NARUC Summer Policy Summit

# Committee on Int’l Relations and Staff Subcomm on Gas LNG Exports: New Realities

This session will begin at 11:15 am

# Emissions and Natural Gas

Andreas Thanos

# Disclaimer

To the extent that statements appear as opinions, they are solely those of the presenter and do not represent those of the Massachusetts Department of Public Utilities, the Commonwealth of Massachusetts or any organization the presenter is affiliated with.

The data used for this presentation, unless otherwise noted, come from the 2022 Edition of bp Statistical Review of World Energy

Any errors or omissions are the sole responsibility of the presenter.

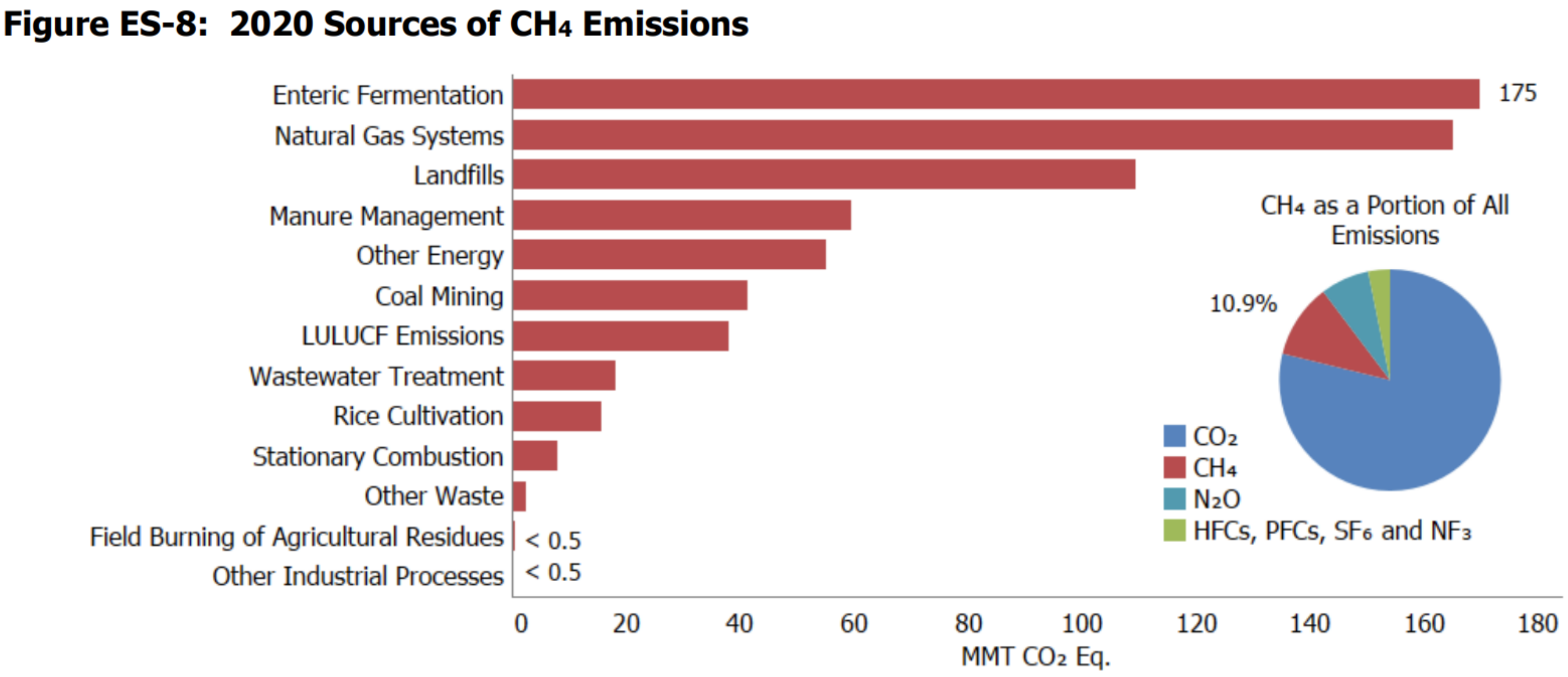
# $CO_2$ & $CH_4$ Emissions from select fuels – Stationary Combustion

(source: https://www.epa.gov/climateleadership/ghg-emission-factors-hub)

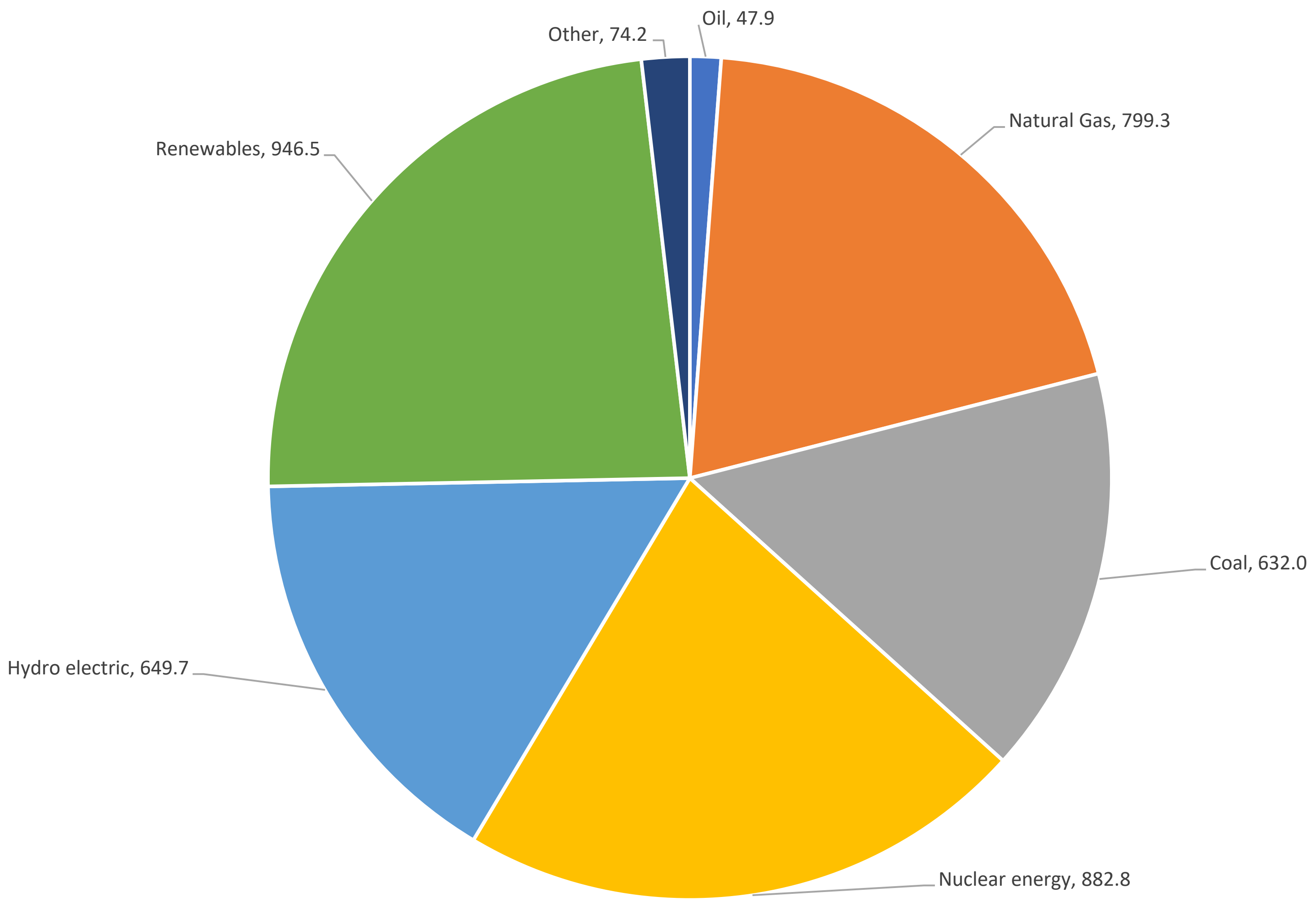
| Fuel | KG $CO_2$/MMBtu | G $CH_4$/MMBtu |
|---|---|---|
| Coal Mixed (Commercial Sector) | 94.27 | 11 |
| Coal Mixed (Electric Power Sector) | 95.52 | 11 |
| Natural Gas | 53.06 | 1.0 |
| Propane Gas | 61.46 | 3.0 |
| Landfill Gas | 52.07 | 3.2 |
| Distillate Fuel Oil No. 1 | 73.25 | 3.0 |
| Distillate Fuel Oil No. 2 | 73.96 | 3.0 |
| Distillate Fuel Oil No. 4 | 75.04 | 3.0 |
| Propane | 62.87 | 3.0 |
| North American Softwood | 94.4 | 1.9 |
| North American Hardwood | 93.7 | 1.9 |

