Petroleum Economist

# US LNG FACTBOOK 2024 edition


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# US LNG FACTBOOK 2024 edition

Petroleum Economist

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**Sources**

Gas Processing & LNG
Gibson Shipbrokers
GIIGNL
Global Energy Infrastructure (GEI)
GTT
Gulf Energy Information
International Energy Agency (IEA)
International Gas Union (IGU)
*Petroleum Economist*
US Energy Information Administration (EIA)
Wood Mackenzie Lens Gas and LNG

**Map legend**

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- Liquefaction project (operating)
- Liquefaction project (under construction)
- Liquefaction project (planned)
- Regasification project (operating)
- Gas pipeline (operating)
- Gas pipeline (under construction or planned)
- Gas processing plant
- Gasfield
- Gas and oil field

United States map only

- Shale gas plays
- Shale gas basins

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# Introduction

Paul Hickin
EDITOR-IN-CHIEF, PETROLEUM ECONOMIST



## The emergence of the US as a global LNG superpower

Less than a decade ago, the US was a net natural gas importer and sold hardly any gas overseas. But with the huge increase in US gas production—namely the meteoric rise of shale gas—along with the accompanying growth in LNG export terminal capacity, that narrative has been turned upside down. The US is now the world's number-one supplier of the super-chilled fuel, has transformed the global LNG landscape and has the potential to redraw the global gas map indefinitely.

## The great shale gas rush

The zero-to-hero story of US LNG exports begins with the huge technological breakthroughs in hydraulic fracturing and horizontal drilling in the mid-2000s, which were techniques that enabled access to, and exploitation of, vast reserves of cheap natural gas from shale rock. The 'unconventional production boom' that started during the mid-2000s is often associated with the growth of US tight oil, but the impact of US unconventional gas extraction was just as revolutionary.

Between the mid-2000s and mid-2010s, US drillers mastered the art of fracking, creating great efficiencies through improvements in technology and building their experience, opening-up abundant new resources of natural gas reserves that could be produced at ever lower prices.

The new dynamic in the marketplace caught the industry by surprise, and the radical adjustment meant developing and reconfiguring infrastructure to channel the output and seeking out new locations and opportunities where new forms of demand could be tapped, including LNG exports. Until this point, the US had only had a small, isolated LNG export facility in Alaska, which started in 1969. The rise in US gas production has most recently been underpinned by production from the Marcellus and Utica shale formations in the Appalachian Basin, which has been growing since 2008 and now accounts for around a third of all US dry natural gas output.

## The rise of US LNG

US companies, led by Cheniere Energy, began to convert existing LNG import terminals to produce and export LNG. In February 2016, the first LNG cargo left Cheniere's Sabine Pass liquefaction facility in Louisiana for Brazil, marking the start of the US metamorphosis. US LNG baseload export capacity increased from about 9mt/yr in 2016 to more than 90mt/yr at the end of 2023, according to Global Energy Infrastructure (GEI). During that time, energy companies built seven large facilities in Texas, Louisiana, Maryland and Georgia. In 2023, US LNG exports exceeded 84mt/yr to 34 countries and accounted for more than half of US natural gas exports.

Another five projects along the Gulf Coast are already permitted and under construction as of June 2024. These will nearly double US capacity, increasing it by 79mt/yr, and several additional projects are preparing to take FID. Three more facilities are being built or planned in Mexico that will receive US gas via pipeline before it is shipped overseas. The stratospheric rise in US LNG exports meant that in 2023 the US overtook heavyweights Qatar and Australia, which were both exporting in excess of 75mt/yr.

## A global marketplace

The LNG marketplace was fortunate that the US emerged as a significant and growing exporter when it did, as the 2000s have been a period of strong LNG demand growth, particularly in Asia. In 2011, Japan's reactor disaster at Fukushima led to the country turning away from nuclear energy and increasing its reliance on gas and coal. Other Asian countries, such as China and South Korea, also looked to more LNG, as they sought to improve their urban air-quality.

But the surprising shift in demand came from Russia's invasion of Ukraine in 2022 and Europe's move to turn its back on Russian pipeline gas—a traditional, dominant and long-term source of European energy. A combination of new LNG and demand reduction has helped Europe get through its current energy crisis, to date. And US LNG has played a key role. The top three importers of US LNG in 2023, according to GIIGNL, were all European buyers: France, the UK and Spain. And with the drive to cleaner energy forms, LNG has been in a strong position to take advantage of coal-to-gas switching across both mature and emerging markets on the path to hitting net zero climate targets.

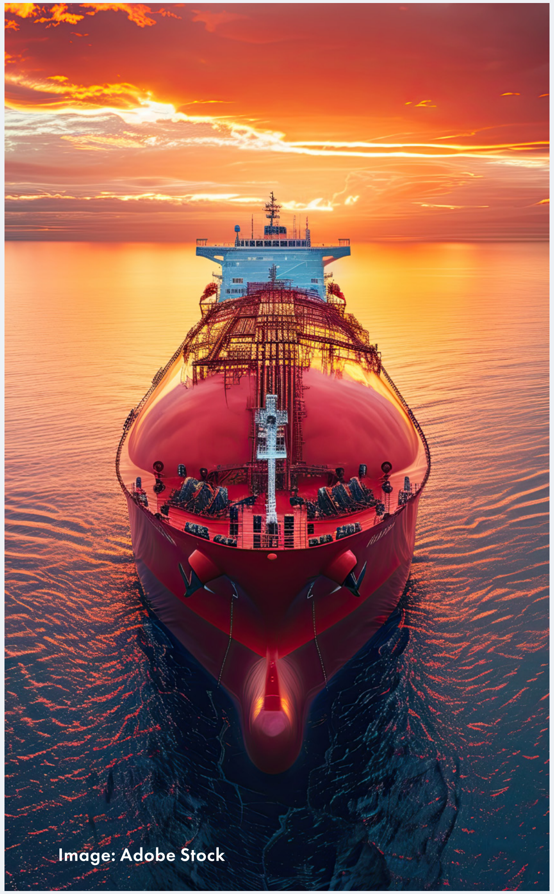


Image: Adobe Stock

## The price of success

Because of the unpredicted surge in productivity, average monthly Henry Hub prices in 2016 plunged to 17-year lows and gas production companies had to face a completely different challenge than when the shale boom started. Operators looked to both increase efficiencies and maintain capital discipline.

Shale gas did however present other advantages. It does not require the long lead times and upfront capital found in conventional drilling, which means it has a lower risk of becoming a stranded asset. This meant US LNG had a distinct advantage over other key global suppliers across the Middle East and Asia and created greater market flexibility.

The improved supply of global LNG resulting from US projects lowered prices and whetted market appetites amid burgeoning energy consumption, growing industrialisation and improved economic prosperity. US LNG was not just competing with other LNG and pipeline gas suppliers but also providers of other forms of energy—from cheaper coal to cleaner nuclear and renewables—a feature that would become more prominent as the supply flooded the market.

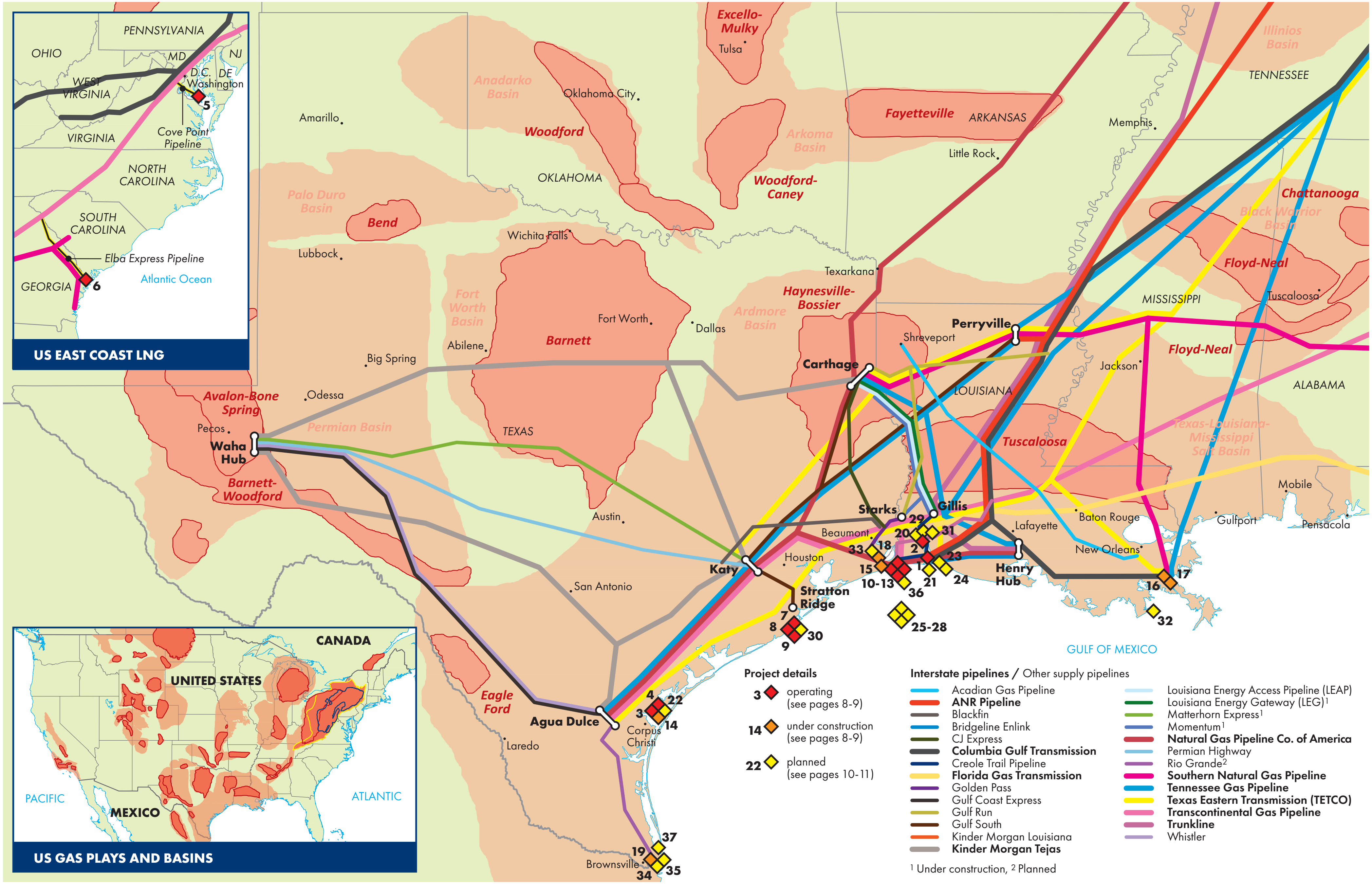
Now a new question is being asked: will significant pipe and LNG exports cause prices to rise for domestic consumers? The abundance of the resource and the efficiencies achieved mean this has not been the case so far. And certainly there is plenty of anecdotal evidence and data to suggest that is not a likely scenario in the decades to come, but shifting policies around the energy transition do present an unknown.

## A new commodity

The LNG trade was traditionally a market formed of hard-wired, bilateral supply chains, which were priced against crude oil. The emergence of the US, with its destination-flexible business model, has changed that. As a result LNG, has started to become a global commodity in its own right. Indeed, it was US LNG that took the globalisation of gas to the next level. It has provided flexible supplies and improved spot liquidity and accelerated the path of LNG from a narrow bilateral traded commodity to a more interconnected efficient global market where cargoes can go where and when they are most needed at the price someone is willing to pay. This in turn has resulted in a growth in global export infrastructure that continues to open up new—and bolster existing—trade and shipping routes.

Overall, US LNG has been instrumental in rewriting the global gas rulebook, accelerated the commodification of LNG and changed the contours of the energy atlas in barely a decade. These monumental changes may be just what the world needs if it is to solve the energy questions around security, sustainability and affordability in the years ahead. PE


Image: Copyright © Cheniere Energy 2024


US EAST COAST LNG
PENNSYLVANIA
OHIO
MD
NJ
WEST VIRGINIA
D.C.
DE
Washington
5
Cove Point Pipeline
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
Elba Express Pipeline
GEORGIA
6
Atlantic Ocean
US GAS PLAYS AND BASINS
CANADA
UNITED STATES
PACIFIC
ATLANTIC
MEXICO
Excello-Mulky
Tulsa
Anadarko Basin
Oklahoma City
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Amarillo
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Arkoma Basin
Fayetteville
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Little Rock
Memphis
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ANR Pipeline
Blackfin
Bridgeline Enlink
CJ Express
Columbia Gulf Transmission
Creole Trail Pipeline
Florida Gas Transmission
Golden Pass
Gulf Coast Express
Gulf Run
Gulf South
Kinder Morgan Louisiana
Kinder Morgan Tejas
Louisiana Energy Access Pipeline (LEAP)
Louisiana Energy Gateway (LEG)1
Matterhorn Express1
Momentum1
Natural Gas Pipeline Co. of America
Permian Highway
Rio Grande2
Southern Natural Gas Pipeline
Tennessee Gas Pipeline
Texas Eastern Transmission (TETCO)
Transcontinental Gas Pipeline
Trunkline
Whistler
1 Under construction, 2 Planned

## PROJECTS OPERATING

| Map Ref | Project Name | Operator | Shareholders | Capacity (mt/yr)[3] | Number of Trains | Storage Capacity ('000cm) | FID Year | Start Year | Processing Method | Capex[2] (USD million) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Calcasieu Pass | Venture Global | Venture Global (100%) | 10.0 | 18 | 400 | 2019 | 2022 | BHGE (PCMR or SCMR) | 7,300 |
| 2 | Cameron LNG | Sempra Infrastructure | Sempra Infrastructure *[Sempra Energy (70%), KKR (20%), Abu Dhabi Investment Authority (10%)]* (50.2%), Mitsui (16.6%), TotalEnergies (16.6%), Mitsubishi (11.6%), NYK Line (5.0%) | 13.5 | 3 | 160[1] | 2014 | 2019 | AP C3MR | 7,000 |
| 3 | Corpus Christi Liquefaction (CCL) T1/2 | Cheniere Energy | Cheniere Energy, Inc. (100%) | 10.0 | 2 | 480 | 2015 | 2018 | CPOCP | 8,800 |
| 4 | Corpus Christi Liquefaction (CCL) T3 | Cheniere Energy | Cheniere Energy, Inc. (100%) | 5.0 | 1 | - | 2018 | 2020 | CPOCP | 2,800 |
| 5 | Cove Point | Berkshire Hathaway | Berkshire Hathaway (75%), Brookfield Super-Core Infrastructure Partners (25%) | 5.3 | 1 | 695[1] | 2014 | 2018 | AP C3MR | 3,600 |
| 6 | Elba Liquefaction Project | Kinder Morgan | Kinder Morgan (51%), Blackstone Credit (49%), | 2.5 | 10 | 550[1] | 2016 | 2020 | Shell MMLS | 2,000 |
| 7 | Freeport LNG T1 | Freeport LNG | Freeport LNG Development *[Freeport LNG Investments (63.5%), JERA (21.9%), Osaka Gas (10.8%), Japex (3.9%)]* (50%), JERA (25%), Osaka Gas (25%) | 5.1 | 1 | 320[1] | 2014 | 2019 | AP C3MR | 3,700 |
| 8 | Freeport LNG T2 | Freeport LNG | Freeport LNG Development *[Freeport LNG Investments (63.5%), JERA (21.9%), Osaka Gas (10.8%), Japex (3.9%)]* (42.4%), IFM (57.6%) | 5.1 | 1 | - | 2014 | 2020 | AP C3MR | 3,400 |
| 9 | Freeport LNG T3 | Freeport LNG | Freeport LNG Development *[Freeport LNG Investments (63.5%), JERA (21.9%), Osaka Gas (10.8%), Japex (3.9%)]* (100%) | 5.1 | 1 | 165 | 2015 | 2020 | AP C3MR | 3,900 |
| 10 | Sabine Pass Liquefaction T1/2 | Cheniere Energy | Cheniere Energy Partners, L.P. (100%) | 10.0 | 2 | 800[1] | 2012 | 2016 | CPOCP | 4,800 |
| 11 | Sabine Pass Liquefaction T3/4 | Cheniere Energy | Cheniere Energy Partners, L.P. (100%) | 10.0 | 2 | - | 2013 | 2017 | CPOCP | 4,700 |
| 12 | Sabine Pass Liquefaction T5 | Cheniere Energy | Cheniere Energy Partners, L.P. (100%) | 5.0 | 1 | - | 2015 | 2018 | CPOCP | 3,500 |
| 13 | Sabine Pass Liquefaction T6 | Cheniere Energy | Cheniere Energy Partners, L.P. (100%) | 5.0 | 1 | - | 2019 | 2021 | CPOCP | 2,900 |

