# LIQUIFIED NATURAL GAS (LNG) MARKETS

DECEMBER 2023

# EXECUTIVE SUMMARY

- LNG use is expected to increase globally as natural gas replaces coal-fired generation and to provide energy security for many regions beset by supply disruption(s).
- The Russia/Ukraine conflict has stimulated interest in Liquefied Natural Gas ('LNG') as Europe seeks to offset declines in Russian gas supply.
- The LNG market experienced a turbulent year in 2022 as Europe competed with Asia for LNG cargoes.
- Global LNG trade grew by 7% between 2021 and 2022 to just over 400 mtpa with the increase primarily driven by European imports.
- The US accounted for 3/4 of new liquefaction capacity in 2022.
- In 2022, European regasification utilization jumped to 65%, up from 40% in 2021.

Sources:
International Gas Union
Incorrys Analysis
GIIGN
US Energy Information Administration

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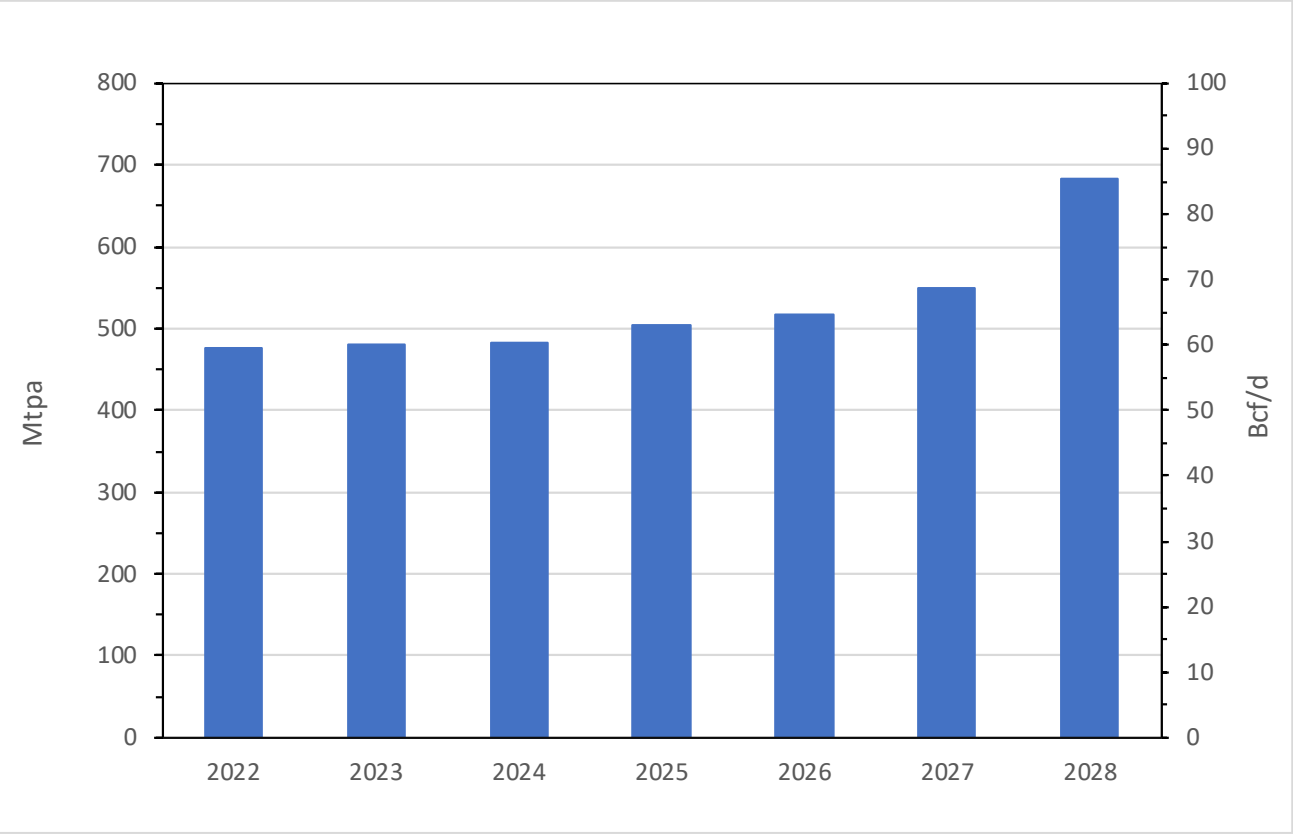
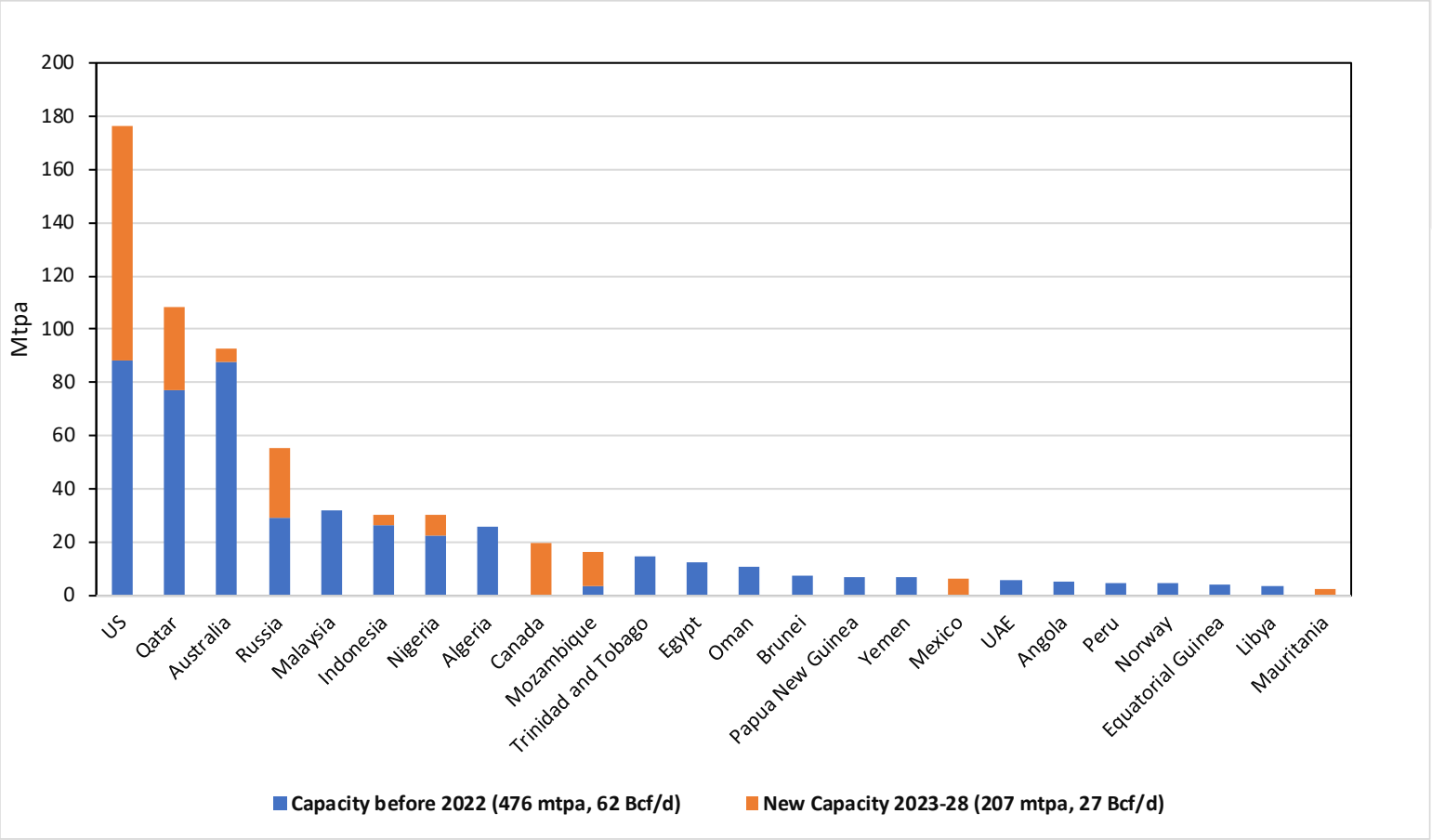
# GLOBAL LIQUEFACTION CAPACITY GROWTH 2022-2028




