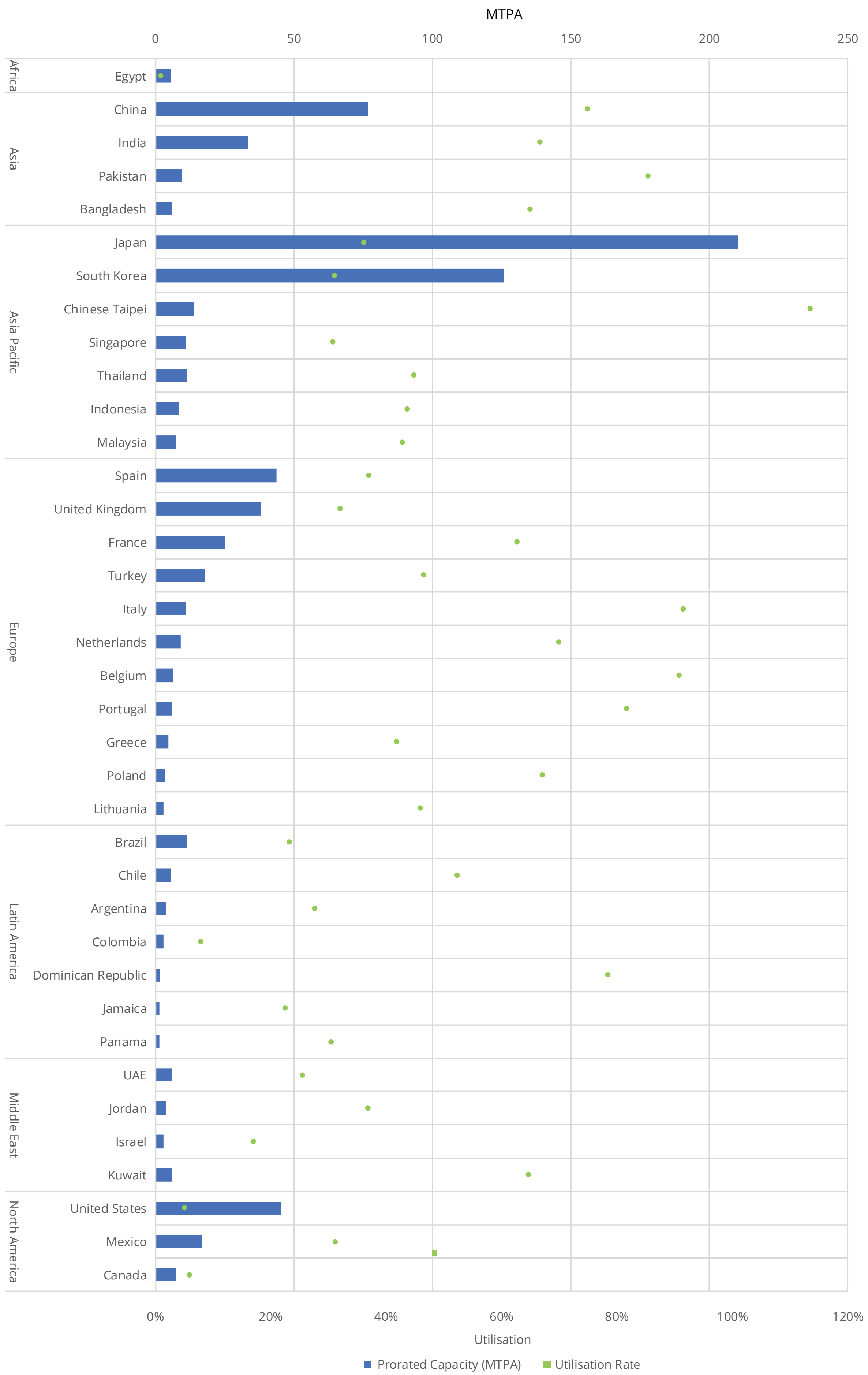
Source: Rystad Energy, Refinitiv

India is another market which has experienced strong regasification capacity growth. Despite contributing only 34.5 MTPA of total global regasification capacity in 2019, India has another 24.0 MTPA of regasification capacity under construction as of February 2020. A new 5.0 MTPA onshore terminal (Ennore LNG) was commissioned in March 2019, while an existing import terminal (Dahej) was expanded by 2.5 MTPA in June 2019. As of the end of 2019, India had five operational regasification terminals in total. In January 2020, the terminal at Mundra received its commissioning cargo, adding 5.0 MTPA of regasification capacity. Another 4.0 MTPA of regasification capacity is expected to be operational by the first quarter of 2020 at Jaigarh, marking India's first FSRU-based terminal. India's second floating terminal (Jafrabad FSRU) is due to come online in mid-2020, adding another 5.0 MTPA of regasification capacity. In August 2019, construction work commenced at the Chhara LNG terminal. With the relatively rapid addition of 7.5 MTPA of regasification capacity at Ennore and Dahej terminals last year coupled with muted LNG import growth, India's utilisation rate dropped to 67% in 2019, a decrease from 82% in 2018.

Chinese Taipei registered the highest regasification utilisation in 2019 at around 113%; the market has typically received higher volumes than its announced regasification capacity. 2019 saw Chinese Taipei's terminals working above its full utilisation rate all year round, with the exception of February 2019. Chinese Taipei is also the fifth largest importer of LNG, partly a result of its clean energy plan to phase out coal and nuclear power in electricity generation. To support the boost in LNG imports, Chinese Taipei is adding regasification capacity at its existing terminal (Taichung), which is currently under construction and is set to come online in 2020. Plans are in place to build a third LNG terminal here, which is expected to be commissioned in 2024. Chinese Taipei's regasification utilisation rate is likely to remain elevated in the near term.

[8] Based on Rystad Energy trade data.
[9] Based on Rystad Energy trade data.
[10] Based on Rystad Energy trade data.

Figure 6.5: Receiving Terminal Import Capacity and Regasification Utilisation Rate by Market in 2019



Source: Rystad Energy

European markets account for approximately 20% of total global regasification capacity. However, regasification capacity additions have been relatively slow in these markets, with the exception of Turkey, which has shown regasification capacity growth in recent years. Following the commissioning of a new 5.4 MTPA regasification terminal (Dortyol FSRU) in 2018, Turkey completed the replacement of an existing vessel with a larger-capacity 5.7 MTPA FSRU at the Etki terminal in July 2019, expanding the terminal's total send-out capacity by 2 MTPA. Three other European markets have regasification projects currently under construction as well. Due for commissioning in 2021, the Krk project — a 1.9 MTPA FSRU-based terminal which began construction in April 2019 — will allow Croatia to access the global LNG market as a new importer. On the other hand, progress on the construction of the Gothenburg terminal in Sweden has been halted following the government's denial of a final permit based on climate concerns in October 2019. Following a significant increase in LNG import levels, 2019 saw a surge in Europe's regasification utilisation rates to an average of 60% from 35% in 2018. While Europe's LNG import terminals have seen low utilisation rates in the past five years, LNG imports to the region grew steadily in 2018 and rose sharply in 2019. In total, European markets imported 85.9[11] MT of LNG in 2019 (net of re-export), which is a 75.6%[12] increase compared to Europe's LNG import levels in 2018. Some of the highest utilisation rates were observed in terminals located in Belgium, Portugal and Italy. Over the past year, European markets absorbed most of the new LNG supplies from US and Russia, largely due to insufficient growth in Asian LNG demand through the summer months and low prices in Asia. Europe's liquid market and slightly higher netback (due to the narrowing of the spread between Asian spot and European prices) attracted new LNG supplies to the region. The over-supply situation at European terminals also drove very high levels of storage tank utilisation rates during the past year. At the six terminals of the Spanish gas system, storage capacity had an average utilisation rate of 77% and peak rate at 99% during 2019.

Although the third highest in terms of global regasification capacity, the United States has low levels of terminal utilisation rates. Utilisation rates averaged 5% in 2019, primarily driven by LNG imports to Puerto Rico. The Penuelas regasification terminal experienced high volumes of LNG imports in recent years, reaching a terminal utilisation rate of 119% in 2019. Puerto Rico has plans to add regasification capacity, with their second FSRU-based terminal in San Juan expected to come online by 2020. Excluding the Puerto Rico terminal and Exelon's Everett Massachusetts LNG facility, only several other US terminals received low volume LNG cargoes between 2018-2019, likely to be used as tank cooling supplies in relation to the addition of liquefaction capacity to existing regasification terminals, which will normally function as bidirectional facilities. As of February 2020, the six active regasification terminals in the US have a combined import capacity of 45.4 MTPA. Given the United States' large-scale domestic production of shale and tight gas resources, the US is likely to further reduce LNG imports and prioritise the construction of LNG export over import terminals.

While still a region with relatively little regasification capacity at 32.1 MTPA, Latin America is expected to add another 6.6 MTPA by 2021 through the construction of new FSRU-based terminals in existing (Brazil) and new markets (El Salvador). Brazil's Sergipe terminal saw the unloading of its first commissioning cargo at its Golar Nanook FSRU in April 2019, and its second commercial cargo in the first quarter of 2020. An upcoming terminal Brazil (Port of Acu) is expected to import LNG cargoes in 2020, once the deployed FSRU arrives and is commissioned at its designated ports. The Acajutla LNG project in El Salvador, which began construction in January 2019, involves an offshore FSRU, underground natural gas pipeline and three substations and is expected to be commissioned in 2021.

Notably, Egypt's regasification utilisation rate has fallen from 23% in 2018 to 1% in 2019 since it halted its LNG imports in 2018. This is the result of Egypt's rapidly growing domestic production from recently discovered gas fields, such as Zohr. As of the end of 2019, Egypt has a remaining 5.7 MTPA of regasification capacity following the departure of its chartered FSRU at the Ain Sokhna terminal in October 2018.

Two interesting new LNG import projects in their stages of development are the Kuwait Al Zour LNG Import Terminal and the nearby Bahrain LNG Terminal, which has completed technical commissioning but have yet to discharge cargoes.

The Al-Zour LNG Import Terminal Project includes the construction of a regasification facility, eight LNG storage tanks with a capacity of 225,000 cubic metres (cm) each, and marine facilities, including two marine jetties and berthing facilities for loading. The project will also include other components, such as 14 HP pumps, boil-off gas (BOG) and flare facilities. Once fully operational, the facility is expected to produce approximately 22 million metric tonnes (MMT) of natural gas a year and will have a storage capacity of 1.8 million cm of LNG. The regasification capacity of the terminal will be 30 billion cubic metres a day (bcm/d). This is most likely the largest greenfield LNG import terminals ever developed.

The Bahrain LNG Terminal, although nominally an FSU based terminal, is being developed on a build-own-operate-transfer (BOOT) basis over a 20-year period beginning in July 2018 and will be handed over to the Government of Bahrain at the end of the BOOT period. The LNG terminal is being constructed at an offshore location 4.3 km away from the existing breakwater at the Khalifa Bin Salman Port (KBSP). It will have a production capacity of 800 million standard cubic feet a day. Plans for the site include an offshore jetty and breakwater to receive LNG shipments, as well as a floating storage unit (FSU) and a regasification platform. It will be linked to underwater and surface gas pipelines from the platform to shore. Onshore infrastructure will include a gas receiving plant and a nitrogen production facility. Teekay LNG will supply a floating storage unit (FSU) by converting a 174,000 cm LNG carrier.

Pyeongtaek LNG Terminal - Courtesy of Kogas

[11] GIIGNL
[12] GIIGNL

Receiving Capacity	New LNG onshore import terminals	New LNG Offshore terminals	Number of regasification markets
+23.4 MTPA Net growth of global LNG receiving capacity	**+3** Number of new onshore regasification terminals	**+3** Number of new offshore LNG terminals	**37** Markets with regasification capacity at end-2019
Net nameplate regasification capacity grew by 23.4 MTPA from 791.6 MTPA at end-2018 to 815.7 MTPA in end-2019. Regasification addition at new terminals reached 17.4 MTPA while expansion projects amounted to 6.0 MTPA.	New onshore terminals were added in India (Ennore), China (Fengchenggang and Shenzhen Gas). Two expansion projects at existing onshore terminals were completed in India (Dahej) and Thailand (Map Ta Phut). India's Mundra terminal imported its commissioning LNG cargo in January 2020.	Three[13] FSRUs came online in 2019, in Bangladesh (Moheshkhali (Summit Corp)), Jamaica (Old Harbour) and Brazil (Sergipe). Turkey's Etki terminal replaced its existing FSRU with a new unit with larger regasification capacity in 2019.	The number of markets with regasification capacity remained at 37 at end-2019.

6.4. RECEIVING TERMINAL LNG STORAGE CAPACITY

65 Million Cubic Meters (mmcm)

Global Storage Capacity

Storage capacity at global receiving terminals has climbed steadily with the construction of new LNG terminals and the expansion of existing facilities. Global storage capacity neared 65 million cubic meters (mmcm) through the addition of seven new receiving terminals and three expansion projects in 2019. The average storage capacity for existing terminals in the global market was around 430 thousand cubic meters (mcm).

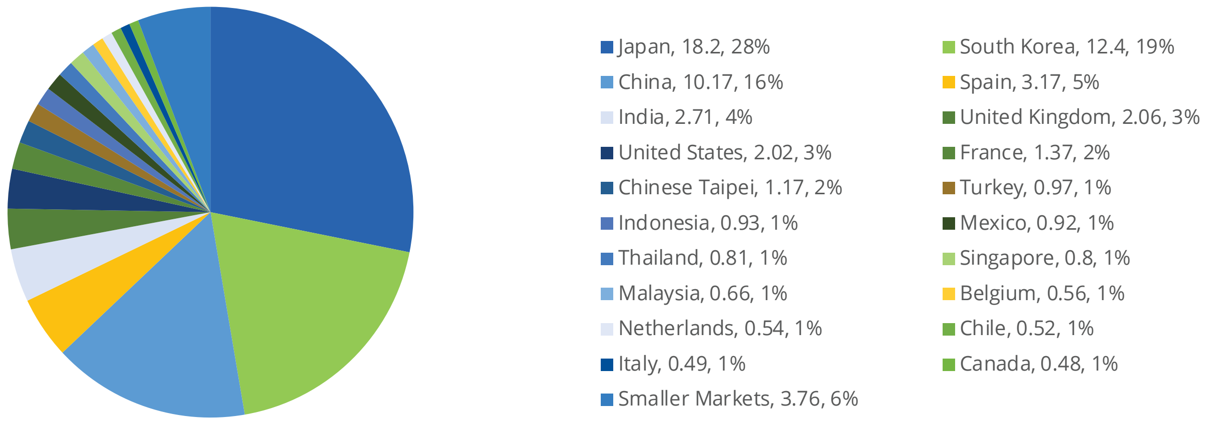
Receiving terminals with higher regasification capacity are often equipped with large storage capacity. Similar to the geographical spread in regasification capacity, over 50% of the LNG market's total existing storage capacity is contained in terminals located in Japan, South Korea and China, ranging from 0.01 to 3.36 mmcm in size. Asian and Asia Pacific markets have the highest share of global storage capacity, as operators in these regions rely on large storage capacity to secure supply and enhance flexibility, particularly given Asia's seasonal demand and in certain markets, the lack of adequate connectivity to gas infrastructure. Additionally, Japan, South Korea and China have limited gas storage options available outside of LNG terminals.

New terminals and project expansions have increased natural gas storage capabilities by 1.40 mmcm in 2019. The largest increase in storage capacity (0.34 mmcm) was added in India, through the addition of the Ennore terminal and expansion project at Dahej terminal. China followed closely, adding a total of 0.25 mmcm of storage capacity, through the construction of two new terminals. The installation of FSRUs added 0.12 mmcm of storage capacity at Jamaica's Old Harbour terminal, 0.17 mmcm at Brazil's Sergipe and 0.13 mmcm at Bangladesh's Moheshkhali terminal. Turkey's Etki terminal storage capacity grew slightly by 0.03 mmcm through its replacement FSRU. Onshore terminals saw storage capacity additions of 0.17 mmcm at Thailand's Map Ta Phut terminal through its recently completed expansion project. Belgium's Zeebrugge terminal commissioned its fifth storage tank in late December 2019, expanding the terminal's storage capacity by another 0.18 mmcm.

Notably, the development of global storage capacity shows signs of divergence. In established LNG markets, the continued construction of new onshore terminals supports the growth of storage capacity. In newer markets, however, the frequent deployment of FSRUs translates into substantially lower storage capacity. As of early 2020, average storage capacity at onshore terminals (0.48 mmcm) is observed to be larger than that of offshore terminals (0.16 mmcm).

[13] Excludes Russia's Kaliningrad terminal as it did not receive any cargoes after it was commissioned in January 2019. The terminal's FSRU was subsequently chartered out as an LNG carrier through December 2019.

Figure 6.6: LNG Storage Tank Capacity by Market (mmcm) and % of Total, as of February 2020[14]



Source: Rystad Energy

6.5. RECEIVING TERMINAL BERTHING CAPACITY

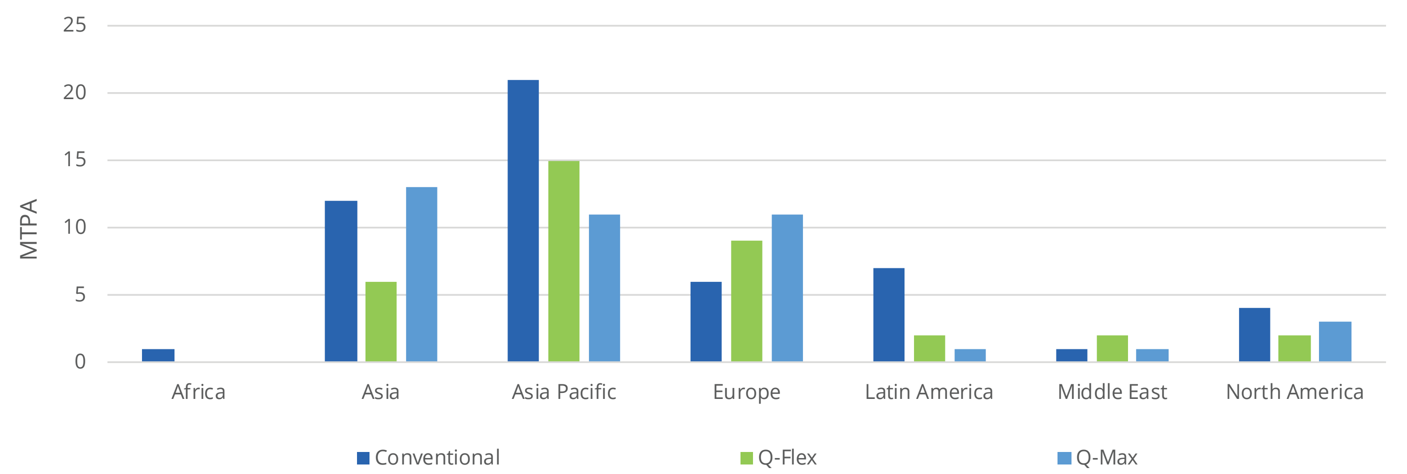
125,000 - 175,000 Cubic Meters

Conventional-Sized Ships Capacity

The berthing capacity at a regasification terminal determines the type of LNG carriers it can accommodate. Traditionally, regasification terminals are built to handle conventional-sized ships, which are predominantly between 125,000 to 175,000 cubic meters in capacity. With the increased utilisation of Q-Class carriers and the global increase in storage capacities, a number of high-demand markets are scaling up their maximum berthing capacity at existing and new-built onshore terminals to receive larger ships. However, in new markets that typically deploy FSRUs or small-scale regasification terminals, terminals have smaller berthing capacities.

As the largest LNG tankers in existence, Q-Flex and Q-Max vessels can carry approximately 210,000 cubic meters and 266,000 cubic meters of LNG respectively, almost 80% more than conventional LNG carriers. As of early 2020, 40 operational regasification facilities have the capacity to receive Q-Max and Q-Flex vessels. Of these 40 terminals, up to 60% are located in the Asia or Asia Pacific regions, while the Middle East and Latin America have one such terminal each. Slightly smaller in capacity, Q-Flex vessels can be berthed at an additional 36 terminals, which are also primarily located in Asia or Asia Pacific regions. The remaining 52 terminals are equipped with sufficient berthing capacity to handle the majority of modern LNG vessels, which are generally below 200,000 cubic meters. Notably, onshore terminals accounted for 93% of terminals capable of handling Q-Max size vessels, and 55% of FSRUs are deployed at terminals that can only accommodate conventional sized vessels. In 2019, one new terminal capable of receiving Q-Flex vessels was added in Bangladesh.

Figure 6.7: Maximum Berthing Capacity of LNG Receiving Terminals by Region, as of February 2020[15]



Source: Rystad Energy

[14] "Smaller Markets" include (in order of size): Portugal, Pakistan, Poland, Brazil, Bangladesh, Greece, Panama, Russia, Egypt, Colombia, Jamaica, Kuwait, Lithuania, Dominican Republic, Jordan, Jordan, UAE, Argentina, Israel. Each of these markets had less than 0.4 mmcm of capacity as of February 2020.
[15] Terminals that can receive deliveries of more than one size of vessel are only included under the largest size that they can accommodate.

