

LNG in the United States

The Institute for Regulatory Policy Studies
Springfield, Illinois
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President of CLNG

What is the Center for LNG?

- **The Center for Liquefied Natural Gas is an association of LNG producers, shippers, terminal operators, energy trade associations and natural gas consumers. CLNG serves as a clearinghouse for educational and technical information about LNG. It is committed to facilitating rational discussions and developing public policies that support LNG's increasing contribution toward meeting the nation's energy needs and supporting economic growth.**

CLNG Membership

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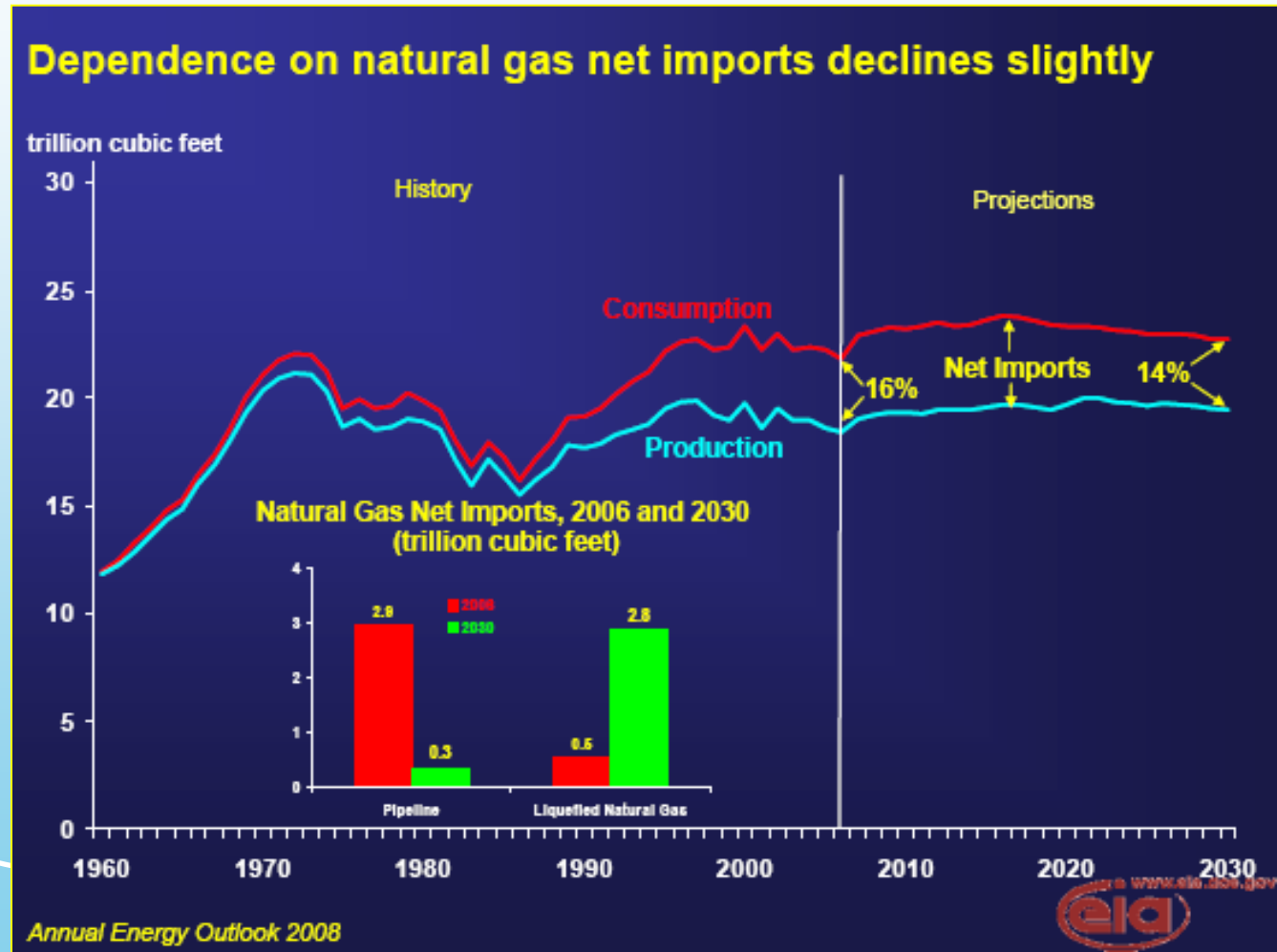
Presentation Overview

- 💧 **What is LNG?**
- 💧 **Why the U.S. needs more LNG**
- 💧 **LNG has a proven safety record**
- 💧 **Summary**

What is liquefied natural gas?