## FID PROJECTS UNDER CONSTRUCTION

| Map Ref | Project Name | Operator | Shareholders | Capacity (mt/yr)[3] | Number of Trains | Storage Capacity ('000cm) | FID Year | Start Year | Processing Method | EPC Contractor | Capex[2] (USD million) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Corpus Christi Liquefaction (CCL) Stage III | Cheniere Energy | Cheniere Energy, Inc. (100%) | 11.5 | 7 | - | 2022 | 2025 | Chart Industries IPSMR | Bechtel | 6,400 |
| 15 | Golden Pass LNG (Export) | QatarEnergy / ExxonMobil | QatarEnergy (70%), ExxonMobil (30%) | 18.0 | 3 | 775[1] | 2019 | 2025/26 | AP C3MR | McDermott, Chiyoda, Zachry | 10,900 |
| 16 | Plaquemines LNG Phase I | Venture Global LNG | Venture Global LNG (100%) | 13.3 | 24 | 400 | 2022 | 2024 | BHGE (PCMR or SCMR) | KBR | 11,200 |
| 17 | Plaquemines LNG Phase II | Venture Global LNG | Venture Global LNG (100%) | 6.7 | 12 | 400 | 2023 | 2026 | BHGE (PCMR or SCMR) | KBR | 6,600 |
| 18 | Port Arthur LNG Phase I | Sempra Infrastructure | Sempra Infrastructure *[Sempra Energy (70%), KKR (20%), Abu Dhabi Investment Authority (10%)]*, (28%), KKR (42%), ConocoPhillips (30%) | 13.0 | 2 | 320 | 2023 | 2027/28 | AP C3MR | Bechtel | 13,000 |
| 19 | Rio Grande LNG T1-3 | NextDecade | NextDecade (20.79%), Adnoc (11.7%), GIP (34.42%), GIC (9.85%), TotalEnergies (16.67%), Mubadala (6.57%) | 17.6 | 3 | 720 | 2023 | 2027 | AP C3MR | Bechtel | 15,600 |

[1]This storage capacity was part of a pre-existing regasification terminal and is now used to support liquefaction operations.

[2]Capex estimate in year of FID (USD million), this includes all associated project costs including the EPC and owner expenditure. [3]Capacity is nominal plant capacity in million tonnes per year, rounded to one decimal place.

## MAJOR PRE-FID PROJECTS

| Map Ref | Project Name | Operator | Shareholders | Capacity (mt/yr)[2] | Number of Trains | Storage Capacity ('000cm) | Processing Method |
|---|---|---|---|---|---|---|---|
| 20 | Cameron LNG Phase II | Sempra Infrastructure | Sempra Infrastructure *[Sempra Energy (70%), KKR (20%), Abu Dhabi Investment Authority (10%)]* (50.2%), Mitsui (16.6%), TotalEnergies (16.6%), Mitsubishi (11.6%), NYK Line (5.0%) | 6.0 | 1 | 160 | AP C3MR |
| 21 | Commonwealth LNG | Kimmeridge | Kimmeridge (90%), Commonwealth Projects (10%) | 9.3 | 6 | 300 | BHGE (PCMR or SCMR) |
| 22 | Corpus Christi Midscale Trains 8 & 9 | Cheniere Energy | Cheniere Energy, Inc. (100%) | 3.3 | 2 | - | Chart Industries IPSMR |
| 23 | CP2 LNG Phase I | Venture Global LNG | Venture Global LNG (100%) | 10.0 | 9 | 400 | BHGE (PCMR or SCMR) |
| 24 | CP2 LNG Phase II | Venture Global LNG | Venture Global LNG (100%) | 10.0 | 9 | 400 | BHGE (PCMR or SCMR) |
| 25 | Delfin FLNG I | Delfin Midstream | Delfin Midstream (100%) | 3.4 | 1 | | PRICO |
| 26 | Delfin FLNG II | Delfin Midstream | Delfin Midstream (100%) | 3.4 | 1 | | PRICO |
| 27 | Delfin FLNG III | Delfin Midstream | Delfin Midstream (100%) | 3.4 | 1 | | PRICO |
| 28 | Delfin FLNG IV | Delfin Midstream | Delfin Midstream (100%) | 3.4 | 1 | | PRICO |
| 29 | Driftwood LNG Phase I [3] | Woodside Energy | Woodside Energy (100%) | 11.0 | 8 | 470 | Chart Industries IPSMR |
| 30 | Freeport LNG Train 4 | Freeport LNG | Freeport LNG Development *[Freeport LNG Investments (63.5%), JERA (21.9%), Osaka Gas (10.8%), Japex (3.9%)]* (100%) | 5.1 | 1 | - | AP C3MR |
| 31 | Lake Charles LNG | Energy Transfer | Energy Transfer (100%) | 16.5 | 3 | 425[1] | AP C3MR |
| 32 | New Fortress Energy Louisiana FLNG | New Fortress Energy | New Fortress Energy (100%) | 2.8 | 2 | | |
| 33 | Port Arthur LNG Phase II | Sempra Infrastructure | Sempra Infrastructure *[Sempra Energy (70%), KKR (20%), Abu Dhabi Investment Authority (10%)]* | 13.0 | 2 | 480 | AP C3MR |
| 34 | Rio Grande LNG T4 | NextDecade | To be decided. Potential equity: *NextDecade (60%), GIP (22.1%), TotalEnergies (10%), GIC (4.7%) Mubadala (3.2%)* | 5.9 | 1 | - | AP C3MR |
| 35 | Rio Grande LNG T5 | NextDecade | To be decided. Potential equity: *NextDecade (60%), GIP (22.1%), TotalEnergies (10%), GIC (4.7%) Mubadala (3.2%)* | 5.9 | 1 | - | AP C3MR |
| 36 | Sabine Pass Liquefaction T7-8 | Cheniere Energy | Cheniere Energy Partners, L.P. (100%) | 14.0 | 2 | 440 | CPOCP |
| 37 | Texas LNG | Glenfarne | Glenfarne (100%) | 4.0 | 2 | 420 | BHGE (PCMR or SCMR) |

[1]This storage capacity was part of a pre-existing regasification terminal and is now used to support liquefaction operations.
[2]Capacity is nominal plant capacity in million tonnes per year, rounded to one decimal place.
[3]Woodside Energy is to acquire Tellurian and Driftwood LNG as announced 22 July 2024.

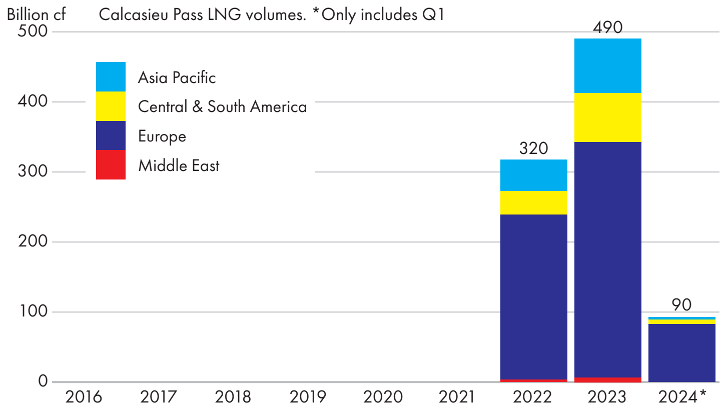
Additional planned and ongoing debottlenecking/small capacity expansions to US LNG projects are shown below.

| Project Name | Additional Capacity Enabled | Comment |
|---|---|---|
| Sabine Pass Liquefaction | 6.0mt/yr | Associated with the Sabine Pass Liquefaction T7-8 expansion |
| Corpus Christi | 1.7mt/yr | Associated with the Corpus Christi Midscale Trains 8 & 9 expansion |
| Freeport LNG | 1.2mt/yr | Announced in March 2024 |
| Cameron LNG | 1.0mt/yr | Associated with the Cameron LNG Phase II expansion |
| Elba Liquefaction Project | 0.4mt/yr | Announced in October 2023 |

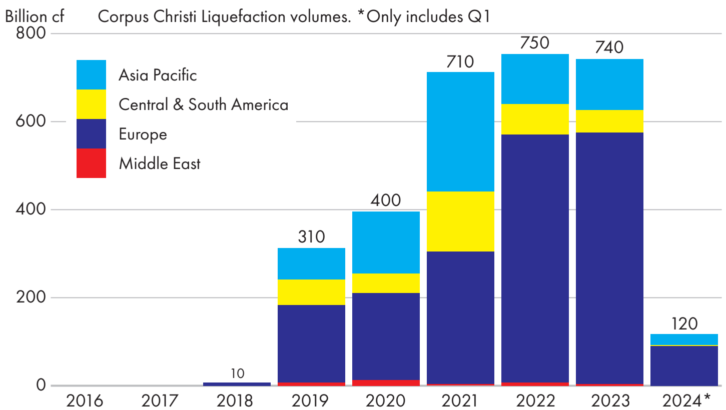
17 additional proposed projects representing more than 100mt/yr of capacity are also in development. They have been excluded from the above list as being less likely to reach final investment decision (FID).