- Almost 20 mtpa of new liquefaction capacity was brought online globally in 2022.
- The US accounted for 75% of this new capacity: Sabine Pass LNG T6 (5.0 mtpa) in February 2022, and Calcasieu Pass LNG T1-T18 (10 mtpa) in May 2022.
- Other projects that began operation in 2022 include:
  - Russia, Portovaya LNG, T1 (1.5 mtpa)
  - Mozambique, Coral South FLNG (3.4 mtpa)
- Two additional liquefaction projects are expected in 2023:
  - Mexico, Altamira FLNG (2.8 mtpa)
  - Indonesia, Tangguh LNG T3 in (3.8 mtpa)
- LNG Canada on Canada's west coast is expected to be in-service with deliveries from the first train (0.9 Bcf/d) expected in 2025.
- Global liquefaction capacity increases slowly through 2026 averaging about 2% growth annually before jumping 6% year-over-year in 2027 and 24% in 2028.
- Global LNG liquefaction capacity is set to increase from 475 mtpa (62 Bcf/d) in 2022 to 685 mtpa (89 Bcf/d) in 2028, up over 40%.
- There is currently 1000 mtpa of new liquefaction capacity in the pre-FID stage. Many of these projects are unlikely to proceed due to weak fundamentals and/or geopolitical factors.

# LIQUEFICATION CAPACITY BY COUNTRY 2028




- Global LNG liquefaction capacity stood at 476 mtpa (62 Bcf/d) by 2022.
- In July 2023, projects totaling 207 mtpa(27 Bcf/d) are being developed globally.
- By 2028, global capacity is expected to reach over 680 mtpa, equivalent to 89 Bcf/d.
- In 2028, 24 countries are expected to be exporting LNG including four new countries: Mauritania, Mexico, Canada, and Congo.
- Canada will become a top 10 LNG exporter by 2028 with the addition and expected expansion of LNG Canada.
- By 2028, the US is expected to double current capacity reaching almost 180 mtpa (~24 Bcf/d) of liquefaction capacity.
- In 2028 the US will be the largest exporter, significantly ahead of 2nd place Qatar and Australia.

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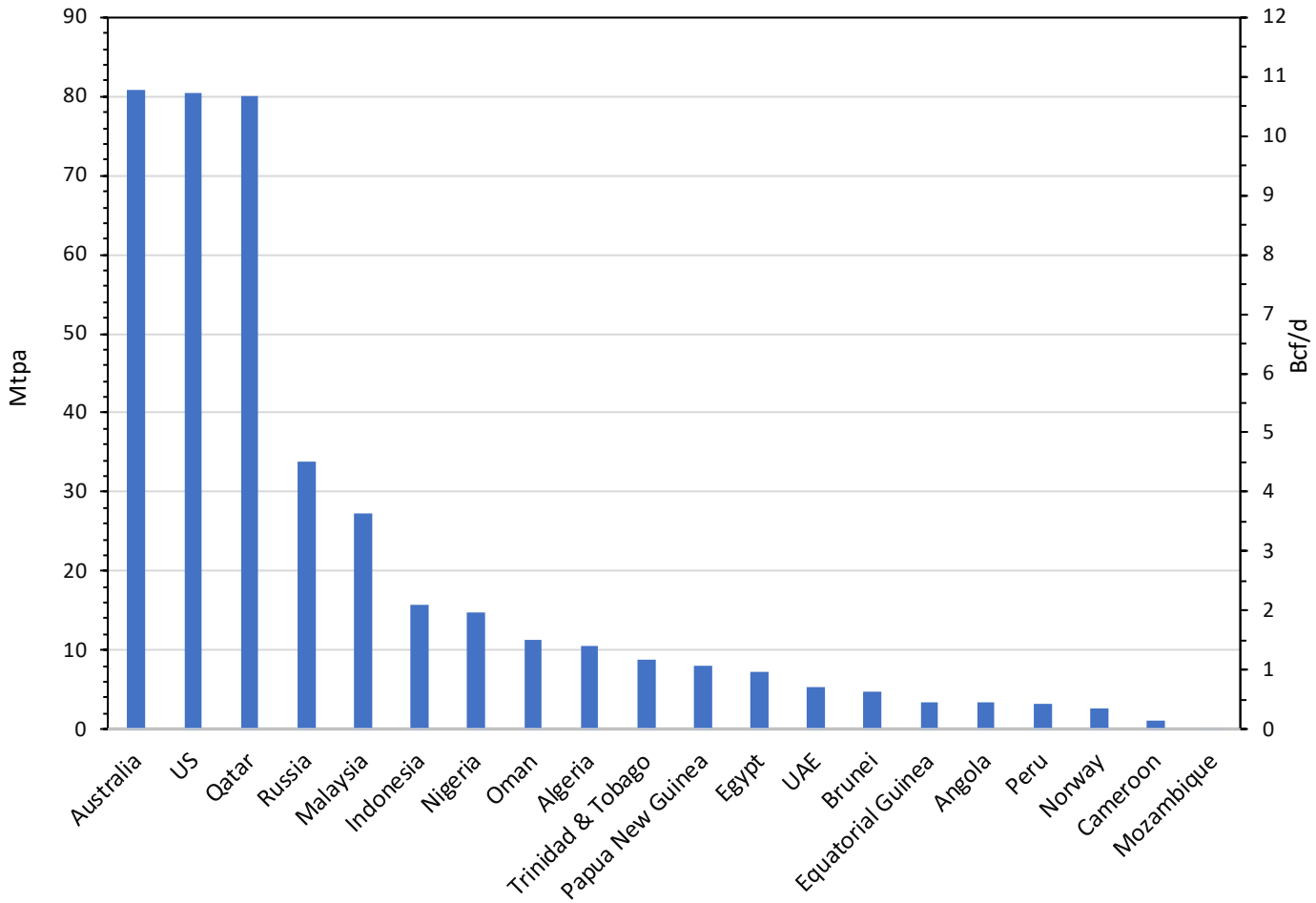
# LNG EXPORTS BY COUNTRY 2022




- In 2022, there were 20 countries exporting LNG led by Australia, the US, Qatar, Russia, and Malaysia. Combined, these top exporters accounted for 75% of the world total.
- The largest exporting region continued to be Asia Pacific with a total of over 130 mtpa (18 Bcf/d) in 2022, a 5 mtpa increase compared to 2021.
- The Middle East with 97 mtpa of output ranked second, and North America ranked third with exports of 81 mtpa.
- North America recorded the largest growth from 2021 of over 10 mtpa.
- Australia retained its position as the largest exporting country in 2022 sending out 81 mtpa versus 79mtpa in 2021.
- The United States is on track to become the world's largest exporter of liquefied natural gas (LNG) in 2023 as new projects come onstream and Europe seeks to offset Russian gas supply.

