LNG: Can We Build It?
Global Gas Market Evolution and Arbitrage: Why North America Matters

Key considerations:
• Economic regulation of U.S. terminals and jurisdiction
• Pipeline takeaway capacity
• NGL content of LNG cargos vs. terminal design and pipeline standards (interchangeability)
• Evolution of short term LNG contracting mechanisms

Orange arrows are generally LNG cargo flows to U.S. for Henry Hub premiums. Green arrows are generally price flows to other markets if Henry Hub sets a premium.
Example Applications of Multiple Layers of Protection Along the LNG Value Chain

Primary Containment  Secondary Containment  Safeguard Systems

Separation Distance
Issues

- Public acceptance of messaging on safety assurance
- Fear of catastrophic failure – vapor clouds, pool fires
  - Inability to communicate probabilities, high degree of emotion
- Preparation of first responders
- Federal/state/local coordination
  - FERC requirements for safety, role of states
- Federal-level inter-agency communication
- Ability to organize opposition
- News media coverage
Status

- **U.S. Proposed** – 15
  - 4 FERC or USCG approved
  - 5 face significant opposition
  - Several face commercial issues
- **U.S. Planned** – 10
  - 6 face significant opposition
- **Outside U.S.**
  - Bahamas: 3 proposed, 2 FERC approved pipes (1 opposed)
  - Canada: 3 proposed, no (observable) opposition
  - Mexico: 1 planned (permitted), 1 approved (opposed)
- **Total withdrawn**: 5 (1 in Mexico, 1 U.S. defeated by voters)
Projected U.S. Import Requirements

Total U.S. demand projected to be 26.5 Tcf in 2015, 29.7 Tcf in 2025, U.S. EIA reference case.

Source: Derived from U.S. EIA, IEA, NPC data

Summary: NPC Outlook, 2030 (Approx. 5 Tcf/y, Base Case)

Balanced
- Expansions to 3 existing facilities
- 7 new facilities
- 4 expansions of new facilities
- 12,550 MMcf/d send out, 4.6 Tcf/y

Reactive
- Expansions to 3 existing facilities
- 2 new facilities
- 1 expansion of new facility
- 6,550 MMcf/d send out, 2.4 Tcf/y
Aggregate of Known Projects: Unsustainable Development

7 – 8 new terminals avg 1 Bcfd capacity

Source: EIA and media announcements
UH IELE Outlook: “Current Path”

Only 4-5 new import terminals would be built

Source: EIA and media announcements
### Case Study: Japan

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<th>U.S.</th>
<th>Japan</th>
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<td>Liquefaction Terminals</td>
<td>1</td>
<td>23</td>
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<tr>
<td>Import Terminals</td>
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<td>23</td>
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<td>Peakshaving Facilities</td>
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- Historically strong collaboration between industry and government
- 10-year planning cycle with METI
- Binding agreements with prefecture/local governments
- Going forward – public concerns toward industrial development, lack of developable sites means more creative use of existing infrastructure and new commercial arrangements
For More Information

- Public education initiatives - examples
  - Center for LNG http://www.lngfacts.org/
  - Gas Processors Association (GPA) LNG committee http://www.Gasprocessors.Com/LNG.Html
  - The International LNG Alliance (ILNGA) www.Ilnga.Org
IELE LNG Research Consortium:
www.energy.uh.edu/Lng

Sponsors:
- Dominion
- bp
- ConocoPhillips
- EXXON Mobil
- Shell
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- BG Group
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Technical Advisors/Reviewers:
- Lloyd's Register
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