6.6. FLOATING AND OFFSHORE REGASIFICATION

101.2 MTPA

Regasification Capacity Across 24 Terminals, February 2020

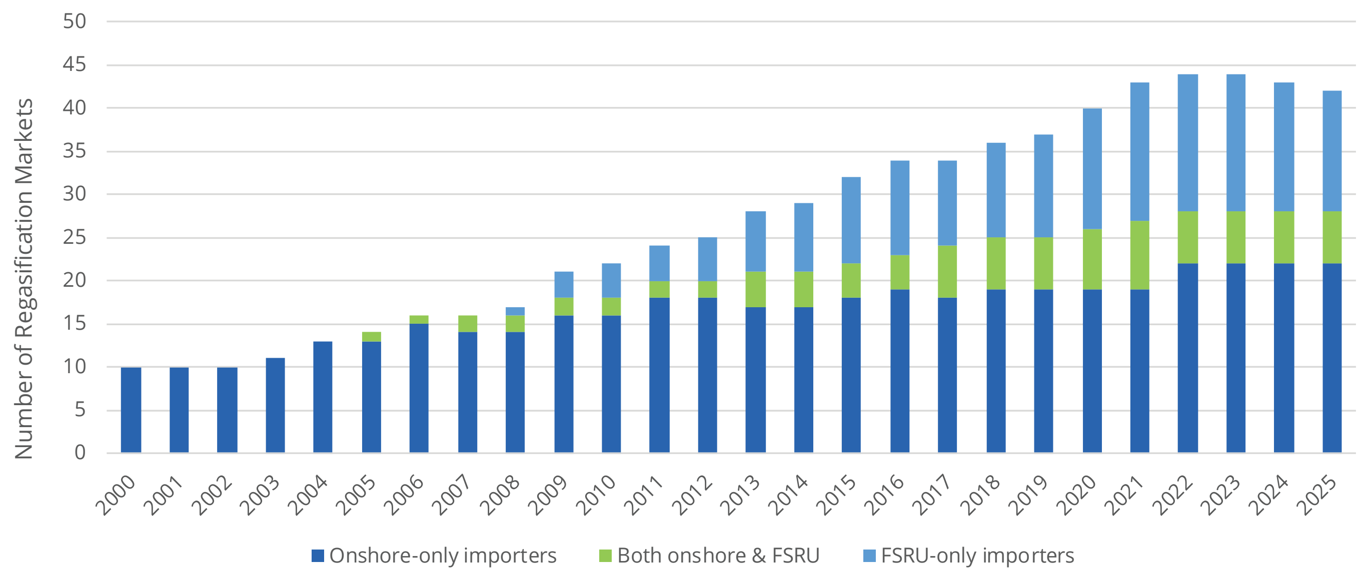
The majority of the existing regasification terminals are land-based, and the ratio of existing onshore to floating regasification terminals as of February 2020 was around 5:1. However, the proportion of floating regasification terminals has grown steadily in recent years, as an increasing number of new FSRU-based projects came online. Floating regasification has grown from a single terminal with 3.8 MTPA of capacity in 2005 to 24 terminals with a combined capacity of 101.2 MTPA as of February 2020. Indeed, three of the six terminals that began operations in 2019 were offshore developments, and 12 of 26 new terminals under construction as of February 2020 are floating regasification projects.

A number of new markets have entered the global LNG trade through the addition of FSRU-based terminals in the past few years, including Bangladesh in 2018. Of the 37 existing LNG import markets as of February 2020, 19 imported LNG with FSRUs, and six of those had onshore terminals as well.

Eight offshore projects are under construction and have announced plans to become operational by the end of 2020, totaling 31.2 MTPA of capacity. Some of these projects are undergoing construction in India, Brazil, the United States (Puerto Rico), Ghana, and Turkey. India will add its first FSRU-based terminal at Jaigarh, equipping it with both onshore and FSRU terminals. In addition, several FSRU projects currently under construction are planned for start-up in 2021. In particular, this would include new import markets such as El Salvador, Croatia and Cyprus. However, not all new importers are utilising floating-based terminals, some new importers, including Vietnam, are building their first regasification terminals as onshore facilities.

Three new floating terminals became operational in 2019[16]: Bangladesh's 3.8 MTPA Moheshkhali (Summit) terminal, Jamaica's 3.6 MTPA Old Harbour terminal and Brazil's 3.6 MTPA Sergipe terminal. Bangladesh's Moheshkhali (Summit) and Jamaica's Old Harbour terminals are the markets' second regasification terminals. Brazil's new FSRU project at Sergipe terminal started commercial operations in early 2020 after the installation and commissioning of its FSRU Golar Nanook in April 2019. Turkey's Etki terminal had its FSRU leave port in July 2019, and started the chartering of a replacement vessel with higher regasification capacity in the same month. With the new FSRU in operations, Turkey's Etki terminal's total regasification capacity expanded to 5.7 MTPA. Following the charter extension on Golar Igloo to the end of 2019, Kuwait's Mina al-Ahmadi terminal has signed a two-year charter for Golar Igloo to provide continued LNG storage and regasification services for the terminal's regasification season, beginning in March 2020 to 2022. As of February-2020, the total global active floating import capacity stood at 101.2 MTPA in 24 terminals.

Figure 6.8: Number of Regasification Markets by Type, 2000-2025[17]

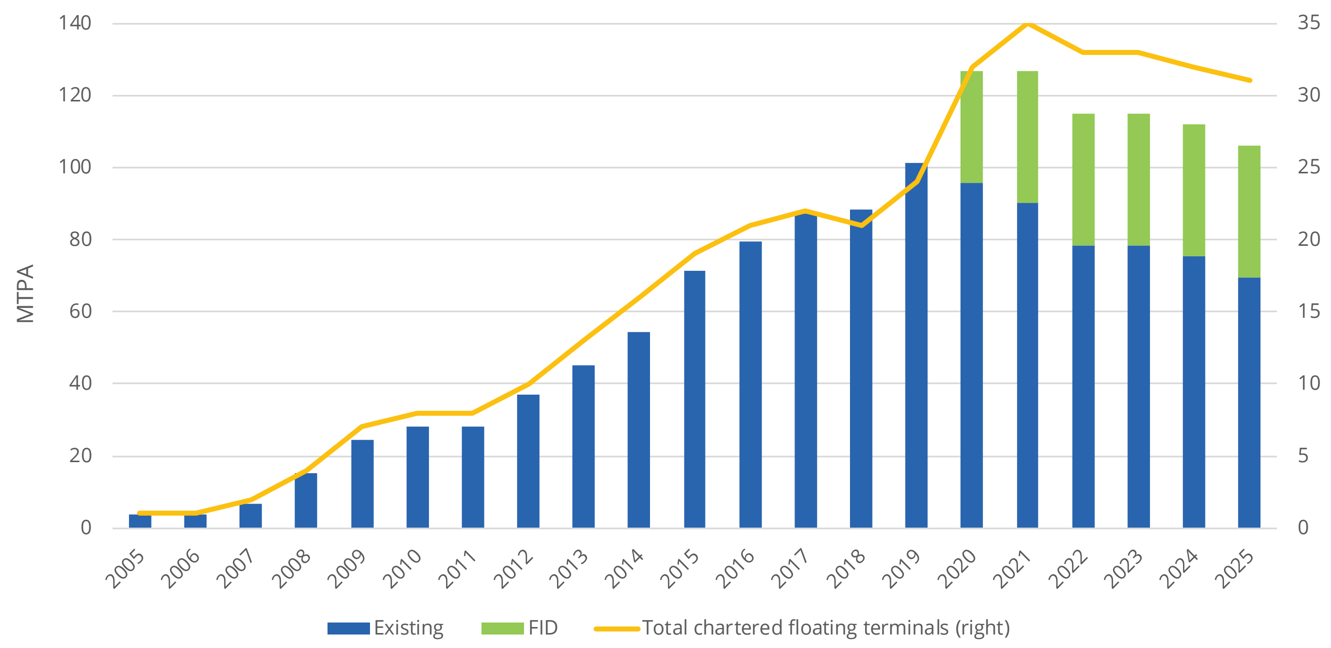


Source: Rystad Energy

[16] Excludes Russia's Kaliningrad terminal as it did not receive any cargoes after it was commissioned in January 2019. The terminal's FSRU was subsequently chartered out as an LNG carrier through December 2019.

[17] The above forecast graph only includes importing markets that had existing or under-construction LNG import capacity as of year-end 2019. Owing to short construction timelines for regasification terminals, additional projects that have not yet been sanctioned may still come online in the forecast period. The decrease in number of markets with receiving terminals is due to the expiration of FSRU charters, although new FSRU charters may be signed during this period.

Figure 6.9: Floating Regasification Capacity by Status and Number of Terminals, 2005-2025[18]



Source: Rystad Energy

Table 6.1: Comparison of Onshore Terminals and FSRUs

Onshore Terminals	FSRUs
Provides a more permanent solution	Allows for quicker fuel switching or complementing domestic production.
Offers longer-term supply security	Greater flexibility in land and port requirements
Greater gas storage capacity	Requires lower capital expenditures (CAPEX)
Requires lower operating expenditures (OPEX)	Depending on location, fewer regulations

The rising prevalence of FSRUs as a storage and regasification solution has demonstrated the potential to deliver a range of benefits often distinct from the onshore alternative. In selecting the concept of a new-built terminal, it is critical for markets to weigh the benefits and drawbacks of each option (FSRU and onshore terminal) against specific market requirements, conditions and constraints. In recent years, FSRUs have enabled several new markets, including Bangladesh, Jordan and Pakistan, to receive their first LNG cargoes in a relatively short time span. FSRUs' shorter construction and delivery time and ease of relocation compared to an onshore terminal can meet potential near-term gas demand surges in a time-efficient manner. This is done by complementing domestic production or accelerating a market's fuel switching process. On average, FSRUs are less CAPEX-intensive than land-based terminals due to the common practice of chartering FSRUs from third parties. As they only require minimal onshore space and construction, the greater flexibility offered by FSRUs make them an attractive option for markets with limited land and port availability.

Onshore terminals, on the contrary, offer a different combination of advantages compared to FSRU. Markets with substantial requirements for storage and regasification capacities can benefit from developing an onshore terminal, which typically supports the installation of larger storage tanks and regasification capacity relative to a floating terminal. Onshore projects are also less exposed to location-dependent risk factors including vessel performance, and potentially longer downtime due to heavy seas or meteorological conditions. As a permanent asset, onshore terminals allow for easier on-site storage and regasification capacity expansions, if required, making them an economical solution for markets that require longer-term supply security.

As of February 2020, there were ten FSRUs with capacity over 60,000 cubic meters on the order book. With several vessels temporarily utilised as conventional LNG carriers and multiple others open for charter at the same time in the past year, near-term floating regasification capacity can likely satisfy demand. However, the FSRU market is anticipated to tighten in the longer term. The number of proposed import projects (including pre-FID terminals) utilising FSRUs has grown significantly in recent years, but over half have yet to sign any charter agreements to secure their vessels. As the global LNG market expands, the strategic importance of being time-efficient and cost-effective in terminal commissioning is set to grow, particularly in new import markets.

[18] The above forecast only includes floating capacity sanctioned as of year-end 2019. Owing to short construction timelines for regasification terminals, additional projects that have not yet been sanctioned may still come online in the forecast period. The decrease in number of markets with receiving terminals is due to the expiration of FSRU charters, although new FSRU charters may be signed during this period.

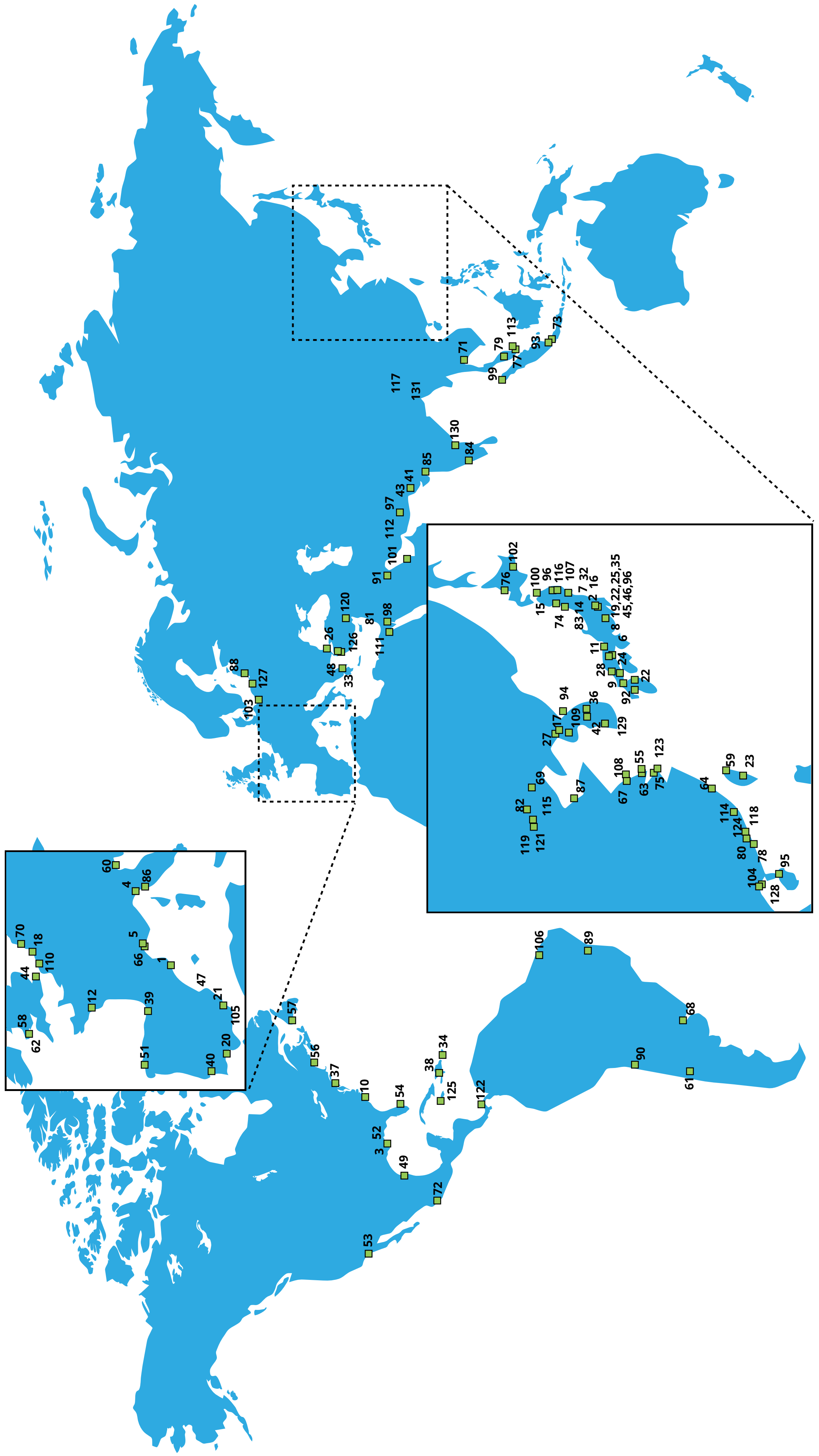


Figure 6.10: Global LNG Receiving Terminal Locations

Note: Terminal Numbers Correspond to Appendix 5: Table of Global LNG Receiving Terminals.
Source: Rystad Energy

6.7. RECEIVING TERMINALS WITH RELOADING AND TRANSSHIPMENT CAPABILITIES

France Re-Exported 0.61 MTPA

Receiving terminals with diversified service offerings have emerged in recent years. Beyond traditional regasification operations, diversified terminals are equipped with additional value-adding services such as reloading, transshipment, small-scale LNG bunkering and truck-loading. Following the rise of terminals with reloading and transshipment capabilities, re-export volume from markets where reloading terminals are located have more than doubled since 2017. Generally, re-exporting activities increase profitability for traders by taking advantage of arbitrage opportunities through LNG trade between regional markets as well as logistical factors within certain markets. For the fourth consecutive year, France re-exported the most cargoes globally in 2019 at 61 MTPA[19], through its terminals in Montoir, Fos Cavaou and Dunkirk. However, France experienced a 1 MTPA[19] decline compared to its re-export volume in 2018. After France, Singapore re-exported the second largest volume of cargoes in 2019 at 4 MTPA[19]. Despite sending out high re-export volumes historically, European markets including Spain, Belgium and the Netherlands have seen a reduction in cargo volumes in recent years. With the decline in global re-export volume, the share of European re-exports in the global LNG market has fallen from 77% in 2018[19] to 58% in 2019[19].

One new market began the re-exporting of LNG cargoes in 2019 — Jamaica. Seeking to position itself as the Caribbean hub for LNG re-export, Jamaica has re-exported around 01 MTPA[19] of LNG cargoes from its new regasification terminal at Port Esquivel in 2019 since its commissioning in late July. France's Dunkirk, which generated its first re-export cargoes in early 2018, has seen a re-export volume of 0.08 MTPA in 2019. Lithuania, which began re-exports within the region in 2017 with small-scale volumes of less than 0.01 MTPA, has experienced a growth in LNG re-exports in 2019, reaching a total of 02 MTPA[19]. As of February 2020, 27 terminals in 16 different markets have reloading capabilities.

Value-adding services including transshipments and bunkering services can be performed at terminals with multiple jetties, such as the Montoir-de-Bretagne terminal in France. Established markets in Europe have terminals such as Gate LNG, Barcelona and Cartagena that are capable of providing this functionality for ships as small as 500 cubic meters. Multiple receiving facilities enhance their infrastructure to provide transshipment, bunkering and truck loading capabilities. Belgium's Zeebrugge terminal has expanded its storage capacity through the construction of its fifth storage tank to support larger transshipment volumes in late December 2019. The Huelva terminal in Spain completed its first LNG bunkering operation from truck to ship in June 2019, and Spain is now offering this service on a frequent basis in several of its ports. Singapore's Jurong terminal completed the modification of its second jetty to receive and reload LNG carriers of between 2,000 cubic meters and 10,000 cubic meters in capacity. The jetty will enable regional small-scale LNG distribution and LNG bunkering services.

Incheon LNG Terminal - Courtesy of KOGAS

[19] GIIGNL

Table 6.2: Regasification Terminals with Reloading Capabilities as of February 2020

Market	Terminal	Reloading Capacity (mcm/h)	Storage (mcm)	No. of Jetties	Start of Re-Exports
Belgium	Zeebrugge	6	560	1	2008
Brazil	Guanabara Bay	1	171	2	2011
Brazil	Bahia	5	136	1	N/A
Brazil	Pecém	1	127	2	N/A
Colombia	Cartagena	0.005	170	1	N/A
Dominican Republic	AES Andres LNG	N/A	160	1	2017
France	Fos Cavaou	4	330	1	2012
France	Montoir-de-Bretagne	5	360	2	2012
France	Dunkirk LNG	4	570	1	2018
France	Fos Tonkin	1	150	1	N/A
India	Kochi LNG	N/A	320	1	2015
Japan	Sodeshi	N/A	337	1	2017
Jamaica	Port Esquivel	N/A	170	1	2019
Mexico	Energia Costa Azul	N/A	320	1	2011
Netherlands	Gate LNG	10	540	3	2013
Portugal	Sines LNG Terminal	3	390	1	2012
Singapore	Jurong	8	564	2	2015
South Korea	Gwangyang	N/A	530	1	2013
Spain	Cartagena	7.2	587	2	2011
Spain	Huelva	3.7	620	1	2011
Spain	Mugardos LNG	2	300	1	2011
Spain	Barcelona LNG	4.2	760	2	2014
Spain	Bilbao	3	450	1	2015
Spain	Sagunto	6	600	1	2013
United Kingdom	Grain	Ship-dependent	960	1	2015
United States	Freeport LNG	2.5	320	1	2010
United States	Sabine Pass LNG	2.5	800	2	2010
United States	Cameron LNG	2.5	480	1	2011

6.8. RISKS TO PROJECT DEVELOPMENT

Regasification Terminal Developers

Often Confront Multiple Difficulties

Regasification terminal developers must often confront multiple difficulties in completing proposed terminal plans, some of which are different than those facing prospective liquefaction plant developers. Regasification developers can mitigate some of these risks when choosing a development concept, based on the advantages and disadvantages of floating and onshore terminal approaches. Both FSRUs and onshore developments are tasked with circumventing comparable risks in order to move forward. However, unlike onshore terminals, FSRUs can mitigate the risk of demand variation as they may be chartered on a short or medium-term basis and be later redeployed to serve a different market.

The extent to which the economics of regasification projects work are often a combination of the ability to take on risk, or mitigate risks, as well as the ability to add or extract value from parts of the chain. Risks and factors that determine economic and commercial viability of regasification projects include:

Project and equity financing

Historically, projects have faced delays as a result of financing challenges. These challenges can arise from the perceived risk profile of the partners, of the market in which the project is to be located, as well as of the capacity owners. Creditworthiness of parties involved will determine the ability to get financing. Aggregators and traders can to some extent help take on these risks and lower the perceived liabilities to the bank. Financing challenges may in some cases derive from regulatory constraints relying mostly on public investment by state-owned enterprises and impeding the flows of private capital into the sector.

Regulatory and fiscal regime

New regasification terminals can face significant delays in markets with complicated government approval processes or lengthy permit authorisation periods. New terminals can also be hampered by the lack of an adequate regulatory framework or by detrimental fiscal regimes. Some markets also have incumbents with strong control over infrastructure and import facilities, which despite liberalisation trajectories, gives them some control over capacity and profitability of parties looking to participate in that market. A transparent and stable regulatory framework which incorporates a proper risk-sharing mechanism among all stakeholders is essential.

Challenging site-related conditions

In specific geographical areas, technical conditions and/or environmental conditions can lead to additional costs, delays or cancellations of regasification projects. An example is weather disturbances that cause construction delays.

Climate risks

Projects that are viewed as having an impact on climate change due to their direct or indirect carbon footprint may be increasingly challenged by policymakers, lenders and local residents. Equally, climate change and temperature rise may create additional uncertainty with regard to the resilience of facilities to scenarios of rise of the oceans.

Reliability and liquidity of contractors and engineering firms

During the construction process, financial and regulatory issues with contractors or construction companies can lead to project delays or even equity partners pulling out of the project altogether. Part of this responsibility lies with the contractor — to ensure documentation and applications are prepared in time, but also with governments, to set clear and efficient processes, and communicate these clearly. Examples of delays have been caused by visa delays, and delays in approvals of permits due to incomplete submissions.

Securing long-term regasification and offtake contracts

Terminal capacity holders and downstream consumers will need to be contracted for an FID to be taken, particularly as the market shifts toward shorter-term contracting. For the development of new terminals, political support could be needed if long-term commitments are not secured. Parties need to agree a sharing of some of the remaining risks when not all capacity or offtake has been contracted in time for a competitive investment decision. Uncertainty in demand outlook, or significant unexpected changes in the demand outlook will cause delays or cancellation of regasification projects. Increased scalability of regasification facilities will help to some extent.

Access to downstream market and availability of downstream infrastructure

Pipelines or power plant construction that are required to connect a terminal with end-users are often separate infrastructure projects that are not planned and executed by the terminal owners themselves. The misalignment of timelines between the projects, or lack of infrastructure development downstream of the terminal can cause under-utilisation of facilities or delays in start-up.

Samcheok LNG Terminal - Courtesy of Kogas

7. The LNG Industry in Years Ahead

What is the emerging trend in European LNG import market developments versus Russian pipeline gas supply?

The European gas market will continue to look at LNG imports as a way to diversify its natural gas supply. While Russia has been the largest exporter of natural gas to Europe and has influenced the European gas market, declines in European natural gas production in the Netherlands and elsewhere; growth of natural gas demand as a substitute for coal; and the competitive supply of Russian gas and global LNG; are shaping the European gas market.

The expansion of the Russian Nord Stream pipeline projects, including Nord Stream 2, and the TurkStream pipeline to southeastern Europe demonstrate Russia's approach as a long-term natural gas supplier to Europe. As a low-cost natural gas supplier, Russia is well positioned to maintain its position as a major gas supplier to Europe. However, with the expansion of US Atlantic basin export projects, LNG is becoming an increasingly viable supply source.