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# US LNG PROJECTS

### Driftwood LNG, LA
- Tellurian Inc. EPC contractor - Bechtel
- Limited Notice To Proceed – issued in April 2022
- First LNG in 2026
- Phase 1: 1.5 Bcf/d (11 mtpa)
- Expanded: 3.6 Bcf/d (27.6 mtpa)

### Golden Pass, TX
- ExxonMobil and Qatar Petroleum
- 3 trains, 0.8 Bcf/d (6 mtpa) each
- Anticipated startup of Train 1 is H1, 2025.
- 2.4 Bcf/d (18mtpa)

### Freeport, TX
- Freeport LNG
- 0.7 Bcf/d (5 mtpa) – Train 1
- 1.4 Bcf/d (10 mtpa) – Train 2-3
- Completed in 2020
- *Shutdown Jun'22-Feb'23 due to an explosion*

### Corpus Christi, TX
- Cheniere
- 1.2 Bcf/d (9 mtpa) –Train 1-2
- 0.6 Bcf/d (4.5 mtpa) – Train 3
- Completed in 2021

### Corpus Christi Stage 3, TX
- 1.3 Bcf/d (9.94 mtpa) – 7 trains
- Production to be started in 2027

### Calcasieu Pass, LA
- Venture Global LNG
- Total of 9 Units (8 modular trains), first 2 trains startup 2022 (~0.15 Bcf/d)
- Total capacity: 1.3 Bcf/d (10 mtpa)

### Cameron LNG, LA
- Sempra
- 0.6 Bcf/d (4.5 mtpa) –Train 1
- 1.4 Bcf/d (9 mtpa) – Train 2-3
- Completed in 2020

### Cove Point, MD
- Dominion Resources
- 0.8 Bcf/d (6 mtpa)

### Elba Island, GA
- Kinder Morgan
- 0.35 Bcf/d (2.5 mtpa)
- Full capacity in 2020

### Sabine Pass, LA
- Cheniere
- 3.95 Bcf/d (22.5 mtpa) from 6 trains

### Rio Grande LNG, Brownsville, TX
- NextDecade
- 5 trains (approximately 16 mtpa), trains 1-3 under construction
- 27 mtpa/3.55Bcf/d at full capacity


Operational | Under Construction | Approved | Proposed

### Plaquemines Phases 1 & 2, LA
- Venture Global LNG ($21 billion)
- 2.8 Bcf/d (20 mtpa) with a peak of 24 mtpa)
- Venture Global issued full notice to KZJV to continue construction of phase 2 (March 2023)
- Start of production: phase 1- 2024 (10 mtpa), phase 2- 2025.

### Port Arthur Phase 1, TX
- Sempra Energy ($13 billion)
- Phase 1: 1.7 Bcf/d (13 mtpa)
- Long-term contracts for 1.5 Bcf/d (10.5 mtpa)
- Construction started: 2023 ( EPC contractor- Bechtel)
- Expected commercial operation Train 1 2027 and Train 2 2028

