Prospects, exports and benefits
There Are RENTS to Be Found In the East ... but Competition Fierce

Costs of Delivering LNG to Japan in 2025

- **Japan**: $18.00
- **Africa**: $10.00
- **Canada**: $12.00
- **C & S America**: $14.00
- **Middle East**: $16.00
- **Oceania**: $18.00
- **Sakhalin**: $16.00
- **U.S.**: $18.00

**Costs in $/MM Btu**

- **Demand Price**
- **Pipeline Cost to Citygate**
- **Regasification at Japan**
- **Tanker Transport**
- **Liquefaction**
- **Into Plant**
1. **Baseline: LNG Supply Demand in 2025 without US/Canada Participation**

LNG Supply/Demand by Region in 2025 (Tcf)

Europe  
Middle East  
Africa  
China/India  
Southeast Asia  
Former Soviet Union  
Sakhalin  
Japan/Korea  
Oceania  
Central & South America  
USA  
Canada  

LNG Exports  
LNG Imports
2. North America Enters the Market, US Exports to Europe, Canada Exports to Asia

Changes in Regional LNG Supply/Demand in 2025 (Tcf)
U.S. Wellhead Price Increases Would Be Limited

- The global market response limits how high U.S. natural gas prices could rise even with unlimited exports
  - Depending on market and U.S. gas costs, 0 – 5 Tcf exports by 2025, with 2 Tcf most likely
  - If North American wellhead prices are bid too high, landed cost of North American exports will become uncompetitive with other low cost and more advantageously located suppliers

- Natural gas price changes attributable to LNG exports remain in a relatively narrow range across all scenarios:
  - Increases in the first full year of exports could range from zero to $0.33 (2010$/Mcf)
  - The largest increases after five more years could range from $0.22 to $1.11 (2010$/Mcf)
More Gas Is Better Than Less
More Exports Are Better Than Less
Controversies
Gas Is Either Too Good or Too Bad to Export

- Sierra Club and others would use LNG export policy as surrogate for environmental regulation
  1. Opposition to fracking
  2. Speculation about effects of higher natural gas prices on carbon dioxide emissions

- Price difference in 2025 attributable to
  - Fracking ban = $3/Mmbtu
  - Maximum unlimited exports = $1/Mmbtu

- “One riot, one Ranger”
Keep It Here to Subsidize Other Exports

- Limit natural resource exports to subsidize domestic downstream industries
  - “Exports will choke off manufacturing renaissance”
  - “Chemicals produce 20 times more value added per Btu than natural gas exports”

- Potential outcomes of limits
  - 20 Tcf in applications now vs 0 – 5 Tcf exports by 2025
  - Administrative allocation of licenses becomes inescapable

- All trade policy creates winners and losers
  - Rent-seeking is normal
  - Unusual feature of LNG exports is that they create net benefits
Only Narrow Slices of Industry with High Energy Intensity and Low Value-Added Might Suffer Noticeable Impacts

Price increases attributable to excessive regulation of gas shale technology would be larger and more threatening to these sectors.
Perverse Results of Limits on Exports
Exports to FTA countries do not require approval
- Korea and Canada are FTA countries
- Canada is supporting exports enthusiastically
- Korea has announced plans to serve as a hub

U.S. pipeline exports to Eastern Canada would free up Alberta gas for export to Asia

By limiting LNG exports, U.S. would give up potential rents from overseas markets
- But with one North American market, U.S. would still bear all the consumer and producer surplus losses of making natural gas available for export
5. If U.S. Prohibits LNG Exports, U.S. Gas Will Move Through Canada

Changes in Regional LNG Supply/Demand in 2025 (Tcf)

- LNG exports
- Increase in volumes
- LNG imports
- Decrease in volume

Regions:
- Europe
- Middle East
- Africa
- China/India
- Former Soviet Union
- Sakhalin
- Japan/Korea
- Southeast Asia
- Oceania
- Canada
- USA
- Central & South America