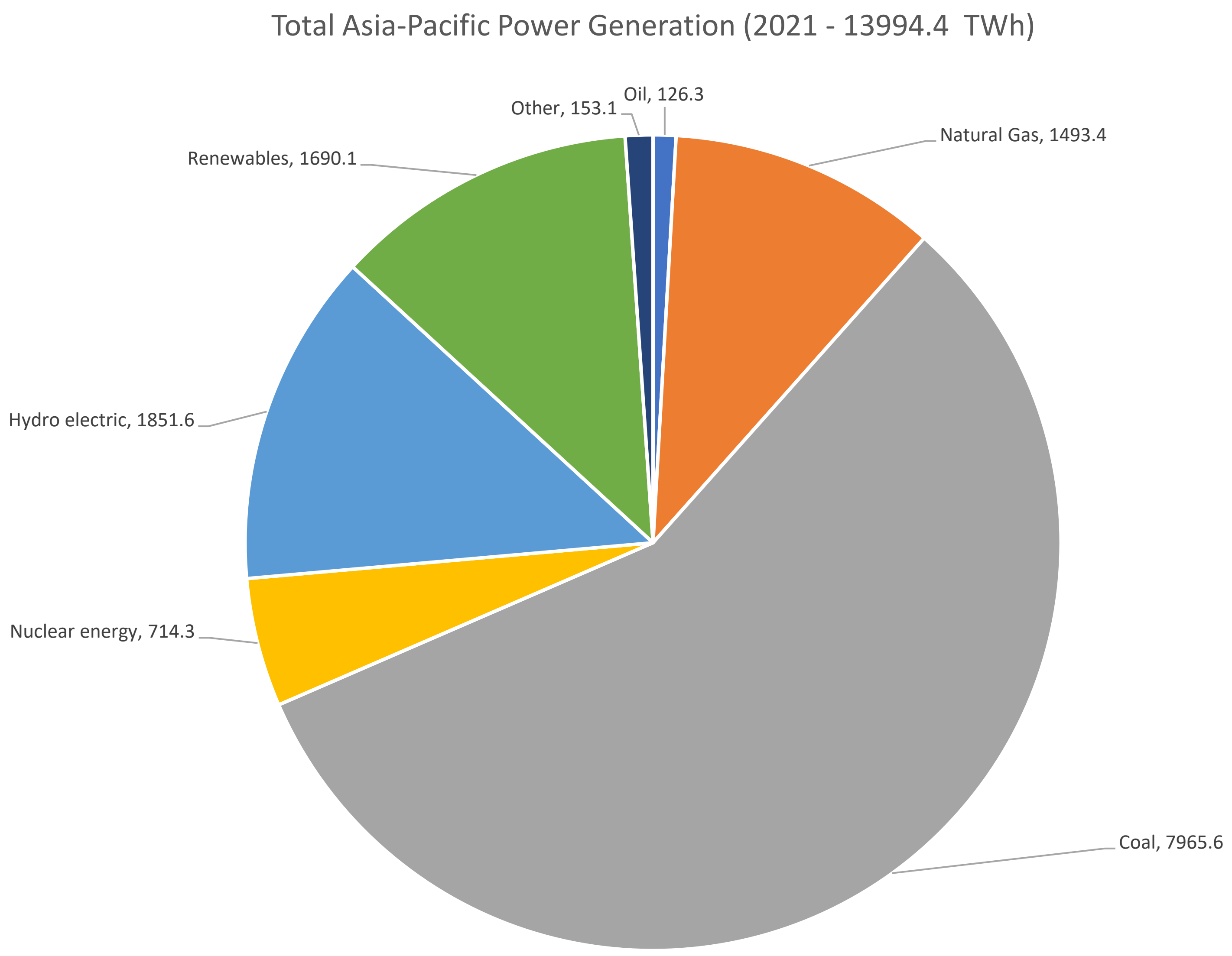
# Methane Emissions by Source

(source: Inventory of U.S. Greenhouse Gas Emissions and Sinks (EPA 430-R-22-003)