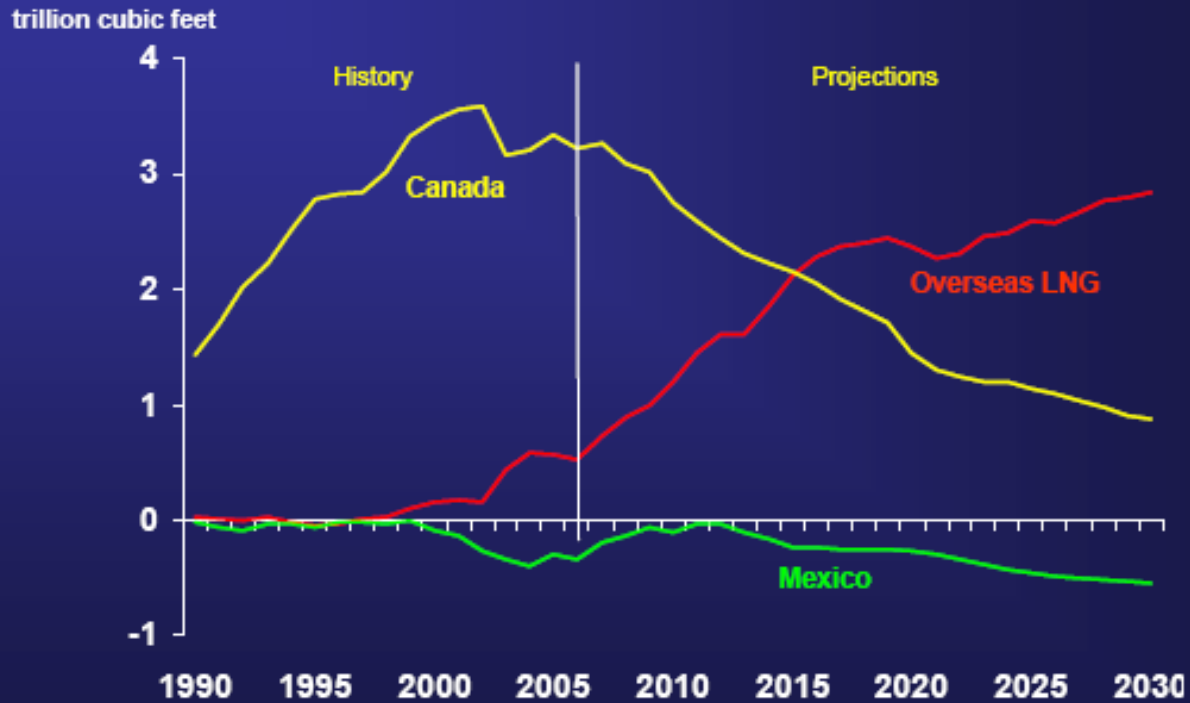
- ◆ **LNG is natural gas in its liquid form**
- ◆ **It is the same natural gas that:**
 - 60 million U.S. consumers use daily to heat and cool their homes
 - Industries use
 - Powers electricity generation
- ◆ **LNG has been used safely for 40+ years**
- ◆ **Natural gas is converted to LNG by cooling it to -260° F**
- ◆ **LNG is 1/600th the volume of gas, allowing for more efficient and economic transportation**
- ◆ **LNG is not stored under pressure for shipping or storage**