### Approved - Not Under Construction
- 11 Projects in total; 10 FERC and 1 MARAD/USCG
- 15 Bcf/d Total

### Proposed
- 7 Projects in total; 4 pending applications and 3 pre-filing
- 9.3 Bcf/d Total

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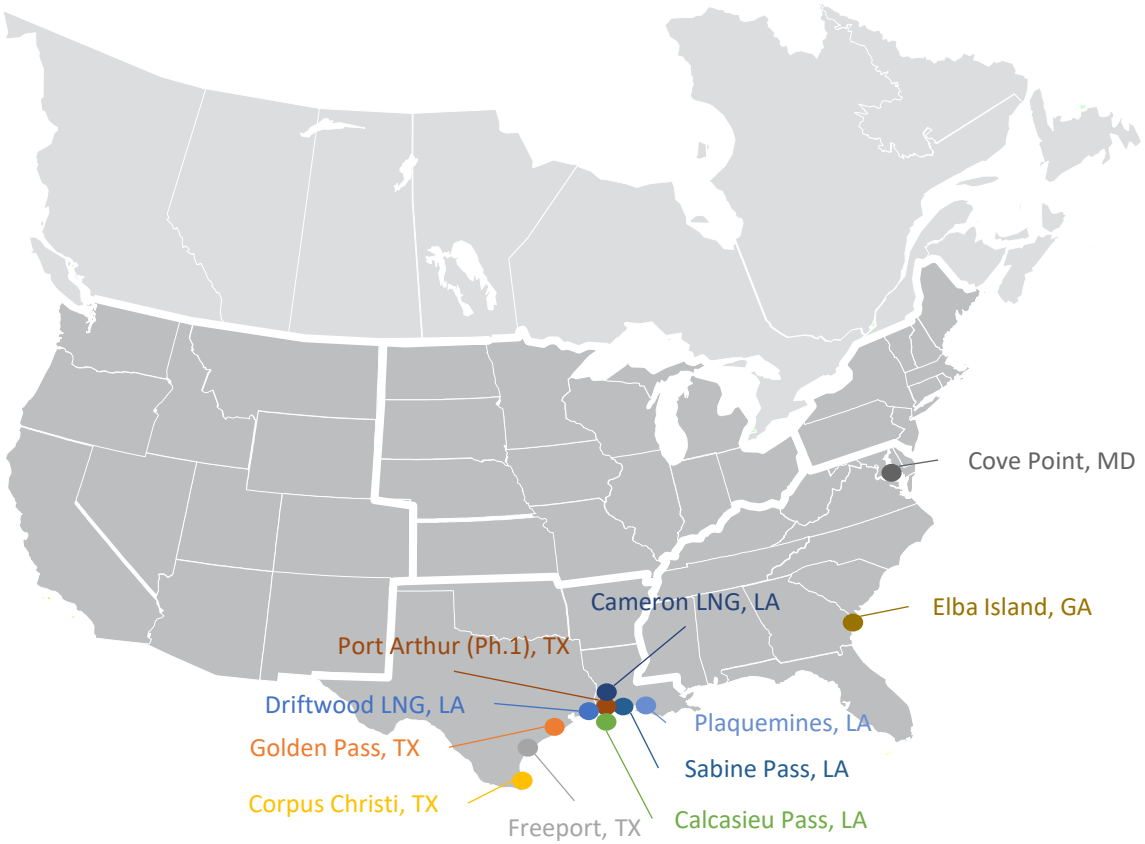
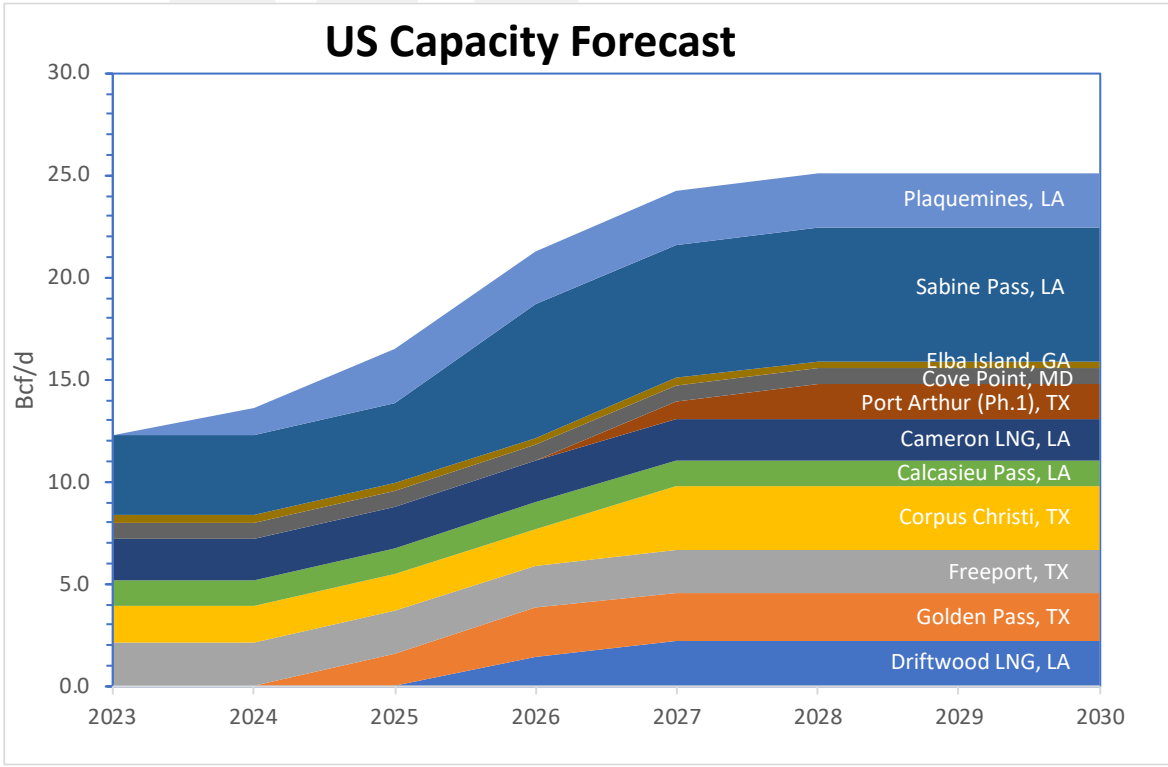
# US LNG EXPORTS TO 2030




- The US is expected to reach ~ 12.0 Bcf/d of exports in 2023, up 17% from 2022.
- Incorrys is forecasting US exports to increase further to 13.5 Bcf/d in 2024 and 25 Bcf/d by 2028.
- The US accounts for almost 90% of the 2030 total.

- Sabine Pass is by far the largest facility in North America at 4.0 Bcf/d in 2022 increasing to 6.5 Bcf/d by 2026.
- Corpus Christi, TX is the 2nd largest facility growing from 1.8 Bcf/d in 2023 to 3.1 Bcf/d by 2027.
- Plaquemines, LA grows from 1.3 Bcf/d in 2024 to 2.6Bcf/d by 2024.
- These 3 facilities are expected to represent about 45% total North American capacity.

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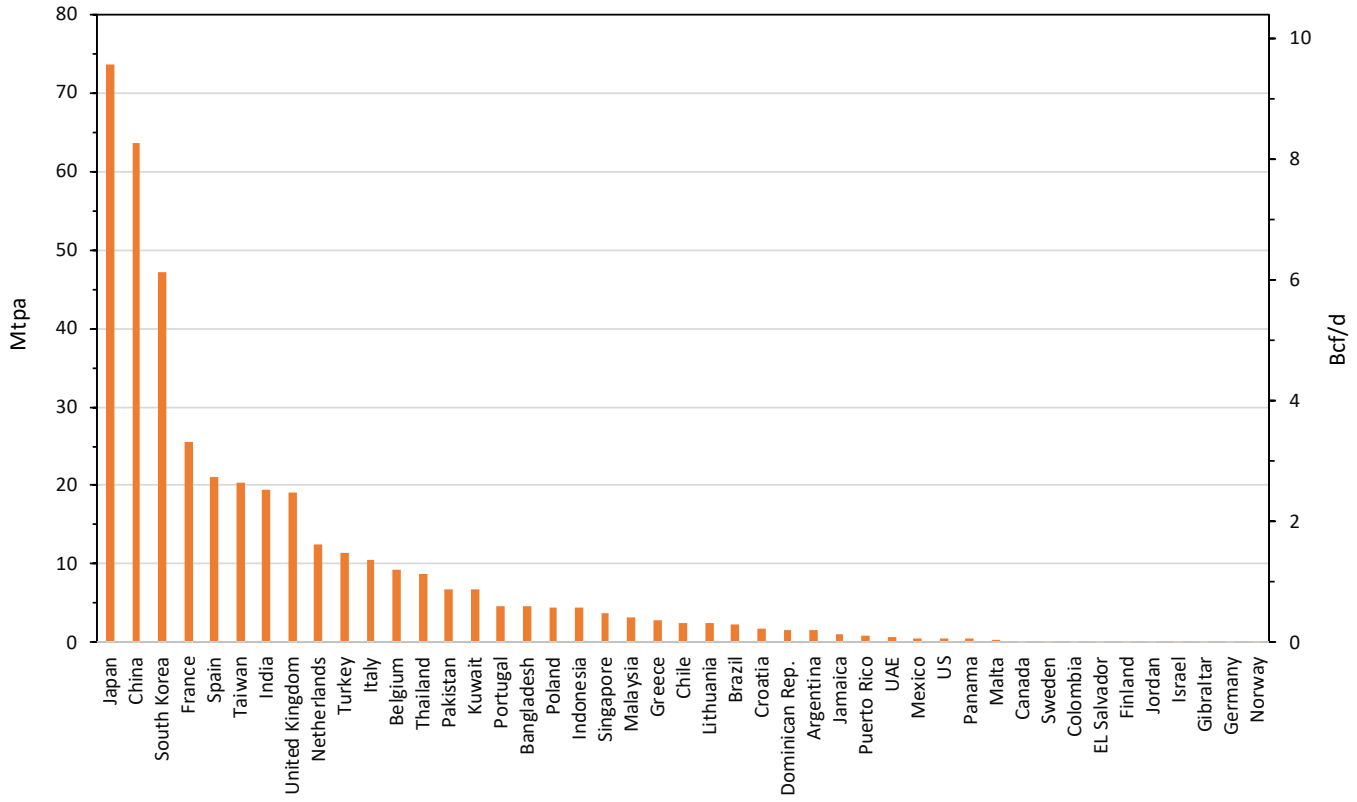
# LNG IMPORTS BY COUNTRY2022




- Global LNG trade reached a new record of over 400 mtpa (53 Bcf/d) in 2022 with El Salvador (0.2 mtpa) and Germany (0.07 mtpa) joining the ranks.