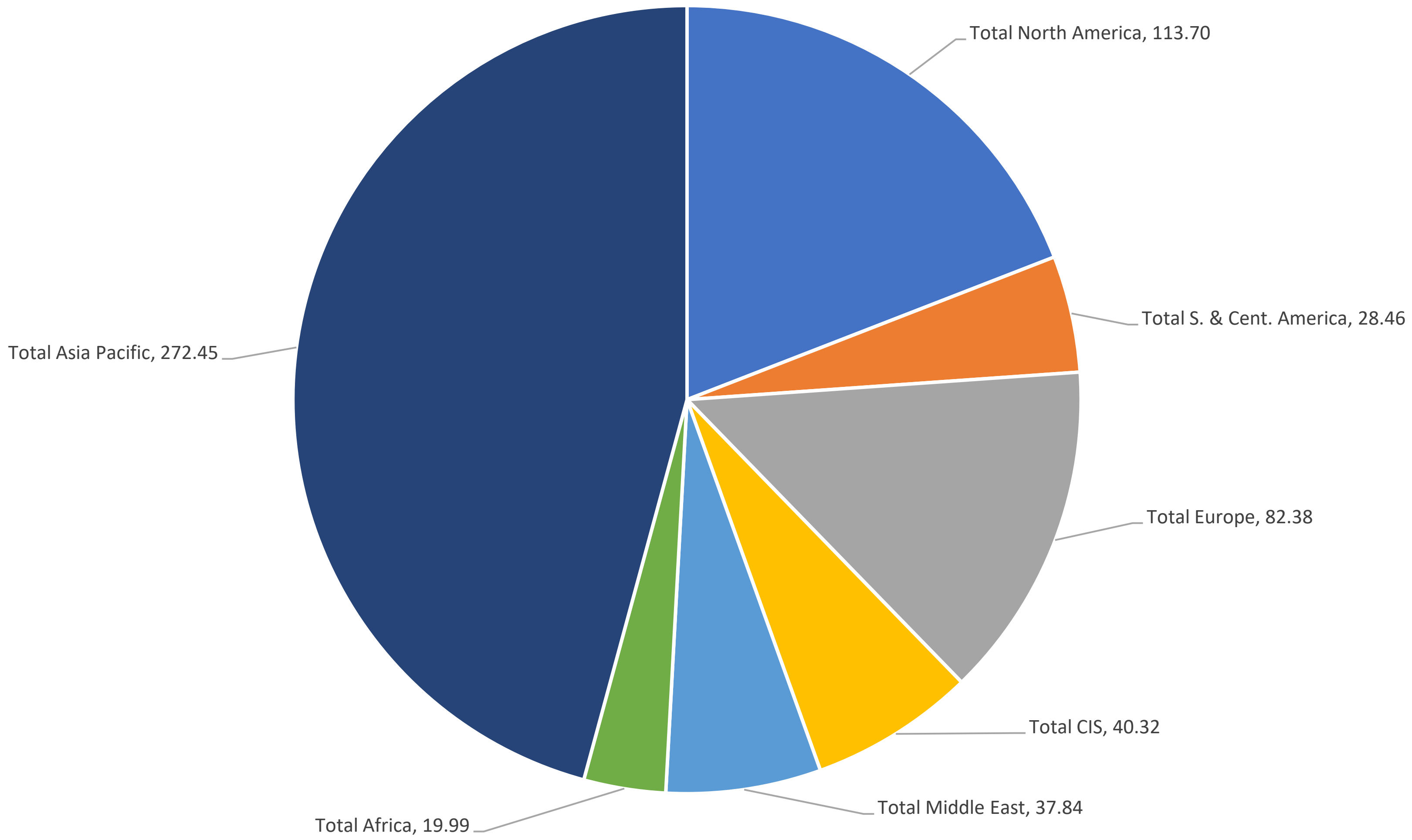


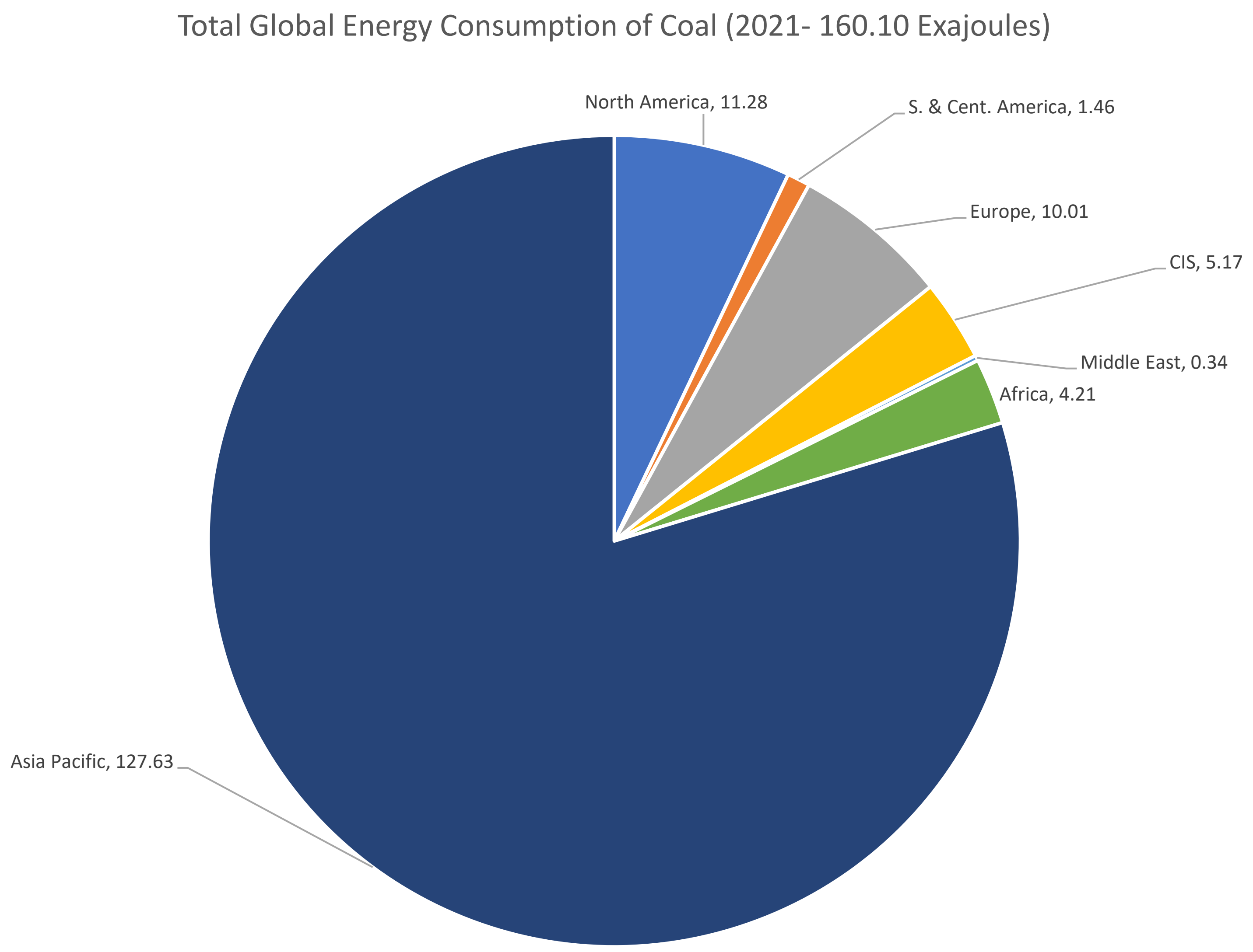
Total European Power Generation (2021 - 4032.5 TWh)