Natural Gas Demand Exceeds Supply



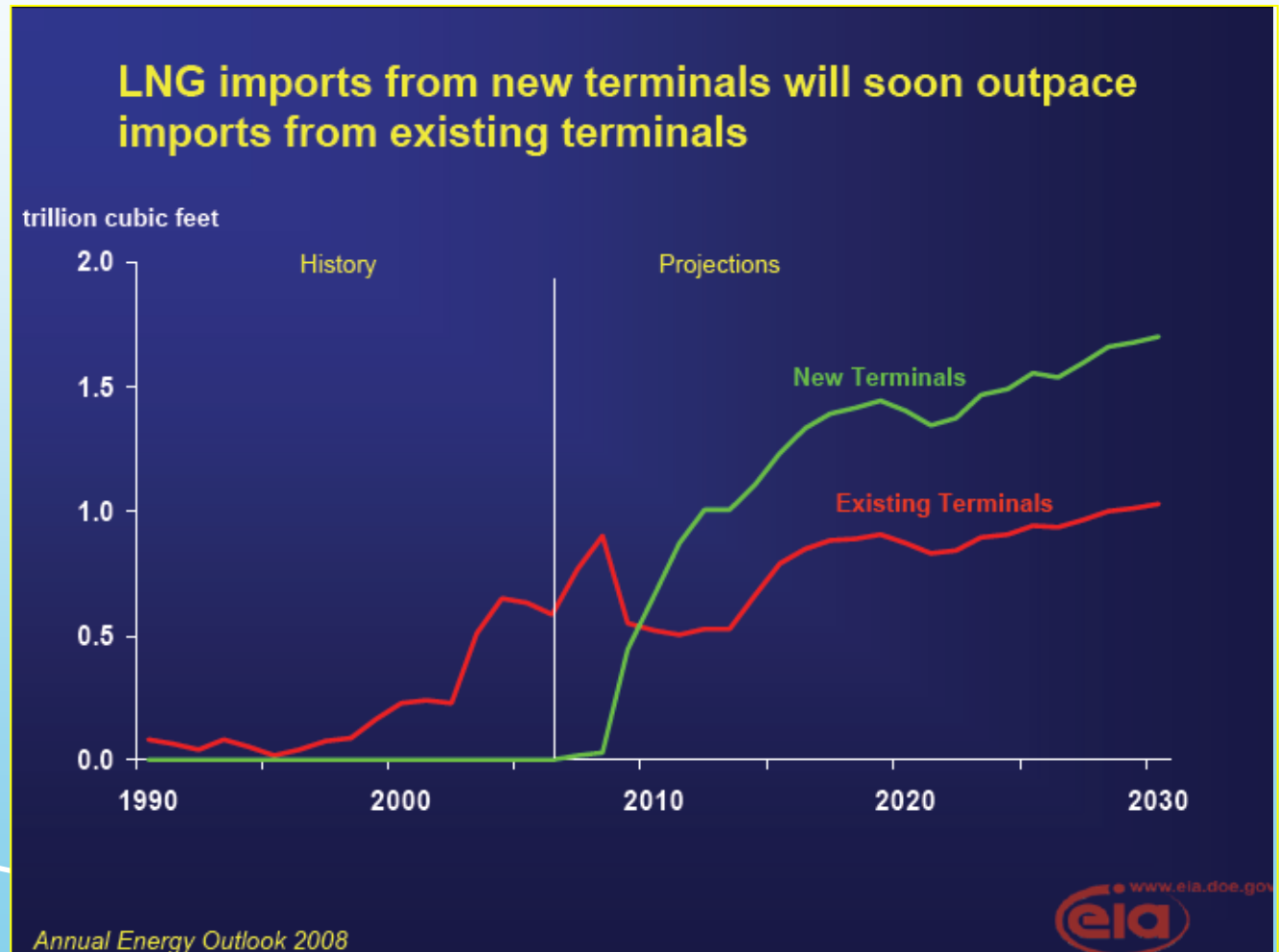
Growing Imports to Meet U.S. Needs

Net pipeline imports fall as supplies from Canada decline and exports to Mexico increase; LNG imports grow rapidly