Under-utilised European receiving terminal capacity and development of additional capacity, especially through new projects, reduces physical constraints to LNG supply as a hedge. Due to the size of the projects and the short shipping distance, Russian LNG projects including Yamal, Arctic LNG, and Baltic LNG are expected to continue to play a role, exerting competitive pressures in the European LNG market, while the LNG developments in Qatar may also push the country to protect its European market share and to secure outlets in the region.

Eventually, Europe's ability to absorb additional LNG volumes will also depend on the ability of buyers to exert downward flexibility in long-term pipeline gas contracts, on the availability of underground gas storages and on the rate of coal-to-gas switching in the power sector.

Which project development barriers will newly importing markets and prospective importing markets face?

Many of the project development barriers captured in the 2012 IGU "Report of Study Group D.2: Penetration of New Markets for LNG" remain relevant to the current situation facing newly importing and potentially importing markets. Traditional barriers including project siting limitations, environmental and domestic land use requirements and opportunity costs, investment qualification and availability deficiencies, and policy uncertainties and instabilities will continue to exert pressure against LNG development among prospective importers. Institutional risk factors, even among technically- and economically-feasible projects, may play a major role as barriers to projects, especially up to the FID decision. Ultimately, such factors manifest themselves in the form of financial constraints and contingencies that make projects less feasible.

A newly-developed set of factors may include carbon emission policies, and potential taxation and banking policies. These factors have only recently been associated with determining project outcomes, but commitments to meet these societal goals may show up in tangible resistance to projects as environmental, social, and governance (ESG) metrics play a further increased role in project sanctions and investment criteria.

Different types of markets will require different approaches to ensure that an import value chain is implemented. For example, a larger but regulated market will need to ensure national and regional parties work together to link grid infrastructure to new import terminals. For developing markets, often the funding and financing of import projects is a struggle with several parties along the value chain wanting guarantees of others' financial commitments. As the LNG market is commoditising further, the role of different types of players in executing these projects have changed – trading houses now take stakes in import terminals where they did not previously do so, while larger portfolio players have been able to supply into flexible markets without necessarily being involved directly in the terminal through shareholding or capacity bookings. As the underlying barriers to developing import projects are unlikely to be removed in the immediate future, and participants roles are changing, it is important to consider how the industry can ensure import projects continue to be developed.

What are the remaining potential power generation opportunities for switching from coal to natural gas internationally? What are the opportunities for LNG imports and what role will regional differences play?

Natural gas from imported LNG will continue to play a major role in replacing coal and liquid fuel-fired electricity generation and reducing emissions, in both developed and developing economies.

However, capital constraints, availability of local gas production, gas infrastructure and national energy policies will impact coal-to-gas substitution rates. Regional differences in triggers for coal to gas switching (including gas versus coal price differentials, policies on carbon emissions, and prospects for carbon pricing) are important as well as policy roadmaps which influence infrastructure investment.

In its 2019 World Energy Outlook[1], the International Energy Agency estimated that a carbon price of $60-80/tonne CO_2 would be needed to provide enough support for the power sector to switch from coal to gas in China, whereas emissions savings from switching could be unlocked in Europe as soon as carbon prices exceed $20/tonne CO_2. As a result, simple measurements such as current coal-fired power capacity, are not reliable indicators of the opportunities for importing LNG as a replacement for other fuels.

Natural gas and LNG also have the potential to help balance variable renewable electricity generation and meet peak power demand. The economics of LNG supplied natural gas fired generation will become more challenging as their demand profile adjusts to balance variable renewable electricity generation and meet peak power demand.

Current forecasts by the International Energy Agency (from the World Energy Outlook[1]), indicate renewables could account for two-thirds of world electricity generation output and 37% of final energy consumption by 2040 under its "Sustainable Development Scenario." Under this forecast, LNG trade supporting displacement of coal-fired generation must find ways of working with renewable electricity infrastructure development to find the best uses of natural gas-fired generation in a "renewable electricity world."

How will LNG demand in China respond to the alternatives of LNG imports, Russia and Central Asia pipeline supply, and domestic production?

LNG demand in China is driven by a combination of price levels of LNG versus pipeline supply options from Central Asia and Russia, regional demand dynamics versus where supply comes in geographically. Security of supply may also be prioritised.

While China has consistently added import options, LNG import terminals and pipeline gas supply routes, infrastructure has not been connected comprehensively. This means that access points for LNG and gas do not necessarily always connect with demand centers and seasonal dynamics. The extent to which LNG demand in China will grow to a large extent depends on the ability to extend this infrastructure to ensure supply can efficiently reach demand centers.

Also in the near-term, however, recovery of the Chinese economy is needed to boost aggregate energy demand and to avoid dominance of Russian pipeline gas as the lowest-cost supply. In a fully recovered Chinese economy, both Russian gas and LNG imports can play significant roles based upon regional demand patterns, domestic infrastructure limitations, and the need to hedge against supplier dominance. Nevertheless, seasonality and regionality will continue to play major roles in China's exercising of options, including development of domestic supply and delivery within the domestic market.

In the long run the traditional drivers of relative prices, end user cost elasticity, and continuing regional differences in demand and availability are expected to play a role in how China exercises its options. It appears that an "all of the above" strategy might be best suited for China's geographic and economic scale. Additionally, this approach would be the prudent course to help ensure supply stability and security, which is needed to continue to grow the economy. While renewable energy is growing rapidly within China, the sheer scale of the needs for energy and distributed economic needs will require China to continue to diversify its energy sources.

[1] https://www.iea.org/reports/world-energy-outlook-2019

With the continuing wave of project FIDs, will we see trends in traditional versus newer commercial models for LNG export projects?

Final investment decisions in 2018 and 2019 have emphasised traditional project designs and orientations with most FIDs taken on integrated projects that have relied on equity financing. In large part, this tendency to focus on traditional commercial models is associated with stable oil and relative fuel prices, as well as the significant demand uncertainty faced by legacy as well as growth markets.

The continued evolution of the LNG market, with for instance more liquidity, may incentivise use of broader portfolio approaches, incorporating the flexibility of short term and spot markets to allow for arbitrage and hedging as energy prices change.

While traditional market approaches of long-term supply contracts are expected to continue to be in the mix to ensure supply security, more innovative spot and short-term project orientations are expected to cover more uncertain demand tranches. As some of the newer commercial models rely on external financing, the developers behind them had to convince that their market access is secured, by having 80 to 90% of offtake sold under long term SPAs. Very few projects were able to do this, on the contrary, most FIDs in 2018 and 2019 were taken by larger players that were able to rely on equity financing, and take FID without the need for long-term SPAs in place for their export volumes.

Concerns around reduced importance of economies of scale do not appear to be developing, except where barriers to development constrain the feasibility of large-scale projects. In the late 2010's, a significant debate over project scales and economies of scale emerged but recent projects with new configurations, like modular adjustments, appear to have settled the concern. For example, liquefaction added in smaller increments to reduce CAPEX risk. Economies of scale from what might become the fully-developed projects appears to be less of a concern now than controlling for project risk. For some players, and especially new market entrants, this is likely to serve as a model, especially for liquefaction projects. However, for other players, project scales that take full advantage of economies of scale will continue to be the driving consideration for project design, although staged expansion through rollout of multiple trains in the case of liquefaction is expected to continue.

Ultimately additional liquidity and availability of LNG benefits market functionality, and if by the time a next wave of sanctioning is required, some of the barriers faced by newer commercial models will have been addressed, and the industry could see the emergence of more advanced project configurations.

How is the increased flexibility demanded in LNG contracts influencing LNG shipping?

In keeping up with liquefaction capacity growth, LNG carrier capacity shortfalls will incentivise dedication to traditional trade and employment of carriers, increased market flexibility in the form of relief from destination clauses and shorter term contracts. Further LNG commoditisation will align shipping capacity more with these trends and drive commitments of carriers to more flexible trade.

In the longer term, LNG carrier newbuilds may show greater diversity in capacity to accommodate increasing flexibility demanded from contracts and capabilities to meet LNG transfer requirements of a more diverse import terminal population. The current level of newbuilds should be sufficient to allow for meeting broader technical requirements. Additionally, greater use of break bulk operations and other flexible shipping strategies can be implemented to provide greater flexibility. This includes reassignment of FSRUs to serve as LNG carriers, a development that we already see happening today. However, amid the slight current upward trends in shipping and LNG carrier construction, uncertainties regarding economic growth will continue to exert influence over expansion of shipping capacity and its employment. Additionally, efficiency improvements in LNG carrier operations and fuel usage will be increasingly important to maintain competitiveness as trade routes change with more flexible LNG trade.

The main challenges for LNG carrier owners are currently economic and technical. Utilisation of the steam carrier fleet, a less efficient option in terms of fuel consumption, increasing pressure on charter contracts with reduced periods and more competition with the entry of newcomers are the key commercial challenges. Selection of the right technologies for the new generation of ships is also key for the owner to succeed in the current environment.

How is regional bunkering infrastructure developing and are there any discrepancies the industry should consider?

Growth opportunities will continue to be most relevant in regional shipping, with larger international shipping opportunities expected in the future. Growth continues to be strong in the European, Northern Atlantic, Baltic, Mediterranean, and Asia-Pacific regions. To date, development of bunkering in the Middle East has lagged behind other regions.

Regarding drivers for bunkering development, increased attention to air pollution rules may provide a boost to LNG bunkering activity in affected regions, providing incentive beyond current IMO emissions rules focused on sulfur and NO_x. Technology developments oriented toward reducing total carbon emissions from vessels will need to be implemented to address both announced IMO GHG reduction objectives and carbon reduction emission policies. Continued development of marine engine technologies to improve performance and minimise "methane slip" in the emissions stream will enable onboard systems to better meet vessel requirements. Development of more uniform onshore fueling infrastructure and safety standards for integrating LNG bunkering activities within busy port operations is proceeding and is not expected to impose significant barriers to bunkering development.

How might global disruptions influence LNG trade in the near term?

Global disruptions, while often not predictable, may play important roles in short-term, and eventually long-term, trade activities. Trade impact may come from a variety of disruptions, including major weather events, trade disputes, pandemics, security threats and regional conflicts, and other transient influences. Increasing LNG market liquidity and trade flexibility may do much to reduce the short-term risks of such disturbances. Some of these influences are currently at work, and their impact on short-term trade are being assessed, in particular COVID-19. Other risks are less visible and may result in regionalised impacts.

In the longer term, most disruptions such as the effects of climate change and other sustained impacts may be accommodated by adjustments to physical LNG infrastructure and longer-term trade agreements. The long-term perspective, as a result, may require more portfolio-oriented planning while including short-term tools to address disruptions.

The other consideration for the impact of disruptive events are different lengths of cycles in the LNG industry. While capacity only gets added a number of years after sanctioning, the prevalent concerns at the time of sanctioning do affect decision making on projects. A key disruptive event during a sanctioning wave could dampen investment appetite and drive an earlier than expected supply and demand gap as less export capacity gets added than was required. On the other hand, a disruptive event during a period of build-out and oversupply could trigger concerns over security of supply, driving more long term contracting and ultimately potentially leading to continued over-supply.

LNG is clearly commoditising further — will it become a fully commoditised product or will there always be barriers that will prevent that from happening?

To achieve full commoditisation, LNG faces a "high bar" with respect to current trade patterns, energy needs, and physical constraints of transportation, storage, and handling of LNG. Different schools of thought speak to some of the barriers to full commoditisation.

While some market players see full commoditisation as both an objective and eventual reality, others still see that a significant portion of the industry will retain strategies using long-term agreements as a means of addressing security of supply, price stability, and project financing. LNG-term SPAs and fixed contract terms for large segments of the trade while appearing to hamper full commoditisation, are still needed to secure project financing Under this view, commoditisation would likely stay within the segment of trade represented by short-term and spot LNG, with limited effect overall.

Another signpost, and at the same time, enabler of further commoditisation of LNG would be the an LNG hub. Development of hubs can provide increased price transparency, flexibility, fungibility and liberalisation signposts essential to commoditisation. Hubs would also further underpin the ability to trade paper in addition to physical volumes. However, in the case of LNG, factors such as high project CAPEX for liquefaction, slow adjustment of supply and high transportation and storage costs, are not fully addressed by creation of physical and virtual LNG hubs.

Domestic energy policies are also expected to play an important role.

While signposts indicate that LNG has commoditised further since the last wave of sanctioning of supply, inherent barriers as discussed above, have not necessarily been mitigated, indicating that full commoditisation is unlikely to occur in the short term.

QGC LNG Plant - Courtesy of Shell

Will small-scale and mid-scale LNG facilities downstream of receiving terminals and other LNG sources continue to develop?

It is expected that use of LNG as a transport fuel for road and marine and potentially rail to expand, but perhaps at a slower pace than some innovators and first adopters have believed. Each of these LNG end use applications face specific opportunities and challenges.

LNG transportation to satellite LNG regasification operations for industrial facilities and remote communities is expected to increase due to economic development in areas that cannot be served by natural gas pipeline supplies in a timely way or face significant barriers. Initiatives to create "virtual LNG pipelines" to access isolated areas and create a more flexible supply, can increase and generate more demand for LNG. They also can reduce emissions, using LNG as a substitute to other, less clean, fossil fuels.

These applications imply a general growth in development of small-scale and mid-scale LNG storage facilities close to end use applications and markets. To date, worldwide activity in these distributed LNG markets has not been well characterised and represented in data, as is also the case in this report since the volumes of LNG do not meet the current reporting thresholds.

As described by various LNG prognosticators, the growth of the worldwide LNG industry is more challenged on the demand side than on the supply side. Small-scale and mid-scale LNG facilities downstream of the traditional LNG trade may provide a means to address impediments in demand growth as new vehicle and satellite facility opportunities are recognised. Greater efforts to capture data on these supply chains will provide greater clarity on how this infrastructure is developing.

Will floating gas-to-power capacity development show significant increases as a near-term alternative for LNG importation, and what are the drivers to choose this approach?

Activities supporting deployment of floating LNG power plants are expected to increase most readily among energy markets with high aggregate electric power demand growth and a strong need for rapid power capacity for expansion or introduction of electrical supply capacity in energy-poor regions. This is especially the case where high barriers for onshore power station development are in place or where access to gas pipelines is not guaranteed. These drivers may independently justify new projects and serve broadly diverse domestic economies and circumstances. Regardless of these drivers, floating gas-to-power projects will represent moderate to high technology risk and, on an individual project basis, relatively high CAPEX requirements for fully-independent power generation systems.

Floating power plant concepts fueled by LNG will have to compete with other floating power options including liquid fuels, renewables and nuclear power, which may receive governmental support over LNG. The most viable and low technology risk to these floating gas-to-power projects are FSRUs, for shore delivery of pipeline gas to a conventional onshore power station. As such, the strategy for deployment of floating gas-to-power appears to require a careful analysis of the market niche served by these projects over other, more conventional approaches. While implementation of floating gas-to-power projects are expected to roll out in the near future, Asian commercial interests will continue to lead technology and commercial development in floating LNG power concepts.

The concept of a fully integrated floating regasification and power plant may be a more realistic solution to grant easy access to clean electricity production. Therefore, such fast track projects, built and commissioned at reputed shipyards, may materialise in the near future.

What improvements in emissions measurement and controls will help the LNG industry reduce its environmental footprint?

Critical emissions streams for consideration from the LNG value chain include carbon emissions in the form of carbon dioxide and methane emissions. The major contributor to LNG's carbon footprint is associated with combustion from power generation and heat generation and in the form of carbon dioxide from liquefaction operations (principally from power generation), ship prime movers, and several key regasification approaches. For reductions in carbon dioxide, greater process efficiency will continue to be the most important and impactful mitigation measure. Some of the near-term means of pursuing these improvements are outlined in the 2015 IGU report, "Programme Committee D Study Group 4: Life Cycle Assessment of LNG."

Methane emissions represent product losses as fugitive emissions and will continue to be addressed losses of LNG operations. As such, reduction of methane emissions will be in the interest of LNG operators to control product losses, regardless of potential regulatory interventions. To a lesser extent, methane emissions from flaring and other operations contribute to the LNG value chain carbon footprint and will continue to be emphasised for control. However, regulation of methane emissions will receive increased emphasis in domestic regulatory schemes and through international requirements, especially in the latter case for marine operations where fugitive emissions and "methane slip" from engine combustion contribute. Monitoring efforts for methane losses and maintenance of emission inventories will continue to be emphasised, whether required by regulatory authorities and where not required. Remote sensing technologies will be increasingly deployed across LNG operations to assist ultimately in methane emissions control.

What innovative LNG receiving terminal business operations will the industry see in the coming years?

As dynamics of LNG importing markets continue to evolve with changing economic conditions, growth in renewable energy sources, natural gas infrastructure build-out, and policy and regulatory shifts, major players and receiving markets are expected to emergence of new business models.

For example in Spain, regulatory changes in the domestic LNG market are moving toward implementing what is called a "virtual global LNG tank" model in the next decade. This unifies the entire domestic capacity of LNG terminals including storage, regasification, and natural gas send out as a single business entity instead of separate physical assets. Spain's total LNG storage capacity of natural gas will be commercialised as a single "tank," independently of the physical facilities located around the market. In doing so, business decisions based upon individual facility capacity utilisation and operations will play a much reduced role in commercial activities, and the importance of individual facility data and characterisations, as reported in this document historically, will likewise play a reduced role for the purposes of the Spanish natural gas industry. Under this new regulatory model, to be initiated on 1 April 2020 and fully implemented by 1 October 2020, the Spanish system's total LNG storage capacity of 3.17 mmcm and total regasification capacity of 43.8 MTPA will be commercialised as a "global capacity". The new model is expected to give more flexibility and liquidity in the LNG market by adding together Spain's LNG receiving terminal capacities, and to create a liquid virtual hub.

While it is unclear what other innovations we may see, continued consideration of virtual hub development, breakbulk carrier operations, "milk run" transportation models, containerised delivery by multi modal transportation, use of FSRUs and other floating assets may play a greater role in LNG receiving country business models as they adapt to changing market conditions and the need to accommodate short-term and spot LNG trade activity and efforts to implement greater flexibility and market liquidity.

Methane Mickie Harpet at QGC LNG Plant - Courtesy of Shell

8.
References Used in the 2020 Edition

8.1 DATA COLLECTION FOR CHAPTER 3,4,5 AND 6

Data in Chapters 3, 4, 5 and 6 of the 2020 IGU World LNG Report is sourced from a range of public and private domains, including the BP Statistical Review of World Energy, the International Energy Agency (IEA), the Oxford Institute for Energy Studies (OIES), the US Energy Information Agency (EIA), the US Department of Energy (DOE), GIIGNL, Rystad Energy, Refinitiv Eikon, Barry Rogliano Salles (BRS), company reports and announcements. Additionally, any private data obtained from third-party organisations are cited as a source at the point of reference (i.e. charts and tables). No representations or warranties, express or implied, are made by the sponsors concerning the accuracy or completeness of the data and forecasts supplied under the report.

8.2 DATA COLLECTION FOR CHAPTER 2

Data in Chapter 2 of the 2020 IGU World LNG Report is sourced from the International Group of Liquefied Natural Gas Importers (GIIGNL). No representations or warranties, express or implied, are made by the sponsors concerning the accuracy or completeness of the data and forecasts supplied under the report.

8.3 PREPARATION AND PUBLICATION OF THE 2020 IGU WORLD LNG REPORT

The IGU wishes to thank the following organisations and Task Force members entrusted to oversee the preparation and publication of this report:

•American Gas Association (AGA), USA: Ted Williams
•Australian Gas Industry Trust (AGIT), Australia: Geoff Hunter
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•Shell, The Netherlands: Birthe van Vliet

8.4 DEFINITIONS

Brownfield Liquefaction Project: A land-based LNG project at a site with existing LNG infrastructure, such as: jetties, storage tanks, liquefaction facilities or regasification facilities.

Commercial Operations: For LNG liquefaction plants, commercial operations start when the plants deliver commercial cargos under the supply contracts with their customers.

East and West of Suez: The terms East and West of Suez refer to the location where an LNG tanker fixture begins. For these purposes, marine locations to the west of the Suez Canal, Cape of Good Hope, or Novaya Zemlya, but to the east of Tierra del Fuego, the Panama Canal, or Lancaster Sound, are considered to lie west of Suez. Other points are considered to lie east of Suez.

Forecasted Data: Forecasted liquefaction and regasification capacity data only considers existing and sanctioned capacity (criteria being FID taken), and is based on company announced start dates.

Greenfield Liquefaction Project: A land-based LNG project at a site where no previous LNG infrastructure has been developed.

Home Market: The market in which a company is based.

Laid-Up Vessel: A vessel is considered laid-up when it is inactive and temporarily out of commercial operation. This can be due to low freight demand or when running costs exceed ongoing freight rates. Laid-up LNG vessels can return to commercial operation, undergo FSU/FSRU conversion or proceed to be sold for scrap.

Liquefaction and Regasification Capacity: Unless otherwise noted, liquefaction and regasification capacity throughout the document refers to nominal capacity. It must be noted that re-loading and storage activity can significantly reduce the effective capacity available for regasification.

LNG Carriers: For the purposes of this report, only Q-Class and conventional LNG vessels with a capacity greater than 30,000 cm are considered part of the global fleet discussed in the "Shipping" chapter (Chapter 5). Vessels with a capacity of 30,000 cm or less are considered small-scale LNG carriers.

Scale of LNG Trains:

-Small-scale: 0-0.5 MTPA capacity per train

-Mid-scale: >0.5-1.5 MTPA capacity per train

-Large-scale: More than 1.5 MTPA capacity per train

Spot Charter Rates: Spot charter rates refer to fixtures beginning between five days after the date of assessment and the end of the following calendar month.

8.5 REGIONS AND BASINS

The IGU regions referred to throughout the report are defined as per the colour coded areas in the map above. The report also refers to three basins: Atlantic, Pacific and Middle East. The Atlantic Basin encompasses all markets that border the Atlantic Ocean or Mediterranean Sea, while the Pacific Basin refers to all markets bordering the Pacific and Indian Oceans. However, these two categories do not include the following markets, which have been differentiated to compose the Middle East Basin: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Oman, Qatar, UAE and Yemen. IGU has also considered markets with liquefaction or regasification activities in multiple basins and has adjusted the data accordingly.