- In total, there are now 46 countries importing LNG worldwide.

- The top 7 countries accounted for almost 70% of total LNG import volumes in 2022.

- The Russia/Ukraine conflict and global energy crisis changed LNG import patterns during 2022:
  - France moved from 7th place to 4th in 2022 after importing 25 mtpa, up 109% from 2021
  - Spain ranked 5th largest importer with over 20 mtpa (+7.3 mtpa)
  - Taiwan imported 20 mtpa (+0.5 mtpa).
  - China's imports dropped from 80 mtpa in 2021 to 65 mtpa in 2022 replaced by increased coal-fired power generation.
  - India imported 19 mtpa last year, a 4 mtpa drop from 2021, replaced by increased coa-fired power generation.
  - South Korea imported over 45 mtpa, relatively flat to 2021.
  - Japan was the world's largest LNG importer at almost 75 mtpa.

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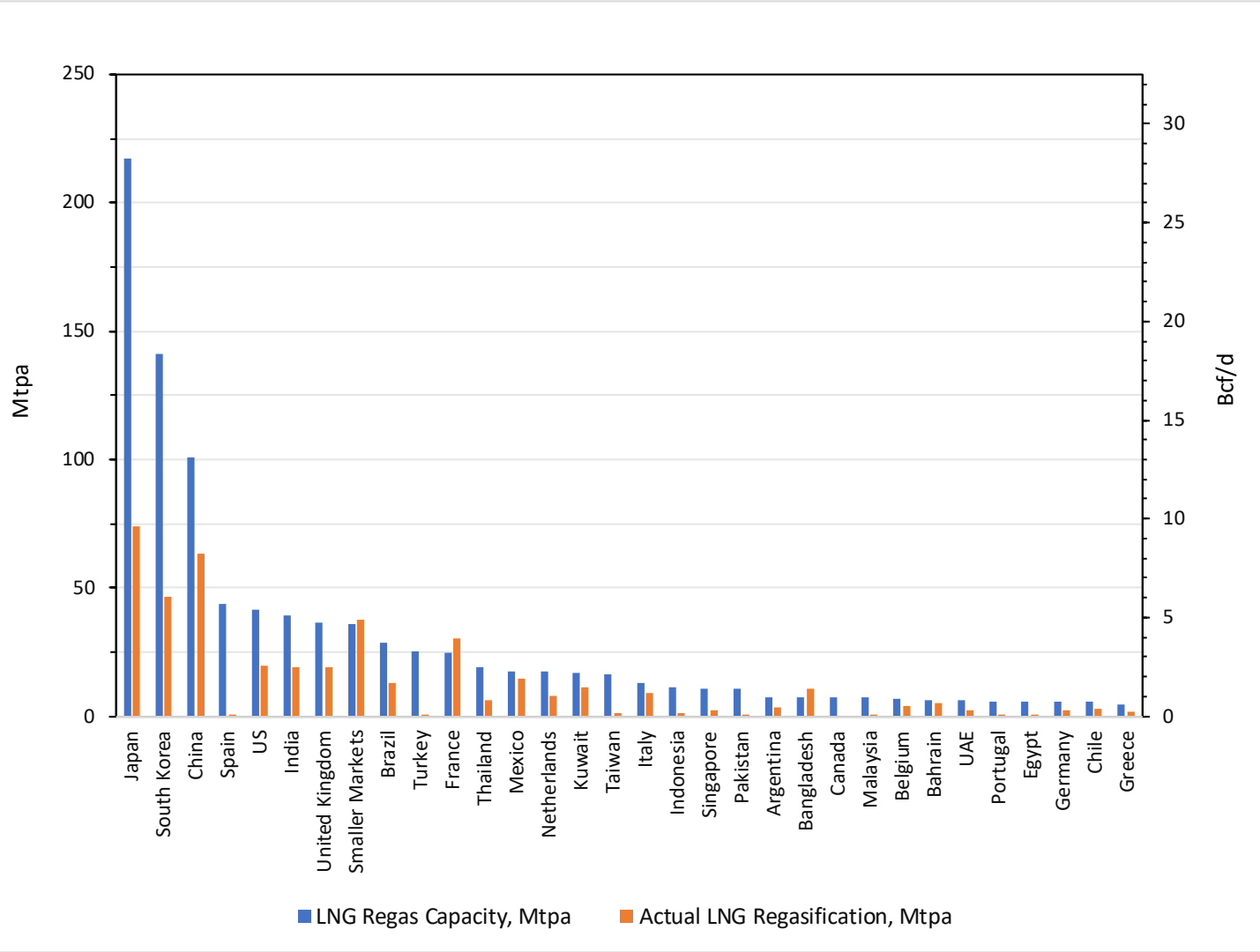
# LNG REGASIFICATION BY COUNTRY 2022




- As of April 2023, global regasification capacity grew by 25 mtpa to 970 mtpa across 48 markets, up from 39 countries just a few years ago.
- Germany has committed to building 5 new import terminals to end their reliance on Russian pipeline gas. The first terminal, a Floating Storage & Regasification Unit (FSRU) in the north, opened in Dec. 2022 and took under 10 months to construct.
- Japan has the largest regasification capacity at 218 mtpa (28 Bcf/d), followed by South Korea at 140 mtpa (18 Bcf/d) and China at 100 mtpa (13 Bcf/d).
- Combined, these 3 countries account for almost half of global regasification capacity.
- Utilization rates for global regasification facilities in 2022 was about 40%.
- European regasification utilization jumped to 65%, up from 40% in 2021.
- As of April 2023, 220 mtpa of new regasification capacity is under construction worldwide, including 26 new onshore terminals, 16 new floating-based terminals and 17 expansion projects.