Annual Energy Outlook 2008

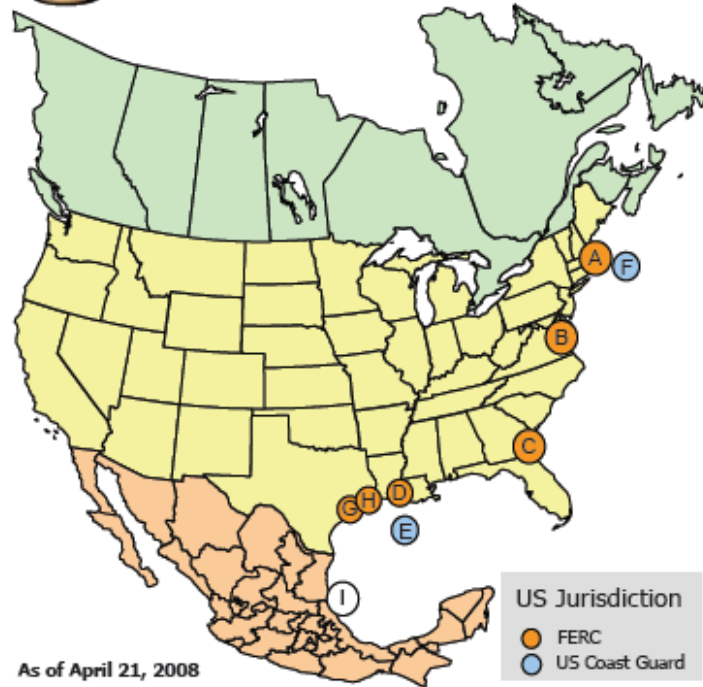
Imports Will Outpace Exports



Existing U.S. Import Terminals



North American LNG Import Terminals *Existing*



As of April 21, 2008

U.S.

- A. Everett, MA :** 1.035 Bcfd (SUEZ LNG - DOMAC)
- B. Cove Point, MD :** 1.0 Bcfd (Dominion - Cove Point LNG)
- C. Elba Island, GA :** 1.2 Bcfd (El Paso - Southern LNG)
- D. Lake Charles, LA :** 2.1 Bcfd (Southern Union - Trunkline LNG)
- E. Gulf of Mexico:** 0.5 Bcfd, (Gulf Gateway Energy Bridge - Excelerate Energy)
- F. Offshore Boston:** 0.8 Bcfd, (Gulf Gateway-Excelerate Energy)
- G. Freeport, TX:** 1.5 Bcfd, (Cheniere/Freeport LNG Dev.)
- H. Sabine, LA:** 2.6 Bcfd (Sabine Pass Cheniere LNG)

Mexico

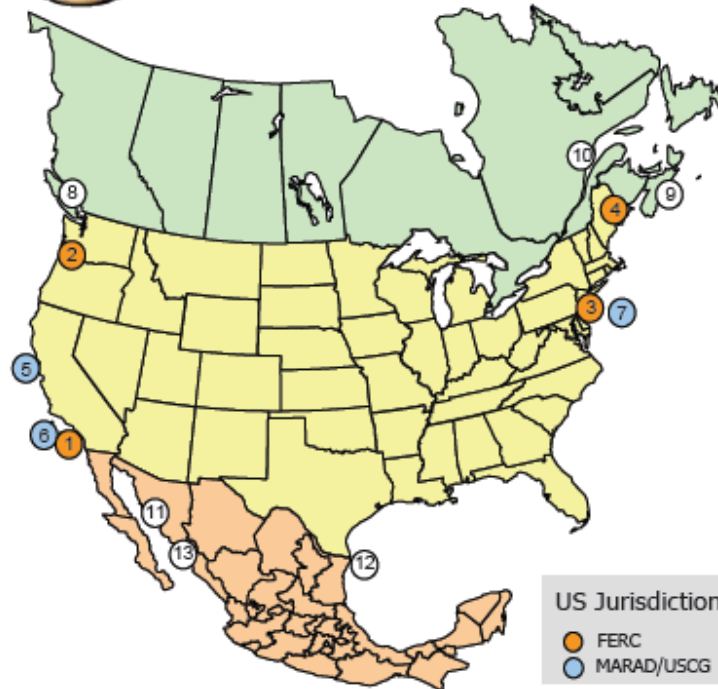
- I. Altamira, Tamulipas:** 0.7 Bcfd, (Shell/Total/Mitsui)

Note: There is an existing import terminal in Peñuelas, PR. It does not appear on this map since it can not serve or affect deliveries in the Lower 48 U.S. states.