Figure 8.1: Grouping of Markets into Regions

8.6 ACRONYMS

CAPEX = Capital Expenditures
CSG = Coal Seam Gas
DFDE = Dual-Fuel Diesel Electric
DMR = Dual Mixed Refrigerant
EPC = Engineering, Procurement and Construction
EU = European Union
FEED = Front-End Engineering and Design
FERC = Federal Energy Regulatory Commission
FID = Final Investment Decision
FLNG = Floating Liquefaction
FPSO = Floating Production, Storage, and Offloading
FSRU = Floating Storage and Regasification Unit
FSU = Floating Storage Unit
FSU = Former Soviet Union
GCU = Gas Combustion Unit
GTT = Gaztransport and Technigaz
IHI = Ishikawajima Heavy Industries
ISO = International Organisation for Standardisation
LPG = Liquefied Petroleum Gas
MEGI = M-type, Electronically Controlled, Gas Injection
MMLS = Moveable Modular Liquefaction System
OPEX = Operating Expenditures
SPA = Sales and Purchase Agreement
STaGE = Steam Turbine and Gas Engine
SSDR = Slow Speed Diesel with Re-liquefaction plant
TFDE = Triple-Fuel Diesel Electric
UAE = United Arab Emirates
UK = United Kingdom
US = United States
YOY = Year-on-Year

8.7 UNITS

bbl = barrel
Bcfd = billion cubic feet per dat
bcm = billion cubic metres
cm = cubic metres
KTPA = thousand tonnes per annum
mcm = thousand cubic metres
mmcfd = million cubic feet per day
mmcm = million cubic metres
MMBtu = million British thermal units
MT = million tonnes
MTPA = million tonnes per annum
nm = nautical miles
Tcf = trillion cubic feet

8.8 CONVERSION FACTORS

Multiply by

	Tonnes LNG	cm LNG	mmcm gas	mmcf gas	MMBtu	boe
Tonnes LNG		2.222	0.0013	0.0459	53.38	9.203
cm LNG	0.45		5.85×10^{-4}	0.0207	24.02	4.141
mmcm gas	769.2	1,700		35.31	41,100	7,100
mmcf gas	21.78	48	0.0283		1,200	200.5
MMBtu	0.0187	0.0416	2.44×10^{-5}	8.601×10^{-4}	0.1724	0.1724
boe	0.1087	0.2415	1.41×10^{-4}	0.00499	5.8	

8.9 Discrepancies in Data vs. Previous IGU World LNG Reports

Due to the use of different datasources in the 2020 IGU World LNG Report compared to earlier IGU World LNG Reports, there may be some data discrepancies between stated totals for 2018 and before 2018 in this report, compared to those same totals stated in earlier reports IGU World LNG Reports.

In addition, the Trade section of this report is based on data from GIIGNL, whereas the remaining sections have used a wide range of sources.

Appendix 1: Table of Global Liquefaction Plants

Reference Number	Market	Liquefaction Plant Train	Infrastructure Start Year	Liquefaction Capacity (MTPA)	Owners	Liquefaction Technology
1	Libya	Marsa El Brega LNG T1-4[1]	1970	3.20	LNOC	AP-SMR
2	Brunei	Brunei LNG T1-T2	1972	2.88	Shell*; Brunei Government ; Mitsubishi Corp	AP-C3MR
2	Brunei	Brunei LNG T3-T4	1973	2.88	Shell*; Brunei Government ; Mitsubishi Corp	AP-C3MR
2	Brunei	Brunei LNG T5	1974	1.44	Shell*; Brunei Government ; Mitsubishi Corp	AP-C3MR
3	UAE	ADGAS LNG T1-2	1977	2.60	ADNOC LNG* (0%); Abu Dhabi NOC ; Mitsui; BP; Total;	AP-C3MR
4	Algeria	Arzew GL1Z T1-T6	1978	7.90	Sonatrach*	AP-C3MR
4	Algeria	Arzew GL2Z T1-T6	1981	8.40	Sonatrach*	AP-C3MR
5	Indonesia	Bontang LNG TC-TD3	1983	5.60	Pertamina* ; PT VICO Indonesia; Total	AP-C3MR
6	Malaysia	MLNG Satu T1-T3	1983	8.40	Petronas*; Mitsubishi Corp; Sarawak State	AP-C3MR
5	Indonesia	Bontang LNG TE	1989	2.80	Pertamina* ; PT VICO Indonesia; Total	AP-C3MR
7	Australia	North West Shelf LNG T1-2	1989	5.00	Woodside*; BHP; BP ; Chevron; Shell; Mitsubishi Corp; Mitsui	AP-C3MR
7	Australia	North West Shelf LNG T3	1992	2.50	Woodside*; BHP; BP ; Chevron; Shell; Mitsubishi Corp; Mitsui	AP-C3MR
5	Indonesia	Bontang LNG TF	1993	2.80	Pertamina* ; PT VICO Indonesia; Total	AP-C3MR
3	UAE	ADGAS LNG T3	1994	3.20	ADNOC LNG* (0%); Abu Dhabi NOC ; Mitsui; BP; Total	AP-C3MR
6	Malaysia	MLNG Dua T4-T5	1995	6.40	Petronas*; Mitsubishi Corp; Sarawak State	AP-C3MR
6	Malaysia	MLNG Dua T6	1995	3.20	Petronas*; Mitsubishi Corp; Sarawak State	AP-C3MR
8	Qatar	Qatargas 1 T1	1996	3.20	Qatargas* (0%); Qatar Petroleum; ExxonMobil; Total ; Marubeni; Mitsui	AP-C3MR
5	Indonesia	Bontang LNG TG	1997	2.80	Pertamina* ; PT VICO Indonesia; Total	AP-C3MR
8	Qatar	Qatargas 1 T2	1997	3.20	Qatargas* (0%); Qatar Petroleum; ExxonMobil; Total ; Marubeni; Mitsui	AP-C3MR
8	Qatar	Qatargas 1 T3	1998	3.20	Qatargas* (0%); Qatar Petroleum; ExxonMobil; Total ; Marubeni; Mitsui	AP-C3MR
5	Indonesia	Bontang LNG TH	1999	2.95	Pertamina* ; PT VICO Indonesia; Total	AP-C3MR
8	Qatar	Rasgas 1 T1	1999	3.30	Qatargas* (0%); Qatar Petroleum; ExxonMobil; ITOCHU; Korea Gas; Sojitz; Sumitomo; Samsung; Hyundai; SK Energy; LG International; Daesung; Hanwha Energy	AP-C3MR
9	Trinidad and Tobago	Atlantic LNG T1	1999	3.00	Atlantic LNG* (0%); Shell; BP; China Investment Corporation; NGC	ConocoPhillips Optimized Cascade
10	Nigeria	NLNG T1-2	1999	6.60	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
8	Qatar	Rasgas 1 T2	2000	3.30	Qatargas* (0%); Qatar Petroleum; ExxonMobil; ITOCHU; Korea Gas; Sojitz; Sumitomo; Samsung; Hyundai; SK Energy; LG International; Daesung; Hanwha Energy	AP-C3MR

[1]Marsa El Brega LNG in Libya has not been operational since 2011. It is included for reference only.

Appendix 1: Table of Global Liquefaction Plants (continued)

Reference Number	Market	Liquefaction Plant Train	Infrastructure Start Year	Liquefaction Capacity (MTPA)	Owners	Liquefaction Technology
11	Oman	Oman LNG T1-2	2000	7.10	Oman LNG* (0%); Omani Government; Shell; Total; Korea LNG; Mitsubishi Corp; Mitsui; Partex (Gulbenkian Foundation); ITOCHU	AP-C3MR
9	Trinidad and Tobago	Atlantic LNG T2	2002	3.30	Atlantic LNG* (0%); Shell; BP	ConocoPhillips Optimized Cascade
10	Nigeria	NLNG T3	2002	3.30	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
6	Malaysia	MLNG Tiga T7-T8	2003	7.70	Petronas*; Sarawak State; JX Nippon Oil and Gas; Mitsubishi Corp	AP-C3MR
9	Trinidad and Tobago	Atlantic LNG T3	2003	3.30	Atlantic LNG*; Shell; BP	ConocoPhillips Optimized Cascade
7	Australia	North West Shelf LNG T4	2004	4.60	Woodside*; BHP; BP ; Chevron; Shell; Mitsubishi Corp; Mitsui	AP-C3MR
8	Qatar	Rasgas 2 T3	2004	4.70	Qatargas* (0%); Qatar Petroleum ; ExxonMobil	AP-C3MR/ SplitMR
8	Qatar	Rasgas 2 T4	2005	4.70	Qatargas* (0%); Qatar Petroleum ; ExxonMobil	AP-C3MR/ SplitMR
9	Trinidad and Tobago	Atlantic LNG T4	2005	5.20	Atlantic LNG* (0%); Shell; BP; NGC	ConocoPhillips Optimized Cascade
10	Nigeria	NLNG T4	2005	4.10	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
12	Egypt	Damietta LNG T1[2]	2005	5.00	Union Fenosa*; Eni; EGPC (Egypt)	AP-C3MR/ SplitMR
13	Egypt	Egyptian LNG (Idku) T1-2	2005	7.20	Shell*; Petronas; EGPC (Egypt); EGAS; Total	ConocoPhillips Optimized Cascade
10	Nigeria	NLNG T5	2006	4.10	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
11	Oman	Oman LNG T3 (Qalhat)	2006	3.30	Oman LNG* (0%); Omani Government; Shell; Mitsubishi Corp; Eni; Gas Natural SDG; ITOCHU; Osaka Gas; Total; Korea LNG; Mitsui; Partex (Gulbenkian Foundation)	AP-C3MR
14	Australia	Darwin LNG T1	2006	3.70	Santos*; Inpex; Eni; Tokyo Electric; Tokyo Gas	ConocoPhillips Optimized Cascade
8	Qatar	Rasgas 2 T5	2007	4.70	Qatargas* (0%); Qatar Petroleum ; ExxonMobil	AP-C3MR/ SplitMR
10	Nigeria	NLNG T6	2007	4.10	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
15	Equatorial Guinea	EG LNG T1	2007	3.70	Marathon Oil*; Sonagas G.E.; Mitsui; Marubeni	ConocoPhillips Optimized Cascade
16	Norway	Snohvit LNG T1	2007	4.20	Equinor*; Petoro; Total; Neptune Energy; Wintershall Dea	Linde MFC
7	Australia	North West Shelf LNG T5	2008	4.60	Woodside*; BHP; BP ; Chevron; Shell; Mitsubishi Corp; Mitsui	AP-C3MR
8	Qatar	Qatargas 2 T4-5	2009	15.60	Qatargas* (0%); Qatar Petroleum; ExxonMobil; Total	AP-X
8	Qatar	Rasgas 3 T6-7	2009	15.60	Qatargas* (0%); Qatar Petroleum ; ExxonMobil	AP-X

[2]Damietta LNG (SEAGAS LNG) has not exported since the end of 2012. The plant remained idle in 2019 but may restart operations in 2020.

Appendix 1: Table of Global Liquefaction Plants (continued)

Reference Number	Market	Liquefaction Plant Train	Infrastructure Start Year	Liquefaction Capacity (MTPA)	Owners	Liquefaction Technology
17	Russia	Sakhalin 2 T1-2	2009	9.60	Sakhalin Energy Investment Company* (0%); Gazprom ; Shell; Mitsui; Mitsubishi Corp	Shell DMR
18	Indonesia	Tangguh LNG T1	2009	3.80	BP*; CNOOC; JOGMEC; Mitsubishi Corp; Inpex; JX Nippon Oil and Gas; Sojitz; Sumitomo; Mitsui	AP-C3MR/ SplitMR
19	Yemen	Yemen LNG T1-2[3]	2009	6.70	Total*; Yemen Gas Company; Hunt Oil; Korea Gas; SK Energy; Hyundai; Social Security and Pensions (GASSP)	AP-C3MR/ SplitMR
8	Qatar	Qatargas 3 T6	2010	7.80	Qatargas* (0%); Qatar Petroleum; ConocoPhillips; Mitsui	AP-X
18	Indonesia	Tangguh LNG T2	2010	3.80	BP*; CNOOC; JOGMEC; Mitsubishi Corp; Inpex; JX Nippon Oil and Gas; Sojitz; Sumitomo; Mitsui	AP-C3MR/ SplitMR
20	Peru	Peru LNG T1	2010	4.45	Hunt Oil* ; Repsol; SK Energy; Marubeni	AP-C3MR/ SplitMR
8	Qatar	Qatargas 4 T7	2011	7.80	Qatargas* (0%); Qatar Petroleum ; Shell	AP-X
21	Australia	Pluto LNG T1	2012	4.90	Woodside*; Kansai Electric; Tokyo Gas	Shell Propane Pre-cooled Mixed Refrigerant
4	Algeria	Skikda GL1K T1 (rebuild)	2013	4.50	Sonatrach*	AP-C3MR/ SplitMR
22	Angola	Angola LNG T1	2013	5.20	Angola LNG* (0%); Chevron; Sonangol; BP; Eni; Total	ConocoPhillips Optimized Cascade
4	Algeria	Arzew GL3Z (Gassi Touil) T1	2014	4.70	Sonatrach*	AP-C3MR/ SplitMR
23	Papua New Guinea	PNG LNG T1-2	2014	6.90	ExxonMobil*; Oil Search; PNG Government; Santos; JX Nippon Oil and Gas; Mineral Resources Development; Marubeni	AP-C3MR
24	Indonesia	Donggi-Senoro LNG T1	2015	2.00	Donggi-Senoro LNG (DSLNG)* (0%); Mitsubishi Corp; Pertamina; Korea Gas; MedcoEnergi	AP-C3MR
25	Australia	GLNG T1	2015	3.90	Santos*; Petronas; Total; Korea Gas	ConocoPhillips Optimized Cascade
26	Australia	Queensland Curtis LNG T1-2	2015	8.50	Shell* ; CNOOC	ConocoPhillips Optimized Cascade
25	Australia	GLNG T2	2016	3.90	Santos*; Petronas; Total; Korea Gas	ConocoPhillips Optimized Cascade
27	Australia	Australia Pacific LNG T1-2	2016	9.00	Origin Energy*; ConocoPhillips; Sinopec Group	ConocoPhillips Optimized Cascade
28	Australia	Gorgon LNG T1-2	2016	10.40	Chevron*; ExxonMobil; Shell ; Osaka Gas; Tokyo Gas; Chubu Electric	AP-C3MR/ SplitMR
29	United States	Sabine Pass T1-T2	2016	9.00	Cheniere Energy*	ConocoPhillips Optimized Cascade

[3] Yemen LNG has not exported since 2015 due to ongoing civil war.

Appendix 1: Table of Global Liquefaction Plants (continued)

Reference Number	Market	Liquefaction Plant Train	Infrastructure Start Year	Liquefaction Capacity (MTPA)	Owners	Liquefaction Technology
6	Malaysia	MLNG T9	2017	3.60	Petronas*; JX Nippon Oil and Gas; Sarawak State	AP-C3MR/ SplitMR
28	Australia	Gorgon LNG T3	2017	5.20	Chevron*; ExxonMobil; Shell; Osaka Gas; Tokyo Gas; Chubu Electric	AP-C3MR/ SplitMR
29	United States	Sabine Pass T3-T4	2017	9.00	Cheniere Energy*	ConocoPhillips Optimized Cascade
30	Malaysia	Petronas FLNG Satu	2017	1.20	Petronas*	AP-N
31	Australia	Wheatstone LNG T1	2017	4.45	Chevron*; Kuwait Petroleum Corp (KPC); Woodside; JOGMEC; Mitsubishi Corp; Kyushu Electric; Nippon Yusen; Chubu Electric; Tokyo Electric	ConocoPhillips Optimized Cascade
32	Russia	Yamal LNG T1	2017	5.50	Novatek*; CNPC; Total; Silk Road Fund	AP-C3MR
31	Australia	Wheatstone LNG T2	2018	4.45	Chevron*; Kuwait Petroleum Corp (KPC); Woodside; JOGMEC; Mitsubishi Corp; Kyushu Electric; Nippon Yusen; Chubu Electric; Tokyo Electric	ConocoPhillips Optimized Cascade
32	Russia	Yamal LNG T2	2018	5.50	Novatek*; CNPC; Total; Silk Road Fund	AP-C3MR
33	Cameroon	Cameroon FLNG	2018	2.40	Golar*	Black and Veatch PRICO
34	United States	Cove Point LNG T1	2018	5.25	Dominion Cove Point LNG LP*	AP-C3MR
29	United States	Sabine Pass T5	2019	4.50	Cheniere Energy*	ConocoPhillips Optimized Cascade
32	Russia	Yamal LNG T3	2019	5.50	Novatek*; CNPC; Total; Silk Road Fund	AP-C3MR
35	Australia	Ichthys LNG T1-2	2019	8.90	Inpex*; Total; CPC (Chinese Taipei); Tokyo Gas; Kansai Electric; Osaka Gas; Chubu Electric; Toho Gas	AP-C3MR/ SplitMR
36	Argentina	Tango FLNG	2019	0.50	Exmar*	Black and Veatch PRICO
37	United States	Corpus Christi T1	2019	4.50	Cheniere Energy*	ConocoPhillips Optimized Cascade
37	United States	Cameron LNG T1	2019	4.00	Cameron LNG* (0%); Sempra; Mitsui; Total; Mitsubishi Corp; Nippon Yusen Kabushiki Kaisha	AP-C3MR/ SplitMR
38	United States	Corpus Christi T2	2019	4.5	Cheniere Energy*	ConocoPhillips Optimized Cascade
39	United States	Freeport LNG T1	2019	5.10	Freeport LNG*; Zachry Hastings; Osaka Gas; Dow Chemical Company; Global Infrastructure Partners	AP-C3MR
40	Australia	Prelude FLNG	2019	3.60	Shell*	Shell DMR
41	Russia	Vysotsk LNG T1	2019	0.66	Novatek*, Gazprombank	Air Liquide Smartfin
42	United States	Elba Island T1-T3	2019	0.75	Southern LNG*; Kinder Morgan; EIG Partners	Shell MMLS

Appendix 2: Table of Liquefaction Plants Sanctioned or Under Construction

Market	Liquefaction Plant Train	Infrastructure Start Year	Liquefaction Capacity (MTPA)	Owners	Liquefaction Technology
United States	Elba Island T4-10	2020	1.75	Southern LNG*; Kinder Morgan; EIG Partners	Shell MMLS
Indonesia	Sengkang LNG T1	2020	0.5	Energy World*	Chart Industries IPSMR
United States	Cameron LNG T2-3	2020	8.0	Cameron LNG*; Sempra; Mitsui; Total; Mitsubishi Corp; Nippon Yusen Kabushiki Kaisha	AP-C3MR/SplitMR
United States	Freeport LNG T2-3	2020	10.2	Freeport LNG*; Zachry Hastings; Osaka Gas; Dow Chemical Company; Global Infrastructure Partners	AP-C3MR
Malaysia	Petronas FLNG Dua	2020	1.5	Petronas*	AP-N
Russia	Portovaya LNG T1	2020	1.5	Gazprom*	Linde LIMUM
Russia	Yamal LNG T4	2020	0.9	Novatek*; CNPC; Total; Silk Road Fund	Novatek Arctic Cascade
United States	Corpus Christi T3	2021	4.5	Cheniere Energy*	ConocoPhillips Optimized Cascade
Indonesia	Tangguh LNG T3	2021	3.8	BP*; CNOOC; JOGMEC; Mitsubishi Corp; Inpex; JX Nippon Oil and Gas; Sojitz; Sumitomo; Mitsui	AP-C3MR/SplitMR
Mozambique	Coral South FLNG	2022	3.4	Eni*; ExxonMobil; CNPC; ENH (Mozambique); Galp Energia SA; Korea Gas	AP-DMR
Mauritania	Tortue/Ahmeyim FLNG T1	2022	2.5	Golar	Black and Veatch PRICO
United States	Calcasieu Pass LNG T1-18	2023	10	Venture Global LNG*	BHGE SMR
United States	Sabine Pass T6	2023	4.5	Cheniere Energy*	ConocoPhillips Optimized Cascade
Russia	Arctic LNG 2 T1	2024	6.6	Novatek*; CNOOC; CNPC; Total; JOGMEC; Mitsui	Linde MFC
United States	Golden Pass LNG T1-3	2024	15.6	Golden Pass Products*; Qatar Petroleum; ExxonMobil	AP-C3MR/SplitMR
Canada	LNG Canada T1-2	2024	14.0	Shell*; Petronas ; Mitsubishi Corp; PetroChina; Korea Gas	Shell DMR
Mozambique	Mozambique LNG (Area 1) T1-2	2024	12.88	Total*; Mitsui; ONGC (India); ENH (Mozambique); Bharat Petroleum Corp (BPCL); PTTEP (Thailand); Oil India	AP-C3MR
Nigeria	NLNG T7	2024	8.0	NNPC (Nigeria)*; Shell; Total; Eni	AP-C3MR
Russia	Arctic LNG 2 T2-3	2025	13.2	Novatek*; CNOOC; CNPC; Total; JOGMEC; Mitsui	Linde MFC

Note:

1. In the ownership column, companies with "*" refer to plant operators. If a company doesn't have any ownership stake in the LNG plant, it will be marked with "(0%)".