Source: U.S. Department of Energy

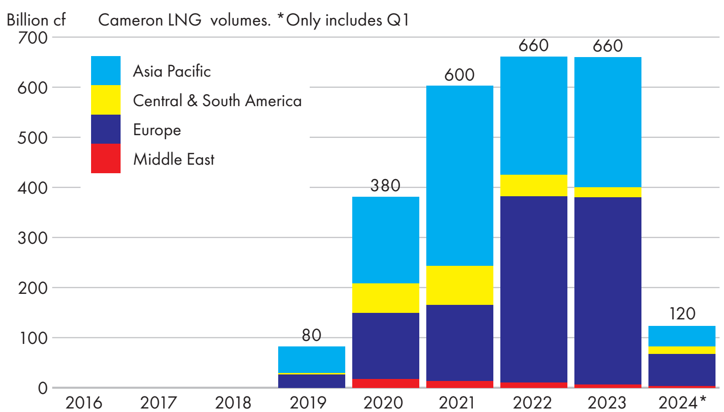
### CALCASIEU PASS, LA



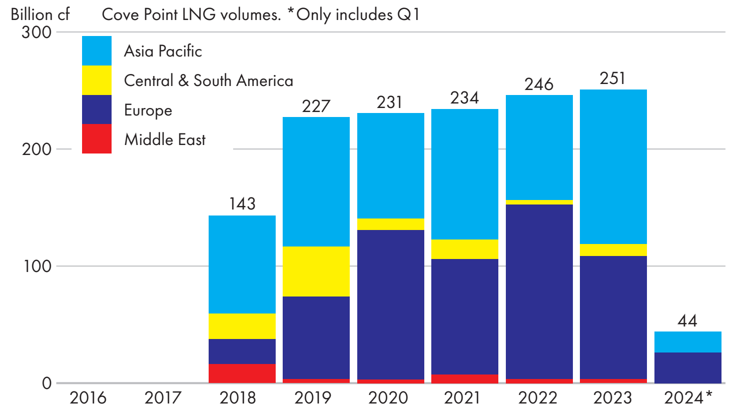

### CORPUS CHRISTI, TX



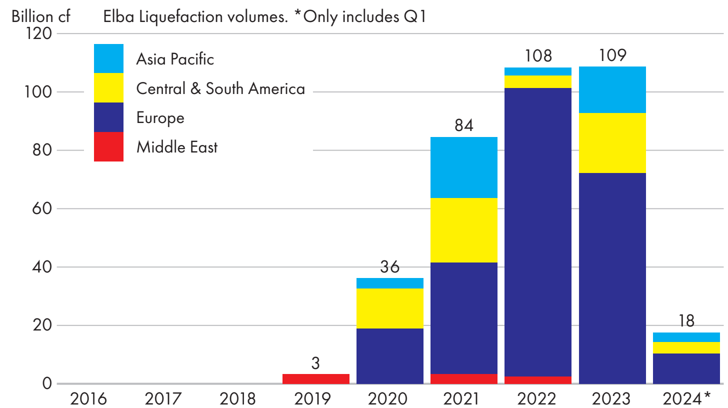

### CAMERON, LA



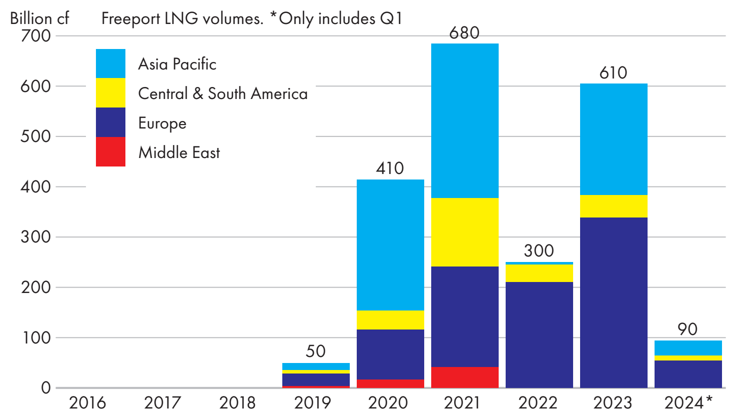

### COVE POINT, MD




### ELBA ISLAND, GA

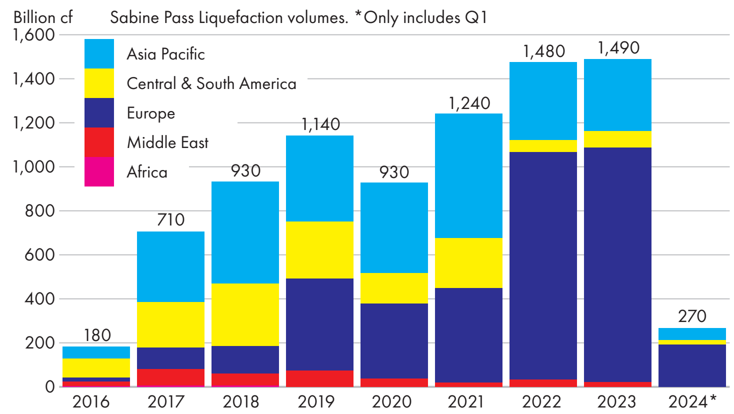



### FREEPORT, TX



Source: U.S. Department of Energy

**SABINE PASS, LA**




**ALL UNITED STATES**

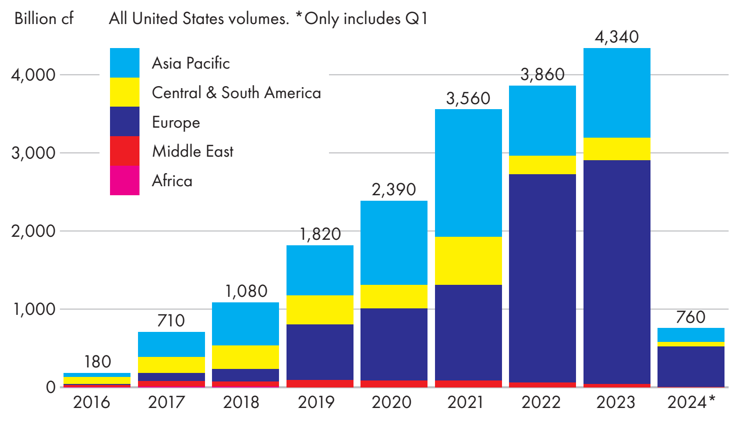
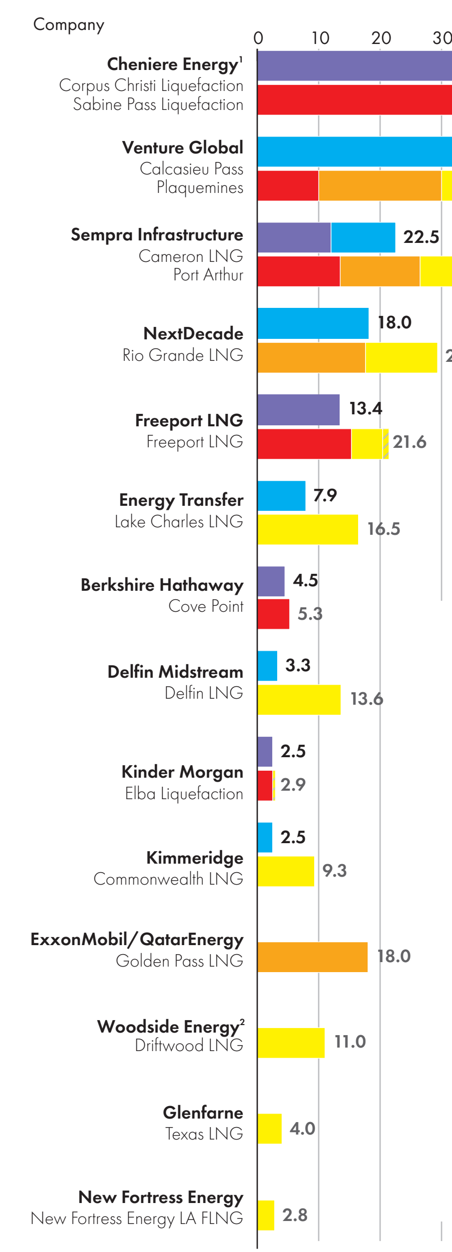


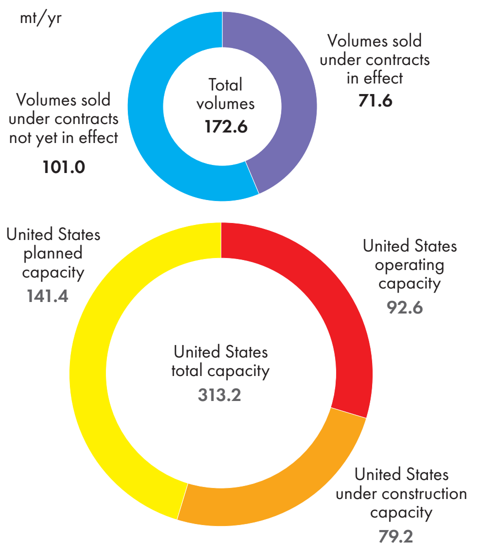

Image: Adobe Stock



**UNITED STATES PRIMARY SPA AND TOLLING VOLUMES AND PROJECT CAPACITY BY SPONSOR**




**UNITED STATES SPA VOLUMES AND PROJECT CAPACITY**




Volumes rounded to one decimal place. [1]Primary SPA and Tolling agreements, which includes IPM agreements [2]Woodside Energy is to acquire Tellurian and Driftwood LNG as announced 22 July 2024.

#### TABLE OF PRIMARY SPA AND TOLLING AGREEMENTS

| Facility | Buyer | mt/yr | Type[4] | Signed | Start | Duration |
|---|---|---|---|---|---|---|
| Calcasieu Pass[1] | Shell | 2 | FOB | Jan-16 | Start CP LNG | 20 |
| Calcasieu Pass[1] | Edison | 1 | FOB | Sep-17 | Start CP LNG | 20 |
| Calcasieu Pass[1] | GALP | 1 | FOB | Apr-18 | Start CP LNG | 20 |
| Calcasieu Pass[1] | bp | 2 | FOB | May-18 | Start CP LNG | 20 |
| Calcasieu Pass[1] | Repsol | 1 | FOB | Aug-18 | Start CP LNG | 20 |
| Calcasieu Pass[1] | Orlen | 1.5 | FOB | Sep-18 | Start CP LNG | 20 |
| **Cameron LNG** | **Mitsubishi** | **4** | **Tolling** | **May-13** | **2019** | **20** |
| **Cameron LNG** | **Mitsui** | **4** | **Tolling** | **May-13** | **2019** | **20** |
| **Cameron LNG** | **TotalEnergies** | **4** | **Tolling** | **May-13** | **2019** | **20** |
| **Cheniere portfolio[3]** | **Trafigura** | **1** | **FOB** | **Jan-18** | **2019** | **15** |
| **Cheniere portfolio[3]** | **Petrochina** | **0.3** | **FOB/DES** | **Feb-18** | **2018** | **25** |
| **Cheniere portfolio[3]** | **Petrochina** | **0.9** | **FOB/DES** | **Feb-18** | **2023** | **20** |
| **Cheniere portfolio[3]** | **CPC** | **2** | **DES** | **Aug-18** | **2021** | **25** |
| **Cheniere portfolio[3]** | **Vitol** | **0.7** | **FOB** | **Sep-18** | **2018** | **15** |
| **Cheniere portfolio[3]** | **New Fortress Energy** | **1** | **-** | **Sep-18** | **2021** | **6** |
| **Cheniere portfolio[3]** | **Orlen** | **1.5** | **DES** | **Nov-18** | **2019** | **24** |
| **Cheniere portfolio[3]** | **ENN** | **0.9** | **FOB** | **Oct-21** | **2022** | **13** |
| **Cheniere portfolio[3]** | **Glencore** | **0.8** | **FOB** | **Oct-21** | **2023** | **13** |
| **Cheniere portfolio[3]** | **Sinochem** | **1.8** | **FOB** | **Nov-21** | **2022** | **17.5** |
| **Cheniere portfolio[3]** | **Foran** | **0.3** | **DES** | **Nov-21** | **2023** | **20** |
| Cheniere portfolio[3] | POSCO | 0.4 | FOB | May-22 | 2026 | 20 |
| Cheniere portfolio[3] | Chevron | 1 | FOB | Jun-22 | 2027 | 15 |
| Cheniere portfolio[3] | Equinor | 1.8 | FOB | Jun-22 | 2026 | 15 |
| Cheniere portfolio[3] | Petrochina | 1.8 | FOB | Jul-22 | 2026 | 25 |
| Cheniere portfolio[3] | KOSPO | 0.4 | DES | May-23 | 2027 | 20 |
| Cheniere portfolio[3] | Equinor | 1.8 | FOB | Jun-23 | 2027 | 17 |
| Cheniere portfolio[3] | ENN | 1.8 | FOB | Jun-23 | 2026 | 20 |
| Cheniere portfolio[3] | BASF | 0.8 | FOB | Aug-23 | 2026 | 18 |
| Cheniere portfolio[3] | OMV | 0.9 | DES | Nov-23 | 2029 | Unknown |
| Cheniere portfolio[2,3] | Foran | 0.9 | FOB | Nov-23 | Start Sabine Pass Liquefaction T8 | 20 |
| Commonwealth LNG[2] | Woodside | 2 | FOB | Sep-22 | Start Commonwealth LNG | 20 |
| Commonwealth LNG[2] | Woodside | 0.5 | FOB | Sep-22 | Start Commonwealth LNG | 20 |
| **Corpus Christi Liquefaction** | **Pertamina** | **1.5** | **FOB** | **Dec-13** | **2019** | **20** |
| **Corpus Christi Liquefaction** | **Endesa** | **2.3** | **FOB** | **Apr-14** | **2019** | **20** |
| **Corpus Christi Liquefaction** | **Iberdrola** | **0.8** | **FOB** | **May-14** | **2019** | **20** |
| **Corpus Christi Liquefaction** | **Naturgy Energy Gr.** | **1.5** | **FOB** | **Jun-14** | **2020** | **20** |
| **Corpus Christi Liquefaction** | **Woodside** | **0.9** | **FOB** | **Jun-14** | **2020** | **20** |
| **Corpus Christi Liquefaction** | **EDF** | **0.8** | **FOB** | **Jul-14** | **2020** | **20** |
| **Corpus Christi Liquefaction** | **EDP** | **0.8** | **FOB** | **Dec-14** | **2020** | **20** |
| **Corpus Christi Liquefaction** | **ENGIE** | **0.9** | **FOB** | **Jun-21** | **2021** | **20** |
| Corpus Christi Liquefaction | PTT | 1 | FOB/DES | Jul-22 | 2026 | 20 |
| Cove Point | GAIL | 2.3 | Tolling | May-13 | 2018 | 20 |
| Cove Point | Sumitomo | 0.8 | Tolling | May-13 | 2018 | 20 |
| Cove Point | Tokyo Gas | 1.4 | Tolling | May-13 | 2018 | 20 |
| CP2[2] | ExxonMobil | 1 | FOB | Mar-22 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | New Fortress Energy | 1 | FOB | Mar-22 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | Chevron | 1 | FOB | Jun-22 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | ENBW | 1 | FOB | Jun-22 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | INPEX | 1 | FOB | Dec-22 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | China Gas Hongda | 1 | FOB | Feb-23 | StartCP2 LNG Ph.1 | 20 |
| CP2[2] | JERA | 1 | FOB | Apr-23 | Start CP2 LNG Ph.1 | 20 |
| CP2[2] | SEFE | 2.3 | FOB | Jun-23 | Start CP2 LNG Ph.1 | 20 |
| Delfin FLNG[2] | Vitol | 0.5 | FOB | Jul-22 | Start FLNG 1 | 15 |
| Delfin FLNG[2] | Hartree | 0.6 | FOB | Apr-23 | Start FLNG 1 | 20 |

[1]Calcasieu Pass is undergoing a lengthy start-up phase and has not yet declared the start of commercial operations. [2]Start date of agreement not shown as this relates to the start date of the project named.