Potential U.S. Import Terminals



North American LNG Import Terminals *Potential*



POTENTIAL U.S. SITES IDENTIFIED BY PROJECT SPONSORS

1. Offshore California: 0.75 Bcfd, (Chevron Texaco)
2. St. Helens, OR: 0.7 Bcfd (Port Westward LNG LLC)
3. Philadelphia, PA: 0.6 Bcfd (Freedom Energy Center - PGW)
4. Calais, ME: 1.0 Bcfd (BP Consulting LLC)
5. Offshore California: 0.6 Bcfd (Pacific Gateway - Excelerate Energy)
6. Offshore California: 1.2 Bcfd (Esperanza Energy - Tidelands)
7. Offshore New Jersey: 1.2 Bcfd (BlueOcean Energy—Exxon Mobil)

POTENTIAL CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS

8. Texada Island, BC: 0.50 Bcfd (WestPac Terminals)
9. Goldboro, NS: 1.0 Bcfd (Keltic Petrochemicals)
10. Énergie Grande-Anse QC: 1.0 Bcfd

POTENTIAL MEXICAN SITES IDENTIFIED BY PROJECT SPONSORS

11. Puerto Libertad, MX: 1.3 Bcfd (Sonora Pacific LNG)
12. Offshore Gulf, MX: 1.0 Bcfd (Dorado - Tidelands)
13. Topolobampo, MX: 0.5 Bcfd

US Jurisdiction

- FERC
- MARAD/USCG

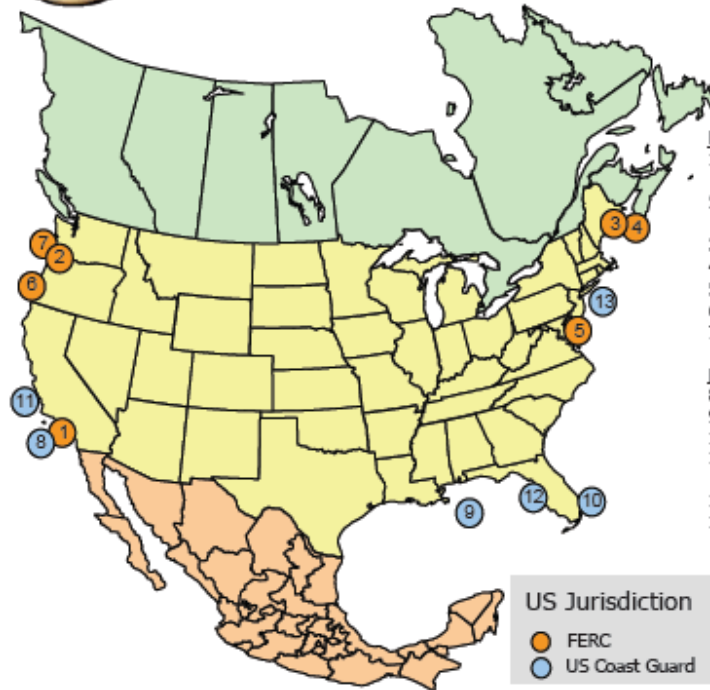
As of April 21, 2008

Office of Energy Projects

Proposed U.S. Import Terminals



North American LNG Import Terminals *Proposed*



PROPOSED TO FERC

1. Long Beach, CA : 0.7 Bcfd, (Mitsubishi/ConocoPhillips - Sound Energy Solutions)
2. Bradwood, OR: 1.0 Bcfd (Northern Star LNG - Northern Star Natural Gas LLC)
3. Pleasant Point, ME: 2.0 Bcfd (Quoddy Bay, LLC)
4. Robbinston, ME: 0.5 Bcfd (Downeast LNG - Kestrel Energy)
5. Baltimore, MD: 1.5 Bcfd (AES Sparrows Point - AES Corporation)
6. Coos Bay, OR: 1.0 Bcfd (Jordan Cove Energy Project)
7. Astoria, OR: 1.5 Bcfd (Oregon LNG)