Appendix 3: Table of Global Active LNG Fleet, Year-End 2019

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9443401	Aamira	Nakilat	Samsung	266000	Membrane	Q-Max	SSDR	2010
9210828	Abadi	Brunei Gas Carriers	Mitsubishi	137000	Spherical	Conventional	Steam	2002
9501186	Adam LNG	Oman Shipping Co (OSC)	Hyundai	162000	Membrane	Conventional	DFDE	2014
9831220	Adriano Knutsen	Knutsen OAS	Hyundai	180000	Membrane	Conventional	MEGI	2019
9338266	Al Aamriya	NYK, K Line, MOL, Iino, Mitsui, Nakilat	Daewoo	216200	Membrane	Q-Flex	SSDR	2008
9325697	Al Areesh	Teekay	Daewoo	151700	Membrane	Conventional	Steam	2007
9431147	Al Bahiya	Nakilat	Daewoo	210100	Membrane	Q-Flex	SSDR	2010
9132741	Al Bidda	J4 Consortium	Kawasaki	137300	Spherical	Conventional	Steam	1999
9325702	Al Daayen	Teekay	Daewoo	151700	Membrane	Conventional	Steam	2007
9443683	Al Dafna	Nakilat	Samsung	266400	Membrane	Q-Max	SSDR	2009
9307176	Al Deebel	MOL, NYK, K Line	Samsung	145700	Membrane	Conventional	Steam	2005
9337705	Al Gattara	Nakilat, OSC	Hyundai	216200	Membrane	Q-Flex	SSDR	2007
9337987	Al Ghariya	Commerz Real, Nakilat, PRONAV	Daewoo	210200	Membrane	Q-Flex	SSDR	2008
9337717	Al Gharrafa	Nakilat, OSC	Hyundai	216200	Membrane	Q-Flex	SSDR	2008
9397286	Al Ghashamiya	Nakilat	Samsung	217600	Membrane	Q-Flex	SSDR	2009
9372743	Al Ghuwairiya	Nakilat	Daewoo	263300	Membrane	Q-Max	SSDR	2008
9337743	Al Hamla	Nakilat, OSC	Samsung	216200	Membrane	Q-Flex	SSDR	2008
9074640	Al Hamra	National Gas Shipping Co	Kvaerner Masa	135000	Spherical	Conventional	Steam	1997
9360879	Al Huwaila	Nakilat, Teekay	Samsung	217000	Membrane	Q-Flex	SSDR	2008
9132791	Al Jasra	J4 Consortium	Mitsubishi	137200	Spherical	Conventional	Steam	2000
9324435	Al Jassasiya	Maran G.M, Nakilat	Daewoo	145700	Membrane	Conventional	Steam	2007
9431123	Al Karaana	Nakilat	Daewoo	210100	Membrane	Q-Flex	SSDR	2009
9397327	Al Kharaitiyat	Nakilat	Hyundai	216300	Membrane	Q-Flex	SSDR	2009
9360881	Al Kharsaah	Nakilat, Teekay	Samsung	217000	Membrane	Q-Flex	SSDR	2008
9431111	Al Khattiya	Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2009
9038440	Al Khaznah	National Gas Shipping Co	Mitsui	135000	Spherical	Conventional	Steam	1994
9085613	Al Khor	J4 Consortium	Mitsubishi	137400	Spherical	Conventional	Steam	1996
9360908	Al Khuwair	Nakilat, Teekay	Samsung	217000	Membrane	Q-Flex	SSDR	2008
9397315	Al Mafyar	Nakilat	Samsung	266400	Membrane	Q-Max	SSDR	2009
9325685	Al Marrouna	Nakilat, Teekay	Daewoo	152600	Membrane	Conventional	Steam	2006
9397298	Al Mayeda	Nakilat	Samsung	266000	Membrane	Q-Max	SSDR	2009
9431135	Al Nuaman	Nakilat	Daewoo	210100	Membrane	Q-Flex	SSDR	2009
9360790	Al Oraiq	NYK, K Line, MOL, Iino, Mitsui, Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2008
9086734	Al Rayyan	J4 Consortium	Kawasaki	137400	Spherical	Conventional	Steam	1997
9397339	Al Rekayyat	Nakilat	Hyundai	216300	Membrane	Q-Flex	SSDR	2009
9337951	Al Ruwais	Commerz Real, Nakilat, PRONAV	Daewoo	210200	Membrane	Q-Flex	SSDR	2007

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9397341	Al Sadd	Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2009
9337963	Al Safliya	Commerz Real, Nakilat, PRONAV	Daewoo	210200	Membrane	Q-Flex	SSDR	2007
9360855	Al Sahla	NYK, K Line, MOL, lino, Mitsui, Nakilat	Hyundai	216200	Membrane	Q-Flex	SSDR	2008
9388821	Al Samriya	Nakilat	Daewoo	263300	Membrane	Q-Max	SSDR	2009
9360893	Al Shamal	Nakilat, Teekay	Samsung	217000	Membrane	Q-Flex	SSDR	2008
9360831	Al Sheehaniya	Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2009
9298399	Al Thakhira	K Line, Qatar Shpg.	Samsung	145700	Membrane	Conventional	Steam	2005
9360843	Al Thumama	NYK, K Line, MOL, lino, Mitsui, Nakilat	Hyundai	216200	Membrane	Q-Flex	SSDR	2008
9360867	Al Utouriya	NYK, K Line, MOL, lino, Mitsui, Nakilat	Hyundai	215000	Membrane	Q-Flex	SSDR	2008
9085625	Al Wajbah	J4 Consortium	Mitsubishi	137300	Spherical	Conventional	Steam	1997
9086746	Al Wakrah	J4 Consortium	Kawasaki	137600	Spherical	Conventional	Steam	1998
9085649	Al Zubarah	J4 Consortium	Mitsui	137600	Spherical	Conventional	Steam	1996
9343106	Alto Acrux	TEPCO, NYK, Mitsubishi	Mitsubishi	147800	Spherical	Conventional	Steam	2008
9682552	Amadi	Brunei Gas Carriers	Hyundai	154800	Membrane	Conventional	TFDE	2015
9496317	Amali	Brunei Gas Carriers	Daewoo	147000	Membrane	Conventional	TFDE	2011
9661869	Amani	Brunei Gas Carriers	Hyundai	154800	Membrane	Conventional	TFDE	2014
9317999	Amur River	Dynagas	Hyundai	149700	Membrane	Conventional	Steam	2008
9645970	Arctic Aurora	Dynagas	Hyundai	155000	Membrane	Conventional	TFDE	2013
9276389	Arctic Discoverer	K Line, Statoil, Mitsui, lino	Mitsui	142600	Spherical	Conventional	Steam	2006
9284192	Arctic Lady	Hoegh	Mitsubishi	148000	Spherical	Conventional	Steam	2006
9271248	Arctic Princess	Hoegh, MOL, Statoil	Mitsubishi	148000	Spherical	Conventional	Steam	2006
9001784	Arctic Spirit	Teekay	I.H.I.	87300	Self-Supporting Prismatic	Conventional	Steam	1993
9275335	Arctic Voyager	K Line, Statoil, Mitsui, lino	Kawasaki	142800	Spherical	Conventional	Steam	2006
9496305	Arkat	Brunei Gas Carriers	Daewoo	147000	Membrane	Conventional	TFDE	2011
8125868	Armada LNG Mediterrana	Bumi Armada Berhad	Mitsui	127209	Spherical	FSU	Steam	1985
9339260	Arwa Spirit	Teekay, Marubeni	Samsung	168900	Membrane	Conventional	DFDE	2008
9377547	Aseem	MOL, NYK, K Line, SCI, Nakilat, Petronet	Samsung	155000	Membrane	Conventional	DFDE	2009
9610779	Asia Endeavour	Chevron	Samsung	160000	Membrane	Conventional	DFDE	2015
9606950	Asia Energy	Chevron	Samsung	160000	Membrane	Conventional	DFDE	2014
9610767	Asia Excellence	Chevron	Samsung	160000	Membrane	Conventional	DFDE	2015

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9680188	Asia Integrity	Chevron	Samsung	160000	Membrane	Conventional	DFDE	2017
9680190	Asia Venture	Chevron	Samsung	160000	Membrane	Conventional	TFDE	2017
9606948	Asia Vision	Chevron	Samsung	160000	Membrane	Conventional	TFDE	2014
9771080	Bahrain Spirit	Teekay	Daewoo	173000	Membrane	FSU	MEGI	2018
9401295	Barcelona Knutsen	Knutsen OAS	Daewoo	173400	Membrane	Conventional	TFDE	2009
9613159	Beidou Star	MOL, China LNG	Hudong-Zhonghua	171800	Membrane	Conventional	SSDR	2015
9256597	Berge Arzew	BW	Daewoo	138000	Membrane	Conventional	Steam	2004
9236432	Bilbao Knutsen	Knutsen OAS	IZAR	138000	Membrane	Conventional	Steam	2004
9691137	Bishu Maru	Trans Pacific Shipping	Kawasaki	164700	Spherical	Conventional	Steam Reheat	2017
9768394	Boris Davydov	Sovcomflot	Daewoo	172000	Membrane	Icebreaker	TFDE	2018
9768368	Boris Vilkitsky	Sovcomflot	Daewoo	172600	Membrane	Icebreaker	TFDE	2017
9766542	British Achiever	BP	Daewoo	174000	Membrane	Conventional	MEGI	2018
9766554	British Contributor	BP	Daewoo	173400	Membrane	Conventional	MEGI	2018
9333620	British Diamond	BP	Hyundai	155000	Membrane	Conventional	DFDE	2008
9333591	British Emerald	BP	Hyundai	155000	Membrane	Conventional	DFDE	2007
9766566	British Listener	BP	Daewoo	174000	Membrane	Conventional	MEGI	2019
9766578	British Mentor	BP	Daewoo	174000	Membrane	Conventional	MEGI	2019
9766530	British Partner	BP	Daewoo	173400	Membrane	Conventional	MEGI	2018
9333606	British Ruby	BP	Hyundai	155000	Membrane	Conventional	DFDE	2008
9333618	British Sapphire	BP	Hyundai	155000	Membrane	Conventional	DFDE	2008
9766580	British Sponsor	BP	Daewoo	174000	Membrane	Conventional	MEGI	2019
9085651	Broog	J4	Mitsui	137500	Spherical	Conventional	Steam	1998
9388833	Bu Samra	Nakilat	Samsung	266000	Membrane	Q-Max	SSDR	2008
9796793	Bushu Maru	NYK, JERA	Mitsubishi	180000	Spherical	Conventional	STaGE	2019
9230062	BW Boston	BW, Total	Daewoo	138000	Membrane	Conventional	Steam	2003
9368314	BW Brussels	BW	Daewoo	162500	Membrane	Conventional	DFDE	2009
9243148	BW Everett	BW	Daewoo	138000	Membrane	Conventional	Steam	2003
9724946	BW Integrity	BW, MOL	Samsung	173500	Membrane	FSRU	TFDE	2017
9758076	BW Lilac	BW	Daewoo	173400	Membrane	Conventional	MEGI	2018
9792591	BW Magna	BW	Daewoo	173400	Membrane	FSRU	TFDE	2019
9368302	BW Paris	BW	Daewoo	162400	Membrane	Converted FSRU	TFDE	2009
9792606	BW Pavilion Aranda	BW, Pavilion LNG	Daewoo	173400	Membrane	Conventional	MEGI	2019
9640645	BW Pavilion Leeara	BW, Pavilion LNG	Hyundai	162000	Membrane	Conventional	TFDE	2015
9640437	BW Pavilion Vanda	BW, Pavilion LNG	Hyundai	162000	Membrane	Conventional	TFDE	2015
9684495	BW Singapore	BW	Samsung	170200	Membrane	FSRU	TFDE	2015
9758064	BW Tulip	BW	Daewoo	173400	Membrane	Conventional	MEGI	2018
9246578	Cadiz Knutsen	Knutsen OAS	IZAR	138000	Membrane	Conventional	Steam	2004
9390680	Cape Ann	Hoegh, MOL, TLTC	Samsung	145000	Membrane	FSRU	DFDE	2010
9742819	Castillo De Caldelas	Caldelas LNG Shipping LTD	Imabari	178800	Membrane	Conventional	MEGI	2018

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9742807	Castillo De Merida	Merida LNG Shipping LTD	Imabari	178800	Membrane	Conventional	MEGI	2018
9433717	Castillo De Santisteban	Jofre Shipping LTD	STX	173600	Membrane	Conventional	TFDE	2010
9236418	Castillo De Villalba	Elcano Gas Transport, S.A.U.	IZAR	138200	Membrane	Conventional	Steam	2003
9236420	Catalunya Spirit	Teekay	IZAR	138200	Membrane	Conventional	Steam	2003
9672844	Cesi Beihai	China Shipping Group	Hudong-Zhonghua	174100	Membrane	Conventional	TFDE	2017
9672820	Cesi Gladstone	Chuo Kaiun/ Shinwa Chem.	Hudong-Zhonghua	174100	Membrane	Conventional	DFDE	2016
9672818	Cesi Lianyungang	China Shipping Group	Hudong-Zhonghua	174100	Membrane	Conventional	DFDE	2018
9672832	Cesi Qingdao	China Shipping Group	Hudong-Zhonghua	174100	Membrane	Conventional	DFDE	2017
9694749	Cesi Tianjin	China Shipping Group	Hudong-Zhonghua	174100	Membrane	Conventional	DFDE	2017
9694751	Cesi Wenzhou	China Shipping Group	Hudong-Zhonghua	174100	Membrane	Conventional	TFDE	2018
9324344	Cheikh Bouamama	HYPROC, Sonatrach, Itochu, MOL	Universal	75500	Membrane	Conventional	Steam	2008
9324332	Cheikh El Mokrani	HYPROC, Sonatrach, Itochu, MOL	Universal	75500	Membrane	Conventional	Steam	2007
9737187	Christophe De Margerie	Sovcomflot	Daewoo	172600	Membrane	Icebreaker	TFDE	2016
9323687	Clean Energy	Dynagas	Hyundai	149700	Membrane	Conventional	Steam	2007
9655444	Clean Horizon	Dynagas	Hyundai	162000	Membrane	Conventional	TFDE	2015
9637492	Clean Ocean	Dynagas	Hyundai	162000	Membrane	Conventional	TFDE	2014
9637507	Clean Planet	Dynagas	Hyundai	162000	Membrane	Conventional	TFDE	2014
9655456	Clean Vision	Dynagas	Hyundai	162000	Membrane	Conventional	TFDE	2016
9640023	Cool Explorer	Thenamaris	Samsung	160000	Membrane	Conventional	TFDE	2015
9636797	Cool Runner	Thenamaris	Samsung	160000	Membrane	Conventional	TFDE	2014
9636785	Cool Voyager	Thenamaris	Samsung	160000	Membrane	Conventional	TFDE	2013
9636711	Corcovado LNG	TMS Cardiff Gas	Daewoo	160100	Membrane	Conventional	TFDE	2014
9681687	Creole Spirit	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2016
9491812	Cubal	Mitsui, NYK, Teekay	Samsung	160000	Membrane	Conventional	TFDE	2012
9376294	Cygnus Passage	TEPCO, NYK, Mitsubishi	Mitsubishi	147000	Spherical	Conventional	Steam	2009
9308481	Dapeng Moon	China LNG Ship MgMT	Hudong-Zhonghua	147200	Membrane	Conventional	Steam	2008
9369473	Dapeng Star	China LNG Ship MgMT	Hudong-Zhonghua	147600	Membrane	Conventional	Steam	2009
9308479	Dapeng Sun	China LNG Ship MgMT	Hudong-Zhonghua	147200	Membrane	Conventional	Steam	2008
9779226	Diamond Gas Orchid	NYK	Mitsubishi	165000	Spherical	Conventional	STaGE	2018
9779238	Diamond Gas Rose	NYK	Mitsubishi	165000	Spherical	Conventional	STaGE	2018
9810020	Diamond Gas Sakura	NYK	Mitsubishi	165000	Spherical	Conventional	STaGE	2019

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9250713	Disha	MOL, NYK, K Line, SCI, Nakilat, Petronet	Daewoo	138100	Membrane	Conventional	Steam	2004
9085637	Doha	J4 Consortium	Mitsubishi	137300	Spherical	Conventional	Steam	1999
9337975	Duhail	Commerz Real, Nakilat, PRONAV	Daewoo	210200	Membrane	Q-Flex	SSDR	2008
9265500	Dukhan	J4 Consortium	Mitsui	137500	Spherical	Conventional	Steam	2004
9750696	Eduard Toll	Teekay	Daewoo	172600	Membrane	Icebreaker	TFDE	2017
9334076	Ejnan	K Line, MOL, NYK, Mitsui, Nakilat	Samsung	145000	Membrane	Conventional	Steam	2007
8706155	Ekaputra 1	P.T. Humpuss Trans	Mitsubishi	137000	Spherical	Conventional	Steam	1990
9269180	Energy Advance	Tokyo Gas	Kawasaki	147000	Spherical	Conventional	Steam	2005
9649328	Energy Atlantic	Alpha Tankers	STX	159700	Membrane	Conventional	TFDE	2015
9405588	Energy Confidence	Tokyo Gas, NYK	Kawasaki	155000	Spherical	Conventional	Steam	2009
9245720	Energy Frontier	Tokyo Gas	Kawasaki	147000	Spherical	Conventional	Steam	2003
9752565	Energy Glory	NYK, Tokyo Gas	Japan Marine	165000	Self-Supporting Prismatic	Conventional	TFDE	2019
9483877	Energy Horizon	NYK, TLTC	Kawasaki	177000	Spherical	Conventional	Steam	2011
9758832	Energy Innovator	MOL, Tokyo Gas	Japan Marine	165000	Self-Supporting Prismatic	Conventional	TFDE	2019
9736092	Energy Liberty	MOL, Tokyo Gas	Japan Marine	165000	Self-Supporting Prismatic	Conventional	TFDE	2018
9355264	Energy Navigator	Tokyo Gas, MOL	Kawasaki	147000	Spherical	Conventional	Steam	2008
9274226	Energy Progress	MOL	Kawasaki	147000	Spherical	Conventional	Steam	2006
9758844	Energy Universe	MOL, Tokyo Gas	Japan Marine	165000	Self-Supporting Prismatic	Conventional	TFDE	2019
9749609	Enshu Maru	K Line	Kawasaki	164700	Spherical	Conventional	Steam Reheat	2018
9666560	Esshu Maru	MOL, Tokyo Gas	Mitsubishi	153000	Spherical	Conventional	Steam	2014
9230050	Excalibur	Excelerate, Teekay	Daewoo	138000	Membrane	Conventional	Steam	2002
9252539	Excellence	Excelerate Energy	Daewoo	138000	Membrane	FSRU	Steam	2005
9239616	Excelsior	Excelerate Energy	Daewoo	138000	Membrane	FSRU	Steam	2005
9444649	Exemplar	Excelerate Energy	Daewoo	150900	Membrane	FSRU	Steam	2010
9389643	Expedient	Excelerate Energy	Daewoo	150900	Membrane	FSRU	Steam	2010
9638525	Experience	Excelerate Energy	Daewoo	173400	Membrane	FSRU	TFDE	2014
9361079	Explorer	Excelerate Energy	Daewoo	150900	Membrane	FSRU	Steam	2008

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9361445	Express	Excelerate Energy	Daewoo	150900	Membrane	FSRU	Steam	2009
9381134	Exquisite	Excelerate, Nakilat	Daewoo	150900	Membrane	FSRU	Steam	2009
9768370	Fedor Litke	LITKE	Daewoo	172600	Membrane	Icebreaker	TFDE	2017
9825427	Flex Constellation	Flex LNG	Daewoo	173400	Membrane	Conventional	MEGI	2019
9825439	Flex Courageous	Flex LNG	Daewoo	173400	Spherical	Conventional	MEGI	2019
9762261	Flex Endeavour	Flex LNG	Daewoo	173400	Membrane	Conventional	MEGI	2018
9762273	Flex Enterprise	Flex LNG	Daewoo	173400	Membrane	Conventional	MEGI	2018
9709037	Flex Rainbow	Flex LNG	Samsung	174000	Membrane	Conventional	MEGI	2018
9709025	Flex Ranger	Flex LNG	Samsung	174000	Membrane	Conventional	MEGI	2018
9360817	Fraiha	NYK, K Line, MOL, Iino, Mitsui, Nakilat	Daewoo	210100	Membrane	Q-Flex	SSDR	2008
9253284	FSRU Toscana	OLT Offshore LNG Toscana	Hyundai	137100	Spherical	Converted FSRU		2004
9275359	Fuji LNG	TMS Cardiff Gas	Kawasaki	147900	Spherical	Conventional	Steam	2004
9256200	Fuwairit	MOL	Samsung	138262	Membrane	Conventional	Steam	2004
9236614	Galea	Shell	Mitsubishi	136600	Spherical	Conventional	Steam	2002
9247364	Galicia Spirit	Teekay	Daewoo	140500	Membrane	Conventional	Steam	2004
9236626	Gallina	Shell	Mitsubishi	136600	Spherical	Conventional	Steam	2002
9390185	Gaslog Chelsea	GasLog	Hanjin H.I.	153600	Membrane	Conventional	TFDE	2010
9707508	Gaslog Geneva	GasLog	Samsung	174000	Membrane	Conventional	TFDE	2016
9744013	Gaslog Genoa	GasLog	Samsung	174000	Membrane	Conventional	XDF	2018
9707510	Gaslog Gibraltar	GasLog	Samsung	174000	Membrane	Conventional	TFDE	2016
9744025	Gaslog Gladstone	Gaslog	Samsung	174000	Membrane	Conventional	XDF	2019
9687021	Gaslog Glasgow	GasLog	Samsung	174000	Membrane	Conventional	TFDE	2016
9687019	Gaslog Greece	GasLog	Samsung	174000	Membrane	Conventional	TFDE	2016
9748904	Gaslog Hongkong	GasLog	Hyundai	174000	Membrane	Conventional	XDF	2018
9748899	Gaslog Houston	GasLog	Hyundai	174000	Membrane	Conventional	XDF	2018
9638915	Gaslog Salem	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2015
9600530	Gaslog Santiago	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2013
9638903	Gaslog Saratoga	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2014
9352860	Gaslog Savannah	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2010
9634086	Gaslog Seattle	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2013
9600528	Gaslog Shanghai	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2013
9355604	Gaslog Singapore	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2010
9626285	Gaslog Skagen	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2013
9626273	Gaslog Sydney	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2013
9816763	Gaslog Warsaw	Gaslog	Samsung	180000	Membrane	Conventional	XDF	2019
9253222	Gemmata	Shell	Mitsubishi	135000	Spherical	Conventional	Steam	2004
9768382	Georgiy Brusilov	Dynagas	Daewoo	172600	Membrane	Icebreaker	TFDE	2018
9750749	Georgiy Ushakov	Teekay, China LNG Shipping	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9038452	Ghasha	National Gas Shipping Co	Mitsui	135000	Spherical	Conventional	Steam	1995
9360922	Gigira Laitebo	MOL, Itochu	Hyundai	155000	Membrane	Conventional	TFDE	2010
9269207	Global Energy	Total	Chantiers de l'Atlantique	74,100	Membrane	Conventional	Steam	2004