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# LNG SHIPPING

## Daily Charter Rates (USD):

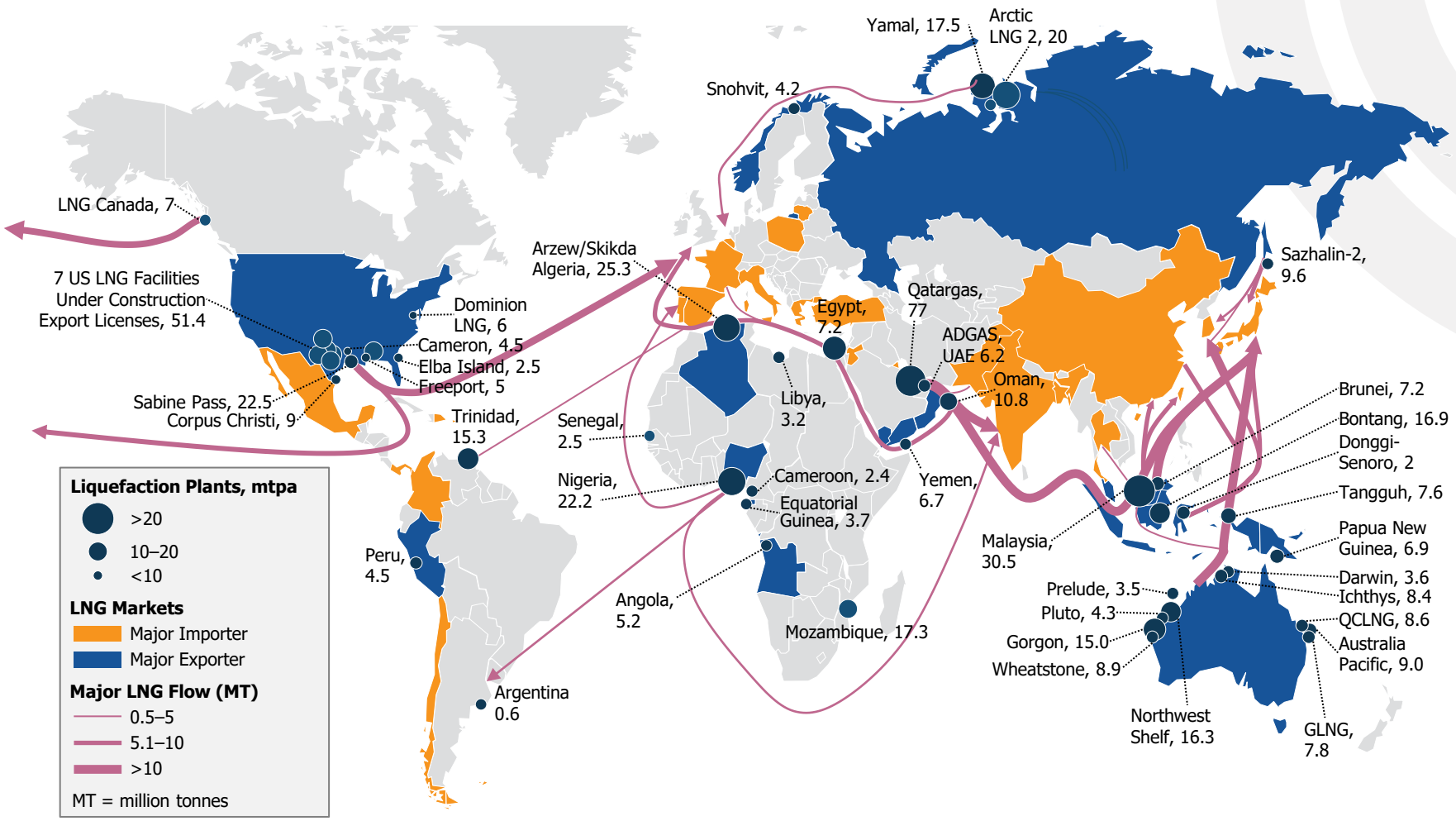
| Shipping Technology ** | May-June 2022 | October 2022 | Early 2023 |
|---|---|---|---|
| Steam turbine | $45,000 | $250,000 | $52,000 |
| Duel and Triple-Fuel Diesel Electric (DFDE/TFDE) | $80,000 | $355,000 | $82,000 |
| Low-pressure slow-speed dual-fuel (X-DF), high-pressure slow-speed dual-fuel (ME-GI) | $120,000 | $450,000 | $92,000 |

## LNG Shipping Fleet:

- The global LNG fleet increased by 4% in 2022 with the delivery of 27 new vessels and . grew by another 11 vessels in the first four months of 2023 to ~ 670 active vessels; includes 45 operational Floating Storage and Regasification Units (FSRUs) and 8 Floating Storage Unit (FSUs).
- There are currently 312 newbuild vessels under construction, almost 50% more than the existing fleet; 28 of these new vessels are expected to be delivered by the end of 2023 and a further 81 in 2024.
- There were 6900 trade voyages in 2022, with increased shipping to Europe to offset Russian gas pipeline declines due to the Ukraine / Russia conflict.

- At the beginning of 2022, charter rates eased briefly before ticking upwards with the start of the Russian invasion of the Ukraine in February. This sparked increased LNG demand in Europe pushing charter rates higher.
- Rates reached USD $45,000/day for steam turbine vessels, $80,000/day for DFDE/TFDE vessels and $120,000/day for X-DF/ME-GI vessels by mid year.
- With a decline in Russian gas expected, Europe began to prepare for winter in August 2022, leading to dramatic rate increases by the end of October; $250,000/day for steam turbine vessels, $355,000/day for TFDE/DFDE vessels and $450,000/ day for X-DF/ME-GI vessels
- A milder than expected winter in 2022/2023 led to high storage inventories in both Europe and Asia causing charter rates to soften considerably.
- Heading into the winter of 2023, the Panama Canal is experiencing low water levels (due to drought in the region) which has led to a restriction on the number of transits. This is forcing some LNG shippers to either pay millions to jump the queue or alter their route to round the Cape of Good Hope which adds thousands of extra miles and about two weeks to the total trip.
- In 2024, the demand for shipping is expected to increase by almost 20%, putting upward pressure on rates.
- Post 2024, charter rates are expected to decline due to large investments in new ships, and fleet optimization.

# LNG EXPORT & IMPORT SHIPPING ROUTES




- Global LNG trade reached a new record of just over 400 mtpa in 2022, up 7% from 2021, connecting 20 exporting countries with 46 importing markets.
- The increase can be attributed primarily to restricted pipeline flows from Russia following their invasion of the Ukraine.
- Increased European demand pushed LNG prices higher to attract cargoes from Asia.
- European and East Asian markets are sourcing LNG primarily from the Middle East, Indonesia, Malaysia, Australia, and increasingly from the US.

- Approximate Locations (as of Nov 2021); includes operational and under construction projects with start dates before 2026. Not all facilities are operating at capacity due to declining gas feedstock production, operational issues, and other factors.