PROPOSED TO MARAD/COAST GUARD

8. California Offshore : 1.4 Bcfd, (Clearwater Port LLC)
9. Gulf of Mexico: 1.4 Bcfd (Bienville LNG - TORP Technology)
10. Offshore Florida: 1.9 Bcfd (SUEZ Calypso - SUEZ LNG)
11. Offshore California: 1.2 Bcfd (OceanWay - Woodside Natural Gas)
12. Offshore Florida: 1.2 Bcfd (Hoëgh LNG - Port Dolphin Energy)
13. Offshore New York: 2.0 Bcfd (Safe Harbor Energy - ASIC, LLC)

US Jurisdiction
● FERC
● US Coast Guard

* Expansion of an existing facility

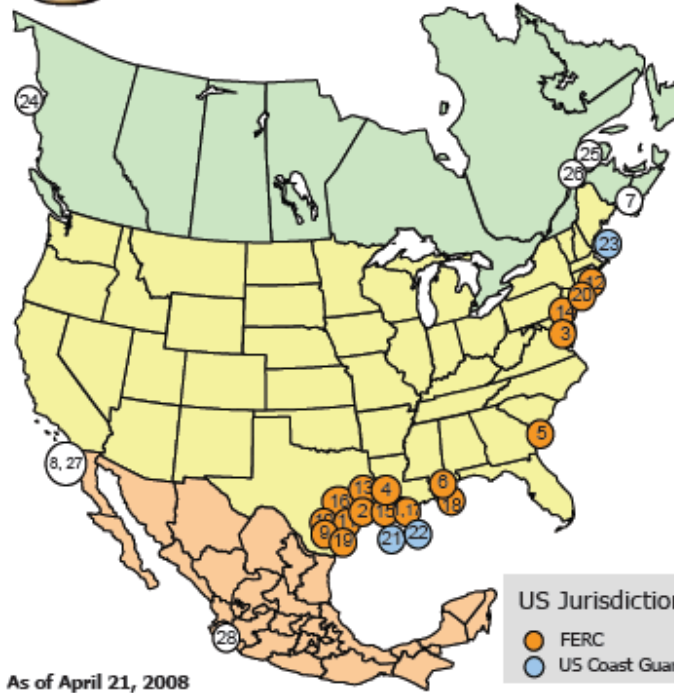
As of April 21, 2008

Office of Energy Projects

Approved U.S. Import Terminals



North American LNG Import Terminals *Approved*



As of April 21, 2008

* Expansion of an existing facility

US Jurisdiction
 ● FERC
 ● US Coast Guard

APPROVED - UNDER CONSTRUCTION

U.S.

1. Hackberry, LA: 1.8 Bcfd (Cameron LNG - Sempra Energy)
2. Sabine, TX: 2.0 Bcfd (Golden Pass - ExxonMobil)
3. Cove Point, MD: 0.8 Bcfd (Dominion - Expansion)*
4. Sabine, LA: 1.4 Bcfd (Sabine Pass Cheniere LNG - Expansion)
5. Elba Island, GA: 0.9 Bcfd (El Paso - Southern LNG Expansion)*
6. Pascagoula, MS: 1.5 Bcfd (Gulf LNG Energy LLC)

Canada

7. St. John, NB: 1.0 Bcfd, (Canaport - Irving Oil)

Mexico

8. Baja California, MX: 1.0 Bcfd, (Sempra)

APPROVED - NOT UNDER CONSTRUCTION

U.S. - FERC

9. Corpus Christi, TX: 1.0 Bcfd (Ingleside Energy - Occidental Energy Ventures)
10. Corpus Christi, TX: 2.6 Bcfd, (Cheniere LNG)
11. Corpus Christi, TX: 1.1 Bcfd (Vista Del Sol - 4Gas)
12. Fall River, MA: 0.8 Bcfd, (Weaver's Cove Energy/Hess LNG)
13. Port Arthur, TX: 3.0 Bcfd (Sempra)
14. Logan Township, NJ: 1.2 Bcfd (Crown Landing LNG - BP)
15. Cameron, LA: 3.3 Bcfd (Creole Trail LNG - Cheniere LNG)
16. Freeport, TX: 2.5 Bcfd (Cheniere/Freeport LNG Dev. - Expansion)
17. Hackberry, LA: 0.85 Bcfd (Cameron LNG - Sempra Energy - Expansion)
18. Pascagoula, MS: 1.3 Bcfd (Casotte Landing - ChevronTexaco)
19. Port Lavaca, TX: 1.0 Bcfd (Calhoun LNG - Gulf Coast LNG Partners)
20. LI Sound, NY: 1.0 Bcfd (Broadwater Energy-TransCanada/Shell)

