Energy Bridge
Bringing Continents of Energy Together

Marine Technology Society
Houston, Texas
April 28, 2005
• The economics of LNG

• Challenges to building regasification facilities in the United States

• Growth in worldwide liquefaction capacity

• Will betting on economies of scale pay off in LNG?

• Excelerate Energy…a catalyst for action in the LNG space

• What might the future hold for United States imports of LNG?
In its liquid form, LNG occupies only 1/600th of the volume that it does in its gaseous state. Therefore, it is can be stored in a limited space and transported more efficiently by ship over long distances.
LNG is economically delivered to the US at $2.00 to $4.20 (plus or minus location value)
Challenges to Building New Regasification in the U.S.

Existing and Proposed North American LNG Terminals

FERC

Existing Terminals with Approved Expansions
- Everett, WA: 1.035 Bcf/d (Traced - QCLNG)
- Cove Point, MD: 1.8 Bcf/d ( Dominion - Cove Point LNG)
- Elba Island, GA: 1.2 Bcf/d (El Paso Southern LNG)
- Lake Charles, LA: 1.2 Bcf/d (Southern Union - Trunkline LNG)

Approved Terminals
- Hackberry, LA: 1.5 Bcf/d, (Semora Energy)
- Port Pelican: 1.0 Bcf/d, (Chevron Texaco)
- Bahama: 0.94 Bcf/d, (AEG Ocean Express)*
- Gulf of Mexico: 0.5 Bcf/d, (El Paso Energy Bridge GOM, LLC)
- Bahamas: 0.8 Bcf/d, (Cypco Tracfab)
- Prosep, TX: 1.5 Bcf/d, (Chevron/Prosep LNG Dev.)

Proposed Terminals and Expansions - FERC
- Fall River, MA: 0.05 Bcf/d, (Wärtsilä's Cove Energy/Res LNG)
- Long Beach, CA: 1.0 Bcf/d, (Monarch/Huntington LNG - South Energy Solutions)
- Corpus Christi, TX: 2.4 Bcf/d, (Chevron LNG Partners)
- Sabine, LA: 1.8 Bcf/d, (Chevron's Sabine LNG)
- Corpus Christi, TX: 1.0 Bcf/d, (Vista Del Sol - ExxonMobil)
- Sabine, TX: 1.0 Bcf/d, (Ewing Foss - ExxonMobil)
- Logan Township, NJ: 1.2 Bcf/d, (Crown Landing LNG - BP)
- Lake Charles, LA: 1.6 Bcf/d, (Southern Union - Translight LNG)
- Bahamas: 0.5 Bcf/d, (Seaboard - El Paso/FL)
- Corpus Christi, TX: 1.0 Bcf/d, (Occidental Energy Ventures)
- Providence, RI: 0.5 Bcf/d, (Keegan & Bo LG)
- Port Arthur, TX: 1.5 Bcf/d, (Semora)

Proposed Terminals - Coast Guard
- California Offshore: 1.5 Bcf/d, (Cabrillo Port - BP/Billon)
- Louisiana Offshore: 1.0 Bcf/d, (Gulf Landing - Shell)
- So. California Offshore: 0.6 Bcf/d, (Crystal Energy)
- Louisiana Offshore: 1.0 Bcf/d, (Man Pass McMurran Exp.)
- Gulf of Mexico: n/a (Compass Point - ConocoPhillips)

Planned Terminals and Expansions
- Brunsville, TX: n/a, (Chevron LNG Partners)
- Mobile Bay, AL: 1.8 Bcf/d, (ExxonMobil)
- Somerset, MA: 0.65 Bcf/d, (Somerset LNG)
- Bollman, NJ Offshore: n/a, (El Paso Global)
- Altamaha, Talmatip: 1.12 Bcf/d, (Shell)
- Baja California, MX: 1.0 Bcf/d, (Tempco & Shell)
- Baja California Offshore: 1.4 Bcf/d, (Chevron Texaco)
- California Offshore: 0.75 Bcf/d, (Chevron Texaco)
- St. John, NB: 0.2 Bcf/d, (Concert - Irving OI)
- Point Tupper, NS: 1.2 Bcf/d, (St. John LNG - Access Northeast Energy)
- Pleasant Point, ME: 0.5 Bcf/d, (Quoddy Bay, LLC)
- Quebec City, QC: n/a, (Innovacée/Québec/Mécanique de France)
- Lázaro Cárdenas, MX: 0.8 Bcf/d, (Tractebel/Repsol)
- Gulf of Mexico: 1.0 Bcf/d, (Shell Crossing - ExxonMobil)
- Mobile Bay, AL: 1.0 Bcf/d, (Chevron LNG Partners)
- St. Helens, OR: 0.7 Bcf/d, (Fort Westward LNG LLC)
- Cove Point, MD: 0.8 Bcf/d, (Dominion)
- Puerto Libertad, CO: 1.3 Bcf/d, (Campeche Pacific LNG)
- Klinak, BC: 0.34 Bcf/d, (Salsex LNG)
- Prince Rupert, BC: 0.30 Bcf/d, (WestPac Terminal)

*US pipeline approved; LNG terminal pending in Bahamas
Challenges to Building New Regasification in the U.S.