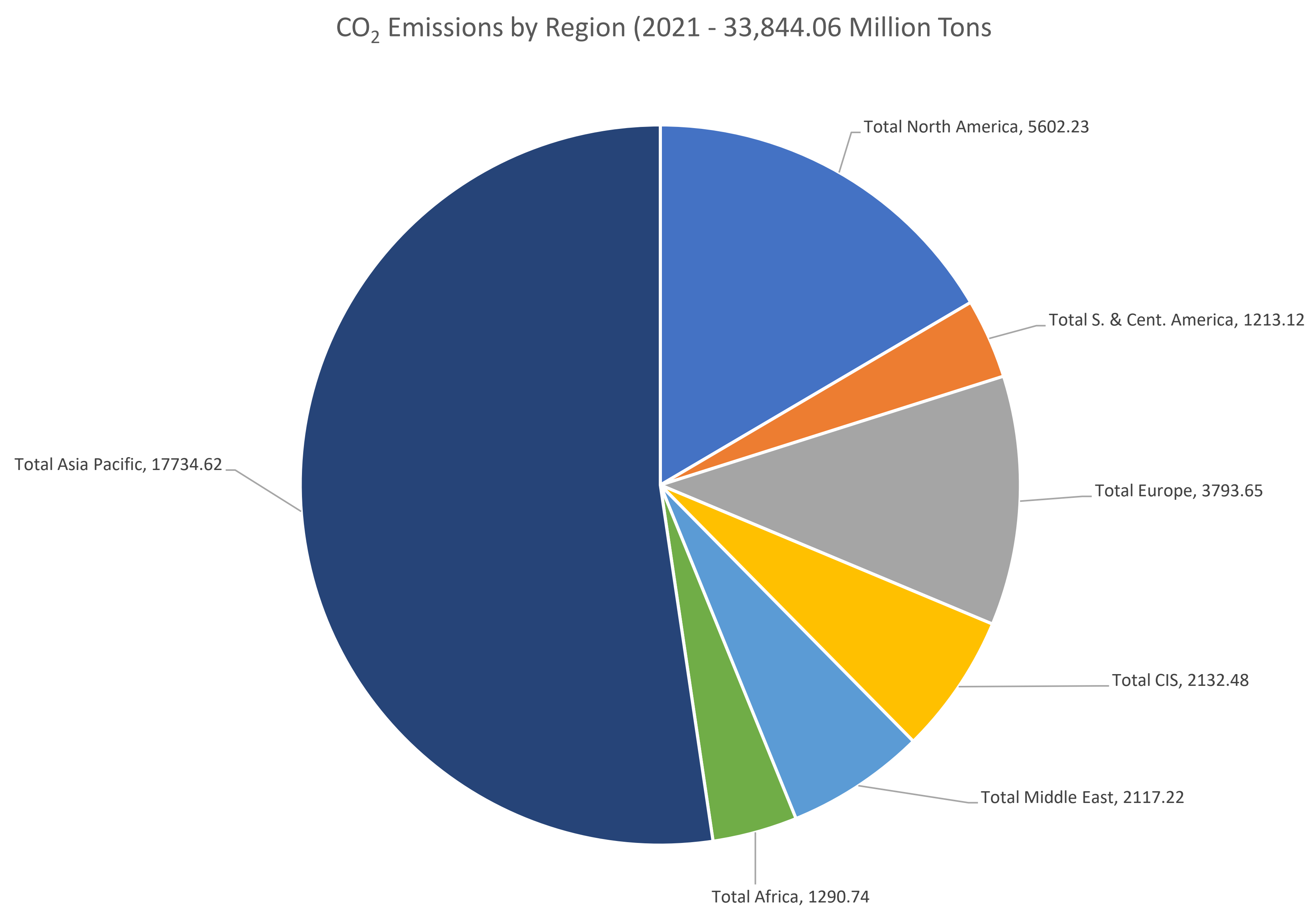



Total Asia-Pacific Power Generation (2021 - 13994.4  TWh)
Oil, 126.3
Other, 153.1
Natural Gas, 1493.4
Renewables, 1690.1
Hydro electric, 1851.6
Nuclear energy, 714.3
Coal, 7965.6

Total Primary Energy Consumption (2021 -- 595.15 Exajoules)




Total Global Energy Consumption of Coal (2021- 160.10 Exajoules)
North America, 11.28
S. & Cent. America, 1.46
Europe, 10.01
CIS, 5.17
Middle East, 0.34
Africa, 4.21
Asia Pacific, 127.63


$CO_2$ Emissions by Region (2021 - 33,844.06 Million Tons
Total North America, 5602.23
Total S. & Cent. America, 1213.12
Total Europe, 3793.65
Total CIS, 2132.48
Total Middle East, 2117.22
Total Africa, 1290.74
Total Asia Pacific, 17734.62

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(source: https://www.epa.gov/climateleadership/ghg-emission-factors-hub)