U.S. - MARAD/Coast Guard

21. Port Pelican: 1.6 Bcfd, (Chevron Texaco)
22. Gulf of Mexico: 1.0 Bcfd (Main Pass McMoran Exp.)
23. Offshore Boston, MA: 0.4 Bcfd (Neptune LNG - Tractebel)

Canada

24. Kitimat, BC: 1.0 Bcfd (Galveston LNG)
25. Rivière-du-Loup, QC: 0.5 Bcfd (Cacouna Energy - TransCanada/PetroCanada)
26. Quebec City, QC: 0.5 Bcfd (Project Rabaska - Enbridge/Gaz Met/Gaz de France)

Mexico

27. Baja California, MX: 1.5 Bcfd (Energy Costa Azul - Sempra - Expansion)
28. Manzanillo, MX: 0.5 Bcfd

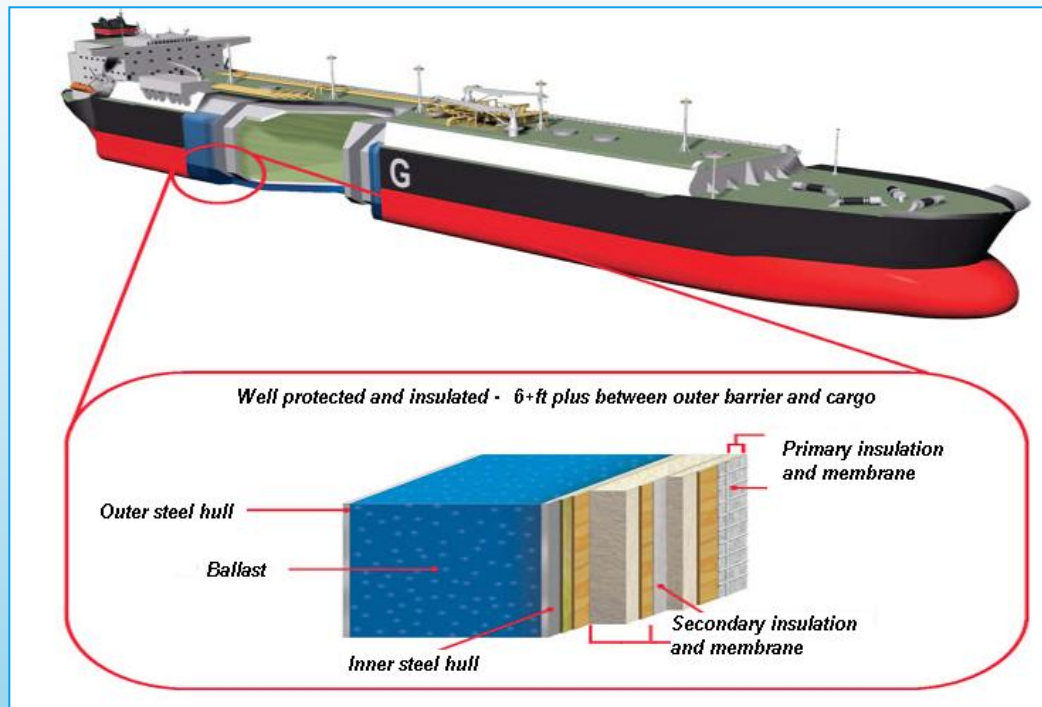
Office of Energy Projects

Bringing LNG to the Market

- ◆ Natural gas is produced in countries with vast supplies that exceed their domestic energy demand
- ◆ Gas is condensed to a liquid and transported by ship
- ◆ At the receiving terminal, LNG is re-gasified and is distributed via pipeline as ordinary natural gas



