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.
# CO₂ & CH₄ Emissions from select fuels – Stationary Combustion

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

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<thead>
<tr>
<th>Fuel</th>
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<tbody>
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<td>Natural Gas</td>
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<tr>
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<td>93.7</td>
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Methane Emissions by Source

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

Figure ES-8: 2020 Sources of CH₄ Emissions
Total European Power Generation (2021 - 4032.5 TWh)

- Natural Gas, 799.3 TWh
- Oil, 47.9 TWh
- Nuclear energy, 882.8 TWh
- Hydroelectric, 649.7 TWh
- Renewables, 946.5 TWh
- Coal, 632.0 TWh
- Other, 74.2 TWh

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Total Asia-Pacific Power Generation (2021 - 13994.4 TWh)

- Coal, 7965.6
- Natural Gas, 1493.4
- Hydro electric, 1851.6
- Renewables, 1690.1
- Nuclear energy, 714.3
- Oil, 126.3
- Other, 153.1

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Total Primary Energy Consumption (2021 -- 595.15 Exajoules)

- Total North America, 113.70
- Total S. & Cent. America, 28.46
- Total Europe, 82.38
- Total CIS, 40.32
- Total Middle East, 37.84
- Total Africa, 19.99
- Total Asia Pacific, 272.45

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Total Global Energy Consumption of Coal (2021- 160.10 Exajoules)

- Asia Pacific, 127.63
- North America, 11.28
- S. & Cent. America, 1.46
- Europe, 10.01
- CIS, 5.17
- Middle East, 0.34
- Africa, 4.21
CO₂ Emissions by Region (2021 - 33,844.06 Million Tons)

- Total North America: 5,602.23
- Total S. & Cent. America: 1,213.12
- Total Europe: 3,793.65
- Total CIS: 2,132.48
- Total Middle East: 2,117.22
- Total Africa: 1,290.74
- Total Asia Pacific: 17,734.62

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## CO₂ & CH₄ Emissions from select fuels – Stationary Combustion

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Questions/Comments

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Committee on Int’l Relations and Staff Subcomm on Gas LNG Exports: New Realities
NARUC Summer Policy Summit

Charlie Riedl
Executive Director of the Center for LNG

July 18, 2022
Global Demand for U.S. LNG Grows

U.S. LNG cargoes have reached over 35 countries, and the list continues to grow.
Demand in Europe has Grown for LNG

U.S. Now Europe's Largest Supplier of LNG
Global Long-Term Supply & Demand Outlook

EIA, IEA, and others all point to continued growth in global LNG market
For more information visit:

www.lngfacts.org

The Center for Liquefied Natural Gas
Charlie Riedl, Executive Director
Follow us on Twitter @LNGfacts and @charlieriedl
Committee on Int’l Relations and Staff Subcomm on Gas LNG Exports: New Realities
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 characteristics, including amounts of liquefaction capacities;
- statements regarding our business strategy, our strengths, our characteristics, including amounts of liquefaction capacities;
- statements regarding legislative, governmental, regulatory, administrative or other public body actions, approvals, requirements, permits, applications, filings, investigations, proceedings or decisions;
- 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 the amounts of total LNG regasification, natural gas, liquefaction or storage capacities that are, or may become, subject to contracts; and
- 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 that our Trains, when completed, will have certain characteristics, including amounts of liquefaction capacities;
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

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* 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
Long-term LNG fundamentals expected to remain robust

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

Global LNG Supply & Demand Outlook to 2040

- **2020 to 2040 CAGR: 3.3%**
- **2030: ~52 mtpa**
- **2040: ~193 mtpa**

- **Existing**
- **Forecast**
- **Gap opens from late-2020s**
- **Additional Supply Required**

- **USA**
- **Australia**
- **Qatar**
- **Russia**

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**

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
Thank you
Committee on Int’l Relations and Staff Subcomm on Gas LNG Exports: New Realities
Thanks for attending. The next session begins at 2:00 pm.