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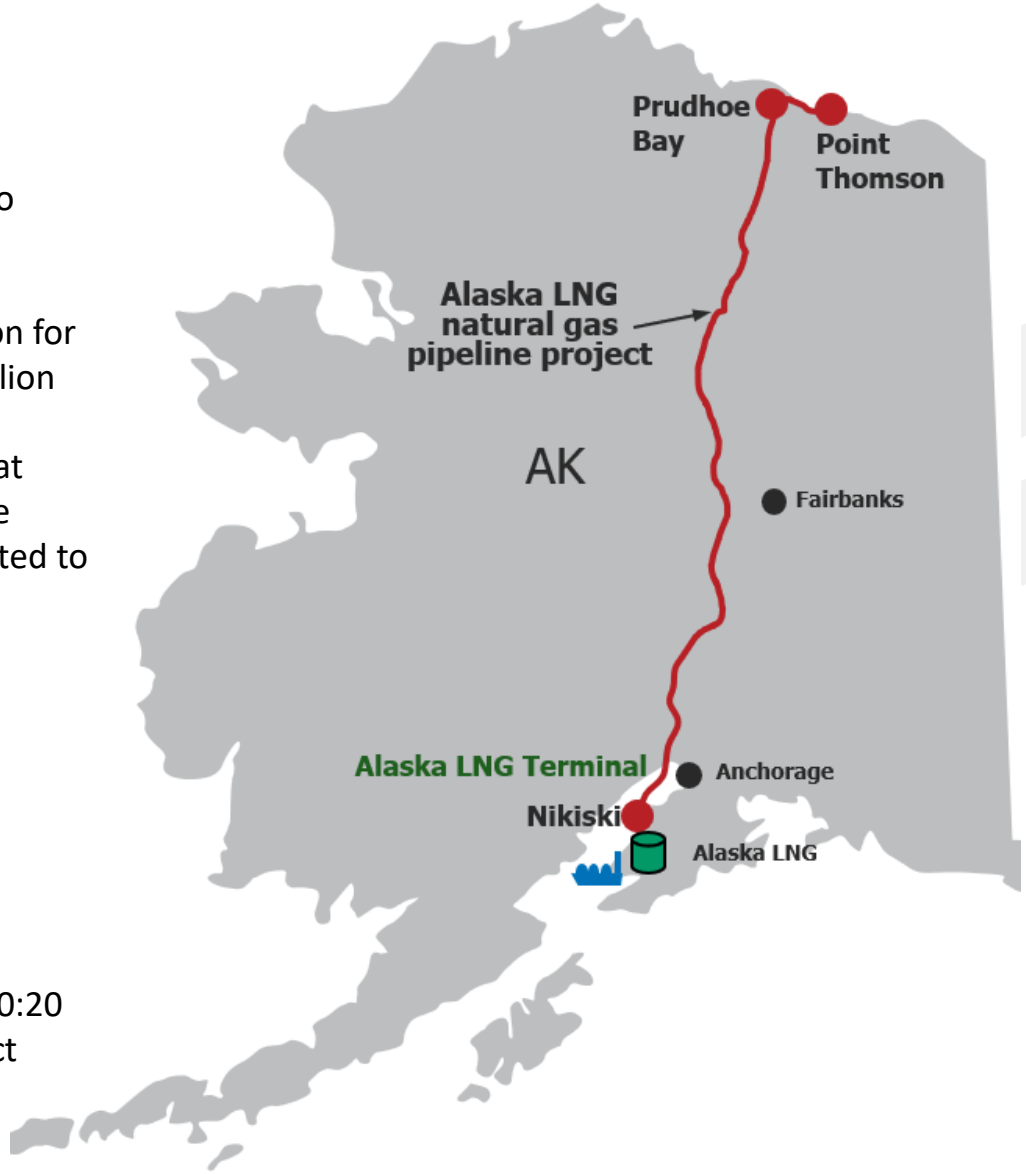
# ALASKA LNG

- The proposed Alaska LNG and pipeline project connects the North Slope to Southcentral Alaska.
- Proponent: Alaska Gasline Development Corporation (AGDC)
- The most recent cost estimate for the project (June 2022) is USD $17 billion for the facility and $39 billion total including the pipeline. Total is down $6 billion from the 2015 estimate of $45 billion.
- 2.6 Bcf/d (20.0 mtpa) – 3 Trains, Gas Treatment Plant (3.3 Bcf/d capacity) at Prudhoe Bay, 3 × 160,000 m3 Storage Tanks, and 800-mile 42-inch pipeline (3.3 Bcf/d capacity). The Prudhoe Bay and Point Thomson fields are expected to produce 3.5 Bcf/d of gas.
- The project received permits from the following authorities:
  - Federal Energy Regulatory Commission (FERC) - May 2020
  - Environmental Impact Statement (EIS) and Order
  - Major federal permits and authorizations
  - Land rights-of-way (ROW): about 93% of Project area
  - Approved Cultural Resources Management Plan
  - Gas Treatment Plant Air Permit
  - Liquefaction Facility Air Permit
- US Government has provided a 30-year, US$26 Billion loan guarantee at 80:20 debt to equity ratio which will reduce the cost of debt and enhance project economics.

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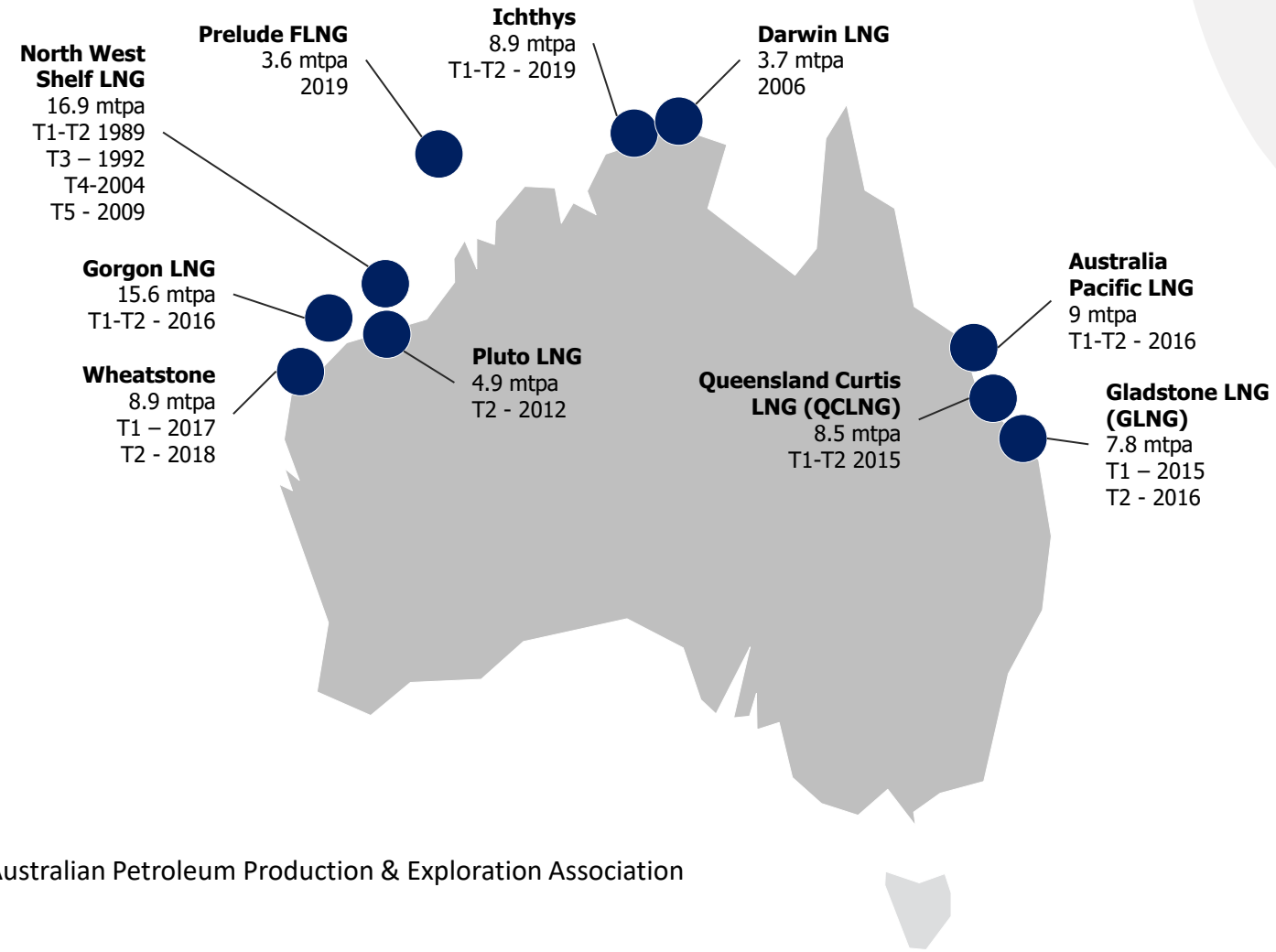
# AUSTRALIAN LNG PROJECTS