Legend:
- Tcf
- Changes in volumes
- Decrease in volume
Appendix

DOE Study and NewERA Model
Proposed LNG Projects in North America

North American LNG Import/Export Terminals

Import Terminal
PROPOSED TO FERC
1. Robbinston, ME: 0.5 Bcf/d (Kestrel Energy - Downeast LNG)
2. Astoria, OR: 1.5 Bcf/d (Oregon LNG)
3. Corpus Christi, TX: 0.4 Bcf/d (Cheniere - Corpus Christi LNG)

POTENTIAL U.S. SITES IDENTIFIED BY PROJECT SPONSORS
4. Offshore New York: 0.4 Bcf/d (Liberty Natural Gas)

Export Terminal
PROPOSED TO FERC
5. Freeport, TX: 1.8 Bcf/d (Freeport LNG Dev/Freeport LNG Expansion/LNG Liquefaction)
6. Corpus Christi, TX: 2.1 Bcf/d (Cheniere - Corpus Christi LNG)
7. Coos Bay, OR: 0.9 Bcf/d (Jordan Cove Energy Project)
8. Lake Charles, LA: 2.4 Bcf/d (Southern Union - Trunkline LNG)
9. Hackberry, LA: 1.7 Bcf/d (Sempra - Cameron LNG)
10. Cove Point, MD: 0.75 Bcf/d (Dominion - Cove Point LNG)
11. Astoria, OR: 1.30 Bcf/d (Oregon LNG)
12. Lavaca Bay, TX: 1.38 Bcf/d (Excelerate Liquefaction)

PROPOSED CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS
13. Kitimat, BC: 0.7 Bcf/d (Apache Canada Ltd.)

POTENTIAL U.S. SITES IDENTIFIED BY PROJECT SPONSORS
15. Brownsville, TX: 2.0 Bcf/d (Gulf Coast LNG Export)
16. Pascagoula, MS: 1.5 Bcf/d (Gulf LNG Liquefaction)
17. Elba Island, GA: 0.5 Bcf/d (Southern LNG Company)
18. Sabine Pass, TX: 1.8 Bcf/d (ExxonMobil - Golden Pass)
19. Plaquemines Parish, LA: 1.07 Bcf/d (CE FLNG)
20. Cameron Parish, LA: 0.16 Bcf/d (Waller LNG Services)
21. Ingleside, TX: 1.09 Bcf/d (Pangea LNG (North America))
22. Lake Charles, LA: 0.54 Bcf/d (Magnolia LNG)
23. Cameron Parish, LA: 0.20 Bcf/d (Gasfin Development)

POTENTIAL CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS
24. Prince Rupert Island, BC: 1.0 Bcf/d (Shell Canada)
25. Goldboro, NS: 0.67 Bcf/d (Perth Energy Canada)
26. Kitimat, BC: 2.0 Bcf/d (LNG Canada)

As of February 21, 2013

Office of Energy Projects
Many scenarios were examined to reach robust conclusions on:
- Whether economic impacts were positive or negative
- How changing export levels affect impacts

3 outlooks for international gas market dynamics:
- Reference, Demand shock, and Supply and Demand shock

3 U.S. natural gas resource outlooks from EIA 2011:
- Reference, High shale EUR, and Low shale EUR

6 maximum limits and one unconstrained case for US exports:

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<tr>
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NERA Methodology

**Global Natural Gas Model**

A 12 region model of world natural gas supply and demand with and capacity constraints on LNG and pipeline exports

**N_{ew}ERA Model**

A dynamic general equilibrium model of the U.S. economy with 5 energy sectors 7 industrial sectors

**Macroeconomic Impacts**

(welfare, GDP, income components)
NERA and EIA AEO 2013 Scenarios for U.S. LNG Exports

LNG Exports

*Assuming High EUR demand shock
Comparison of NERA and EIA Natural Gas Price Scenarios with Abundant U.S. Shale

**US Average Wellhead Prices**

- **2010$ per million btu**
  - 2015
  - 2020
  - 2025
  - 2030
  - 2035

- **Lines**:
  - **AEO 2013**
  - **low/slowest**
  - **low/slow**
  - **high/rapid**
  - **high/slow**
  - **no constraint**
  - **low/rapid**
  - **no exports**

*Assuming High EUR demand shock*
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