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9253105	Golar Arctic	Golar LNG	Daewoo	140000	Membrane	Conventional	Steam	2003
9626039	Golar Bear	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2014
9626027	Golar Celsius	Golar Power	Samsung	160000	Membrane	Conventional	TFDE	2013
9624926	Golar Crystal	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2014
9624940	Golar Eskimo	Golar LNG Partners	Samsung	160000	Membrane	FSRU	TFDE	2014
7361922	Golar Freeze	Golar LNG Partners	HDW	125000	Spherical	Converted FSRU	Steam	1977
9655042	Golar Frost	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2014
9654696	Golar Glacier	Golar LNG	Hyundai	162000	Membrane	Conventional	TFDE	2014
9303560	Golar Grand	Golar LNG Partners	Daewoo	145000	Membrane	Conventional	Steam	2005
9637325	Golar Ice	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2015
9633991	Golar Igloo	Golar LNG Partners	Samsung	170000	Membrane	FSRU	TFDE	2014
9654701	Golar Kelvin	Golar LNG	Hyundai	162000	Membrane	Conventional	TFDE	2015
9320374	Golar Maria	Golar LNG Partners	Daewoo	145000	Membrane	Conventional	Steam	2006
9165011	Golar Mazo	Golar LNG Partners	Mitsubishi	135000	Spherical	Conventional	Steam	2000
9785500	Golar Nanook	Golar Power	Samsung	170000	Membrane	FSRU	DFDE	2018
9624938	Golar Penguin	Golar Power	Samsung	160000	Membrane	Conventional	TFDE	2014
9624914	Golar Seal	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2013
9635315	Golar Snow	Golar LNG	Samsung	160000	Membrane	Conventional	TFDE	2015
9655808	Golar Tundra	Golar LNG	Samsung	170000	Membrane	FSRU	TFDE	2015
9256614	Golar Winter	Golar LNG Partners	Daewoo	138000	Membrane	Converted FSRU	Steam	2004
9315707	Grace Acacia	NYK	Hyundai	150000	Membrane	Conventional	Steam	2007
9315719	Grace Barleria	NYK	Hyundai	150000	Membrane	Conventional	Steam	2007
9323675	Grace Cosmos	MOL, NYK	Hyundai	150000	Membrane	Conventional	Steam	2008
9540716	Grace Dahlia	NYK	Kawasaki	177400	Spherical	Conventional	Steam	2013
8702941	Grace Energy	Sinokor Merchant Marine	Mitsubishi	127,400	Spherical	Conventional	Steam	1989
9338955	Grand Aniva	NYK, Sovcomflot	Mitsubishi	147000	Spherical	Conventional	Steam	2008
9332054	Grand Elena	NYK, Sovcomflot	Mitsubishi	147000	Spherical	Conventional	Steam	2007
9338929	Grand Mereya	MOL, K Line, Primorsk	Mitsui	147600	Spherical	Conventional	Steam	2008
9696266	Hai Yang Shi You 301	CNOOC	Jiangnan	30422	Membrane	Conventional	DFDE	2015
9230048	Hispania Spirit	Teekay	Daewoo	140500	Membrane	Conventional	Steam	2002
9155078	HL Muscat	Hanjin Shipping Co.	Hanjin H.I.	138000	Membrane	Conventional	Steam	1999
9061928	HL Pyeongtaek	Hanjin Shipping Co.	Hanjin H.I.	130100	Membrane	Conventional	Steam	1995
9176008	HL Ras Laffan	Hanjin Shipping Co.	Hanjin H.I.	138000	Membrane	Conventional	Steam	2000
9176010	HL Sur	Hanjin Shipping Co.	Hanjin H.I.	138300	Membrane	Conventional	Steam	2000
9780354	Hoegh Esperanza	Hoegh	Hyundai	170000	Membrane	FSRU	DFDE	2018
9653678	Hoegh Gallant	Hoegh	Hyundai	170100	Membrane	FSRU	DFDE	2014

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9820013	Hoegh Galleon	Hoegh	Samsung	170000	Membrane	FSRU	TFDE	2019
9822451	Hoegh Gannet	Hoegh	Hyundai	170000	Membrane	FSRU	DFDE	2018
9762962	Hoegh Giant	Hoegh	Hyundai	170000	Membrane	FSRU	DFDE	2017
9674907	Hoegh Grace	Hoegh	Hyundai	170000	Membrane	FSRU	DFDE	2016
9250725	Hongkong Energy	Sinokor Merchant Marine	Daewoo	140500	Membrane	Conventional	Steam	2004
9179581	Hyundai Aquapia	Hyundai LNG Shipping	Hyundai	135000	Spherical	Conventional	Steam	2000
9155157	Hyundai Cosmopia	Hyundai LNG Shipping	Hyundai	135000	Spherical	Conventional	Steam	2000
9372999	Hyundai Ecopia	Hyundai LNG Shipping	Hyundai	150000	Membrane	Conventional	Steam	2008
9075333	Hyundai Greenpia	Hyundai LNG Shipping	Hyundai	125000	Spherical	Conventional	Steam	1996
9183269	Hyundai Oceanpia	Hyundai LNG Shipping	Hyundai	135000	Spherical	Conventional	Steam	2000
9761853	Hyundai Peacepia	Hyundai LNG Shipping	Daewoo	174000	Membrane	Conventional	MEGI	2017
9761841	Hyundai Princepia	Hyundai LNG Shipping	Daewoo	174000	Membrane	Conventional	MEGI	2017
9155145	Hyundai Technopia	Hyundai LNG Shipping	Hyundai	135000	Spherical	Conventional	Steam	1999
9018555	Hyundai Utopia	Hyundai LNG Shipping	Hyundai	125200	Spherical	Conventional	Steam	1994
9326603	Iberica Knutsen	Knutsen OAS	Daewoo	138000	Membrane	Conventional	Steam	2006
9326689	Ibra LNG	OSC, MOL	Samsung	147600	Membrane	Conventional	Steam	2006
9317315	Ibri LNG	OSC, MOL, Mitsubishi	Mitsubishi	147600	Spherical	Conventional	Steam	2006
9629536	Independence	Hoegh	Hyundai	170100	Membrane	FSRU	DFDE	2014
9035864	Ish	National Gas Shipping Co	Mitsubishi	137300	Spherical	Conventional	Steam	1995
9157636	K. Acacia	Korea Line	Daewoo	138000	Membrane	Conventional	Steam	2000
9186584	K. Freesia	Korea Line	Daewoo	138000	Membrane	Conventional	Steam	2000
9373008	K. Jasmine	Korea Line	Daewoo	145700	Membrane	Conventional	Steam	2008
9373010	K. Mugungwha	Korea Line	Daewoo	151700	Membrane	Conventional	Steam	2008
9785158	Kinisis	Chandris Group	Daewoo	173400	Membrane	Conventional	MEGI	2018
9636723	Kita LNG	TMS Cardiff Gas	Daewoo	160100	Membrane	Conventional	TFDE	2014
9613161	Kumul	MOL, China LNG	Hudong-Zhonghua	172000	Membrane	Conventional	SSDR	2016
9721724	La Mancha Knutsen	Knutsen OAS	Hyundai	176000	Membrane	Conventional	MEGI	2016
9275347	Lalla Fatma N'soumer	HYPROC	Kawaski	147300	Spherical	Conventional	Steam	2004
9629598	Lena River	Dynagas	Hyundai	155000	Membrane	Conventional	DFDE	2013
9064085	Lerici	ENI	Sestri	65300	Membrane	Conventional	Steam	1998
9388819	Lijmiliya	Nakilat	Daewoo	263300	Membrane	Q-Max	SSDR	2009
9690171	LNG Abalamabie	BGT Ltd.	Samsung	175000	Membrane	Conventional	DFDE	2016
9690169	LNG Abuja II	BGT LTD	Samsung	175000	Membrane	Conventional	DFDE	2016
9262211	LNG Adamawa	BGT Ltd.	Hyundai	141000	Spherical	Conventional	Steam	2005
9262209	LNG Akwa Ibom	BGT Ltd.	Hyundai	141000	Spherical	Conventional	Steam	2004
9320075	LNG Alliance	Gazocean	Chantiers de l'Atlantique	154500	Membrane	Conventional	DFDE	2007

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
7390181	LNG Aquarius	Hanochem	General Dynamics	126300	Spherical	Conventional	Steam	1977
9341299	LNG Barka	OSC, OG, NYK, K Line	Kawasaki	153600	Spherical	Conventional	Steam	2008
9241267	LNG Bayelsa	BGT Ltd.	Hyundai	137000	Spherical	Conventional	Steam	2003
9267015	LNG Benue	BW	Daewoo	145700	Membrane	Conventional	Steam	2006
9692002	LNG Bonny II	BGT LTD	Hyundai	177000	Membrane	Conventional	DFDE	2015
9322803	LNG Borno	NYK	Samsung	149600	Membrane	Conventional	Steam	2007
9262223	LNG Cross River	BGT Ltd.	Hyundai	141000	Spherical	Conventional	Steam	2005
9277620	LNG Dream	NYK	Kawasaki	145300	Spherical	Conventional	Steam	2006
9834296	LNG Dubhe	MOL, COSCO	Hudong-Zhonghua	174000	Membrane	Conventional	XDF	2019
9329291	LNG Ebisu	MOL, KEPCO	Kawasaki	147500	Spherical	Conventional	Steam	2008
9266994	LNG Enugu	BW	Daewoo	145000	Membrane	Conventional	Steam	2005
9690145	LNG Finima II	BGT Ltd.	Samsung	175000	Membrane	Conventional	DFDE	2015
9666986	LNG Fukurokuju	MOL, KPCO	Kawasaki	165100	Spherical	Conventional	Steam Reheat	2016
9311581	LNG Imo	BW	Daewoo	148500	Membrane	Conventional	Steam	2008
9200316	LNG Jamal	NYK, Osaka Gas	Mitsubishi	137000	Spherical	Conventional	Steam	2000
9774628	LNG Juno	MOL	Mitsubishi	177300	Spherical	Conventional	STaGE	2018
9341689	LNG Jupiter	Osaka Gas, NYK	Kawasaki	156000	Spherical	Conventional	Steam	2009
9666998	LNG Jurojin	MOL, KEPCO	Mitsubishi	155300	Spherical	Conventional	Steam Reheat	2015
9311567	LNG Kano	BW	Daewoo	148300	Membrane	Conventional	Steam	2007
9372963	LNG Kolt	STX Pan Ocean	Hanjin H.I.	153000	Membrane	Conventional	Steam	2008
9692014	LNG Lagos II	BGT Ltd.	Hyundai	177000	Membrane	Conventional	DFDE	2016
9269960	LNG Lokoja	BW	Daewoo	148300	Membrane	Conventional	Steam	2006
8701791	LNG Maleo	MOL, NYK, K Line	Mitsui	127700	Spherical	Conventional	Steam	1989
9645748	LNG Mars	Osaka Gas, MOL	Mitsubishi	155000	Spherical	Conventional	Steam Reheat	2016
9322815	LNG Ogun	NYK	Samsung	149600	Membrane	Conventional	Steam	2007
9311579	LNG Ondo	BW	Daewoo	148300	Membrane	Conventional	Steam	2007
9267003	LNG Oyo	BW	Daewoo	145800	Membrane	Conventional	Steam	2005
9256602	LNG Pioneer	MOL	Daewoo	138000	Membrane	Conventional	Steam	2005
9690157	LNG Port-Harcourt II	BGT Ltd.	Samsung	175000	Membrane	Conventional	DFDE	2015
9262235	LNG River Niger	BGT Ltd.	Hyundai	141000	Spherical	Conventional	Steam	2006
9266982	LNG River Orashi	BW	Daewoo	145900	Membrane	Conventional	Steam	2004
9216298	LNG Rivers	BGT Ltd.	Hyundai	137000	Spherical	Conventional	Steam	2002
9774135	LNG Sakura	NYK/Kepco	Kawasaki	177000	Spherical	Conventional	TFDE	2018
9696149	LNG Saturn	MOL	Mitsubishi	155700	Spherical	Conventional	Steam Reheat	2016
9771913	LNG Schneeweisschen	MOL	Daewoo	180000	Membrane	Conventional	XDF	2018
9216303	LNG Sokoto	BGT Ltd.	Hyundai	137000	Spherical	Conventional	Steam	2002
9306495	LNG Unity	TOTAL	Chantiers de l'Atlantique	154500	Membrane	Conventional	DFDE	2006
9645736	LNG Venus	Osaka Gas, MOL	Mitsubishi	155000	Spherical	Conventional	Steam	2014
9020766	LNG Vesta	Tokyo Gas, MOL, Iino	Mitsubishi	127000	Spherical	Conventional	Steam	1994

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9490961	Lobito	Mitsui, NYK, Teekay	Samsung	160400	Membrane	Conventional	TFDE	2011
9285952	Lusail	K Line, MOL, NYK, Nakilat	Samsung	145700	Membrane	Conventional	Steam	2005
9705653	Macoma	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2017
9259276	Madrid Spirit	Teekay	IZAR	138000	Membrane	Conventional	Steam	2004
9770921	Magdala	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2018
9342487	Magellan Spirit	Teekay, Marubeni	Samsung	165500	Membrane	Conventional	DFDE	2009
9490959	Malanje	Mitsui, NYK, Teekay	Samsung	160400	Membrane	Conventional	DFDE	2011
9682588	Maran Gas Achilles	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	DFDE	2015
9682590	Maran Gas Agamemnon	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	MEGI	2016
9650054	Maran Gas Alexandria	Maran Gas Maritime	Hyundai	161900	Membrane	Conventional	DFDE	2015
9701217	Maran Gas Amphipolis	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	DFDE	2016
9810379	Maran Gas Andros	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	MEGI	2019
9633422	Maran Gas Apollonia	Maran Gas Maritime	Hyundai	161900	Membrane	Conventional	DFDE	2014
9302499	Maran Gas Asclepius	Maran G.M, Nakilat	Daewoo	145800	Membrane	Conventional	Steam	2005
9753014	Maran Gas Chios	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	MEGI	2019
9331048	Maran Gas Coronis	Maran G.M, Nakilat	Daewoo	145700	Membrane	Conventional	Steam	2007
9633173	Maran Gas Delphi	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	TFDE	2014
9627497	Maran Gas Efessos	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	DFDE	2014
9682605	Maran Gas Hector	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	DFDE	2016
9767962	Maran Gas Hydra	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	MEGI	2019
9682576	Maran Gas Leto	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	DFDE	2016
9627502	Maran Gas Lindos	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	DFDE	2015
9658238	Maran Gas Mystras	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	DFDE	2015
9732371	Maran Gas Olympias	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	TFDE	2017
9709489	Maran Gas Pericles	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	DFDE	2016
9633434	Maran Gas Posidonia	Maran Gas Maritime	Hyundai	161900	Membrane	Conventional	DFDE	2014
9701229	Maran Gas Roxana	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	TFDE	2017
9650042	Maran Gas Sparta	Maran Gas Maritime	Hyundai	161900	Membrane	Conventional	TFDE	2015
9767950	Maran Gas Spetses	Maran G.M, Nakilat	Daewoo	173400	Membrane	Conventional	MEGI	2018
9658240	Maran Gas Troy	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	TFDE	2015

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9709491	Maran Gas Ulysses	Maran Gas Maritime	Hyundai	174000	Membrane	Conventional	TFDE	2017
9732369	Maran Gas Vergina	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	TFDE	2016
9659725	Maria Energy	Tsakos	Hyundai	174000	Membrane	Conventional	TFDE	2016
9336749	Marib Spirit	Teekay	Samsung	165500	Membrane	Conventional	DFDE	2008
9778313	Marshal Vasilevskiy	Gazprom JSC	Hyundai	174000	Membrane	FSRU	TFDE	2018
9770438	Marvel Crane	NYK	Mitsubishi	177000	Spherical	Conventional	STaGE	2019
9759240	Marvel Eagle	MOL	Kawasaki	155000	Spherical	Conventional	TFDE	2018
9760768	Marvel Falcon	MOL	Samsung	174000	Membrane	Conventional	XDF	2018
9760770	Marvel Hawk	MOL	Samsung	174000	Membrane	Conventional	XDF	2018
9770440	Marvel Heron	MOL	Mitsubishi	177000	Spherical	Conventional	STaGE	2019
9760782	Marvel Kite	MOL	Samsung	174000	Membrane	Conventional	XDF	2019
9759252	Marvel Pelican	MOL	Kawasaki	155985	Spherical	Conventional	TFDE	2019
9770945	Megara	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2018
9397303	Mekaines	Nakilat	Samsung	266500	Membrane	Q-Max	SSDR	2009
9250191	Merchant	Sinokor Merchant Marine	Samsung	138200	Membrane	Conventional	Steam	2003
9369904	Meridian Spirit	Teekay, Marubeni	Samsung	165500	Membrane	Conventional	DFDE	2010
9337729	Mesaimeer	Nakilat	Hyundai	216300	Membrane	Q-Flex	SSDR	2009
9321768	Methane Alison Victoria	GasLog	Samsung	145000	Membrane	Conventional	Steam	2007
9516129	Methane Becki Anne	GasLog	Samsung	170000	Membrane	Conventional	TFDE	2010
9321744	Methane Heather Sally	GasLog	Samsung	145000	Membrane	Conventional	Steam	2007
9307190	Methane Jane Elizabeth	GasLog	Samsung	145000	Membrane	Conventional	Steam	2006
9412880	Methane Julia Louise	MOL	Samsung	170000	Membrane	Conventional	TFDE	2010
9256793	Methane Kari Elin	Shell	Samsung	138000	Membrane	Conventional	Steam	2004
9307205	Methane Lydon Volney	GasLog	Samsung	145000	Membrane	Conventional	Steam	2006
9520376	Methane Mickie Harper	Shell	Samsung	170000	Membrane	Conventional	TFDE	2010
9321770	Methane Nile Eagle	Shell, Gaslog	Samsung	145000	Membrane	Conventional	Steam	2007
9425277	Methane Patricia Camila	Shell	Samsung	170000	Membrane	Conventional	TFDE	2010
9253715	Methane Princess	Golar LNG Partners	Daewoo	138000	Membrane	Conventional	Steam	2003
9307188	Methane Rita Andrea	Shell, Gaslog	Samsung	145000	Membrane	Conventional	Steam	2006
9321756	Methane Shirley Elisabeth	Shell, Gaslog	Samsung	145000	Membrane	Conventional	Steam	2007
9336737	Methane Spirit	Teekay, Marubeni	Samsung	165500	Membrane	Conventional	TFDE	2008
9321732	Milaha Qatar	Nakilat, Qatar Shpg., SocGen	Samsung	145600	Membrane	Conventional	Steam	2006
9255854	Milaha Ras Laffan	Nakilat, Qatar Shpg., SocGen	Samsung	138270	Membrane	Conventional	Steam	2004
9305128	Min Lu	China LNG Ship MgMT.	Hudong-Zhonghua	147200	Membrane	Conventional	Steam	2009

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9305116	Min Rong	China LNG Ship MgMT.	Hudong-Zhonghua	147600	Membrane	Conventional	Steam	2009
9713105	MOL FSRU Challenger	MOL	Daewoo	263000	Membrane	FSRU	TFDE	2017
9337755	Mozah	Nakilat	Samsung	266300	Membrane	Q-Max	SSDR	2008
9074638	Mraweh	National Gas Shipping Co	Kvaerner Masa	135000	Spherical	Conventional	Steam	1996
9074626	Mubaraz	National Gas Shipping Co	Kvaerner Masa	135000	Spherical	Conventional	Steam	1996
9705641	Murex	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2017
9360805	Murwab	NYK, K Line, MOL, lino, Mitsui, Nakilat	Daewoo	210100	Membrane	Q-Flex	SSDR	2008
9770933	Myrina	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2018
9324277	Neo Energy	Tsakos	Hyundai	150000	Spherical	Conventional	Steam	2007
9385673	Neptune	Hoegh, MOL, TLTC	Samsung	145000	Membrane	FSRU	DFDE	2009
9750660	Nikolay Urvantsev	MOL, COSCO	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9750725	Nikolay Yevgenov	Teekay, China LNG Shipping	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9768526	Nikolay Zubov	Dynagas	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9294264	Nizwa LNG	OSC, MOL	Kawasaki	147700	Spherical	Conventional	Steam	2005
9796781	Nohshu Maru	MOL, JERA	Mitsubishi	177300	Spherical	Conventional	STaGE	2019
8608872	Northwest Sanderling	North West Shelf Venture	Mitsubishi	126700	Spherical	Conventional	Steam	1989
8913150	Northwest Sandpiper	North West Shelf Venture	Mitsui	127000	Spherical	Conventional	Steam	1993
8608884	Northwest Snipe	North West Shelf Venture	Mitsui	126900	Spherical	Conventional	Steam	1990
9045132	Northwest Stormpetrel	North West Shelf Venture	Mitsubishi	126800	Spherical	Conventional	Steam	1994
7382744	Nusantara Regas Satu	Golar LNG Partners	Rosenberg Verft	125003	Spherical	Converted FSRU	Steam	1977
9681699	Oak Spirit	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2016
9315692	Ob River	Dynagas	Hyundai	149700	Membrane	Conventional	Steam	2007
9698111	Oceanic Breeze	K-Line, Inpex	Mitsubishi	155300	Spherical	Conventional	Steam Reheat	2018
9397353	Onaiza	Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2009
9761267	Ougarta	HYPROC	Hyundai	171800	Membrane	Conventional	TFDE	2017
9621077	Pacific Arcadia	NYK	Mitsubishi	145400	Spherical	Conventional	Steam	2014
9698123	Pacific Breeze	K Line	Kawasaki	182000	Spherical	Conventional	TFDE	2018
9351971	Pacific Enlighten	Kyushu Electric, TEPCO, Mitsubishi, Mitsui, NYK, MOK	Mitsubishi	145000	Spherical	Conventional	Steam	2009
9264910	Pacific Eurus	TEPCO, NYK, Mitsubishi	Mitsubishi	137000	Spherical	Conventional	Steam	2006
9743875	Pacific Mimosa	NYK	Mitsubishi	155300	Membrane	Conventional	Steam Reheat	2018
9247962	Pacific Notus	TEPCO, NYK, Mitsubishi	Mitsubishi	137000	Spherical	Conventional	Steam	2003
9636735	Palu LNG	TMS Cardiff Gas	Daewoo	160000	Membrane	Conventional	TFDE	2014