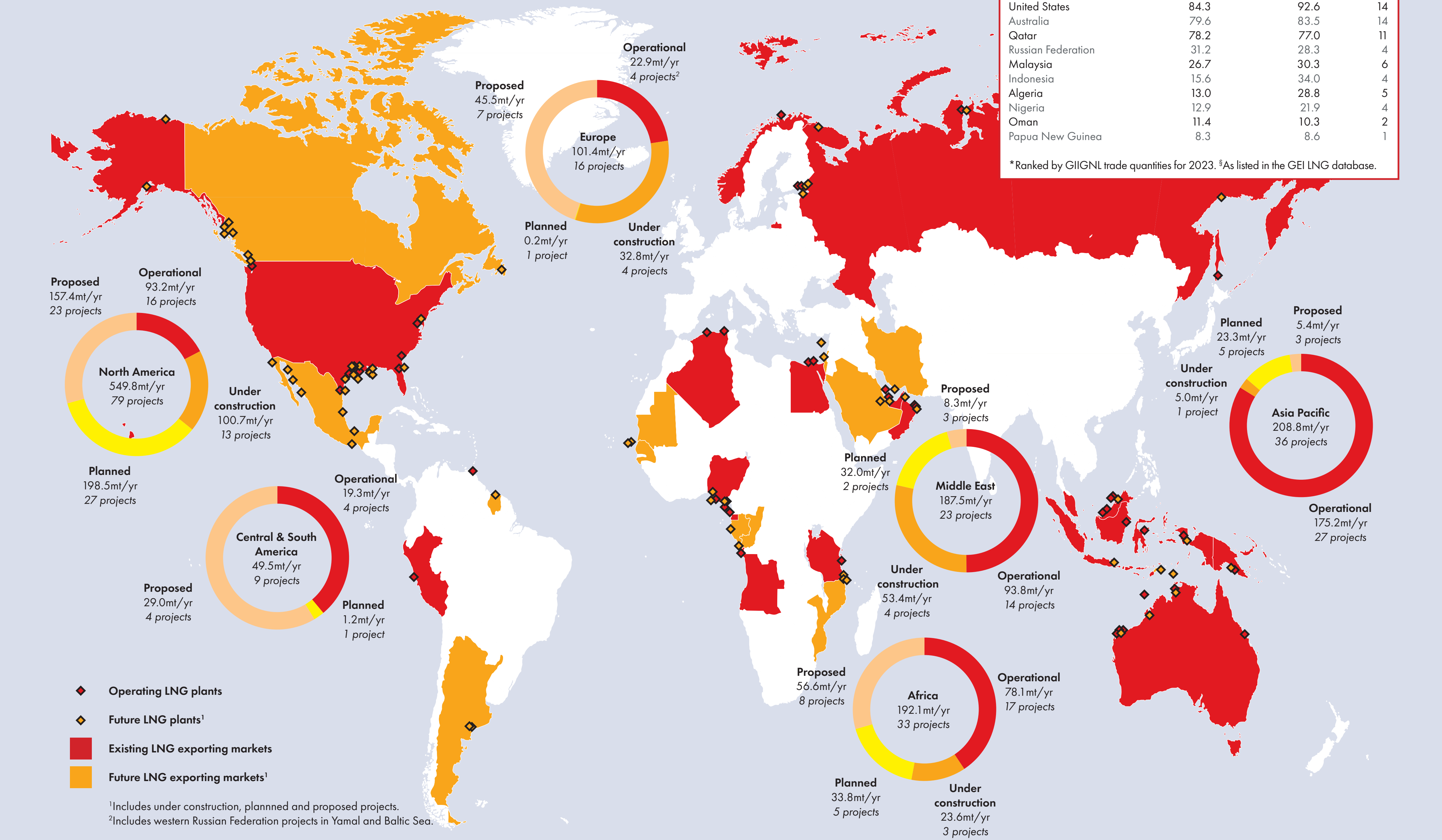
| Facility | Buyer | mt/yr | Type[4] | Signed | Start | Duration |
|---|---|---|---|---|---|---|
| Delfin FLNG[2] | Centrica | 1 | FOB | Jul-23 | Start FLNG 1 | 15 |
| Delfin FLNG[2] | Gunvor | 0.6 | FOB | Nov-23 | Start FLNG 3 | 15 |
| Delfin FLNG[2] | Chesepeake Energy | 0.6 | FOB | Feb-24 | Start FLNG 3 | 15 |
| **Elba Liquefaction Facility** | **Shell** | **2.5** | **Tolling** | **Jan-13** | **2020** | **20** |
| **Freeport LNG** | **JERA** | **2.3** | **Tolling** | **Jul-12** | **2019** | **20** |
| **Freeport LNG** | **Osaka Gas** | **2.3** | **Tolling** | **Jul-12** | **2019** | **20** |
| **Freeport LNG** | **bp** | **4.4** | **Tolling** | **Feb-13** | **2020** | **20** |
| **Freeport LNG** | **SK E&S** | **2.2** | **Tolling** | **Sep-13** | **2020** | **20** |
| **Freeport LNG** | **TotalEnergies** | **2.2** | **Tolling** | **Sep-13** | **2020** | **20** |
| Lake Charles LNG[2] | ENN | 0.9 | FOB | Mar-22 | Start Lake Charles LNG | 20 |
| Lake Charles LNG[2] | ENN | 1.8 | FOB | Mar-22 | Start Lake Charles LNG | 20 |
| Lake Charles LNG[2] | Gunvor | 2 | FOB | Apr-22 | Start Lake Charles LNG | 20 |
| Lake Charles LNG[2] | SK E&S | 0.4 | FOB | Apr-22 | Start Lake Charles LNG | 18 |
| Lake Charles LNG[2] | Shell | 2.1 | FOB | Aug-22 | Start Lake Charles LNG | 20 |
| Lake Charles LNG[2] | China Gas Hongda | 0.7 | FOB | Jun-22 | Start Lake Charles LNG | 25 |
| Plaquemines LNG[2] | Orlen | 4 | FOB | Sep-18 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | EDF | 1 | FOB | Feb-20 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | Sinopec | 2.8 | FOB | Sep-21 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | Sinopec | 1.2 | DPU | Sep-21 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | CNOOC | 2 | FOB | Dec-21 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | Shell | 2 | FOB | Feb-22 | Start Plaquemines LNG Ph.1 | 20 |
| Plaquemines LNG[2] | New Fortress Energy | 1 | FOB | Mar-22 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | ExxonMobil | 1 | FOB | Apr-22 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | Petronas | 1 | FOB | Apr-22 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | Chevron | 1 | FOB | Jun-22 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | EnBW | 1 | FOB | Jun-22 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | China Gas Hongda | 1 | FOB | Feb-23 | Start Plaquemines LNG Ph.2 | 20 |
| Plaquemines LNG[2] | Excelerate | 0.7 | FOB | Feb-23 | Start Plaquemines LNG Ph.2 | 20 |
| Port Arthur LNG[2] | ConocoPhillips | 5 | FOB | Nov-22 | Start Port Arthur Ph.1 | 20 |
| Port Arthur LNG[2] | INEOS | 1.4 | FOB | Nov-22 | Start Port Arthur Ph.1 | 20 |
| Port Arthur LNG[2] | Engie | 0.9 | FOB | Dec-22 | Start Port Arthur Ph.1 | 15 |
| Port Arthur LNG[2] | RWE | 2.3 | FOB | Dec-22 | Start Port Arthur Ph.1 | 15 |
| Port Arthur LNG[2] | Orlen | 1 | FOB | Jan-23 | Start Port Arthur Ph.1 | 20 |
| Rio Grande LNG[2] | Shell | 2 | FOB | Mar-19 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | Engie | 1.8 | FOB | Apr-22 | Start Rio Grande LNG Ph.1 | 15 |
| Rio Grande LNG[2] | ENN | 2 | FOB | Apr-22 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | Guangdong Energy Gr. | 1 | DES | Jun-22 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | China Gas Hongda | 1 | FOB | Jul-22 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | GALP | 1 | FOB | Dec-22 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | Itochu | 1 | FOB | Jan-23 | Start Rio Grande LNG Ph.1 | 15 |
| Rio Grande LNG[2] | ExxonMobil | 1 | FOB | Jul-22 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | TotalEnergies | 5.4 | FOB | Jul-23 | Start Rio Grande LNG Ph.1 | 20 |
| Rio Grande LNG[2] | ADNOC | 1.9 | FOB | May-24 | Start Rio Grande LNG T4 | 20 |
| **Sabine Pass Liquefaction** | **Shell** | **5.5** | **FOB** | **Oct-11** | **2016** | **20** |
| **Sabine Pass Liquefaction** | **Naturgy Energy Gr.** | **3.5** | **FOB** | **Nov-11** | **2017** | **20** |
| **Sabine Pass Liquefaction** | **GAIL** | **3.5** | **FOB** | **Dec-11** | **2018** | **20** |
| **Sabine Pass Liquefaction** | **KOGAS** | **3.5** | **FOB** | **Jan-12** | **2017** | **20** |
| **Sabine Pass Liquefaction** | **TotalEnergies** | **2** | **FOB** | **Dec-12** | **2019** | **20** |
| **Sabine Pass Liquefaction** | **Centrica** | **1.8** | **FOB** | **Mar-13** | **2019** | **20** |
| **Sabine Pass Liquefaction** | **Petronas** | **1.1** | **FOB** | **Dec-18** | **2024** | **20** |
| Sabine Pass Liquefaction | Chevron | 1 | FOB | Jun-22 | 2026 | 16.5 |

[3]Supply location flexibility, including Corpus Christi Liquefaction and Sabine Pass Liquefaction. Primary SPA and Tolling agreements only.
[4]See pages 36-37 for definition. This list also excludes Cheniere Energy's Integrated Production Marketing (IPM) deals. Volumes rounded to one decimal place. Those in **bold** are agreements in operation.

**Top 10 LNG exporting markets in 2023**

| Market | Total exports 2023 (mt) | Installed capacity (mt/yr)[§] | Number of projects[§] |
|---|---|---|---|
| United States | 84.3 | 92.6 | 14 |
| Australia | 79.6 | 83.5 | 14 |
| Qatar | 78.2 | 77.0 | 11 |
| Russian Federation | 31.2 | 28.3 | 4 |
| Malaysia | 26.7 | 30.3 | 6 |
| Indonesia | 15.6 | 34.0 | 4 |
| Algeria | 13.0 | 28.8 | 5 |
| Nigeria | 12.9 | 21.9 | 4 |
| Oman | 11.4 | 10.3 | 2 |
| Papua New Guinea | 8.3 | 8.6 | 1 |

*Ranked by GIIGNL trade quantities for 2023. [§]As listed in the GEI LNG database.

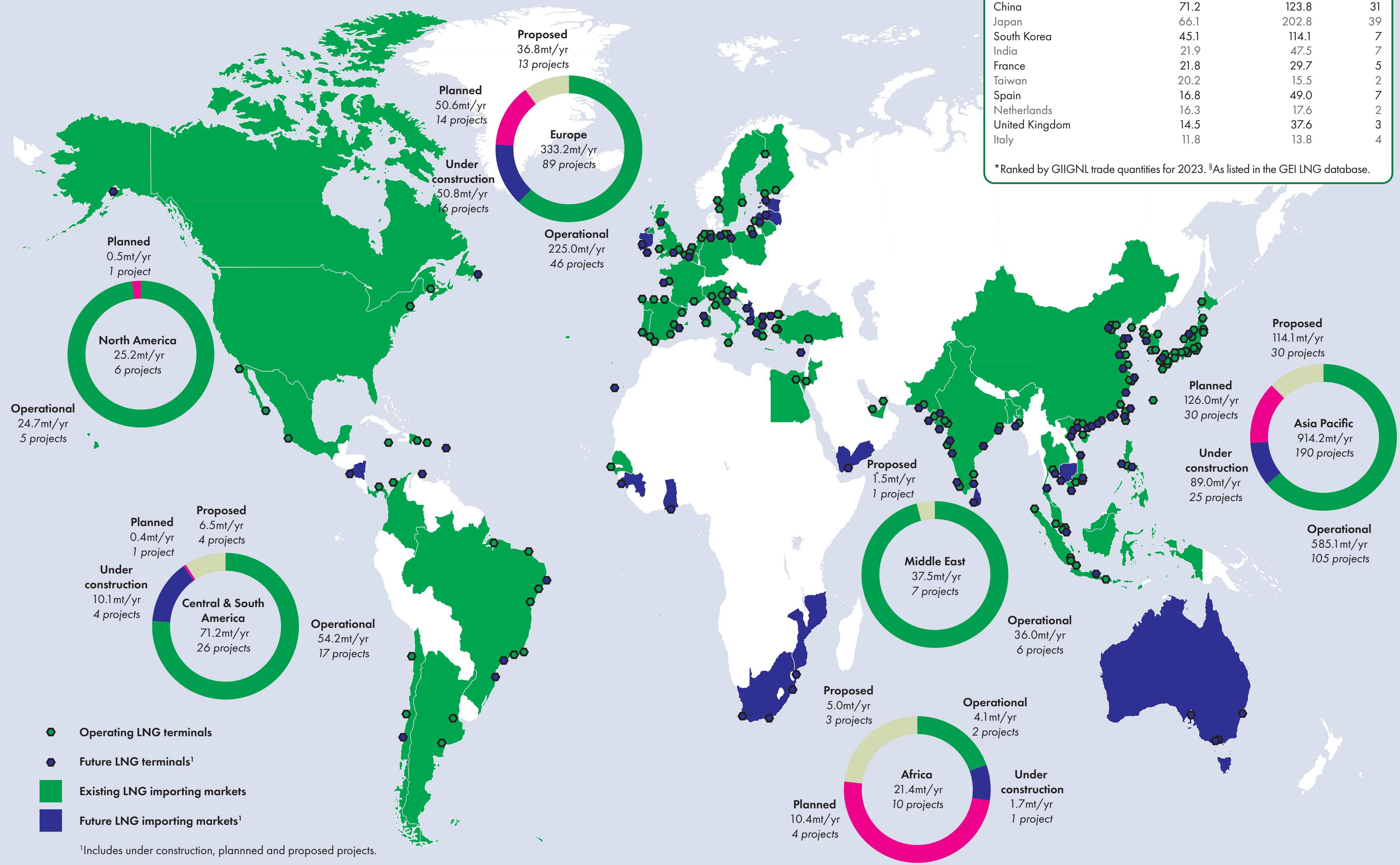



[1]Includes under construction, plannned and proposed projects.
[2]Includes western Russian Federation projects in Yamal and Baltic Sea.

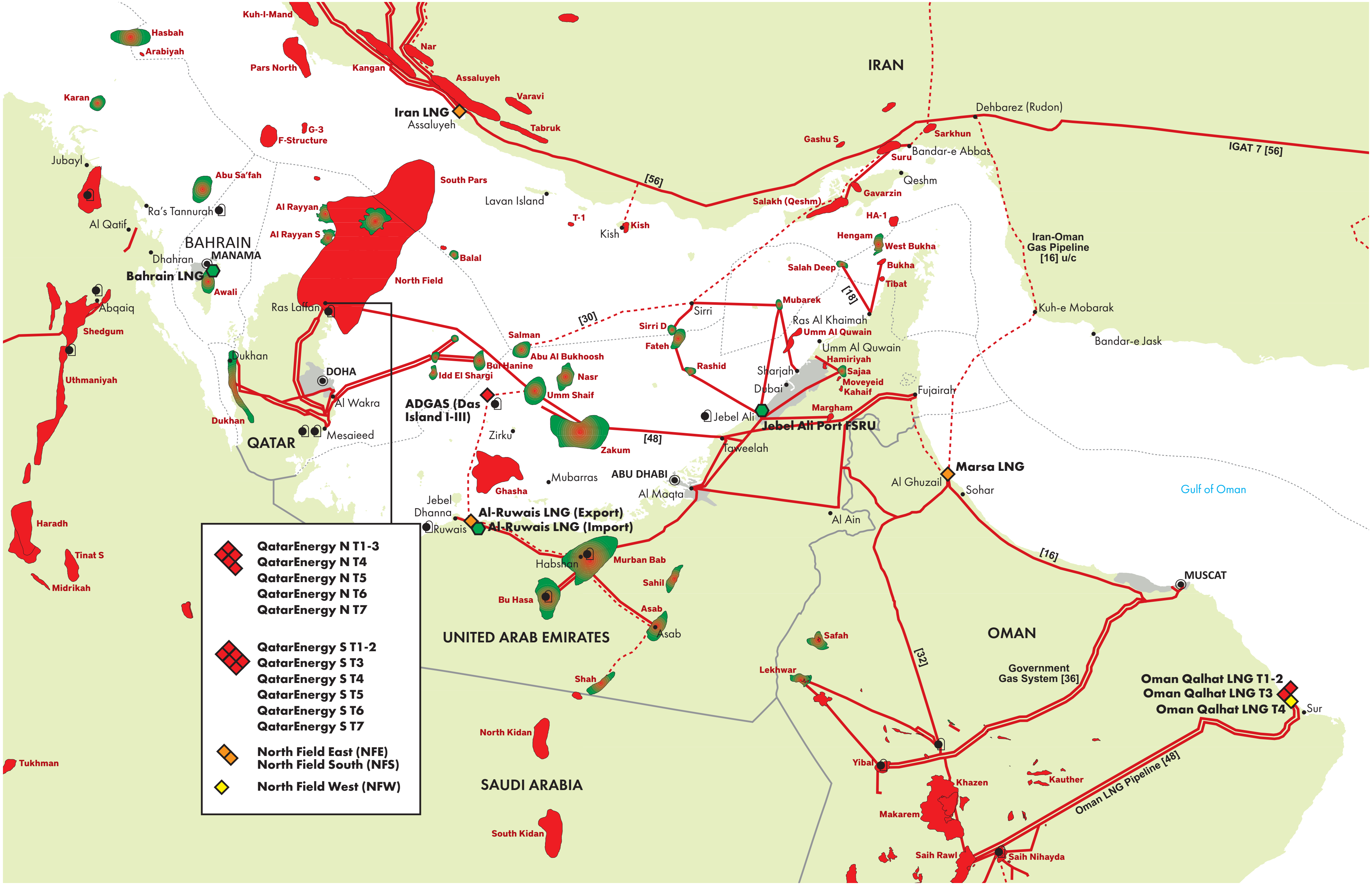
**Top 10 LNG importing markets in 2023***

| Market | Total imports 2023 (mt) | Installed capacity (mt/yr)[§] | Number of terminals[§] |
|---|---|---|---|
| China | 71.2 | 123.8 | 31 |
| Japan | 66.1 | 202.8 | 39 |
| South Korea | 45.1 | 114.1 | 7 |
| India | 21.9 | 47.5 | 7 |
| France | 21.8 | 29.7 | 5 |
| Taiwan | 20.2 | 15.5 | 2 |
| Spain | 16.8 | 49.0 | 7 |
| Netherlands | 16.3 | 17.6 | 2 |
| United Kingdom | 14.5 | 37.6 | 3 |
| Italy | 11.8 | 13.8 | 4 |

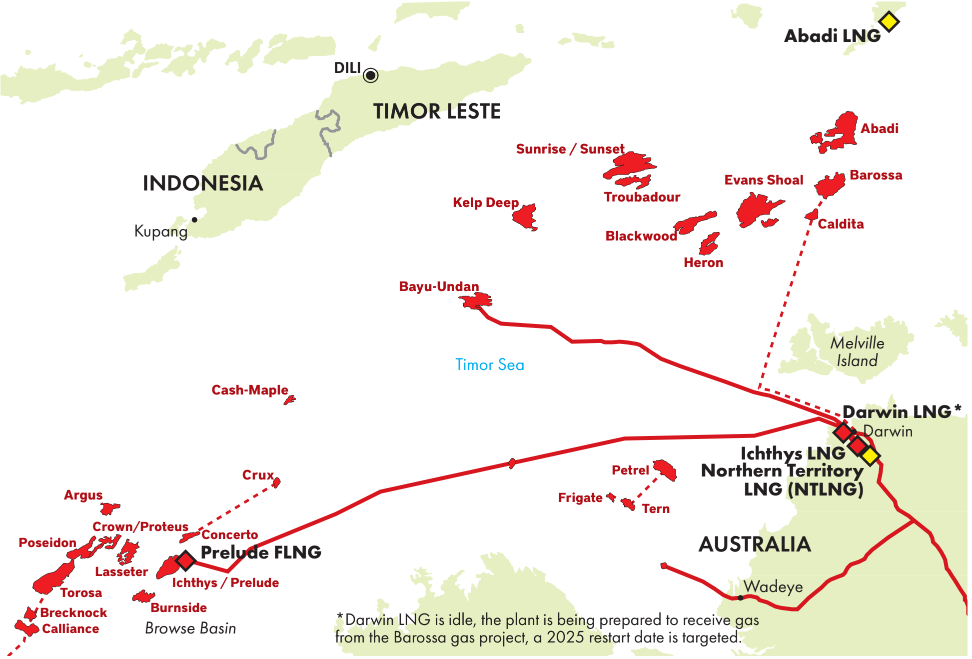
*Ranked by GIIGNL trade quantities for 2023. §As listed in the GEI LNG database.