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# Questions/Comments

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NARUC Summer Policy Summit

# Committee on Int'l Relations and Staff Subcomm on Gas LNG Exports: New Realities

Cool, Clean Fuel

# NARUC Summer Policy Summit

**Charlie Riedl**
**Executive Director of the Center for LNG**

**July 18, 2022**

CLNG
center for liquefied natural gas

Cool, Clean Fuel

# Who We Are

BHE GT&S
A BERKSHIRE HATHAWAY ENERGY COMPANY

bp

CHENIERE

ExxonMobil

FREEPORT LNG

Golden Pass LNG

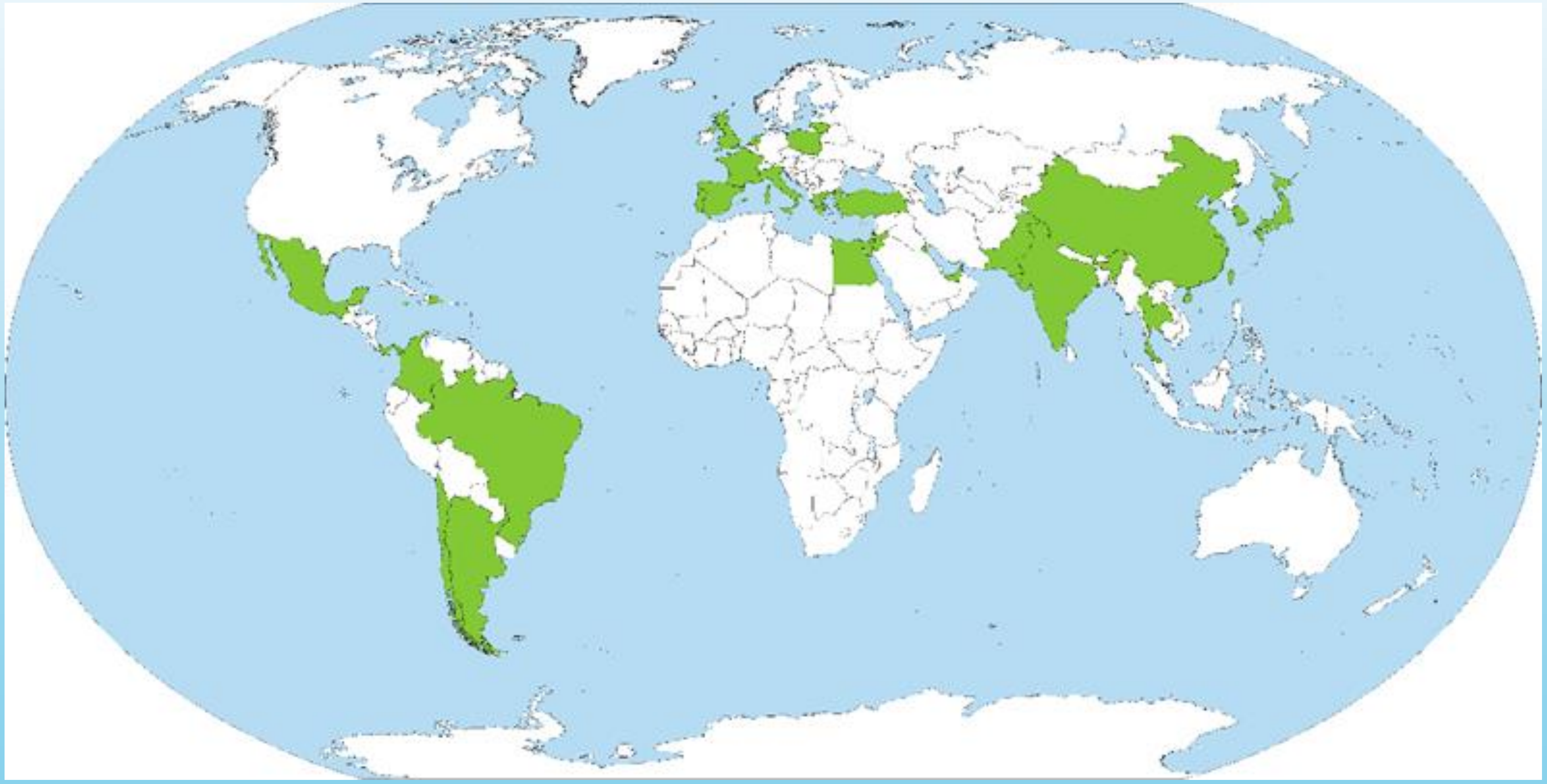
NEXTDECADE

Sempra Energy®

Cool, Clean Fuel

# Global Demand for U.S. LNG Grows

**U.S. LNG cargoes have reached over 35 countries, and the list continues to grow**



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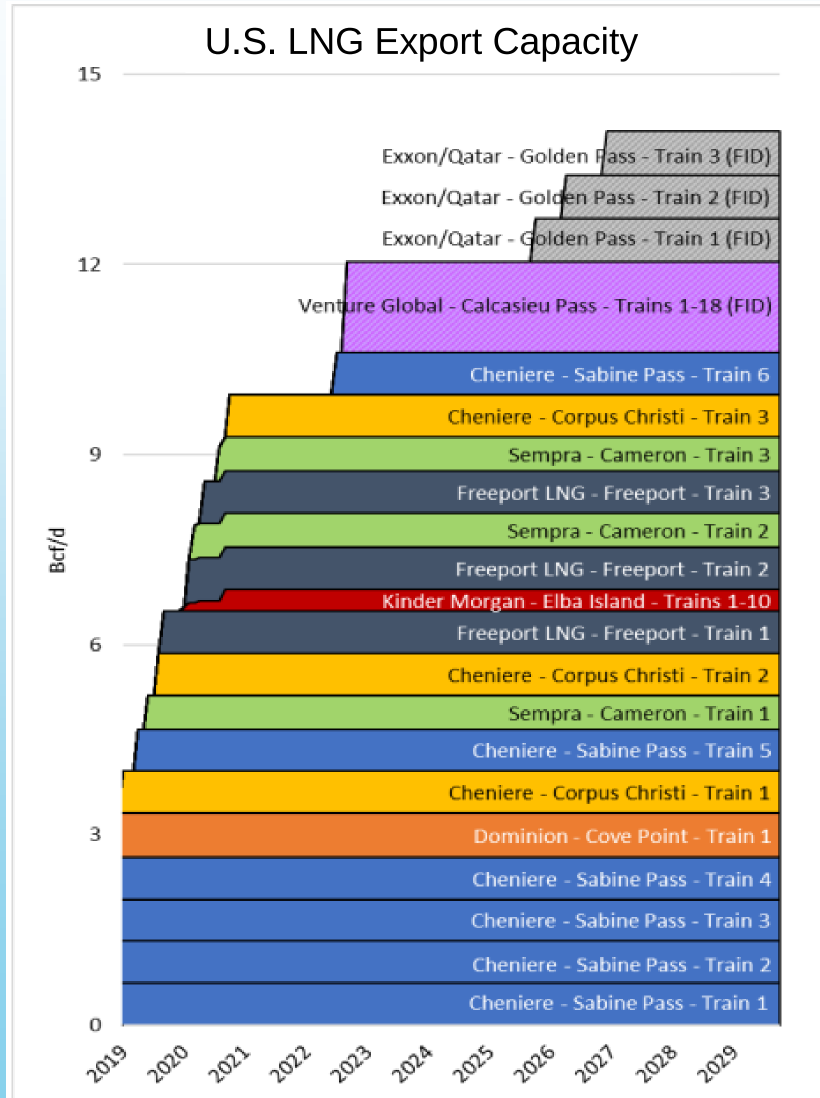
# U.S. LNG Outlook




Source: RBN Energy LLC

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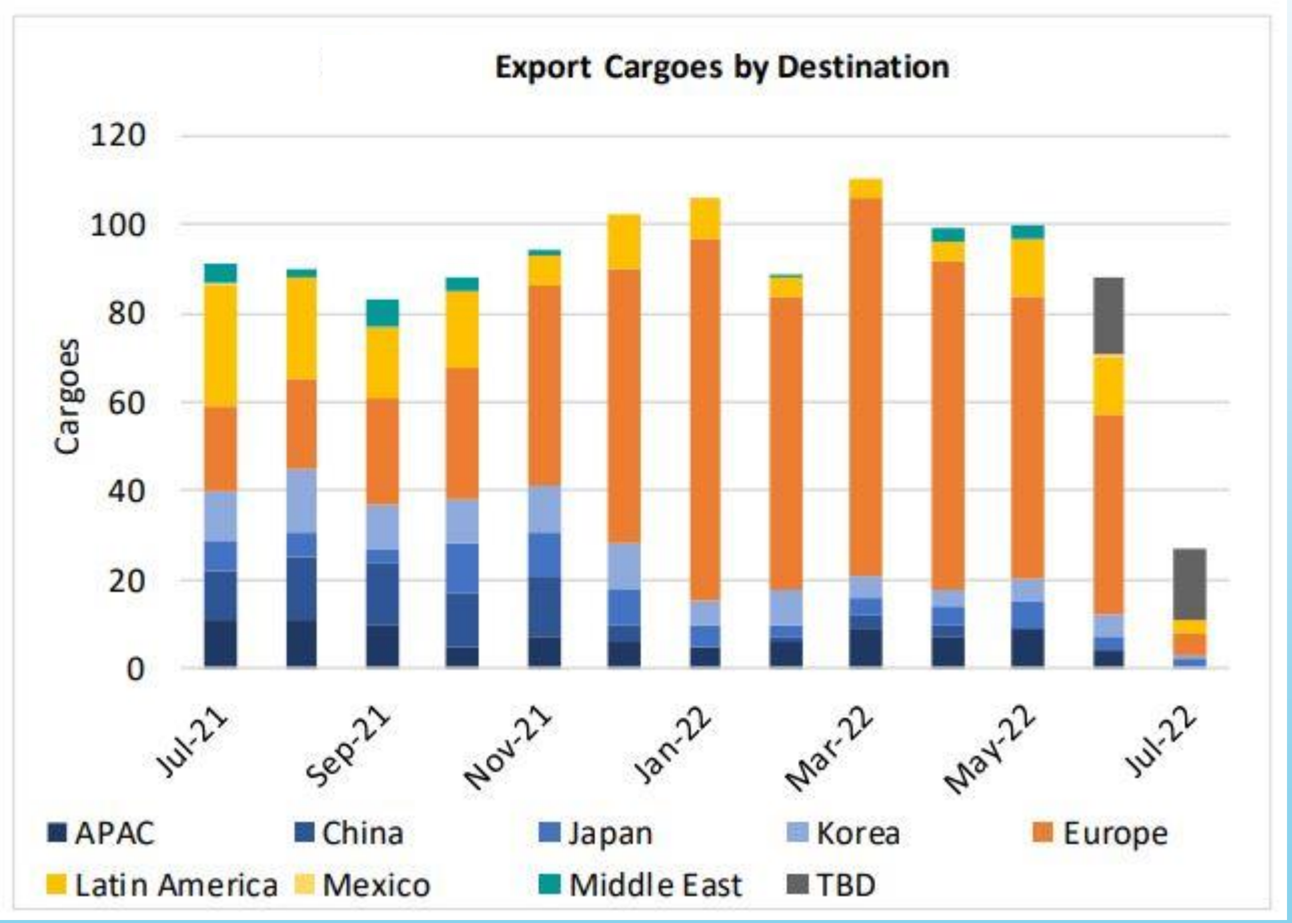
# Demand in Europe has Grown for LNG