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9750256	Pan Africa	Teekay, China LNG Shipping, CETS Investment Management, BW	Hudong-Zhonghua	174000	Membrane	Conventional	DFDE	2019
9750232	Pan Americas	Teekay	Hudong-Zhonghua	174000	Membrane	Conventional	DFDE	2018
9750220	Pan Asia	Teekay	Hudong-Zhonghua	174000	Membrane	Conventional	DFDE	2017
9750244	Pan Europe	Teekay	Hudong-Zhonghua	174000	Membrane	Conventional	DFDE	2018
9613135	Papua	MOL, China LNG	Hudong-Zhonghua	172000	Membrane	Conventional	SSDR	2015
9766889	Patris	Chandris Group	Daewoo	173400	Membrane	Conventional	MEGI	2018
9629524	PGN FSRU Lampung	Hoegh	Hyundai	170132	Membrane	FSRU	DFDE	2014
9375721	Point Fortin	MOL, Sumitomo, LNG JAPAN	Imabari	154200	Membrane	Conventional	Steam	2010
9001772	Polar Spirit	Teekay	I.H.I.	87300	Self-Supporting Prismatic	Conventional	Steam	1993
9064073	Portovenere	ENI	Sestri	65300	Membrane	Conventional	Steam	1996
9246621	Portovyy	Gazprom	Daewoo	138100	Membrane	Conventional	Steam	2003
9723801	Prachi	MOL, NYK, K Line, SCI, Nakilat, Petronet	Hyundai	173000	Membrane	Conventional	TFDE	2016
9810549	Prism Agility	SK Shipping	Hyundai	180000	Membrane	Conventional	XDF	2019
9810551	Prism Brilliance	SK Shipping	Hyundai	180000	Membrane	Conventional	XDF	2019
9630028	Pskov	Sovcomflot	STX	170200	Membrane	Conventional	DFDE	2014
9030814	Puteri Delima	MISC	Chantiers de l'Atlantique	130000	Membrane	Conventional	Steam	1995
9211872	Puteri Delima Satu	MISC	Mitsui	137500	Membrane	Conventional	Steam	2002
9248502	Puteri Firus Satu	MISC	Mitsubishi	137500	Membrane	Conventional	Steam	2004
9030802	Puteri Intan	MISC	Chantiers de l'Atlantique	130000	Membrane	Conventional	Steam	1994
9213416	Puteri Intan Satu	MISC	Mitsubishi	137500	Membrane	Conventional	Steam	2002
9261205	Puteri Mutiara Satu	MISC	Mitsui	137000	Membrane	Conventional	Steam	2005
9030826	Puteri Nilam	MISC	Chantiers de l'Atlantique	130000	Membrane	Conventional	Steam	1995
9229647	Puteri Nilam Satu	MISC	Mitsubishi	137500	Membrane	Conventional	Steam	2003
9030838	Puteri Zamrud	MISC	Chantiers de l'Atlantique	130000	Membrane	Conventional	Steam	1996
9245031	Puteri Zamrud Satu	MISC	Mitsui	137500	Membrane	Conventional	Steam	2004
9253703	Raahi	MOL, NYK, K Line, SCI, Nakilat, Petronet	Daewoo	138100	Membrane	Conventional	Steam	2004
7411961	Ramdane Abane	Sonatrach	Chantiers de l'Atlantique	126000	Membrane	Conventional	Steam	1981
9443413	Rasheeda	Nakilat	Samsung	266300	Membrane	Q-Max	MEGI	2010
9825568	Rias Baixas Knutsen	Knutsen OAS	Hyundai	180000	Membrane	Conventional	MEGI	2019

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9477593	Ribera Duero Knutsen	Knutsen OAS	Daewoo	173400	Membrane	Conventional	DFDE	2010
9721736	Rioja Knutsen	Knutsen OAS	Hyundai	176000	Membrane	Conventional	MEGI	2016
9750713	Rudolf Samoylovich	Teekay	Daewoo	172600	Membrane	Icebreaker	TFDE	2018
9769855	Saga Dawn	Landmark Capital	Xiamen Shipbuilding Industry	45000	Self-Supporting Prismatic	Conventional	DFDE	2019
9300817	Salalah LNG	OSC, MOL	Samsung	147000	Membrane	Conventional	Steam	2005
9654878	SCF Melampus	Sovcomflot	STX	170200	Membrane	Conventional	TFDE	2015
9654880	SCF Mitre	Sovcomflot	STX	170200	Membrane	Conventional	TFDE	2015
9781918	Sean Spirit	Teekay	Hyundai	174000	Membrane	Conventional	MEGI	2018
9666558	Seishu Maru	Mitsubishi, NYK, Chubu Electric	Mitsubishi	153000	Membrane	Conventional	Steam	2014
8014473	Senshu Maru	MOL, NYK, K Line	Mitsui	125800	Spherical	Conventional	Steam	1984
9293832	Seri Alam	MISC	Samsung	145700	Membrane	Conventional	Steam	2005
9293844	Seri Amanah	MISC	Samsung	145700	Membrane	Conventional	Steam	2006
9321653	Seri Anggun	MISC	Samsung	145700	Membrane	Conventional	Steam	2006
9321665	Seri Angkasa	MISC	Samsung	145700	Membrane	Conventional	Steam	2006
9329679	Seri Ayu	MISC	Samsung	145700	Membrane	Conventional	Steam	2007
9331634	Seri Bakti	MISC	Mitsubishi	152300	Membrane	Conventional	Steam	2007
9331660	Seri Balhaf	MISC	Mitsubishi	157000	Membrane	Conventional	TFDE	2009
9331672	Seri Balqis	MISC	Mitsubishi	152000	Membrane	Conventional	TFDE	2009
9331646	Seri Begawan	MISC	Mitsubishi	152300	Membrane	Conventional	Steam	2007
9331658	Seri Bijaksana	MISC	Mitsubishi	152300	Membrane	Conventional	Steam	2008
9714305	Seri Camar	PETRONAS	Hyundai	150200	Membrane	Conventional	Steam Reheat	2018
9714276	Seri Camellia	PETRONAS	Hyundai	150200	Membrane	Conventional	Steam Reheat	2016
9756389	Seri Cemara	PETRONAS	Hyundai	150200	Spherical	Conventional	Steam Reheat	2018
9714290	Seri Cempaka	PETRONAS	Hyundai	150200	Spherical	Conventional	MEGI	2017
9714288	Seri Cenderawasih	PETRONAS	Hyundai	150200	Spherical	Conventional	Steam Reheat	2017
9338797	Sestao Knutsen	Knutsen OAS	IZAR	138000	Membrane	Conventional	Steam	2007
9414632	Sevilla Knutsen	Knutsen OAS	Daewoo	173400	Membrane	Conventional	DFDE	2010
9418365	Shagra	Nakilat	Samsung	266300	Membrane	Q-Max	SSDR	2009
9035852	Shahamah	National Gas Shipping Co	Kawasaki	135000	Spherical	Conventional	Steam	1994
9583677	Shen Hai	China LNG, CNOOC, Shanghai LNG	Hudong-Zhonghua	147600	Membrane	Conventional	Steam	2012
9791200	Shinshu Maru	MOL	Kawasaki	177000	Spherical	Conventional	DFDE	2019
9320386	Simaisma	Maran G.M, Nakilat	Daewoo	145700	Membrane	Conventional	Steam	2006
9238040	Singapore Energy	Sinokor Merchant Marine	Samsung	138000	Membrane	Conventional	Steam	2003
9693161	SK Audace	SK Shipping, Marubeni	Samsung	180000	Membrane	Conventional	XDF	2017
9693173	SK Resolute	SK Shipping, Marubeni	Samsung	180000	Membrane	Conventional	XDF	2018

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
9761803	SK Serenity	SK Shipping	Samsung	174000	Membrane	Conventional	MEGI	2018
9761815	SK Spica	SK Shipping	Samsung	174000	Membrane	Conventional	MEGI	2018
9180231	SK Splendor	SK Shipping	Samsung	138200	Membrane	Conventional	Steam	2000
9180243	SK Stellar	SK Shipping	Samsung	138200	Membrane	Conventional	Steam	2000
9157624	SK Summit	SK Shipping	Daewoo	138000	Membrane	Conventional	Steam	1999
9247194	SK Sunrise	SK Shipping	Samsung	138200	Membrane	Conventional	Steam	2003
9157739	SK Supreme	SK Shipping	Samsung	138200	Membrane	Conventional	Steam	2000
9761827	SM Eagle	Korea Line	Daewoo	174000	Membrane	Conventional	MEGI	2017
9761839	SM Seahawk	Korea Line	Daewoo	174000	Membrane	Conventional	MEGI	2017
9210816	Sohar LNG	OSC, MOL	Mitsubishi	137200	Spherical	Conventional	Steam	2001
9791212	Sohshu Maru	MOL, JERA	Kawasaki	177269	Spherical	Conventional	DFDE	2019
9634098	Solaris	GasLog	Samsung	155000	Membrane	Conventional	TFDE	2014
9482304	Sonangol Benguela	Mitsui, Sonangol, Sojlitz	Daewoo	160000	Membrane	Conventional	Steam	2011
9482299	Sonangol Etosha	Mitsui, Sonangol, Sojlitz	Daewoo	160000	Membrane	Conventional	Steam	2011
9475600	Sonangol Sambizanga	Mitsui, Sonangol, Sojlitz	Daewoo	160000	Membrane	Conventional	Steam	2011
9613147	Southern Cross	MOL, China LNG	Hudong-Zhonghua	168423	Membrane	Conventional	SSDR	2015
9475208	Soyo	Mitsui, NYK, Teekay	Samsung	160400	Membrane	Conventional	DFDE	2011
9361639	Spirit Of Hela	MOL, Itochu	Hyundai	177000	Membrane	Conventional	DFDE	2009
9315393	Stena Blue Sky	Stena Bulk	Daewoo	145700	Membrane	Conventional	Steam	2006
9413327	Stena Clear Sky	Stena Bulk	Daewoo	173000	Membrane	Conventional	TFDE	2011
9383900	Stena Crystal Sky	Stena Bulk	Daewoo	173000	Membrane	Conventional	TFDE	2011
9322255	Summit LNG	Excelerate Energy	Daewoo	138000	Membrane	FSRU	Steam	2006
9330745	Symphonic Breeze	K Line	Kawasaki	147600	Spherical	Conventional	Steam	2007
9403669	Taitar No.1	CPC, Mitsui. NYK	Mitsubishi	145300	Spherical	Conventional	Steam	2009
9403645	Taitar No.2	MOL, NYK	Kawaski	145300	Spherical	Conventional	Steam	2009
9403671	Taitar No.3	MOL, NYK	Mitsubishi	145300	Spherical	Conventional	Steam	2010
9403657	Taitar No.4	CPC, Mitsui. NYK	Kawaski	145300	Spherical	Conventional	Steam	2010
9334284	Tangguh Batur	Sovcomflot, NYK	Daewoo	145700	Membrane	Conventional	Steam	2008
9349007	Tangguh Foja	K Line, PT Meratus	Samsung	154800	Membrane	Conventional	DFDE	2008
9333632	Tangguh Hiri	Teekay	Hyundai	155000	Membrane	Conventional	DFDE	2008
9349019	Tangguh Jaya	K Line, PT Meratus	Samsung	155000	Membrane	Conventional	DFDE	2008
9355379	Tangguh Palung	K Line, PT Meratus	Samsung	155000	Membrane	Conventional	DFDE	2009
9361990	Tangguh Sago	Teekay	Hyundai	155000	Membrane	Conventional	DFDE	2009
9325893	Tangguh Towuti	NYK, PT Samudera, Sovcomflot	Daewoo	145700	Membrane	Conventional	Steam	2008
9337731	Tembek	Nakilat, OSC	Samsung	216200	Membrane	Q-Flex	SSDR	2007
7428433	Tenaga Empat	MISC	CNIM	130000	Membrane	FSU	Steam	1981

Appendix 3: Table of Global Active LNG Fleet (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cm)	Cargo Type	Vessel Type	Propulsion Type	Delivery Year
7428457	Tenaga Satu	MISC	Dunkerque Chantiers	130000	Membrane	FSU	Steam	1982
9761243	Tessala	HYPROC	Hyundai	171800	Membrane	Conventional	TFDE	2016
9721401	Torben Spirit	Teekay	Daewoo	173000	Membrane	Conventional	MEGI	2017
9238038	Trader	Sinokor Merchant Marine	Samsung	138000	Membrane	Conventional	Steam	2002
9319404	Trinity Arrow	K Line	Imabari	155000	Membrane	Conventional	Steam	2008
9350927	Trinity Glory	K Line	Imabari	155000	Membrane	Conventional	Steam	2009
9823883	Turquoise P	Pardus Energy	Hyundai	170000	Membrane	FSRU	DFDE	2019
9360829	Umm Al Amad	NYK, K Line, MOL, Iino, Mitsui, Nakilat	Daewoo	210200	Membrane	Q-Flex	SSDR	2008
9074652	Umm Al Ashtan	National Gas Shipping Co	Kvaerner Masa	135000	Spherical	Conventional	Steam	1997
9308431	Umm Bab	Maran G.M, Nakilat	Daewoo	145700	Membrane	Conventional	Steam	2005
9372731	Umm Slal	Nakilat	Samsung	266000	Membrane	Q-Max	SSDR	2008
9434266	Valencia Knutsen	Knutsen OAS	Daewoo	173400	Membrane	Conventional	DFDE	2010
9630004	Velikiy Novgorod	Sovcomflot	STX	170200	Membrane	Conventional	DFDE	2014
9750701	Vladimir Rusanov	MOL	Daewoo	172600	Membrane	Icebreaker	TFDE	2018
9750658	Vladimir Vize	MOL	Daewoo	172600	Membrane	Icebreaker	TFDE	2018
9750737	Vladimir Voronin	Teekay, China LNG Shipping	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9627954	Wilforce	Teekay	Daewoo	160000	Membrane	Conventional	TFDE	2013
9627966	Wilpride	Teekay	Daewoo	160000	Membrane	Conventional	TFDE	2013
9753026	Woodside Chaney	Maran Gas Maritime	Hyundai	173525	Membrane	Conventional	SSDR	2019
9369899	Woodside Donaldson	Teekay, Marubeni	Samsung	165500	Membrane	Conventional	DFDE	2009
9633161	Woodside Goode	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	DFDE	2013
9810367	Woodside Rees Wither	Maran Gas Maritime	Daewoo	173400	Membrane	Conventional	MEGI	2019
9627485	Woodside Rogers	Maran Gas Maritime	Daewoo	159800	Membrane	Conventional	DFDE	2013
9750672	Yakov Gakkel	Teekay, China LNG Shipping	Daewoo	172000	Membrane	Icebreaker	TFDE	2019
9781920	Yamal Spirit	Teekay	Hyundai	174000	Membrane	Conventional	MEGI	2019
9636747	Yari LNG	TMS Cardiff Gas	Daewoo	160000	Membrane	Conventional	TFDE	2014
9629586	Yenisei River	Dynagas	Hyundai	155000	Membrane	Conventional	DFDE	2013
9038816	YK Sovereign	SK Shipping	Hyundai	127100	Spherical	Conventional	Steam	1994
9431214	Zarga	Nakilat	Samsung	266000	Membrane	Q-Max	SSDR	2010
9132818	Zekreet	J4 Consortium	Mitsui	137500	Spherical	Conventional	Steam	1998

Source : Rystad Energy Research and Analysis

Appendix 4: Table of Global LNG Vessel Orderbook, Year-End 2019

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cbm)	Propulsion Type	Delivery Year
9850666	BW Magnolia	BW	Daewoo	174000	MEGI	2020
9850678	BW Pavilion Aramhera	BW	Daewoo	170799	MEGI	2020
9854624	Energy Endeavour	Alpha Gas	Daewoo	173400	MEGI	2020
9862308	Flex Freedom	Frontline Management	Daewoo	173400	MEGI	2020
9851634	Flex Reliance	FLEX LNG	Daewoo	173400	MEGI	2020
9851646	Flex Resolute	FLEX LNG	Daewoo	173400	MEGI	2020
9844863	Maran Gas Psara	Maran Gas Maritime	Daewoo	173400	MEGI	2020
9859753	Yiannis	Maran Gas Maritime	Daewoo	173400	MEGI	2020
9820843	Daewoo 2477	Maran Gas Maritime	Daewoo	173400	MEGI	2020
9845013	Daewoo 2478	Maran Gas Maritime	Daewoo	173400	MEGI	2020
9854363	Daewoo 2481	Minerva Marine	Daewoo	173400	MEGI	2021
9854375	Daewoo 2482	Minerva Marine	Daewoo	173400	MEGI	2021
9854612	Daewoo 2483	Alpha Gas	Daewoo	173400	MEGI	2020
9859739	Daewoo 2485	Alpha Gas	Daewoo	173400	MEGI	2021
9859741	Daewoo 2487	Maran Gas Maritime	Daewoo	173400	MEGI	2021
9873840	Daewoo 2496	BW	Daewoo	174000	MEGI	2021
9873852	Daewoo 2497	BW	Daewoo	174000	MEGI	2021
9877133	Daewoo 2498	MOL	Daewoo	174000	XDF	2021
9877145	Daewoo 2499	MOL	Daewoo	176523	XDF	2021
9881201	Daewoo 2500	Alpha Gas	Daewoo	173400	MEGI	2021
9879674	Daewoo 2501	Maran Gas Maritime	Daewoo		MEGI	2021
9880465	Daewoo 2502	Maran Gas Maritime	Daewoo		XDF	2021
9880477	Daewoo 2503	Maran Gas Maritime	Daewoo		XDF	2021
9883742	Daewoo 2504	Maran Gas Maritime	Daewoo		XDF	2021
9887217	Daewoo 2506	Maran Gas Maritime	Daewoo		XDF	2022
9892717	Daewoo 2507	Maran Gas Maritime	Daewoo		XDF	2021
9901350	Daewoo 2508		Daewoo			
9896921	Daewoo 2509	BW	Daewoo		MEGI	2022

Appendix 4: Table of Global LNG Vessel Orderbook (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cbm)	Propulsion Type	Delivery Year
9896933	Daewoo 2510	BW	Daewoo		MEGI	2022
9885996	Daewoo2505	MOL	Daewoo		XDF	2021
9834325	LNG Megrez	MOL	Hudong-Zhonghua	174000	XDF	2020
9834301	LNG Merak	MOL	Hudong-Zhonghua	174000	XDF	2020
9834313	LNG Phecda	MOL	Hudong-Zhonghua	174000	XDF	2020
9861809	Hudong Zhonghua H1786A	Dynagas	Hudong-Zhonghua	174300	DFDE/TFDE	2021
9861811	Hudong Zhonghua H1787A	Dynagas	Hudong-Zhonghua	174300	DFDE/TFDE	2021
9878876	Hudong Zhonghua H1827A	CSSC Shpg Leasing	Hudong-Zhonghua		XDF	2021
9878888	Hudong Zhonghua H1828A	CSSC Shpg Leasing	Hudong-Zhonghua		XDF	2021
9892121	Hudong Zhonghua H1829A		Hudong-Zhonghua			2022
9892133	Hudong Zhonghua H1830A		Hudong-Zhonghua			2022
9879698	Adamastos	Capital Gas	Hyundai	174000	XDF	2021
9845776	Amberjack LNG	TMS Cardiff Gas	Hyundai	174000	XDF	2020
9862920	Aristarchos	Capital Gas	Hyundai	174000	XDF	2021
9862906	Aristidis I	Capital Gas	Hyundai	174000	XDF	2020
9862891	Aristos I	Capital Gas	Hyundai	174000	XDF	2020
	Asklipios	Capital Gas	Hyundai	174000	XDF	2021
9884021	Asterix I	Capital Gas	Hyundai	174000	XDF	2021
9862918	Attalos	Capital Gas	Hyundai	174000	XDF	2021
9845788	Bonito LNG	TMS Cardiff Gas	Hyundai	174000	XDF	2020
9869306	Cobia LNG	TMS Cardiff Gas	Hyundai	174000	XDF	2021
9861031	Cool Discoverer	Thenamaris	Hyundai	174000	XDF	2020
9869265	Cool Racer	Thenamaris	Hyundai	174000	XDF	2021
9852975	Elisa Larus	N.Y.K. Line	Hyundai	174000	XDF	2020
9857377	Flex Amber	FLEX LNG	Hyundai	174000	XDF	2020
9857365	Flex Aurora	FLEX LNG	Hyundai	174000	XDF	2020
9862475	Flex Vigilant	FLEX LNG	Hyundai	174000	XDF	2021

Appendix 4: Table of Global LNG Vessel Orderbook (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cbm)	Propulsion Type	Delivery Year
9862463	Flex Volunter	FLEX LNG	Hyundai	174000	XDF	2021
9845764	La Seine	TMS Cardiff Gas	Hyundai	174000	XDF	2020
9864746	SCF Barents	Sovcomflot	Hyundai	174000	XDF	2020
9849887	Scf La Perouse	Sovcomflot	Hyundai	174000	XDF	2020
9854765	Traiano Knutsen	Knutsen OAS Shipping	Hyundai	180000	MEGI	2020
9837066	Vasant	Triumph Offshore Pvt	Hyundai	180000	DFDE/TFDE	2020
9864667	VIVIT Americas	TMS Cardiff Gas	Hyundai	174000	XDF	2020
9874040	Hyundai Mipo 8232	Knutsen OAS Shipping	Hyundai	30000	XDF	2021
9870525	Hyundai Samho 8008	Sovcomflot	Hyundai	174000	XDF	2021
9862487	Hyundai Samho 8029	N.Y.K. Line	Hyundai	174000	XDF	2020
9874454	Hyundai Samho 8030	N.Y.K. Line	Hyundai	174000	XDF	2021
9874466	Hyundai Samho 8031	N.Y.K. Line	Hyundai	174000	XDF	2021
9872987	Hyundai Samho 8039	Consolidated Marine	Hyundai	173400	XDF	2021
9872999	Hyundai Samho 8040	Consolidated Marine	Hyundai	173400	XDF	2021
9904170	Hyundai Samho 8091	J.P. Morgan	Hyundai	174000	XDF	2022
9904782	Hyundai Samho 8092	J.P. Morgan	Hyundai	174000	XDF	2022
9904194	Hyundai Samho 8093	Korea Line	Hyundai	174000	XDF	2022
9904209	Hyundai Samho 8094	Korea Line	Hyundai	174000	XDF	2022
	Hyundai Samho Newbuild	H-Line Shipping	Hyundai		XDF	2021
9884473	Hyundai Samho S971	N.Y.K. Line	Hyundai		XDF	2021
9888481	Hyundai Ulsan 2939	SK Shipping	Hyundai		XDF	2021
9872901	Hyundai Ulsan 3039	TMS Cardiff Gas	Hyundai	174000	XDF	2021
9859820	Hyundai Ulsan 3095	Turkish Petroleum Corp.	Hyundai	170000	DFDE/TFDE	2020
9892298	Hyundai Ulsan 3111		Hyundai			2020
9872949	Hyundai Ulsan 3112	TMS Cardiff Gas	Hyundai	174000	XDF	2021
9886732	Hyundai Ulsan 3137	Dynagas	Hyundai		XDF	2022
9886744	Hyundai Ulsan 3138	Dynagas	Hyundai		XDF	2022
9892456	Hyundai Ulsan 3157	Tsakos Energy Nav	Hyundai		XDF	2021
9902902	Hyundai Ulsan 3185	Knutsen OAS Shipping	Hyundai	174000	XDF	2022