Source: The Australian Petroleum Production & Exploration Association (APPEA)

- Australia currently has ten operating LNG facilities with total nameplate capacity of almost 90 mtpa.
- Other projects are also being considered.
- Western Australia capacity is 50 mtpa across 5 LNG projects, 2 of which represent almost 60%.
- These two projects are Gorgon (16 mtpa) and Wheatstone (9 mtpa), tapping gas from the Greater Gorgon area field which has more than 35 trillion cubic feet (Tcf) of resources.
- Gorgon is developed by Chevron, ExxonMobil, and Shell.
- Queensland can produce 25 mtpa from 3 projects.
- Northern Territory's 2 projects have a capacity of over 12 mtpa.

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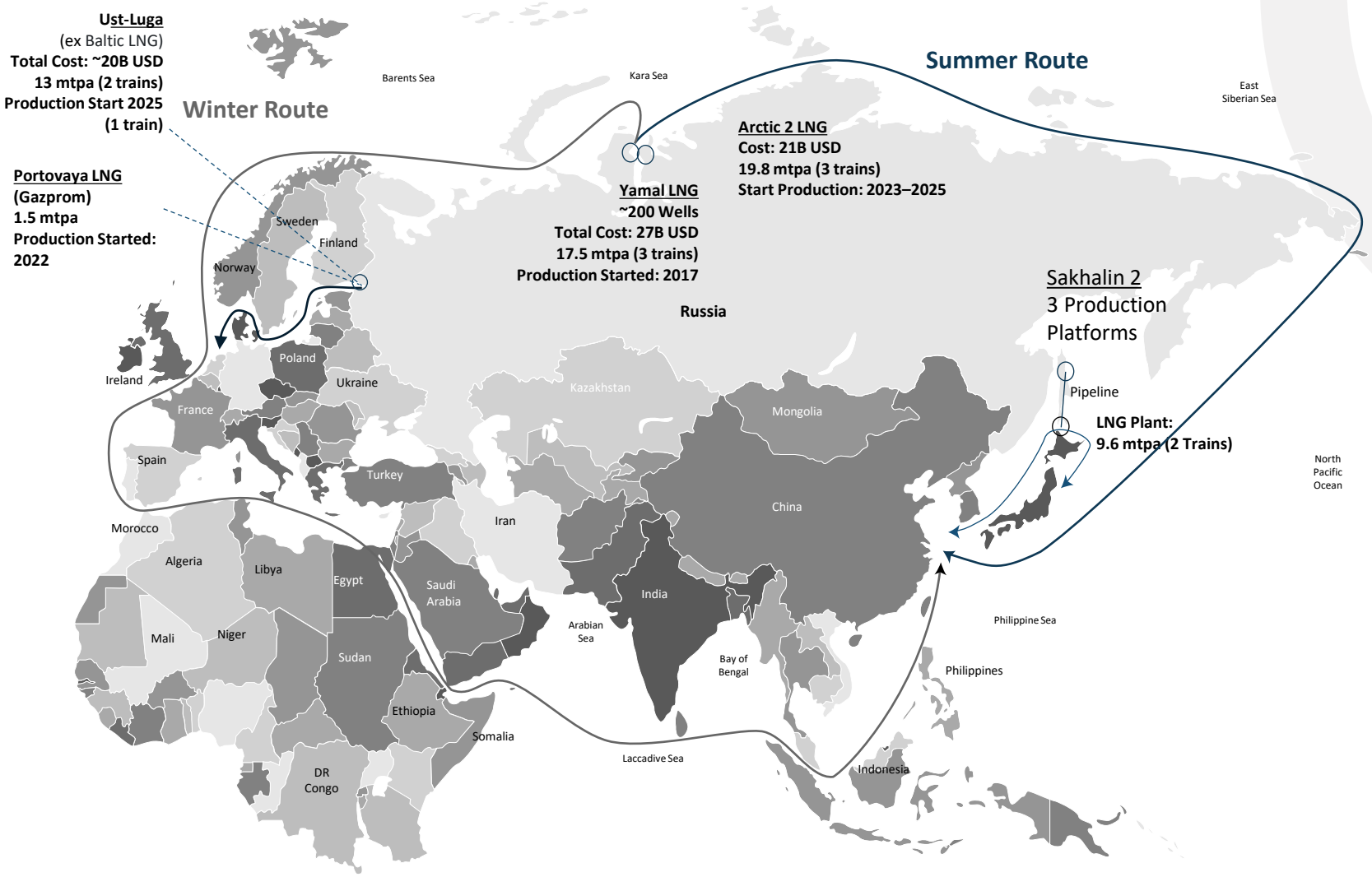
# RUSSIAN LNG PROJECTS




- Russia's strategic objective is at least 100 million mtpa of LNG exports, tripling 2022 output of 33 mtpa.
- Europe is the main target with LNG delivered primarily from Yamal LNG.
- Portovaya LNG T1 (1.5 mtpa) started commercial operation in November 2022.
- Under construction Ust-Luga and Arctic LNG 2, will double Russia's current capacity to over 65 mtpa.
- Ust-Luga's 13 mtpa facility is expected to be the largest in northwestern Europe.
- The invasion of the Ukraine has cast doubt on the Russian LNG development as Western sanctions disable Russia's ability to access Western financing.
- Russia lacks LNG specialists and advanced technology to expand output. For instance, projects will have difficulty sourcing domestically produced turbines to replace imports.
- Incorrys expects additional delays in Russian LNG capacity.
- Only the first phase (1 train) of Ust-Luga is expected to be operating by 2025. Linde (engineering, procurement and construction management company (ECPM)) withdrew from the project in 2022.

# WHY INCORRYS INFORMATION SYSTEM

## COMPREHENSIVE DATA

Incorrys constantly collects huge amounts of data from multiple sources world-wide

## ADVANCED ANALYTICS

Incorrys performs data analysis to ensure quality and consistency among different industries and jurisdictions

## ACCURATE FORECASTS

Incorrys employs proprietary forecasting methodologies to ensure accurate forecasts of trends in different industries.

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