## U.S. Now Europe's Largest Supplier of LNG



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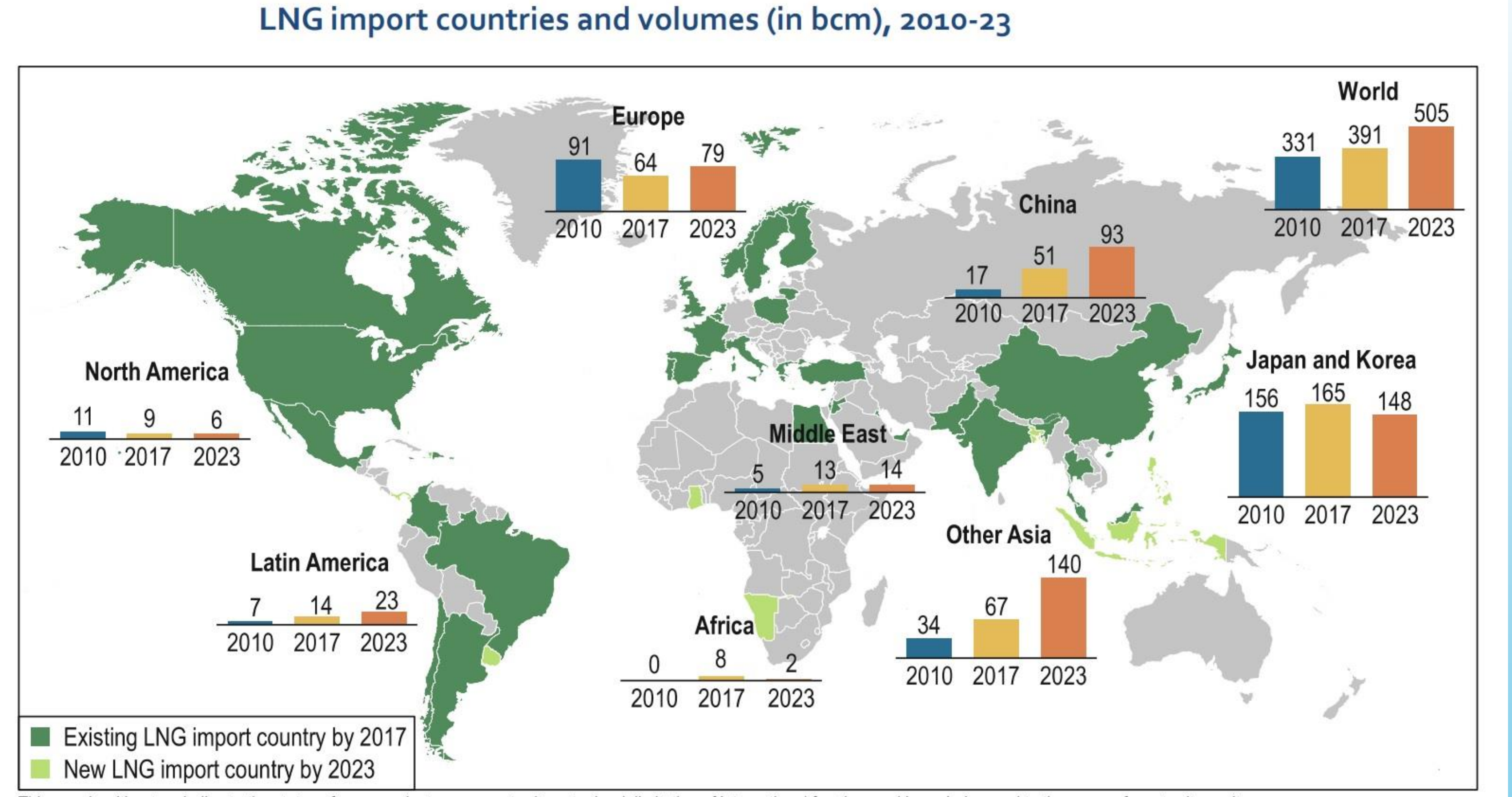
# Global Long-Term Supply & Demand Outlook

**EIA, IEA, and others all point to continued growth in global LNG market**




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# For more information visit:

www.lngfacts.org

**The Center for Liquefied Natural Gas**

**Charlie Riedl, Executive Director**

**Follow us on Twitter @LNGfacts and @charlieriedl**

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2022 NARUC Summer Policy Summit

# ACTING TODAY SECURING TOMORROW

# Safe Harbor Statements

**Forward-Looking Statements**

This presentation contains certain statements that are, or may be deemed to be, "forward-looking statements" within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. All statements, other than statements of historical or present facts or conditions, included or incorporated by reference herein are "forward-looking statements." Included among "forward-looking statements" are, among other things:

- statements regarding the ability of Cheniere Energy Partners, L.P. to pay distributions to its unitholders or Cheniere Energy, Inc. to pay dividends to its shareholders or participate in share or unit buybacks;
- statements regarding Cheniere Energy, Inc.'s or Cheniere Energy Partners, L.P.'s expected receipt of cash distributions from their respective subsidiaries;
- statements that Cheniere Energy Partners, L.P. expects to commence or complete construction of its proposed liquefied natural gas ("LNG") terminals, liquefaction facilities, pipeline facilities or other projects, or any expansions or portions thereof, by certain dates or at all;
- statements that Cheniere Energy, Inc. expects to commence or complete construction of its proposed LNG terminals, liquefaction facilities, pipeline facilities or other projects, or any expansions or portions thereof, by certain dates or at all;
- statements regarding future levels of domestic and international natural gas production, supply or consumption or future levels of LNG imports into or exports from North America and other countries worldwide, or purchases of natural gas, regardless of the source of such information, or the transportation or other infrastructure, or demand for and prices related to natural gas, LNG or other hydrocarbon products;
- statements regarding any financing transactions or arrangements, or ability to enter into such transactions;
- statements regarding the amount and timing of share repurchases;
- statements relating to the construction of our proposed liquefaction facilities and natural gas liquefaction trains ("Trains") and the construction of our pipelines, including statements concerning the engagement of any engineering, procurement and construction ("EPC") contractor or other contractor and the anticipated terms and provisions of any agreement with any EPC or other contractor, and anticipated costs related thereto;
- statements regarding any agreement to be entered into or performed substantially in the future, including any revenues anticipated to be received and the anticipated timing thereof, and statements regarding the amounts of total LNG regasification, natural gas, liquefaction or storage capacities that are, or may become, subject to contracts;
- statements regarding counterparties to our commercial contracts, construction contracts and other contracts;
- statements regarding our planned development and construction of additional Trains or pipelines, including the financing of such Trains or pipelines;
- statements that our Trains, when completed, will have certain characteristics, including amounts of liquefaction capacities;
- statements regarding our business strategy, our strengths, our business and operation plans or any other plans, forecasts, projections or objectives, including anticipated revenues, capital expenditures, maintenance and operating costs, cash flows, EBITDA, Adjusted EBITDA, distributable cash flow, and distributable cash flow per share and unit, any or all of which are subject to change;
- statements regarding projections of revenues, expenses, earnings or losses, working capital or other financial items;
- statements regarding legislative, governmental, regulatory, administrative or other public body actions, approvals, requirements, permits, applications, filings, investigations, proceedings or decisions;
- statements regarding our anticipated LNG and natural gas marketing activities; and
- any other statements that relate to non-historical or future information.