- Proximity to population and infrastructure
  - Impact of spill scenarios onshore
  - Affect of infrastructure and existing waterway usage
- Environmental impacts
  - Dredging and wetlands impacts
  - Facility footprint
  - Water usage and air emissions
- Long lead time to permit and construct facilities
- Further complicated by public perception
Growth in Liquefaction Capacity

Worldwide Liquefaction Capacity (Nameplate)
Growth in Liquefaction Capacity

Worldwide Liquefaction Capacity (Nameplate)

Bcf/Day Liquefaction Capacity

- 2004: 25%
- 2005: 9%
- 2006: 13%
- 2007: 53%
- 2008/09: 53%

Growth in Liquefaction Capacity
Growth in Worldwide Liquefaction Capacity (Nameplate)

- 2004:
- 2005:
- 2006:
- 2007:
- 2008/09:

**Excess Liquefaction Capacity??**

*Exceritate energy*
Excess Liquefaction Capacity??

![Growth in Worldwide Liquefaction Capacity](image)

- Bcf/Day Liquefaction Capacity
- 10% Annual Demand Growth
- 2004 2005 2006 2007 2008/09
Excess Liquefaction Capacity??

Growth in Worldwide Liquefaction Capacity (Nameplate)

- 10% Annual Demand Growth
- 15% Annual Demand Growth
- 20% Annual Demand Growth

Bcf/Day Liquefaction Capacity

2004 2005 2006 2007 2008/09

Excess Liquefaction Capacity??
Are Technology Changes Creating Economic Step Change?

Economies of scale

- Liquefaction
- Shipping
- Regasification

Question: Will the practical application match the theoretical expectation for benefits from economies of sale?
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each

2004 Average Demand

- USA total gas
- USA LNG
- Global LNG
- UK total gas
- California total gas
- Japan LNG
- Spain LNG
- France LNG
- Korea LNG

Bcf/Day

- LNG
- Total Natural Gas

2 Train Project
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each
Will the Practical Application Match the Theoretical Expectation?

A two-train liquefaction project at 7.8 mtpa each

2 Train Project
Evolution of LNG Carrier Size

Cubic Meters

1964: Independent Prismatic Aluminum Cargo Tanks
1965: Independent Cylindrical Tanks
1969: First Membrane Ships
1973: First Moss Rosenberg Independent Spherical Tanks
1975: Ben Franklin & El Paso Kayser
1981: Finima
1995: 125,000
2005: 210,000
2007: 250,000
2009-2010: 27,550

Years:
Will the Practical Application Match the Theoretical Expectation?

Number of Regasification Terminals Accessible to Large LNG Vessels in 2004

47 regasification terminals were in service in 2004
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand

- USA total gas
- USA LNG
- Global LNG
- UK total gas
- California total gas
- Texas total gas
- Louisiana total gas
- Mass. total gas
- Florida total gas

LNG

Total Natural Gas

2.6 Bcf/Day Regas
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand

2.6 Bcf/Day Regas
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand

- USA total gas
- USA LNG
- Global LNG
- UK total gas
- California total gas
- Texas total gas
- Louisiana total gas
- Mass. total gas
- Florida total gas

LNG
Total Natural Gas

2.6 Bcf/Day Regas
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand

- USA total gas
- USA LNG
- Global LNG
- UK total gas
- California total gas
- Texas total gas
- Louisiana total gas
- Mass. total gas
- Florida total gas

Bcf/Day

LNG
Total Natural Gas

Will the Practical Application Match the Theoretical Expectation?
Will the Practical Application Match the Theoretical Expectation?

A 2.6 Bcf/Day Regasification Terminal

2004 Average Demand

- USA total gas
- USA LNG
- Global LNG
- UK total gas
- California total gas
- Texas total gas
- Louisiana total gas
- Mass. total gas
- Florida total gas

LNG
Total Natural Gas
Worldwide Regasification Utilization

Liquefaction Facility Utilization (%)


Simmons and Company International
Robert Kessler 1.713.546.7208
Will the Practical Application Match the Theoretical Expectation?

Issues

– Will enough regasification be built to handle the large liquefaction trains?

– Will enough regasification with capacity to accept the newer, larger ships be built?