Safety Features on LNG Ships



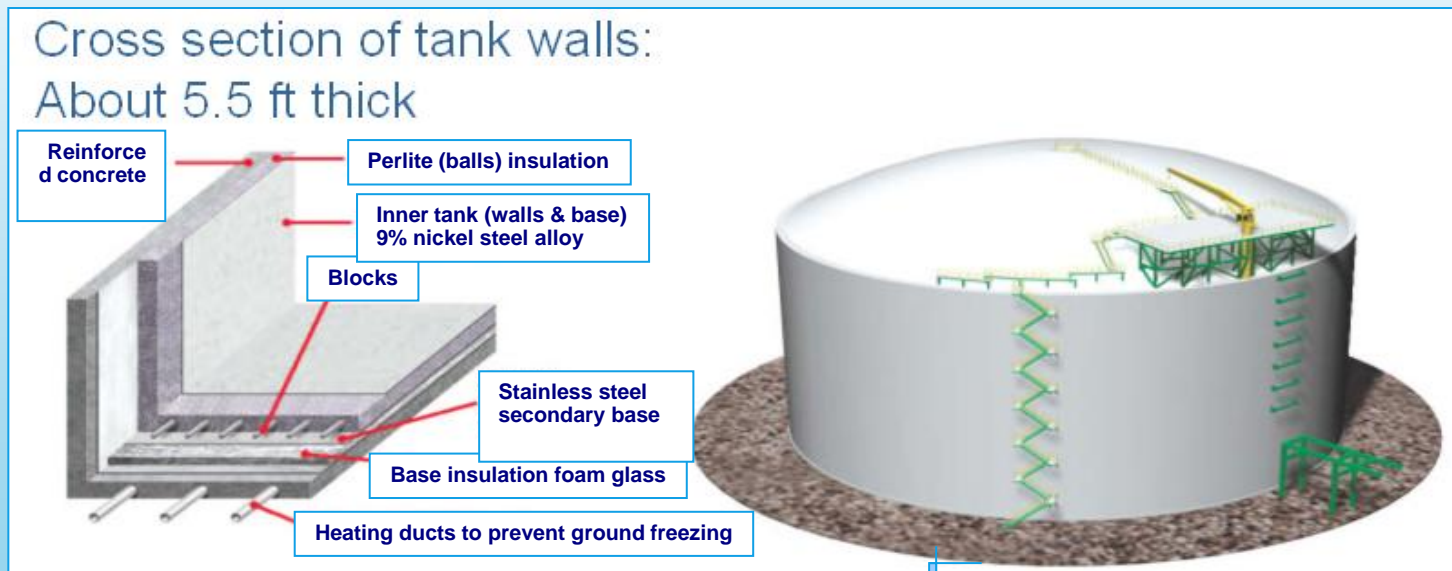
- Multiple layers of containment & security
- Double-hull construction; 6-10 ft between hulls
- Cargo tanks provide 3rd layer of protection
- Gas detectors and safety alarms for continuous leak detection and monitoring
- Safety and security zones in established port areas

Excellent safety record - more than 80,000 carrier voyages covering over more than 100 million miles without a major incident in LNG's 40+ year history.*

*Source: Sandia National Laboratories, December 2004

Robust Onshore LNG Storage Design

- ◆ Typical LNG storage tank design features multiple containment and security layers
- ◆ Constructed using proven technology & materials



“The Commission's LNG program illustrates our strong commitment to protecting public health and safety, and we consistently apply very high safety standards.”

- FERC Chairman Joseph T. Kelliher

Summary

- ◆ LNG is needed to meet increasing U.S. demand for natural gas
 - LNG will supplement, not replace, domestic natural gas production
- ◆ More LNG receiving terminals and supplies are required to meet growing energy demand
- ◆ LNG industry's top priorities are safety & security
- ◆ LNG industry has a proven record of safe & secure operations
- ◆ LNG industry is extensively regulated
- ◆ Residential and industrial consumers will benefit from new LNG supplies

For more information visit:

www.lngfacts.org

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Offshore Terminal Designs



Moored Buoy System with pipeline to shore

- Special ships moor to buoy
- Regasification done on board the ship
- Ship departs once LNG regasified

Floating Storage and Regasification Unit

- Terminal is a specially designed moored vessel
- LNG storage and regasification done on board
- Natural gas piped to shore



Gravity Based Structure

- Terminal is submerged concrete structure
- LNG storage and regasification done on terminal
- Natural gas piped to shore