These forward-looking statements are often identified by the use of terms and phrases such as "achieve," "anticipate," "believe," "contemplate," "develop," "estimate," "example," "expect," "forecast," "goals," "guidance," "opportunities," "plan," "potential," "project," "propose," "subject to," "strategy," "target," and similar terms and phrases, or by use of future tense. Although we believe that the expectations reflected in these forward-looking statements are reasonable, they do involve assumptions, risks and uncertainties, and these expectations may prove to be incorrect. You should not place undue reliance on these forward-looking statements, which speak only as of the date of this presentation. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of a variety of factors, including those discussed in "Risk Factors" in the Cheniere Energy, Inc. and Cheniere Energy Partners, L.P. Annual Reports on Form 10-K filed with the SEC on February 26, 2019, which are incorporated by reference into this presentation. All forward-looking statements attributable to us or persons acting on our behalf are expressly qualified in their entirety by these "Risk Factors." These forward-looking statements are made as of the date of this presentation, and other than as required by law, we undertake no obligation to update or revise any forward-looking statement or provide reasons why actual results may differ, whether as a result of new information, future events or otherwise.

Reconciliation to U.S. GAAP Financial Information

The following presentation includes certain "non-GAAP financial measures" as defined in Regulation G under the Securities Exchange Act of 1934, as amended. Schedules are included in the appendix hereto that reconcile the non-GAAP financial measures included in the following presentation to the most directly comparable financial measures calculated and presented in accordance with U.S. GAAP.

# Update on Cheniere's projects

## Cheniere now the second-largest LNG operator* and third-largest supplier globally

### Cheniere's LNG projects

- Two projects: Sabine Pass & Corpus Christi
- Nine trains in operation
- ~45 mtpa total capacity
- ~10% of global LNG supply in 2021
- CCL expansion project commercialized with early construction underway

### U.S. advantages

- Abundant, low-cost gas
- Low infrastructure costs
- Flexible contracts

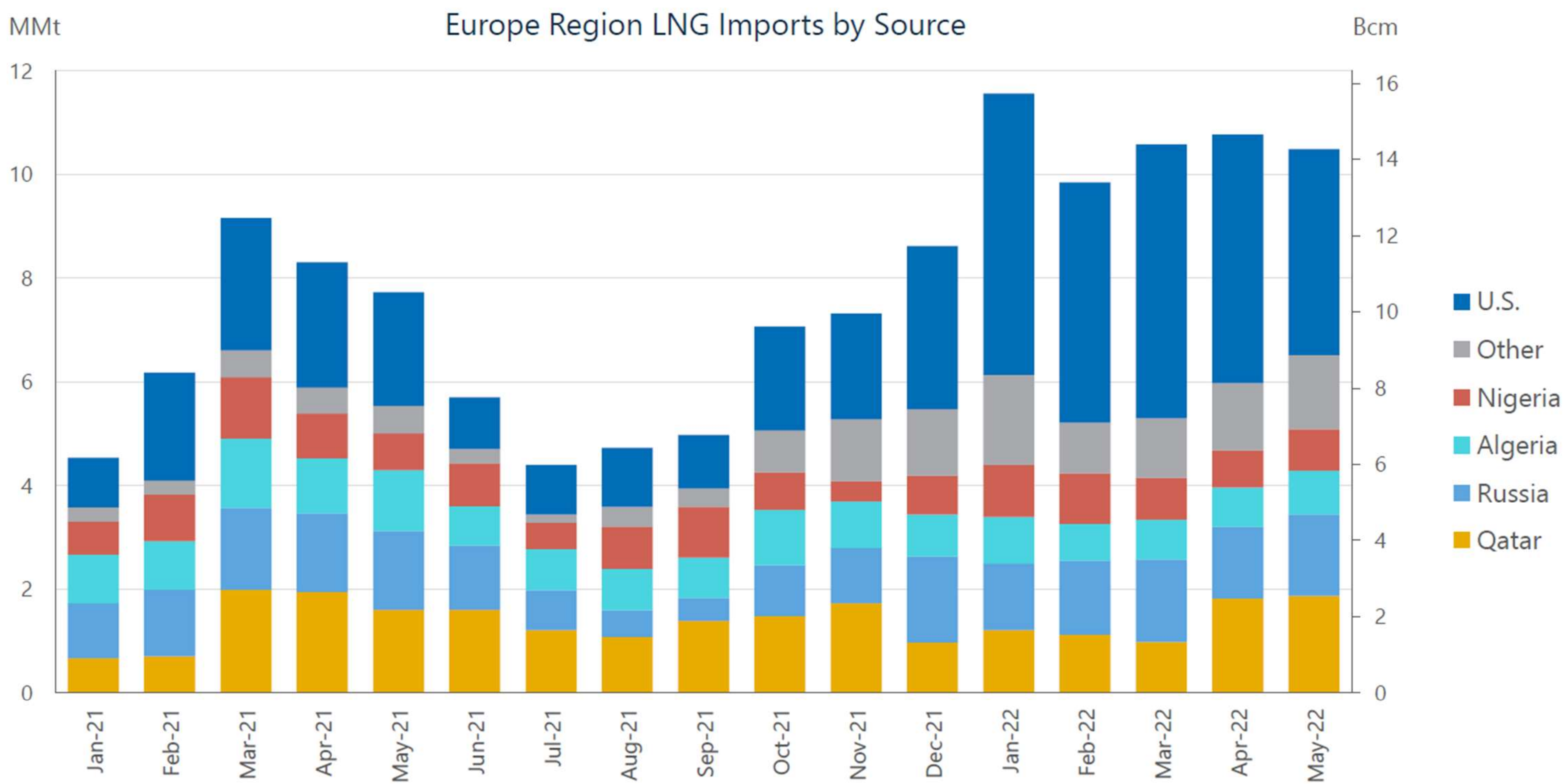

Sabine Pass Liquefaction Project

Corpus Christi Liquefaction Project

* Based on total production capacity.
Source: Cheniere interpretation of Wood Mackenzie data (May 2021; only companies included in the Corporate Service), Cheniere Research

# Europe region: LNG imports by source, 2021/22

## Flexible U.S. LNG volumes are responding to market price signals




Note: Europe region consists of the EU, the UK, and Turkey.
Source: Cheniere Research interpretation of Kpler data