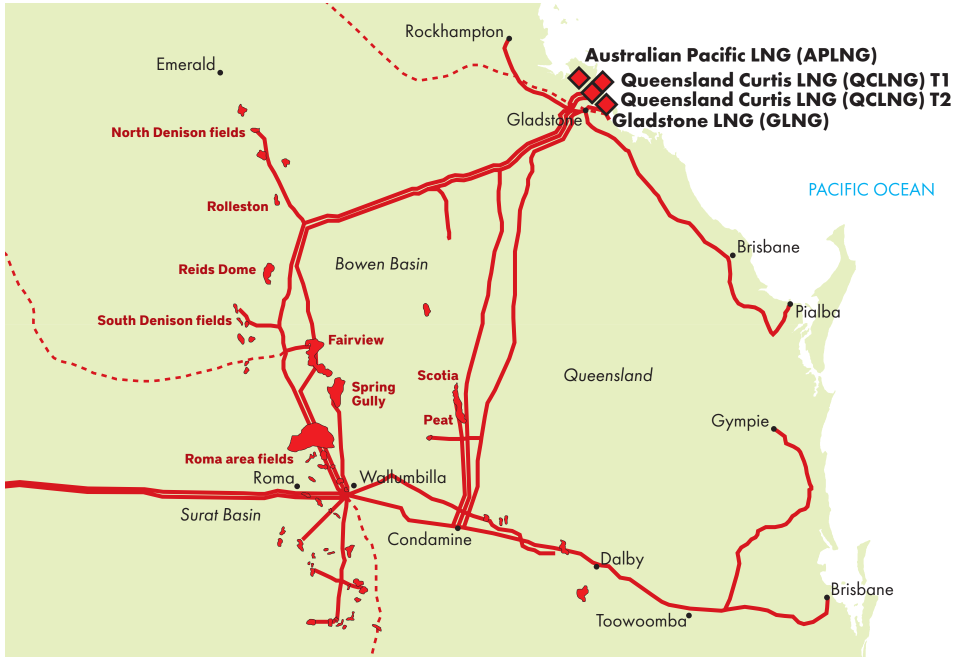

[1]Includes under construction, plannned and proposed projects.


IRAN
QATAR
BAHRAIN
MANAMA
DOHA
ABU DHABI
UNITED ARAB EMIRATES
SAUDI ARABIA
OMAN
MUSCAT
Gulf of Oman
Kuh-I-Mand
Hasbah
Arabiyah
Pars North
Kangan
Nar
Assaluyeh
Varavi
Tabruk
Karan
G-3
F-Structure
Iran LNG
Assaluyeh
Jubayl
Abu Sa'fah
South Pars
Lavan Island
Ra's Tannurah
Al Qatif
Al Rayyan
Al Rayyan S
T-1
Kish
Kish
Balal
Dhahran
Bahrain LNG
Awali
North Field
Abqaiq
Ras Laffan
Shedgum
Salman
[30]
Sirri D
Sirri
Fateh
Dukhan
Abu Al Bukhoosh
Bul Hanine
Idd El Shargi
Nasr
Umm Shaif
Uthmaniyah
ADGAS (Das Island I-III)
Al Wakra
Dukhan
Mesaieed
Zirku
Zakum
[48]
Ghasha
Mubarras
Al Maqta
Jebel Dhanna
Ruwais
Al-Ruwais LNG (Export)
Al-Ruwais LNG (Import)
Haradh
Tinat S
Midrikah
Habshan
Murban Bab
Sahil
Bu Hasa
Asab
Asab
Shah
North Kidan
South Kidan
Tukhman
Dehbarez (Rudon)
IGAT 7 [56]
[56]
Gashu S
Sarkhun
Suru
Bandar-e Abbas
Qeshm
Salakh (Qeshm)
Gavarzin
HA-1
Hengam
West Bukha
Bukha
Tibat
Salah Deep
[18]
Iran-Oman Gas Pipeline [16] u/c
Kuh-e Mobarak
Bandar-e Jask
Mubarek
Ras Al Khaimah
Umm Al Quwain
Umm Al Quwain
Hamiriyah
Sajaa
Moveyeid
Kahaif
Rashid
Sharjah
Dubai
Jebel Ali
Jebel Ali Port FSRU
Margham
Fujairah
Taweelah
Marsa LNG
Al Ghuzail
Sohar
Al Ain
[16]
Safah
Lekhwar
[32]
Government Gas System [36]
Oman Qalhat LNG T1-2
Oman Qalhat LNG T3
Oman Qalhat LNG T4
Sur
Yibal
Khazen
Kauther
Makarem
Oman LNG Pipeline [48]
Saih Rawl
Saih Nihayda
QatarEnergy N T1-3
QatarEnergy N T4
QatarEnergy N T5
QatarEnergy N T6
QatarEnergy N T7
QatarEnergy S T1-2
QatarEnergy S T3
QatarEnergy S T4
QatarEnergy S T5
QatarEnergy S T6
QatarEnergy S T7
North Field East (NFE)
North Field South (NFS)
North Field West (NFW)

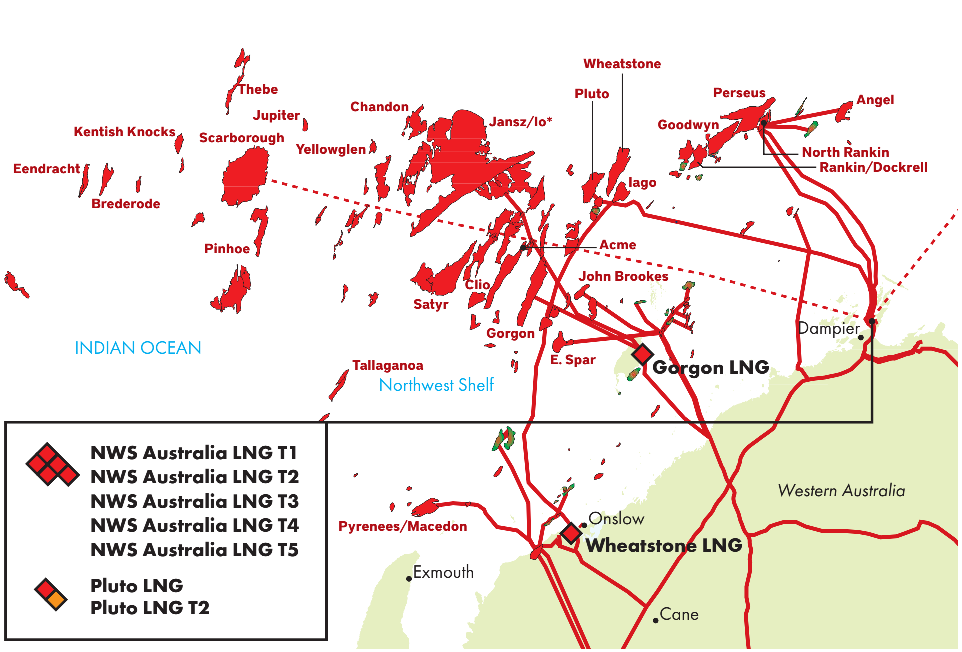
## GLOBAL LNG | NORTHERN AUSTRALIA



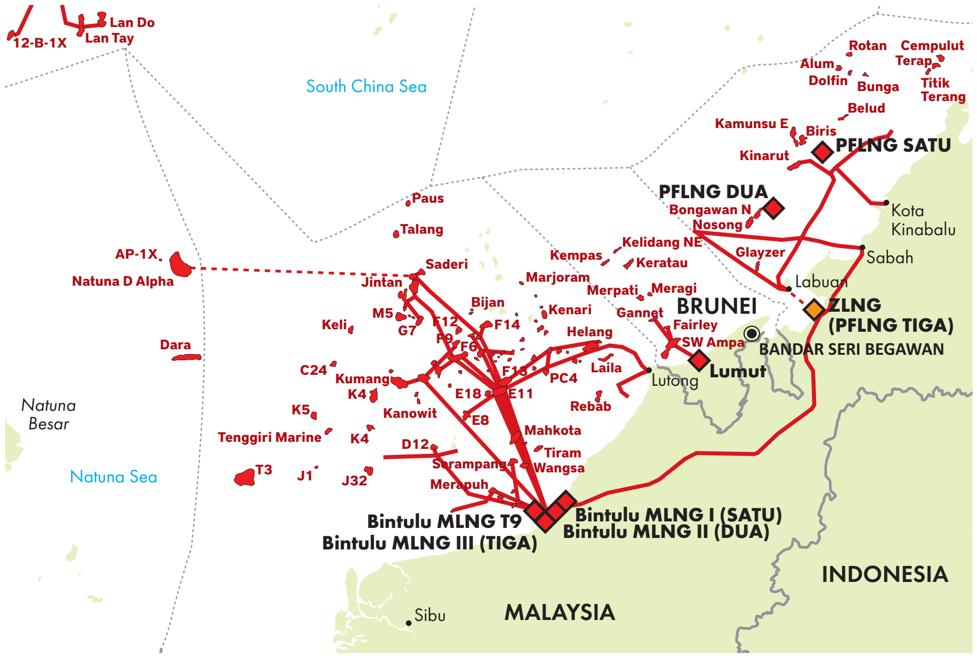

## GLOBAL LNG | EASTERN AUSTRALIA




## GLOBAL LNG | WESTERN AUSTRALIA

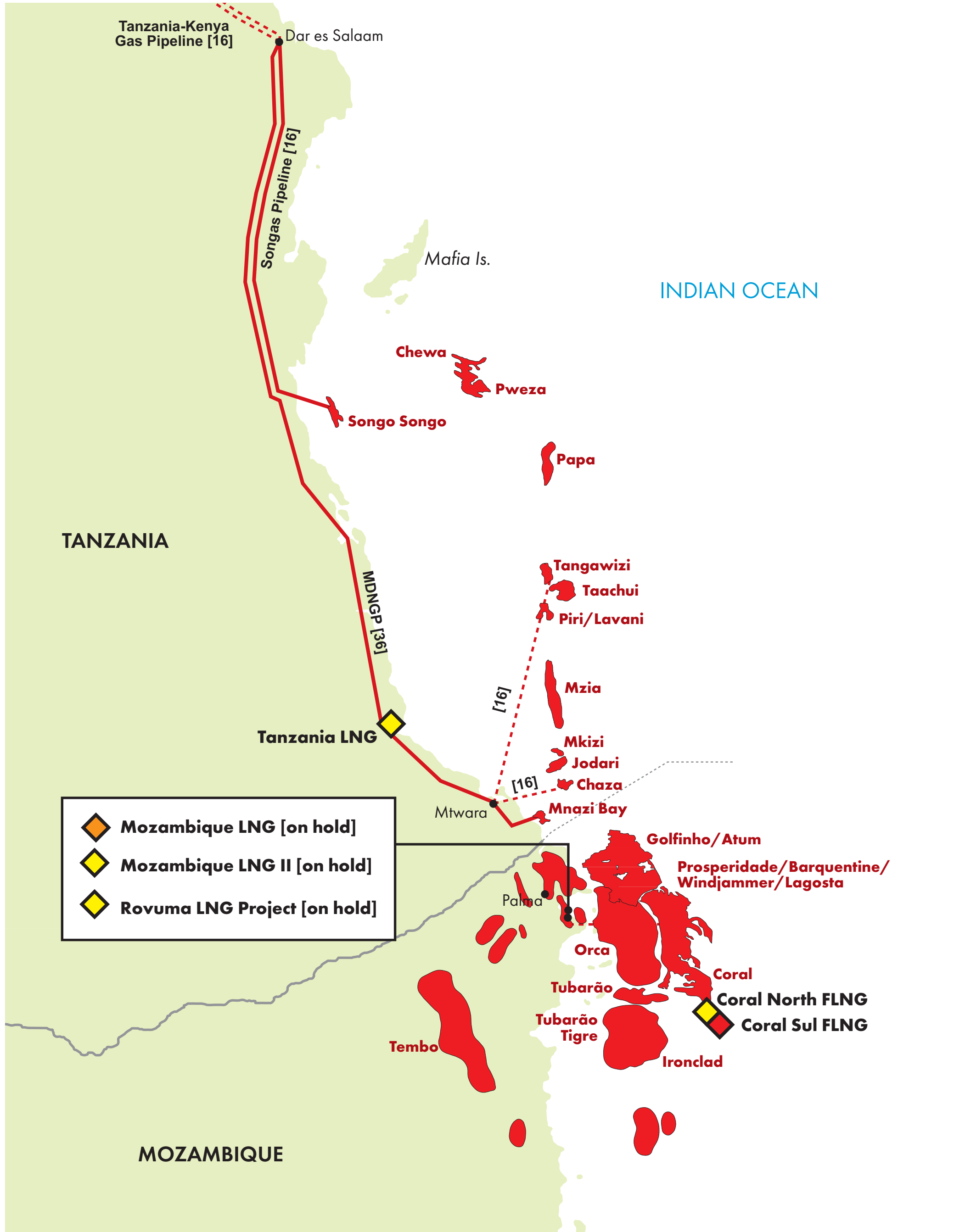



## GLOBAL LNG | MALAYSIA AND BRUNEI




Dikson
Rusanovskoe
Drovyanoy
Gulf of Yenisey
Gulf of Ob
Malyginskoe
Leningradskoe
Tasiyskoe
Shtormovoe
Kara Sea
Sev. Tambeyskoe
Syadorskoe
Arctic LNG 2 T1
Arctic LNG 2 T2
Arctic LNG 2 T3
Zap. Tambeyskoe
Kharasaveyskoe
Yamal LNG
Sabetta
Ladertoyskoe
Yuz. Tambeyskoe
Severo Bovanenkovskoe
Verkhnetiuteyskoe
Utrenneye
Obsky LNG
Gydanskoe
Gydan Peninsula
Zap. Seyakhinskoe
Kruzenshternoskoe
Vostochno Bovanenkovskoe
Bovanenkovskoe
Yuz. Kruzenshternoskoe
Nerstinskoe
Yamal Peninsula
Geofizicheskoe
Trekhbugornoe
Nanadyanskoe
Neytinskoe
Soletsko Khanaveyskoe
Baidaratskoe
Minkhovskoe
Vostochno Burgornoe
Arkticheskoe
Tota Yakhinskoe
Sev. Kamennomyskoe
Antipayutinskoe
Sredneyamalskoe
Semakovskoe
Khambateyskoe
Ust Yuribeyskoe
Severo Parusovoe
Nurminskoe
Yurkharovskoe
Rostovtsevskoe
Arctic Gate Terminal
Maloyamalskoe
Yamburgskoe
Kamennomysskoe
Perekatnoe
Obskoe
Yamburg
YAMAL EUROPE
Novoportovskoe
Novy Port
Serevo Urengoyskoe
Kharvutinskoe
Gulf of Ob
Pestsovoe
Kharp
Tanusalinskoe
Sandibinskoe
Yuzhno Pestsovoe
Urengoyskoe/ Samburgskoe
Nyda
Medvezhye
Urengoy
Shuginskoe
Novy Urengoy
Yarudeyskoe
Zap. Medvezhye
Nadymskoe
Nadym
RUSSIAN FEDERATION
Yamsoveyskoe
Tarko Sale
Longyugan
Yagelnaya
Purpe
Berezovo
Murvalenko