Appendix 4: Table of Global LNG Vessel Orderbook (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cbm)	Propulsion Type	Delivery Year
9902914	Hyundai Ulsan 3186	Knutsen OAS Shipping	Hyundai	174000	XDF	2022
9902926	Hyundai Ulsan 3187	Knutsen OAS Shipping	Hyundai	174000	XDF	2022
9902938	Hyundai Ulsan 3188	Knutsen OAS Shipping	Hyundai	174000	XDF	2022
9778923	MARVEL SWAN	Kawasaki Kisen	Imabari	178000	MEGI	2021
9789037	Imabari Saijo 8215		Imabari	178000	MEGI	2022
9789049	Imabari Saijo 8216		Imabari	178000	MEGI	2022
9789051	Imabari Saijo 8217		Imabari	178000	MEGI	2022
9864837	Jiangnan Jovo 1	Jovo Group	Jiangnan	79800		2021
9864849	Jiangnan Jovo 2	Jovo Group	Jiangnan	79800		2021
9863182	Dorado LNG	TMS Cardiff Gas	Samsung	174000	XDF	2020
9819650	GASLOG WINDSOR	Gaslog LNG Services	Samsung	180000	XDF	2020
9854935	Samsung 2255	PT Jawa Satu Regas	Samsung	170000	DFDE/TFDE	2020
9855812	Samsung 2262	Gaslog LNG Services	Samsung	174000	XDF	2020
9851787	Samsung 2271	TMS Cardiff Gas	Samsung	174000	XDF	2020
9853137	Samsung 2274	Gaslog LNG Services	Samsung	180000	XDF	2020
9862346	Samsung 2275	TMS Cardiff Gas	Samsung	174000	XDF	2020
9864784	Samsung 2297	Celsius Shipping	Samsung	180000	XDF	2020
9864796	Samsung 2298	Celsius Shipping	Samsung	180000	XDF	2020
9864916	Samsung 2300	Gaslog LNG Services	Samsung	174000	XDF	2020
9864928	Samsung 2301	Gaslog LNG Services	Samsung	174000	XDF	2020
9870159	Samsung 2302	N.Y.K. Line	Samsung	180000	XDF	2021
9869942	Samsung 2304	Minerva Marine	Samsung	174000	XDF	2021
9877341	Samsung 2305	Minerva Marine	Samsung		MEGI	2021
9874480	Samsung 2306	N.Y.K. Line	Samsung	174000	XDF	2021
9874492	Samsung 2307	N.Y.K. Line	Samsung	174000	XDF	2021
9875800	Samsung 2308	TMS Cardiff Gas	Samsung	174000	MEGI	2021
9876660	Samsung 2311	Gaslog LNG Services	Samsung	174000	XDF	2021

Appendix 4: Table of Global LNG Vessel Orderbook (continued)

IMO Number	Vessel Name	Shipowner	Shipbuilder	Capacity (cbm)	Propulsion Type	Delivery Year
9876737	Samsung 2312	Gaslog LNG Services	Samsung	174000	XDF	2021
9878711	Samsung 2313	Celsius Shipping	Samsung		XDF	2021
9878723	Samsung 2314	Celsius Shipping	Samsung		XDF	2021
	Samsung 2315		Samsung		XDF	2021
	Samsung 2316		Samsung		XDF	2021
	Samsung 2317		Samsung		XDF	2022
	Samsung 2318		Samsung		XDF	2022
9888766	Samsung 2319	Nisshin Shipping	Samsung		XDF	2022
	Samsung 2336		Samsung		XDF	2022
	Samsung 2337		Samsung		XDF	2022
9893606	Samsung 2355	N.Y.K. Line	Samsung		XDF	2021
9896440	Samsung 2364	MISC	Samsung			2023
9896452	Samsung 2365	MISC	Samsung			2023
9693719	Coral Encanto	Anthony Veder	Zhejiang	30000		2020
	Zvezda Shipbuilding newbuild	Sovcomflot	Zvezda Shipbuilding		TFDE	2023

Source : Rystad Energy

Appendix 5: Table of Global LNG Receiving Terminals[4]

Existing as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
1	Spain	Barcelona LNG	1969	12.5	Enagas (100%);	Onshore
2	Japan	Negishi	1969	12	JERA (50%); Tokyo Gas (50%);	Onshore
3	United States	Everett	1971	5.4	Exelon Generation (100%)	Onshore
4	Italy	Panigaglia LNG	1971	2.5	GNL Italia (100%);	Onshore
5	France	Fos Tonkin	1972	2.2	ENGIE (100%)	Onshore
6	Japan	Senboku	1972	15.3	Osaka Gas (100%);	Onshore
7	Japan	Sodegaura	1973	29.4	JERA (50%); Tokyo Gas (50%);	Onshore
8	Japan	Chita LNG Joint Terminal / Kyodo	1977	7.5	JERA (50%); Toho Gas (50%);	Onshore
9	Japan	Tobata	1977	6.8	Kitakyushu LNG (100%);	Onshore
10	United States	Elba Island LNG	1978	12	Kinder Morgan (100%);	Onshore
11	Japan	Himeji	1979	14	Osaka Gas (100%);	Onshore
12	France	Montoir-de-Bretagne	1980	7.3	ENGIE (100%);	Onshore
13	Japan	Chita LNG	1983	10.9	JERA (50%); Toho Gas (50%);	Onshore
14	Japan	Higashi-Ohgishima	1984	14.7	JERA (100%);	Onshore
15	Japan	Higashi-Niigata	1984	8.9	Nihonkai LNG (58.1%); Tohuko Electric (41.9%);	Onshore
16	Japan	Futtsu LNG	1985	16	JERA (100%);	Onshore
17	South Korea	Pyeongtaek LNG	1986	40.6	KOGAS (100%);	Onshore
18	Belgium	Zeebrugge	1987	6.6	Fluxys LNG SA (100%)	Onshore
19	Japan	Yokkaichi LNG Center	1987	7.1	JERA (100%);	Onshore
20	Spain	Huelva	1988	8.6	Enagas (100%);	Onshore
21	Spain	Cartagena	1989	8.6	Enagas (100%);	Onshore
22	Japan	Oita LNG	1990	5.1	Kyushu Electric (100%);	Onshore
23	Chinese Taipei	Yung-An	1990	9.5	CPC (100%);	Onshore
24	Japan	Yanai	1990	2.4	Chugoku Electric (100%);	Onshore
25	Japan	Yokkaichi Works	1991	2.1	Toho Gas (100%);	Onshore
26	Turkey	Marmara Ereglisi	1994	5.9	Botas (100%);	Onshore
27	South Korea	Incheon	1996	41.7	KOGAS (100%);	Onshore
28	Japan	Hatsukaichi	1996	0.9	Hiroshima Gas (100%);	Onshore
29	Japan	Sodeshi	1996	1.6	Shizuoka Gas (65%); TonenGeneral (35%);	Onshore
30	Japan	Kawagoe	1997	7.7	JERA (100%);	Onshore
31	Japan	Shin-Minato	1997	0.3	Sendai Gas (0%); Gas Bureau (100%);	Onshore
32	Japan	Ohgishima	1998	9.9	Tokyo Gas (100%);	Onshore
33	Greece	Revithoussa	2000	4.6	DEPA (100%)	Onshore
34	United States	EcoElectrica	2000	1.2	Naturgy (47.5%); ENGIE (35%); Mitsui (15%); GE Capital (2.5%)	Onshore
35	Japan	Chita Midorihama Works	2001	8.3	Toho Gas (100%);	Onshore
36	South Korea	Tongyeong LNG	2002	26.6	KOGAS (100%);	Onshore
37	United States	Cove Point LNG	2003	11	Dominion Cove Point LNG (100%);	Onshore

[4] Only floating terminals with active FSRU charter(s) or have chartered FSRU vessel(s) installed at site are included in the table.

Appendix 5: Table of Global LNG Receiving Terminals (continued)

Existing as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
38	Dominican Republic	AES Andres LNG	2003	1.9	AES (92%); Estrella-Linda (8%);	Onshore
39	Spain	Bahía de Bizkaia Gas	2003	5.1	ENAGAS (50%); EVE (50%);	Onshore
40	Portugal	Sines LNG Terminal	2004	5.8	REN (100%);	Onshore
41	India	Dahej LNG	2004	17.5	Petronet LNG (100%);	Onshore
42	South Korea	Gwangyang	2005	2.3	POSCO (100%);	Onshore
43	India	Hazira LNG	2005	5	Shell (100%)	Onshore
44	United Kingdom	Grain LNG	2005	15	National Grid Transco (100%);	Onshore
45	Japan	Sakai LNG	2006	6.4	Kansai Electric (70%); Cosmo Oil (12.5%); Iwatani (12.5%); Ube Industries (5%);	Onshore
46	Japan	Mizushima	2006	4.3	Chugoku Electric (50%); JX Nippon Oil & Energy (50%);	Onshore
47	Spain	Sagunto	2006	6.4	ENAGAS (72.5%); Osaka Gas (20%); Oman Oil (7.5%);	Onshore
48	Turkey	Aliaga Izmir LNG	2006	4.4	EgeGaz (100%);	Onshore
49	Mexico	Terminal de LNG Altamira	2006	5.4	Vopak (60%); ENAGAS (40%);	Onshore
50	China	Guangdong Dapeng LNG	2006	6.8	Local Company (37%); CNOOC (33%); BP (30%)	Onshore
51	Spain	Mugardos LNG	2007	2.6	Grupo Tojeiro (50.36%); Gobierno de Galicia (24.64%); First State Regasificadora (15%); Sonatrach (10%);	Onshore
52	Mexico	Energia Costa Azul	2008	7.6	Sempra Energy (100%);	Onshore
53	United States	Freeport LNG	2008	11.3	Michael S Smith Cos (57.5%); Global Infrastructure Partners (25%); Osaka Gas (10%); Dow Chemical (7.5%);	Onshore
54	China	Wuhaogou LNG	2008	1	Shenergy (100%)	Onshore
55	United States	Northeast Gateway	2008	4.5	Excelerate Energy (100%);	Floating
56	Canada	Canaport LNG	2009	7.5	Repsol (75%); Irving Oil (25%);	Onshore
57	United Kingdom	South Hook	2009	15.6	Qatar Petroleum (67.5%); Exxon Mobil (24.25%); TOTAL (8.35%);	Onshore
58	Chinese Taipei	Taichung LNG	2009	4.5	CPC (100%);	Onshore
59	Italy	Adriatic LNG	2009	5.8	Exxon Mobil (46.35%); Qatar Petroleum (46.35%); Edison (7.3%);	Offshore
60	Chile	GNL Quintero	2009	4	ENAGAS (60.4%); ENAP (20%); Oman Oil (19.6%);	Onshore
61	United Kingdom	Dragon LNG	2009	7.5	Shell (50%); Ancala (50%)	Onshore
62	China	Shanghai LNG	2009	3	Shenergy Group (55%); CNOOC (45%);	Onshore
63	China	Fujian LNG	2009	5.2	CNOOC (60%); Fujian Investment and Development Co (40%);	Onshore

Appendix 5: Table of Global LNG Receiving Terminals (continued)

Existing as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
64	Japan	Sakaide LNG	2010	1.2	Shikoku Electric Power Co. (70%); Cosmo Oil Co. Ltd (20%); Shikoku Gas Co. (10%);	Onshore
65	France	Fos Cavaou	2010	6	ENGIE (71.5%); TOTAL (28.5%);	Onshore
66	China	Jiangsu Rudong LNG	2011	6.5	CNPC (55%); Pacific Oil and Gas (35%); Jiangsu Guoxin (10%);	Onshore
67	Argentina	GNL Escobar - Excelerate Exemplar	2011	3.8	YPF (50%); Enarsa (50%);	Floating
68	China	Dalian LNG	2011	6	CNPC (75%); Dalian Port (20%); Dalian Construction Investment Corporation (5%);	Onshore
69	Netherlands	Gate LNG	2011	9	Gasuine (50%); Vopak (50%);	Onshore
70	Thailand	Map Ta Phut	2011	11.5	PTT LNG (100%);	Onshore
71	Mexico	Terminal KMS	2012	3.8	Samsung (37.5%); Mitsui (37.5%); KOGAS (25%);	Onshore
72	Indonesia	Nusantara Regas Satu - FSRU Jawa Barat	2012	3.8	Pertamina (60%); PGN (40%);	Floating
73	Japan	Joetsu	2012	2.3	JERA (100%);	Onshore
74	China	Zhejiang Ningbo LNG	2012	3	CNOOC (51%); Zhejiang Energy Company (29%); Ningbo Power (20%)	Onshore
75	Japan	Ishikari LNG	2012	2.7	Hokkaido Gas (100%);	Onshore
76	Singapore	Jurong	2013	11	EMA (100%)	Onshore
77	China	Zhuhai LNG	2013	3.5	CNOOC (30%); Guangdong Gas (25%); Guangdong Yuedian (25%); Local companies (20%);	Onshore
78	Malaysia	Melaka LNG	2013	3.8	Petronas (100%);	Floating
79	China	Jovo Dongguan	2013	1.5	Jovo Group (100%);	Onshore
80	Israel	Hadera Deepwater LNG - Excelerate Expedient	2013	3	INGL (100%);	Floating
81	China	Caofeidian (Tangshan) LNG	2013	6.5	CNPC (51%); Beijing Enterprises Group Company (29%); Hebei Natural Gas (20%);	Onshore
82	Japan	Naoetsu LNG	2013	1.5	INPEX (100%);	Onshore
83	India	Kochi LNG	2013	5	Petronet LNG (100%);	Onshore
84	India	Dabhol LNG	2013	2	Gail (31.52%); NTPC (31.52%); Indian Financial Institutions (20.28%); MSEB Holding Co. (16.68%);	Onshore
85	Italy	Toscana - Toscana FSRU	2013	2.7	IREN Group (49.07%); First State Investments (48.24%); Golar LNG (2.69%)	Floating
86	China	Shandong (Qingdao) LNG	2014	3	Sinopec (99%); Qingdao Port(1%);	Onshore
87	Lithuania	Klaipeda LNG - Hoegh Independence	2014	3	Klaipedos Nafta (100%);	Floating
88	Brazil	Bahia LNG - Golar Winter	2014	3.8	Petrobras (100%);	Floating

Appendix 5: Table of Global LNG Receiving Terminals (continued)

Existing as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
89	Chile	GNL Mejillones 2 (onshore storage)	2014	1.5	ENGIE (63%); Ameris Capital AGF(37%);	Onshore
90	Kuwait	Mina Al Ahmadi - Golar Igloo	2014	5.8	Golar LNG (0%); Kuwait Petroleum Corporation (100%);	Floating
91	Japan	Hibiki LNG	2014	2.4	Saibu Gas (90%); Kyushu Electric (10%);	Onshore
92	Indonesia	Lampung LNG - PGN FSRU Lampung	2014	1.8	Terminal: PGN (100%), FSRU: Hoegh LNG (100%)	Floating
93	South Korea	Samcheok LNG	2014	11.6	KOGAS (100%);	Onshore
94	China	Hainan LNG	2014	4.32	CNOOC (65%); Hainan Developing Holding (35%);	Onshore
95	Japan	Shin-Sendai	2015	1.5	Tohoku Electric (100%);	Onshore
96	Pakistan	Port Qasim Karachi - Excelerate Exquisite	2015	3.8	Terminal: Elengy Terminal Pakistan Ltd. (100%), FSRU: Excelerate Energy (100%)	Floating
97	Jordan	Jordan LNG - Golar Eskimo	2015	3.8	Golar LNG (0%); Jordan MEMR (100%);	Floating
98	Indonesia	Arun LNG	2015	3	Pertamina (70%); Aceh Regional Government (30%);	Onshore
99	Japan	Hachinohe	2015	1.5	JX Nippon Oil & Energy (100%);	Onshore
100	UAE	Dubai Jebel Ali - Execelerate Explorer	2015	6	Terminal: DUSUP (100%), FSRU: Excelerate Energy (100%)	Floating
101	Japan	Kushiro LNG	2015	0.5	Nippon Oil (100%);	Onshore
102	Poland	Swinoujscie	2016	3.6	Gaz-System (100%);	Onshore
103	China	Guangxi LNG	2016	3	Sinopec (100%);	Onshore
104	Colombia	Cartagena (Colombia) - Hoegh Grace	2016	3	Hoegh LNG (0%); Promigas (51%); Baru LNG (49%);	Floating
105	Brazil	Pecem LNG - Excelerate Experience	2016	5.4	Petrobras (100%);	Floating
106	Japan	Hitachi LNG	2016	3.8	Tokyo Gas (100%);	Onshore
107	China	Qidong LNG	2017	1.2	Xinjiang Guanghui Petroleum (100%)	Onshore
108	South Korea	Boryeong LNG	2017	3	GS Caltex (50%); SK E&S (50%);	Onshore
109	France	Dunkirk LNG	2017	9.5	EDF (65%); Fluxys (25%); TOTAL (10%);	Onshore
110	Egypt	Sumed - BW Singapore	2017	5.7	Terminal: EGAS (100%), FSRU: BW (100%)	Floating
111	Pakistan	Port Qasim GasPort - BW Integrity	2017	5.7	Terminal: Pakistan LNG Terminals Limited (100%), FSRU: BW (100%)	Floating
112	Malaysia	Pengerang LNG	2017	3.5	PETRONAS (65%); Dialog Group (25%); Johor Government (10%);	Onshore
113	China	Jieyang LNG (Yuedong)	2017	2	CNOOC (100%);	Onshore
114	China	Tianjin (CNOOC)	2018	3.5	CNOOC (100%);	Onshore
115	Japan	Soma LNG	2018	1.5	JAPEX (100%);	Onshore

Appendix 5: Table of Global LNG Receiving Terminals (continued)

Existing as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
116	Bangladesh	Moheshkhali - Excelerate Excellence	2018	3.75	Terminal: PetroBangla (100%), FSRU: Excelerate Energy (100%)	Floating
117	China	Diefu LNG (Shenzhen)	2018	4	CNOOC (70%); Shenzhen Energy Group (30%);	Onshore
118	China	Tianjin FSRU - Hoegh Esperanza	2018	6	Terminal: CNOOC (100%), FSRU: Hoegh LNG (100%)	Floating
119	Turkey	Dortyol - MOL FSRU Challenger	2018	5.4	Botas (100%);	Floating
120	China	Tianjin (Sinopec)	2018	3	Sinopec (100%);	Onshore
121	Panama	Costa Norte LNG	2018	1.5	AES Panama (50.1%); Inversiones Bahia (49.9%);	Onshore
122	China	Zhoushan ENN LNG	2018	3	ENN (100%);	Onshore
123	Turkey	Etki LNG terminal - Turquoise	2019	5.7	Terminal: Etki Liman (100%), FSRU: Kolin Construction (100%)	Floating
124	China	Shenzhen Gas LNG	2019	0.8	Shenzhen Gas (100%);	Onshore
125	Bangladesh	Moheshkhali - Excelerate Excelerate	2019	3.8	Terminal: Summit Corp (75%); Mitsubishi (25%), FSRU: Excelerate Energy (100%)	Floating
126	India	Ennore LNG	2019	5	Indian Oil Corporation (95%); Tamil Nadu Industrial Development Corporation (5%);	Onshore
127	Brazil	Sergipe - Golar Nanook FSRU	2019	3.6	Elbrasil (50%); Golar Power (50%);	Floating
128	China	Fangchenggang LNG	2019	0.6	CNOOC (100%);	Onshore
129	Jamaica	Old Harbour - Golar Freeze	2019	3.6	New Fortress Energy (100%);	Floating
130	India	Mundra LNG	2020	5	GSCP (50%); Adani Group (50%);	Onshore

Appendix 6: Table of LNG Receiving Terminals Under Construction

Under Construction as of February 2020						
Reference Number	Market	Terminal Name or Phase Name	Start Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
1	India	Jafrabad FSRU	2020	5	Exmar (38%); Gujarat Government (26%); Swan Energy (26%); Tata Group (10%);	Floating
2	Russia	Kaliningrad FSRU	2020	2.7	Gazprom (100%);	Floating
3	Bahrain	Bahrain LNG	2020	6	Bahrain LNG WLL (0%); NOGA (30%); Teekay Corporation (30%); Gulf Investment Corporation (20%); Samsung (20%);	Floating
4	India	H-Gas LNG Gateway (Jaigarh) - Hoegh Cape Ann	2020	4	H-Energy Gateway Private limited (100%);	Floating
5	Brazil	Acu Port LNG	2020	5.6	Prumo Logistica (46.9%); Siemens (33%); BP (20.1%)	Floating
6	Ghana	Ghana - FRU	2020	2	GNPC (50%); Helios (50%)	Floating
7	China	Chaozhou Huafeng LNG	2020	1	Sinoenergy (55%); Chaozhou Huafeng Group (45%);	Onshore
8	United States	San Juan - New Fortress LNG	2020	0.5	New Fortress Energy (100%)	Floating
9	Mexico	New Fortress LNG	2020	3	New Fortress Energy (100%);	Onshore
10	Turkey	Gulf of Saros FSRU	2020	5.4	Botas (100%);	Floating
11	Philippines	Pagbilao LNG	2020	3	Energy World Corporation (100%);	Onshore
12	Croatia	Krk - Golar FSRU	2021	1.9	Terminal: HEP (85%); Plinacro (15%), FSRU: Golar (100%)	Floating
13	Kuwait	Kuwait Permanent LNG Import Facility	2021	22	Kuwait Petroleum Corporation (100%);	Onshore
14	China	Wenzhou LNG	2021	3	Sinopec (41%); Zhejiang Group (51%); Local firms (8%);	Onshore
15	India	Dhamra LNG	2021	5	Adani Group (50%); Total (50%)	Onshore
16	El Salvador	El Salvador FSRU	2021	0.5	Energía del Pacífico (100%);	Floating
17	Indonesia	Cilamaya - Jawa 1 FSRU	2021	2.4	Pertamina (26%); Humpuss (25%); Marubeni (20%); MOL (19%); Sojitz (10%)	Floating
18	China	Binhai LNG	2021	3	CNOOC (100%);	Onshore
19	Cyprus	Cyprus FSRU	2021	0.6	DEFA (100%);	Floating
20	Thailand	Nong Fab LNG	2022	7.5	PTT LNG (100%);	Onshore
21	Japan	Niihama LNG	2022	0.5	Tokyo Gas (50.1%); Shikoku Electric Power (30.1%); Other Japanese Partneers (19.8%);	Onshore
22	India	Chhara LNG	2022	5	HPCL (0%); Shapoorji (100%);	Onshore
23	Vietnam	Thi Vai LNG	2022	1	PetroVietnam Gas (100%);	Onshore
24	China	Zhangzhou LNG	2022	3	CNOOC (60%); Fujian Investment and Development Co (40%);	Onshore
25	China	Yueyang LNG	2022	2	Guanghui Energy (50%); China Huadian (50%);	Onshore
26	China	Yangjiang LNG	2023	2	Guangdong Yudean Power (100%);	Onshore

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