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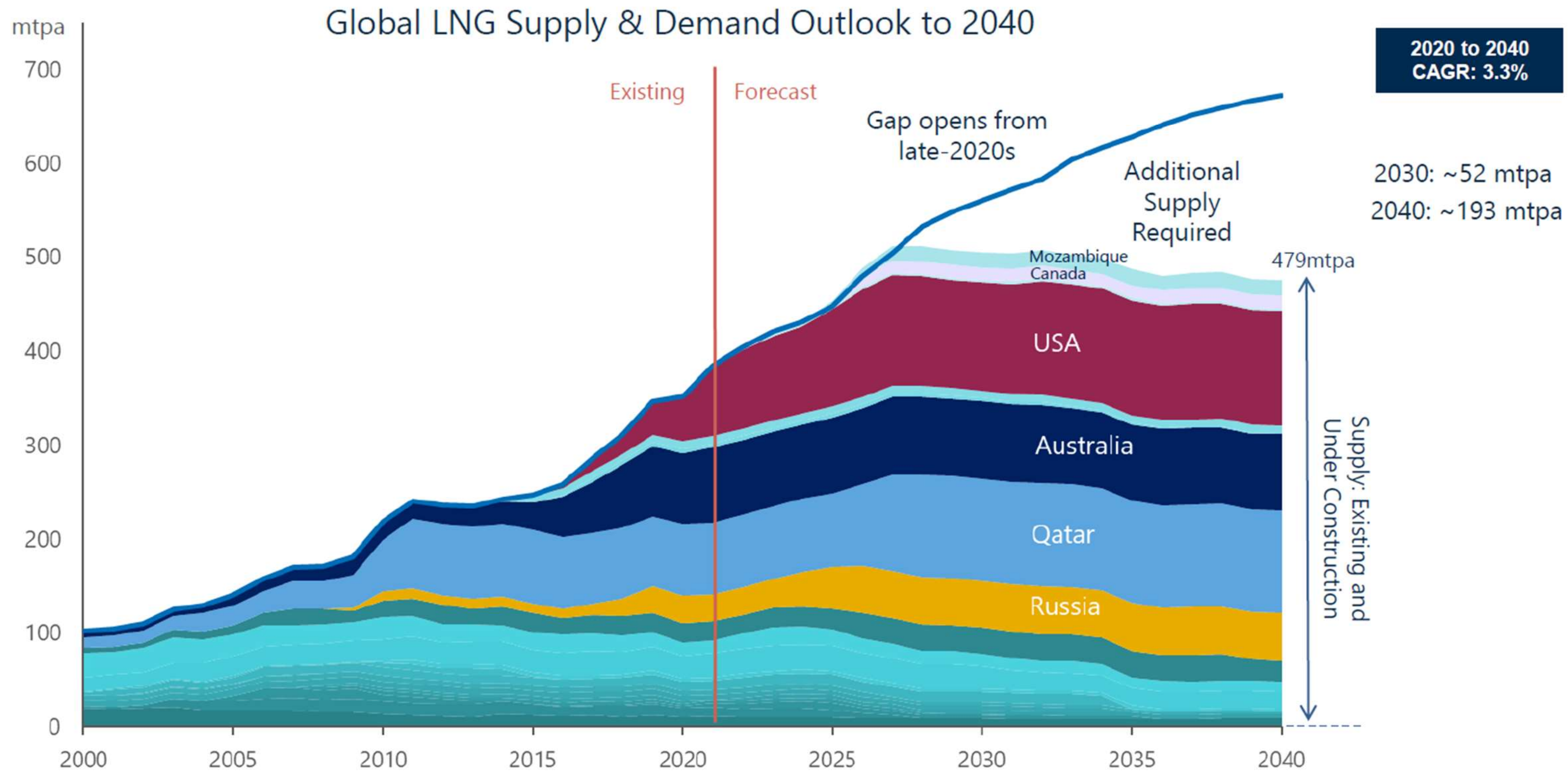
# Long-term LNG fundamentals expected to remain robust

## Driven by growing economies with a desire for secure, affordable and cleaner-burning fuels

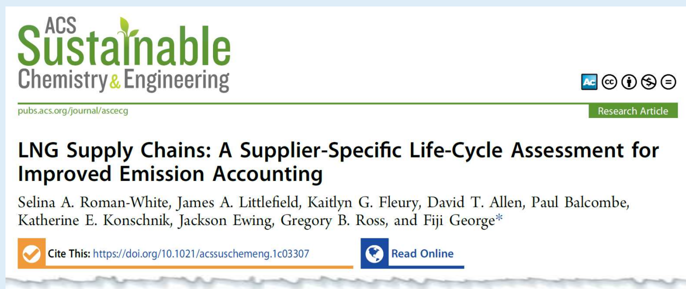



Source: Cheniere Research estimates (Jul. 2021), Wood Mackenzie for historical figures. Area chart includes all FIDs through May. 2022 (including QG NFE, Pluto T2 and Plaquemines Phase 1).

# Cheniere's Actions on Climate

**Cheniere's actions on climate advance the understanding of GHG emissions across the supply chain in a scientific and transparent manner**

## LNG GHG Life-Cycle Assessment


ACS Sustainable Chemistry & Engineering

pubs.acs.org/journal/ascecg

Research Article

**LNG Supply Chains: A Supplier-Specific Life-Cycle Assessment for Improved Emission Accounting**

Selina A. Roman-White, James A. Littlefield, Kaitlyn G. Fleury, David T. Allen, Paul Balcombe, Katherine E. Konschnik, Jackson Ewing, Gregory B. Ross, and Fiji George*

Cite This: https://doi.org/10.1021/acssuschemeng.1c03307

Read Online

Cheniere sponsored the development and publication of a first-of-its-kind, peer-reviewed LNG GHG lifecycle assessment published in the *American Chemical Society Sustainable Chemistry & Engineering Journal*

## Cargo Emissions Tags (CE Tags)


Cheniere to provide all customers with estimated GHG emissions data, from production to delivery point, for each cargo from SPL/CCL, beginning 2022

The CE Tags will be calculated using the Cheniere LCA

## Quantification, Monitoring, Reporting, and Verification

Collaboration with supply chain companies and academic institutions to QMRV GHG emissions

**Natural Gas Production** – initiated 2021

Collaboration with 5 natural gas suppliers in 3 basins and over 100 wells

**Midstream** – initiated 2022

Collaboration with 5 midstream companies on pipelines, compressor stations, G&B, processing, and storage, including Cheniere's Gillis Compressor Station and CTPL

# QMRV – Natural Gas Production

## Collaboration with 5 leading U.S. natural gas producers and academic institutions

- R&D collaboration to implement QMRV of GHG emissions at natural gas production sites in Marcellus, Haynesville, Permian Basins
- Testing 5 measurement technologies
- Preliminary Findings
    - Snapshot measurements + continuous monitoring systems can develop measurement-informed inventories that account for infrequent and variable emissions events
    - Independent, third-party verification critical to analyze measurement data and ensure transparency and credibility

PIONEER NATURAL RESOURCES
ASCENT RESOURCES
EQT
AETHON
Indigo

# Thank you



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Thanks for attending.

The next session begins at 2:00 pm.