Tanzania-Kenya Gas Pipeline [16]
Dar es Salaam
Songas Pipeline [16]
Mafia Is.
INDIAN OCEAN
Chewa
Pweza
Songo Songo
Papa
TANZANIA
Tangawizi
Taachui
MDNGP [36]
Piri/Lavani
Mzia
[16]
Tanzania LNG
Mkizi
Jodari
[16]
Chaza
Mtwara
Mnazi Bay
Mozambique LNG [on hold]
Mozambique LNG II [on hold]
Rovuma LNG Project [on hold]
Golfinho/Atum
Prosperidade/Barquentine/ Windjammer/Lagosta
Palma
Orca
Coral
Tubarão
Coral North FLNG
Tubarão Tigre
Coral Sul FLNG
Tembo
Ironclad
MOZAMBIQUE

Million tonnes

| Markets | Algeria | Angola | Cameroon | Egypt | Equatorial Guinea | Mozambique | Nigeria | NET AFRICA[1] | Australia | Brunei | Indonesia | Malaysia | Papua New Guinea | Russian Fed. (Asia) | NET ASIA PACIFIC[1] | Norway | Russian Fed (Europe) | NET EUROPE[1] | Oman | Qatar | UAE | NET MIDDLE EAST[1] | Peru | Trinidad and Tobago | NET C. & S AMERICA[1] | United States | NET N. AMERICA[1] | Net reloads received[2] | NET IMPORTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bangladesh | 0.13 | 0.20 | - | 0.14 | 0.07 | - | 0.21 | **0.75** | - | - | 0.06 | 0.07 | - | - | **0.13** | - | - | **-** | - | 3.75 | - | **3.75** | - | 0.06 | **0.06** | 0.40 | **0.40** | 0.10 | **5.20** |
| China | 0.35 | - | 0.07 | 0.27 | 0.14 | 0.66 | 1.14 | **2.63** | 24.34 | 0.79 | 4.06 | 6.79 | 2.54 | 2.50 | **41.02** | - | 5.65 | **5.65** | 1.08 | 16.53 | 0.67 | **18.28** | 0.15 | 0.40 | **0.55** | 3.17 | **3.17** | -0.50 | **71.19** |
| Hong Kong | - | - | - | - | 0.06 | - | 0.07 | **0.13** | - | - | - | - | - | - | **-** | - | - | **-** | - | 0.22 | - | **0.22** | - | - | **-** | - | **-** | - | **0.35** |
| India | 0.34 | 0.73 | 0.39 | 0.18 | 0.31 | 0.37 | 0.73 | **3.05** | 0.36 | - | - | - | - | - | **0.36** | - | 0.49 | **0.49** | 0.88 | 10.92 | 2.85 | **14.65** | - | 0.28 | **0.28** | 3.09 | **3.09** | - | **21.96** |
| Indonesia | - | - | - | - | - | - | 0.01 | **0.01** | - | - | 4.04 | - | - | - | **4.57** | - | - | **-** | - | - | - | **-** | - | - | **-** | 0.13 | **0.13** | -0.50 | **4.19** |
| Japan | 0.06 | - | - | 0.14 | 0.13 | 0.14 | 0.26 | **0.73** | 27.61 | 2.43 | 2.69 | 10.43 | 3.80 | 5.82 | **52.78** | - | 0.13 | **0.13** | 2.19 | 2.83 | 0.78 | **5.80** | 0.25 | 0.06 | **0.31** | 5.63 | **5.63** | 0.70 | **66.12** |
| Malaysia | - | - | - | - | - | - | - | **-** | 2.15 | 0.20 | - | 0.44 | - | - | **2.79** | - | - | **-** | - | - | - | **-** | - | - | **-** | - | **-** | -0.20 | **2.60** |
| Pakistan | - | - | - | 0.07 | - | - | 0.38 | **0.45** | - | - | 0.25 | - | - | - | **0.25** | - | - | **-** | 0.07 | 6.32 | - | **6.39** | - | 0.07 | **0.07** | - | **-** | - | **7.15** |
| Philippines | 0.07 | - | - | - | - | - | - | **0.07** | 0.06 | - | - | 0.14 | - | - | **0.20** | - | - | **-** | 0.14 | - | 0.06 | **0.20** | - | - | **-** | 0.14 | **0.14** | - | **0.60** |
| Singapore | - | - | - | - | 0.21 | - | - | **0.21** | 2.71 | - | 0.23 | 0.06 | - | - | **3.00** | - | 0.07 | **0.07** | - | 1.41 | - | **1.41** | - | 0.11 | **0.11** | 0.38 | **0.38** | -0.40 | **4.81** |
| South Korea | 0.13 | - | - | 0.28 | 0.34 | 0.37 | 0.63 | **1.75** | 10.74 | 0.54 | 2.96 | 6.19 | 0.60 | 1.58 | **22.61** | - | 0.07 | **0.07** | 5.08 | 8.67 | 0.37 | **14.12** | 0.83 | - | **0.83** | 5.15 | **5.15** | 0.60 | **45.17** |
| Taiwan | - | - | 0.07 | 0.07 | - | - | 0.33 | **0.47** | 8.14 | 0.26 | 0.44 | 0.65 | 1.40 | - | **10.89** | - | 0.56 | **0.56** | 0.41 | 5.55 | 0.12 | **6.08** | 0.14 | - | **0.14** | 1.96 | **1.96** | 0.10 | **20.16** |
| Thailand | 0.08 | - | - | - | 0.27 | 0.65 | 0.27 | **1.27** | 2.81 | 0.33 | 0.45 | 1.83 | - | - | **5.42** | - | - | **-** | 0.63 | 2.82 | - | **3.45** | - | 0.21 | **0.21** | 1.05 | **1.05** | 0.20 | **11.58** |
| Vietnam | - | - | - | - | - | - | - | **-** | - | - | 0.08 | - | - | - | **0.08** | - | - | **-** | - | - | - | **-** | - | - | **-** | - | **-** | - | **0.08** |
| **ASIA[3]** | **1.16** | **0.93** | **0.53** | **1.15** | **1.53** | **2.19** | **4.03** | **11.52** | **79.45** | **4.55** | **15.26** | **26.60** | **8.34** | **9.90** | **144.10** | **-** | **6.97** | **6.97** | **10.48** | **59.02** | **4.85** | **74.35** | **1.37** | **1.19** | **2.56** | **21.10** | **21.10** | **0.20** | **261.16** |
| Belgium | 0.14 | 0.20 | - | 0.08 | 0.07 | - | 0.06 | **0.55** | - | - | - | - | - | - | **-** | 0.07 | 2.82 | **2.89** | - | 3.20 | - | **3.20** | - | - | **-** | 1.71 | **1.71** | -0.10 | **8.26** |
| Croatia | - | - | - | - | - | 0.12 | 0.06 | **0.18** | - | - | 0.07 | - | - | - | **0.07** | - | - | **-** | 0.23 | - | - | **0.23** | - | 0.39 | **0.39** | 1.10 | **1.10** | - | **1.96** |
| Finland | 0.07 | - | - | - | - | - | - | **0.07** | - | - | - | - | - | - | **-** | 0.29 | 0.15 | **0.44** | - | - | - | **-** | - | - | **-** | 0.74 | **0.74** | 0.10 | **1.36** |
| France | 3.20 | 0.67 | 0.64 | 0.21 | - | - | 0.45 | **5.17** | - | - | - | - | - | - | **-** | 0.89 | 3.47 | **4.36** | 0.07 | 1.65 | - | **1.72** | 0.28 | 0.25 | **0.53** | 10.06 | **10.06** | - | **21.80** |
| Germany | - | 0.34 | - | 0.05 | - | - | - | **0.39** | - | - | - | - | - | - | **-** | 0.20 | - | **0.20** | - | - | 0.06 | **0.06** | - | 0.20 | **0.20** | 4.14 | **4.14** | 0.10 | **5.10** |
| Greece | 0.29 | - | - | 0.23 | - | - | 0.06 | **0.58** | - | - | - | - | - | - | **-** | 0.07 | 0.59 | **0.66** | - | - | - | **-** | - | - | **-** | 0.78 | **0.78** | - | **2.06** |
| Italy | 1.71 | - | - | 0.22 | 0.13 | 0.12 | 0.22 | **2.40** | - | - | - | - | - | - | **-** | - | 0.12 | **0.12** | - | 4.82 | - | **4.82** | - | - | **-** | 3.86 | **3.86** | 0.60 | **11.85** |
| Lithuania | 0.06 | - | - | - | - | - | 0.07 | **0.13** | - | - | - | - | - | - | **-** | 0.91 | - | **0.91** | - | - | - | **-** | - | 0.09 | **0.09** | 1.08 | **1.08** | -0.10 | **2.14** |
| Netherlands | 0.19 | 0.74 | - | 0.13 | 0.28 | - | 0.20 | **1.54** | - | - | - | - | - | - | **-** | 0.87 | 0.72 | **1.59** | - | 0.57 | - | **0.57** | 0.07 | 0.69 | **0.75** | 11.97 | **11.97** | -0.10 | **16.33** |
| Poland | - | - | - | - | 0.07 | - | - | **0.07** | - | - | - | - | - | - | **-** | 0.07 | - | **0.07** | - | 1.74 | - | **1.74** | - | 0.07 | **0.07** | 2.69 | **2.69** | - | **4.63** |
| Portugal | - | - | - | - | - | - | 1.51 | **1.51** | - | - | - | - | - | - | **-** | - | 0.29 | **0.29** | - | - | - | **-** | - | 0.19 | **0.19** | 1.48 | **1.48** | - | **3.46** |
| Spain | 1.43 | 0.20 | 0.28 | 0.20 | 0.14 | - | 3.59 | **5.84** | - | - | - | - | - | - | **-** | 0.25 | 4.83 | **5.08** | 0.19 | 0.96 | - | **1.15** | 0.33 | 0.38 | **0.71** | 5.32 | **5.32** | -1.30 | **16.81** |
| Turkey | 4.29 | - | 0.08 | 0.93 | - | 0.07 | 0.36 | **5.73** | - | - | - | - | - | - | **-** | 0.19 | 1.16 | **1.35** | 0.06 | - | - | **0.06** | - | 0.17 | **0.17** | 2.84 | **2.84** | -1.00 | **10.09** |
| United Kingdom | 0.34 | 0.61 | - | 0.21 | - | - | 0.34 | **1.50** | - | - | - | - | - | - | **-** | 0.31 | - | **0.31** | - | 2.04 | - | **2.04** | 1.38 | 0.40 | **1.78** | 8.81 | **8.81** | 0.10 | **14.51** |
| **EUROPE[3]** | **11.72** | **2.76** | **1.00** | **2.26** | **0.69** | **0.31** | **6.92** | **25.66** | **-** | **-** | **0.07** | **-** | **-** | **-** | **0.07** | **4.12** | **14.15** | **18.27** | **0.55** | **14.98** | **0.06** | **15.59** | **2.06** | **2.83** | **4.89** | **56.58** | **56.58** | **-1.70** | **120.36** |
| Kuwait | 0.08 | - | - | - | 0.07 | 0.15 | 0.87 | **1.17** | 0.07 | - | - | 0.14 | - | - | **0.21** | - | 0.07 | **0.07** | 0.34 | 3.41 | 0.06 | **3.81** | - | 0.13 | **0.13** | 0.68 | **0.68** | 0.10 | **6.14** |
| Jordan | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | 0.06 | - | - | **0.06** | - | - | **-** | 0.07 | **0.07** | - | **0.13** |
| UAE | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | - | 0.66 | 0.07 | **0.73** | - | - | **-** | - | **-** | - | **0.73** |
| **MIDDLE EAST[3]** | **0.08** | **-** | **-** | **-** | **0.07** | **0.15** | **0.87** | **1.17** | **0.07** | **-** | **-** | **0.14** | **-** | **-** | **0.21** | **-** | **0.07** | **0.07** | **0.40** | **4.07** | **0.13** | **4.60** | **-** | **0.13** | **0.13** | **0.75** | **0.75** | **0.10** | **7.00** |
| Egypt | - | - | - | 0.06 | - | - | - | **0.06** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | - | **-** | - | **-** | -0.05 | **0.01** |
| **AFRICA[3]** | **-** | **-** | **-** | **0.06** | **-** | **-** | **-** | **0.06** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-0.05** | **0.01** |
| Argentina | 0.04 | - | - | 0.04 | 0.07 | - | 0.06 | **0.21** | - | - | - | - | - | - | **-** | - | - | **-** | - | 0.14 | - | **0.14** | - | 0.10 | **0.10** | 1.40 | **1.40** | - | **1.85** |
| Brazil | 0.04 | - | - | - | - | - | - | **0.04** | - | - | - | - | - | - | **-** | - | 0.06 | **0.06** | - | - | - | **-** | - | 0.02 | **0.02** | 0.62 | **0.62** | -0.10 | **0.66** |
| Chile | - | - | - | 0.03 | 0.42 | - | - | **0.45** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | 1.41 | **1.41** | 0.62 | **0.62** | - | **2.45** |
| Colombia | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | 0.07 | **0.07** | 0.70 | **0.70** | - | **0.77** |
| Dominican Rep. | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | 0.14 | **0.14** | 1.51 | **1.51** | - | **1.66** |
| El Salvador | - | - | - | - | 0.06 | - | - | **0.06** | 0.04 | - | - | - | - | - | **0.04** | - | - | **-** | - | - | - | **-** | 0.13 | 0.24 | **0.37** | 0.03 | **0.03** | - | **0.50** |
| Jamaica | - | - | - | 0.04 | - | - | 0.76 | **0.80** | - | - | - | - | - | - | **-** | 0.04 | - | **0.04** | - | - | - | **-** | - | 0.34 | **0.34** | 0.27 | **0.27** | -0.30 | **1.09** |
| Panama | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | - | **-** | 0.43 | **0.43** | - | **0.43** |
| Puerto Rico | - | - | - | - | - | - | 0.30 | **0.30** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | - | 0.49 | **0.49** | - | **-** | 0.90 | **1.72** |
| **C. & S AMERICA[3]** | **0.08** | **-** | **-** | **0.11** | **0.55** | **-** | **1.12** | **1.86** | **0.04** | **-** | **-** | **-** | **-** | **-** | **0.04** | **0.04** | **0.06** | **0.10** | **-** | **0.14** | **-** | **0.14** | **0.13** | **2.81** | **2.94** | **5.58** | **5.58** | **0.50** | **11.13** |
| Canada | - | - | - | - | - | - | - | **-** | - | - | - | - | - | - | **-** | - | - | **-** | - | - | - | **-** | 0.07 | 0.10 | **0.17** | - | **-** | - | **0.18** |
| Mexico | - | - | - | - | - | - | - | **-** | - | - | 0.25 | - | - | - | **0.25** | - | - | **-** | - | - | - | **-** | 0.06 | - | **0.06** | 0.32 | **0.32** | - | **0.63** |
| United States | - | - | - | - | - | - | 0.03 | **0.03** | - | - | - | - | - | - | **-** | 0.04 | - | **0.04** | - | - | - | **-** | - | 0.33 | **0.33** | 0.14 | **0.14** | -0.27 | **0.27** |
| **N. AMERICA[3]** | **-** | **-** | **-** | **-** | **-** | **-** | **0.03** | **0.03** | **-** | **-** | **0.25** | **-** | **-** | **-** | **0.25** | **0.04** | **-** | **0.04** | **-** | **-** | **-** | **-** | **0.13** | **0.43** | **0.56** | **0.46** | **0.46** | **-0.27** | **1.08** |
| **NET EXPORTS** | **13.03** | **3.70** | **1.53** | **3.57** | **2.83** | **2.66** | **12.97** | **40.29** | **79.56** | **4.55** | **15.59** | **26.75** | **8.35** | **9.90** | **144.70** | **4.39** | **21.46** | **25.85** | **11.43** | **78.22** | **5.04** | **94.69** | **3.69** | **7.66** | **11.35** | **84.53** | **84.53** | **0.0** | **401.42** |

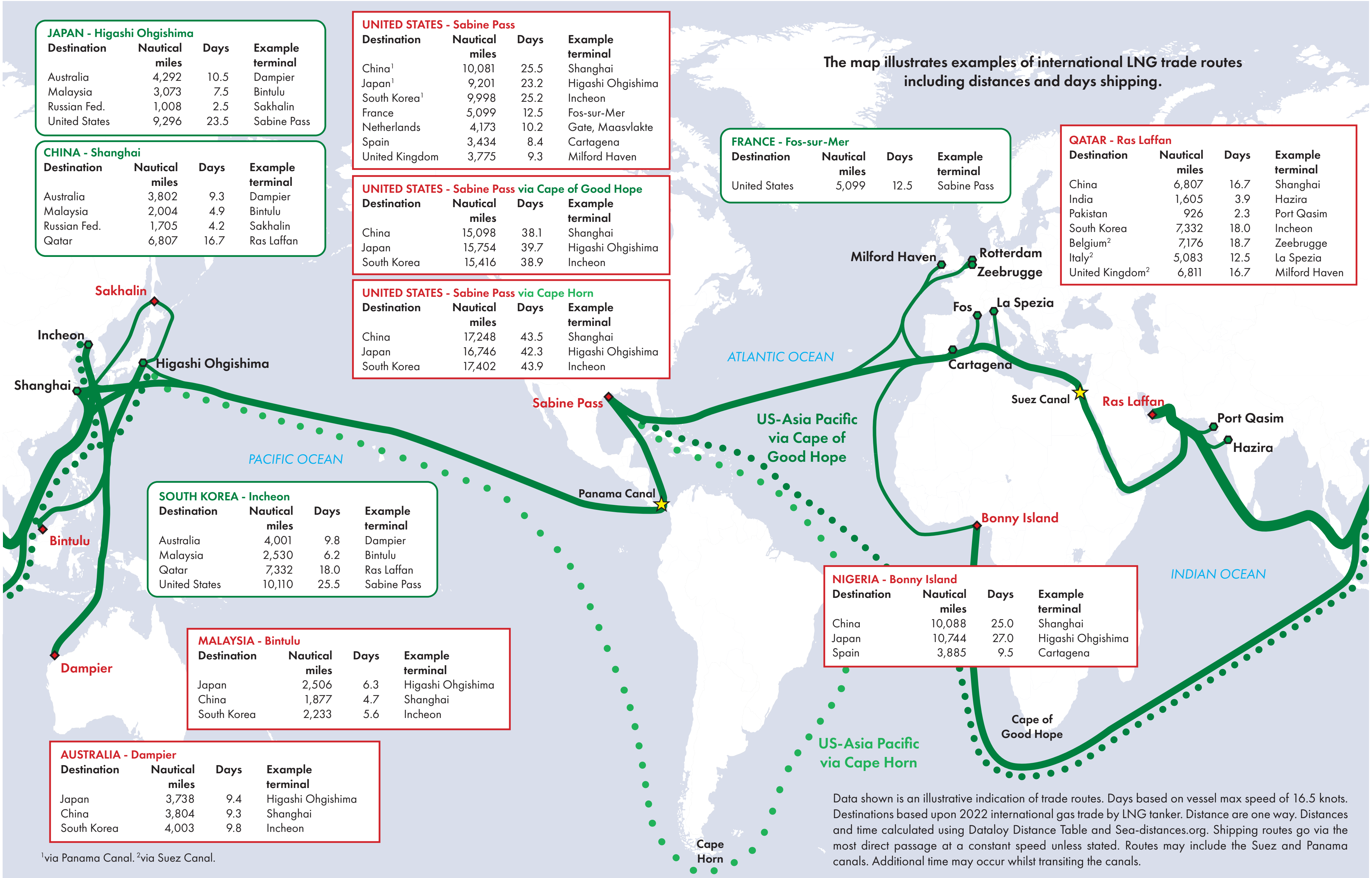
Global trade movements matrix has been produced using the figures published in the GIIGNL Annual Report 2024 edition (pp12-13) and IGU World LNG Report 2024 edition (pp32-33).

[1]Gross LNG import from. [2]Net re-export if negative. [3]Of which main importing countries, full matrix available on GIIGNL website.



Data source GIIGNL, Kpler, IGU 2024

The map illustrates examples of international LNG trade routes including distances and days shipping.




**JAPAN - Higashi Ohgishima**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| Australia | 4,292 | 10.5 | Dampier |
| Malaysia | 3,073 | 7.5 | Bintulu |
| Russian Fed. | 1,008 | 2.5 | Sakhalin |
| United States | 9,296 | 23.5 | Sabine Pass |

**CHINA - Shanghai**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| Australia | 3,802 | 9.3 | Dampier |
| Malaysia | 2,004 | 4.9 | Bintulu |
| Russian Fed. | 1,705 | 4.2 | Sakhalin |
| Qatar | 6,807 | 16.7 | Ras Laffan |

**UNITED STATES - Sabine Pass**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| China[1] | 10,081 | 25.5 | Shanghai |
| Japan[1] | 9,201 | 23.2 | Higashi Ohgishima |
| South Korea[1] | 9,998 | 25.2 | Incheon |
| France | 5,099 | 12.5 | Fos-sur-Mer |
| Netherlands | 4,173 | 10.2 | Gate, Maasvlakte |
| Spain | 3,434 | 8.4 | Cartagena |
| United Kingdom | 3,775 | 9.3 | Milford Haven |

**UNITED STATES - Sabine Pass via Cape of Good Hope**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| China | 15,098 | 38.1 | Shanghai |
| Japan | 15,754 | 39.7 | Higashi Ohgishima |
| South Korea | 15,416 | 38.9 | Incheon |

**UNITED STATES - Sabine Pass via Cape Horn**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| China | 17,248 | 43.5 | Shanghai |
| Japan | 16,746 | 42.3 | Higashi Ohgishima |
| South Korea | 17,402 | 43.9 | Incheon |

**FRANCE - Fos-sur-Mer**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| United States | 5,099 | 12.5 | Sabine Pass |

**QATAR - Ras Laffan**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| China | 6,807 | 16.7 | Shanghai |
| India | 1,605 | 3.9 | Hazira |
| Pakistan | 926 | 2.3 | Port Qasim |
| South Korea | 7,332 | 18.0 | Incheon |
| Belgium[2] | 7,176 | 18.7 | Zeebrugge |
| Italy[2] | 5,083 | 12.5 | La Spezia |
| United Kingdom[2] | 6,811 | 16.7 | Milford Haven |

**SOUTH KOREA - Incheon**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| Australia | 4,001 | 9.8 | Dampier |
| Malaysia | 2,530 | 6.2 | Bintulu |
| Qatar | 7,332 | 18.0 | Ras Laffan |
| United States | 10,110 | 25.5 | Sabine Pass |

**MALAYSIA - Bintulu**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| Japan | 2,506 | 6.3 | Higashi Ohgishima |
| China | 1,877 | 4.7 | Shanghai |
| South Korea | 2,233 | 5.6 | Incheon |

**NIGERIA - Bonny Island**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| China | 10,088 | 25.0 | Shanghai |
| Japan | 10,744 | 27.0 | Higashi Ohgishima |
| Spain | 3,885 | 9.5 | Cartagena |

**AUSTRALIA - Dampier**

| Destination | Nautical miles | Days | Example terminal |
|---|---|---|---|
| Japan | 3,738 | 9.4 | Higashi Ohgishima |
| China | 3,804 | 9.3 | Shanghai |
| South Korea | 4,003 | 9.8 | Incheon |

[1]via Panama Canal. [2]via Suez Canal.

Data shown is an illustrative indication of trade routes. Days based on vessel max speed of 16.5 knots. Destinations based upon 2022 international gas trade by LNG tanker. Distance are one way. Distances and time calculated using Dataloy Distance Table and Sea-distances.org. Shipping routes go via the most direct passage at a constant speed unless stated. Routes may include the Suez and Panama canals. Additional time may occur whilst transiting the canals.

LNG vessels, also known as LNG carriers, tankers, or ships, are specially designed ships built to transport liquefied natural gas (LNG) across oceans. LNG vessels carry the natural gas in a liquefied form, which is achieved by cooling it down to a cryogenic temperature of around -163°C (-260°F). At this extremely low temperature, natural gas shrinks to about 1/600th of its original volume, making it much more efficient to transport by ship.

LNG is not carried under pressure. It's the exceptional insulation of the tanks that keeps the LNG cold, even though a small amount continuously boils off. This boil-off gas (BOG) is often captured and used as fuel, reducing reliance on conventional fuel sources. Notably, LNG shipping boasts an exemplary safety record.

| Type | Containment System | Length (m) | Beam (m) | Depth (m) | Draft (m) | Capacity ('000cm) | Active vessels |
|---|---|---|---|---|---|---|---|
| Conventional | Moss | 274-299 | 47-52 | 26 | 11 | 125-182 | 116 |
| Conventional | Membrane | 215-299 | 33-49 | 26 | 11 | 65-180 | 529 |
| Conventional | SPB | 195-299 | 30-49 | 26 | 9.5 | 89-165 | 5 |
| Q-Flex[1] | Membrane | 315 | 50 | 27 | 12 | 210-217 | 31 |
| Q-Max[1] | Membrane | 345 | 53.8 | 27 | 12 | 263-266 | 14 |
| | | | | | | | **695** |
| Floating Storage and Regasification Units* | | 290 | 49 | 27 | 11-12 | 125-170 | 45 |

Sources: Wood Mackenzie Lens Gas and LNG, Gibson Shipbrokers, International Gas Union (IGU)

Table excludes small-scale LNG vessels. [1]Q stands for Qatar, the only LNG supplier so-far to utilise these two larger ship sizes.
*FSRUs are multi-function vessels, which combine LNG storage and built-in regasification systems onboard a ship or barge.

**Cargo Containment System:**
There are three main types of cargo containment systems used in modern fully refrigerated LNG carriers:

**Moss Type:** This design uses self-supporting, spherical tanks made of nickel steel. Each tank is independent and can expand and contract due to temperature changes. This design offers good durability but requires more deck space.

**Membrane Type:** This uses a thin, flexible, insulated membrane liner within the hull of the ship. The membrane is contained by the primary and secondary steel containment barriers. This design is lighter and more efficient but requires a complex construction process.

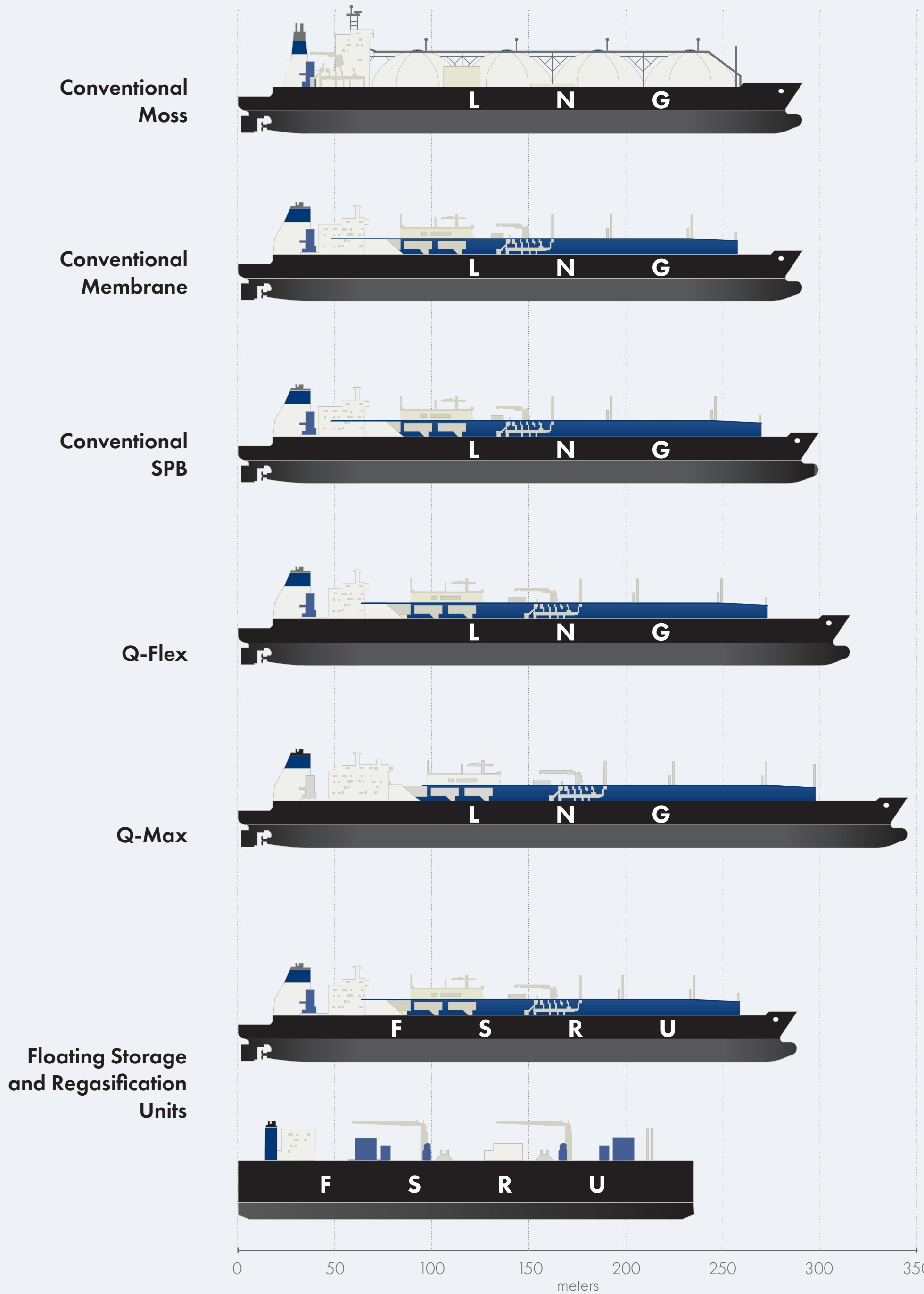
**Self-supporting Prismatic Shape IMO Type B (SPB):** This newer design utilises self-supporting, prismatic tanks with a rectangular or triangular shape, striking a good balance between efficiency and space utilization compared to Moss and Membrane types. However, this increased complexity necessitates more material, resulting in potentially higher costs.

Additional factors to consider for LNG vessels:

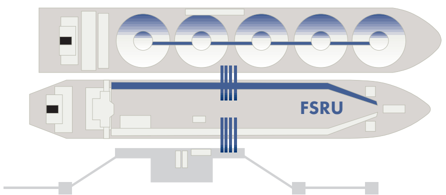
**Size:** Modern LNG carriers range from smaller coastal carriers with capacities around 20,000 cubic meters to Q-Max carriers exceeding 260,000 cubic meters.

**Re-liquefaction systems:** Some LNG carriers are equipped with re-liquefaction plants to capture and reuse BOG during transport, maximising cargo delivery.

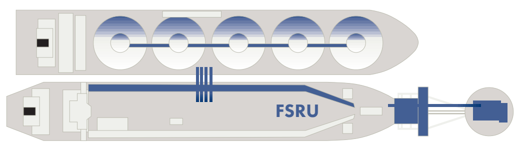

Image: GTT



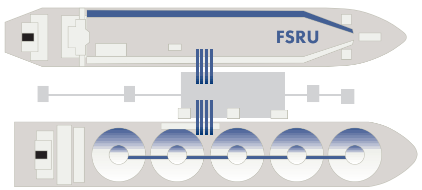
**FRSU, or Floating Regasification Storage Unit**, refers to water-based LNG storage and regasification technologies designed to receive, store and regasify liquefied natural gas (LNG). Mooring systems are crucial for keeping these vessels safely positioned and this low-cost option works best in the following:




**Single berth FSRU**: LNG ships can moor alongside the FRSU and offload LNG for regasification and then supply directly into a pipeline. The low-cost option: works best in protected harbours or near-shore with water depths of 15-30 meters and mild weather conditions.

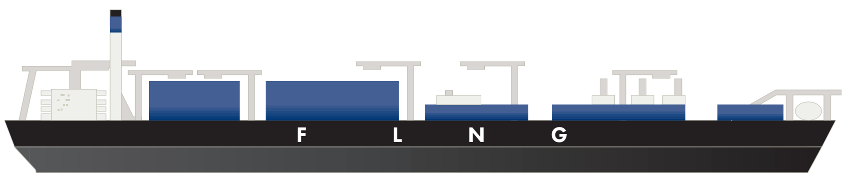



**Single Point Mooring FSRU**: weather-varing solutions often allow the highest availability for offshore ship-to-ship transfer. There are numerous mooring options, depending on site conditions. Most have been tried and tested in the offshore oil industry. Some specific solutions include mooring towers, yokes and turrets (internal or external to the FSRU).




**Cross-dock FSRU**: segregated berths for LNG ships and FSRUs provide flexibility and improved availability. Spacious 'sea island' concepts can be created to enable a flexible, offshore operation: this allows for adding more vaporiser capacity and further berths for a Floating Storage Unit (FSU) or another FSRU.

**Floating liquefied natural gas [FLNG]** refers to water-based LNG operations employing technologies designed to enable the development of offshore natural gas resources. Floating above an offshore natural gasfield or moored near-shore at a jetty or berth with a breakwater, the FLNG facility produces, liquifies, stores and transfers LNG (and potentially LPG and condensate) at sea before carriers ship it directly to markets. PE








## Units

1 metric tonne = 2204.62lb
1 kilolitre = 6.2898 barrels
1 kilocalorie (kcal) = 4.187 kJ = 3.968 Btu
1 Kilojoule (kJ) = 0.239 kcal = 0.948 Btu
1 British thermal unit (Btu) = 0.252 kcal = 1.055 kJ
1 kilowatt-hour (kWh) = 860 kcal = 3,600 kJ = 3,412 Btu

## Natural Gas (NG) and Liquefied Natural Gas (LNG)

| From | To billion cubic metres NG (bn cm NG) | billion cubic feet NG (bcf NG) | million tonnes oil equivalent (mtoe) | million tonnes LNG (mt LNG) | trillion British thermal units (trillion Btu) | million barrels oil equivalent (mboe) |
|---|---|---|---|---|---|---|
| | multiply by | | | | | |
| 1 billion cubic metres NG | 1 | 35.3 | 0.9 | 0.73 | 36 | 6.29 |
| 1 billion cubic feet NG | 0.028 | 1 | 0.026 | 0.021 | 1.03 | 0.18 |
| 1 million tonnes oil equivalent | 1.111 | 39.2 | 1 | 0.805 | 40.4 | 7.33 |
| 1 million tonnes LNG | 1.38 | 48.7 | 1.23 | 1 | 52 | 8.68 |
| 1 trillion British thermal units | 0.028 | 0.98 | 0.025 | 0.02 | 1 | 0.17 |
| 1 million barrels oil equivalent | 0.16 | 5.61 | 0.14 | 0.12 | 5.8 | 1 |

## Conversion factors for Trinidad and Nigeria at different heating values

1 MMBtu = 970 & 900 is equivalent to 1,030 and 1,110 Btu/scf, respectively

**Trinidad (LNG)**

| **1,045 Btu/scf** | | mt/yr | bcm/yr | mmscf/d | dtherm/d | mmBtu/yr | cm/yr |
|---|---|---|---|---|---|---|---|
| 1 | mt/yr | 1 | 1.42 | 37 | 143,569 | 52,402,699 | 2,315,606 |
| 1 | bcm/yr | 0.7 | 1 | 97 | 101,037 | 36,878,517 | 1,629,613 |
| 100 | mmscf/d | 0.73 | 1.03 | 100 | 104,385 | 38,100,649 | 1,683,617 |
| 100,000 | dtherm/d | 0.7 | 0.99 | 96 | 100,000 | 36,500,000 | 1,612,886 |
| 100,000,000 | mmBtu/yr | 1.91 | 2.71 | 262 | 273,973 | 100,000,000 | 4,418,867 |
| 1,000,000 | cm/yr | 0.43 | 0.64 | 57 | 61,997 | 22,630,235 | 1,000,000 |

**Nigeria (LNG)**

| **1,106 Btu/scf** | | mt/yr | bcm/yr | mmscf/d | dtherm/d | mmBtu/yr | cm/yr |
|---|---|---|---|---|---|---|---|
| 1 | mt/yr | 1 | 1.33 | 29 | 142,204 | 51,904,518 | 2,209,050 |
| 1 | bcm/yr | 0.75 | 1 | 97 | 107,002 | 39,,055,776 | 1,662,209 |
| 100 | mmscf/d | 0.78 | 1.03 | 100 | 110,547 | 40,349,739 | 1,717,280 |
| 100,000 | dtherm/d | 0.7 | 0.93 | 90 | 100,000 | 36,500,000 | 1,553,435 |
| 100,000,000 | mmBtu/yr | 1.93 | 2.56 | 247 | 273,973 | 100,000,000 | 4,255,987 |
| 1,000,000 | cm/yr | 0.43 | 0.57 | 57 | 64,372 | 23,496,312 | 1,000,000 |

**Annual contract quantity**
The annual delivery quantity contracted for during each contract year as specified in a gas sales or LNG contract. It may be expressed either as a standalone number or as a multiple of the daily contract quantity.

**Annual delivery programme (ADP)**
A document agreed by buyers and sellers setting out the quantities and timing of LNG cargoes for the coming contract year. For an ex-ship sale, the ADP deals with the dates on which ships will deliver LNG to terminals. For a free on board (FOB) sale, the ADP covers the dates of arrival of the buyers' ships at an LNG plant. The ADP provides a basis for decisions on how buyers and sellers will operate their facilities during the year. Usually, procedures adopted to develop the ADP are agreed on in the sales and purchase agreement (SPA).

**Arbitrage**
The purchase and sale of an asset in order to profit from a difference in its price, usually on different exchanges or marketplaces. Where appropriate infrastructure exists, LNG offers the opportunity for price arbitrage between different gas markets.

**Articles of agreement**
The document containing all particulars relating to the terms of agreement between the Master of the LNG vessel and the crew. Sometimes called ship's articles or shipping articles.

**Baseload (LNG)**
A baseload LNG plant is one capable of sustained liquefaction or regasification, often on a large scale.

**British thermal unit (Btu)**
An energy unit; the quantity of heat necessary to raise the temperature of one pound-mass of water one degree Fahrenheit from 58.5°F to 59.5°F under a standard pressure of 30 inches of mercury at 32°F.

**Calorific value**
The quantity of heat produced by the complete combustion of a fuel. This can be measured dry or saturated with water vapour, net or gross. The general convention is dry and gross.

**Compressed natural gas (CNG)**
Natural gas that has been compressed under high pressures (typically between 3,000 and 3,600 psi) and held in a container. It expands when released for use as a fuel.

**Conventional gas**
1) Usually refers to gas reserves that are the easiest to access with existing technology. Most gas produced to date is conventional gas, although an increasing amount of unconventional gas is now also being produced;
2) The term conventional gas may also refer to naturally occurring gas to distinguish it from synthetically produced gas.

**Cost of development/boe (COD)**
The unit cost ($/boe) required to develop a project. Calculated by taking the total unescalated net development investment including seismic, technical data, drilling and completion costs, and costs of incremental surface facilities divided by incremental net proved developed reserves.

**Cubic feet per day (cf/d)**
At standard conditions, the number of cubic feet of natural gas produced from a well over a 24-hour period, normally an average figure from a longer period of time. May be expressed as mcf/d = thousand cubic feet per day; mmcf/d = million cubic feet per day; bcf/d = billion cubic feet per day; or tcf/d = trillion cubic feet per day.

**Destination Ex-Ship (DES)**
Seller delivers the LNG to the buyer's designated port, with all transportation costs and risks borne by the seller. *See sale and purchase agreement (SPA).*

**Department of Energy (DOE)**
Standing for the United States Department of Energy. This department is responsible for overseeing energy policy and research in the United States.

**Delivered at Place Unloaded (DPU)**
Replacing Delivered at Terminal (DAT), with additional requirements for the seller to unload the goods from the arriving means of transport. An LNG producer procures natural gas feedstock, transports it to the terminal, completes the liquefaction process, charters vessels and delivers LNG to a customer's specified receiving terminal. *See sale and purchase agreement (SPA).*

**Engineering, procurement & construction (EPC) contract**
A legal agreement setting out the terms for all activities required to build a facility to the point that it is ready to undergo preparations for operations as designed.
The final phase in the development of the export portion of the LNG chain that defines the terms under which the detailed design, procurement, construction and commissioning of the facilities will be conducted. Greenfield LNG project development, particularly where this also includes an upstream component, entails a wide variety of design, engineering, fabrication and construction work far beyond the capabilities of a single contractor. Therefore, an LNG project developer divides the work into a number of segments, each one being the subject of an EPC contract. For example, separate EPC contracts are executed for construction of onshore LNG plant and related infrastructure, for the offshore production facilities and for the pipeline from the offshore location to the plant site. *See front-end engineering and design (FEED) contract.*

**Fracturing (fracking)**
Refers to a method used by producers to extract more gas from a well by opening up rock formations using hydraulic or explosive force. Advanced fracturing techniques are enhancing producers' ability to find and recover natural gas, as well as extending the longevity of older wells.

**Front-end engineering and design (FEED) contract**
A legal agreement setting out the terms for all activities required to define the design of a facility to a level of definition necessary for the starting point of an engineering, procurement & construction (EPC) contract.
Generally, the second phase for the development of the export facilities in the LNG chain, which provides greater definition than the prior conceptual design phase. In an LNG project, the most important function of the FEED contract is to provide the maximum possible definition for the work to be performed by the EPC contractor. This enables potential EPC contractors to submit bids on a lump-sum basis, with the least possibility that the contract cost will change through undefined work or through claims for unanticipated changes in the work. Clear definition of contract costs is important not only for cost control purposes, but also for purposes of project financing–LNG project lenders will normally limit their lending commitment to a specific percentage of forecast project costs, and cost overruns will have to be covered by the borrower's equity investment.

**Federal Energy Regulatory Commission (FERC)**
The chief energy regulatory body of the US government. Responsible for regulating LNG facilities in the US. FERC is considered an independent regulatory agency responsible primarily to Congress, but is housed in the US Department of Energy.

**Free-on-board (FOB) contract**
Under an LNG FOB contract, the buyer lifts the LNG from the liquefaction plant and is responsible for transporting the LNG to the receiving terminal. The buyer is responsible for the shipping, either owning the LNG ships or chartering them from a shipowner. In an FOB contract, the seller requires assurance that the shipping protocols provide a safe and reliable off-take for the LNG to prevent disruption to the sales and purchase agreement (SPA). *See sales and purchase agreement (SPA).*

**Henry Hub**
The most widely used reference point for gas price setting in the US. It is based on the price of gas at the Henry Hub physical interconnection between nine interstate and four intrastate gas pipelines in Louisiana. The New York Mercantile Exchange (NYMEX) uses Henry Hub as the notional delivery point for its gas futures contracts, which sets the benchmark gas price in the US Gulf.

**Liquefaction plant**
Facility that converts natural gas (gaseous at normal temperatures and pressure) to liquefied natural gas.

**Midstream activities**
The activities that lie between the Upstream and Downstream sections of the gas supply chain. The term is not well defined and may be used include elements that also fall into the other two categories, such as natural gas processing.

**mt/yr**
Million tonnes per year/per annum.

**Net gas**
Total produced natural gas times net working interest in natural gas production.

**Regasification plant**
A plant that accepts deliveries of liquefied natural gas and vaporises it back to its gaseous form by applying heat so that the gas can be delivered into a pipeline system.

**Sales and purchase agreement (SPA)**
A definitive contract between a seller and buyer for the sale and purchase of a quantity of natural gas or LNG for delivery during a specified period at a specified price. *See annual delivery programme (ADP).*

**Tolling Agreement**
An agreement whereby one party owns (and bears the risks on) the inputs to and outputs from a process, as well as the rights to a portion of the process capacity (the tollee). Another party agrees to operate the process or facility and charges a tolling fee per unit of input that is transformed, or per unit of capacity to which rights are granted (the toller). Under an LNG liquefaction tolling agreement, one company sends a volume of feed gas to a liquefaction facility, wherein the gas is liquefied in return for a preestablished tolling charge.

**Tonne, metric**
A metric tonne equals 1,000 kilograms or 2,204.6 pounds. The capacity of an LNG baseload plant is typically expressed in tonnes and the unit capital costs for producing LNG are expressed as $/tonne.

**Train (liquefaction)**
An independent unit for gas liquefaction. An LNG plant may comprise one or more train.

**Unconventional gas**
Natural gas that cannot be produced using the longest-established technologies. Much of it has only recently become viable to produce, due to either technological improvements or, in some places, higher gas prices that make the use of higher-cost production techniques feasible. Examples include shale gas and coalbed methane.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