– Will the regasification that is built be able to effectively distribute the gas downstream?
Projections

• The “lumpiness” of LNG infrastructure additions, particularly at the scale of current & forecast mega projects, will introduce significant additional volatility to the global LNG marketplace

• The Global LNG industry is building enough liquefaction

   *and will build enough ships to move it*

such that attendant growth in demand will be difficult to achieve for the next decade
Hypothesis –
Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon
Hypothesis –
Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon

<table>
<thead>
<tr>
<th>% Achievable</th>
<th>Shipping</th>
<th>Liquefaction</th>
<th>Regasification Worldwide</th>
<th>United States Regasification</th>
<th>Ultimate Demand Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Probability of achieving high-end growth objectives is significantly higher for Shipping compared to other categories.
Hypothesis – Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon
Hypothesis –
Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon

- Shipping: 100%
- Liquefaction: 80%
- Regasification Worldwide: 50%
- United States Regasification: 40%
- Ultimate Demand Growth: 20%
Hypothesis –
Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon

- Shipping: 90% achievable
- Liquefaction: 70% achievable
- Regasification Worldwide: 50% achievable
- United States Regasification: 30% achievable
- Ultimate Demand Growth: 20% achievable
Hypothesis –
Liquefaction will continue to outpace demand

Probability of Achieving High-end Growth Objectives Within 36 to 42 Month Horizon

- **Shipping**: High probability (90%)
- **Liquefaction**: Moderately high probability (70%)
- **Regasification Worldwide**: Moderate probability (50%)
- **United States Regasification**: Lower probability (30%)
- **Ultimate Demand Growth**: Low probability (10%)
<table>
<thead>
<tr>
<th>Name</th>
<th>Region</th>
<th>Capacity (mmcf/d)</th>
<th>% Filed</th>
<th>Approved</th>
<th>In Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Charles</td>
<td>GC</td>
<td>1,800</td>
<td>83%</td>
<td>F, A</td>
<td>1981</td>
</tr>
<tr>
<td>Everett</td>
<td>EC</td>
<td>725</td>
<td>100%</td>
<td>F, A</td>
<td>1971</td>
</tr>
<tr>
<td>Elba Island</td>
<td>GC</td>
<td>806</td>
<td>100%</td>
<td>F, A</td>
<td>2002</td>
</tr>
<tr>
<td>Cove Point</td>
<td>EC</td>
<td>1,550</td>
<td>85%</td>
<td>F, A</td>
<td>2003</td>
</tr>
<tr>
<td>Energy Bridge</td>
<td>GC</td>
<td>500</td>
<td>100%</td>
<td>F, A</td>
<td>2005</td>
</tr>
<tr>
<td>Freeport</td>
<td>GC</td>
<td>4,000</td>
<td>48%</td>
<td>F, A</td>
<td>2008</td>
</tr>
<tr>
<td>Calypso</td>
<td>GC</td>
<td>830</td>
<td>75%</td>
<td>F, A</td>
<td>2008</td>
</tr>
<tr>
<td>Main Pass Energy Hub</td>
<td>GC</td>
<td>934</td>
<td>50%</td>
<td>F</td>
<td>2008</td>
</tr>
<tr>
<td>Ocean Cay - Bahamas</td>
<td>GC</td>
<td>842</td>
<td>25%</td>
<td>F, A</td>
<td>2008</td>
</tr>
<tr>
<td>KeySpan LNG</td>
<td>EC</td>
<td>500</td>
<td>25%</td>
<td>F</td>
<td>2008</td>
</tr>
<tr>
<td>Cleanwater Port</td>
<td>WC</td>
<td>800</td>
<td>15%</td>
<td>F</td>
<td>2008</td>
</tr>
<tr>
<td>Sound Energy Solutions</td>
<td>WC</td>
<td>700</td>
<td>5%</td>
<td>F</td>
<td>2008</td>
</tr>
<tr>
<td>Sabine Pass</td>
<td>GC</td>
<td>2,600</td>
<td>70%</td>
<td>F, A</td>
<td>2009</td>
</tr>
<tr>
<td>Corpus Christi LNG</td>
<td>GC</td>
<td>2,000</td>
<td>60%</td>
<td>F, A</td>
<td>2009</td>
</tr>
<tr>
<td>Cameron LNG</td>
<td>GC</td>
<td>1,500</td>
<td>70%</td>
<td>F, A</td>
<td>2009</td>
</tr>
<tr>
<td>Port Arthur</td>
<td>GC</td>
<td>1,500</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Gulf Landing</td>
<td>GC</td>
<td>1,000</td>
<td>70%</td>
<td>F, A</td>
<td>2009</td>
</tr>
<tr>
<td>Ingleside Energy Centre</td>
<td>GC</td>
<td>1,100</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Pearl Crossing</td>
<td>GC</td>
<td>2,000</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Vista del Sol</td>
<td>GC</td>
<td>1,000</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Golden Pass</td>
<td>GC</td>
<td>1,000</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Compass Port</td>
<td>GC</td>
<td>1,000</td>
<td>50%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Crown Landing</td>
<td>EC</td>
<td>1,200</td>
<td>25%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Calhoun LNG</td>
<td>GC</td>
<td>1,000</td>
<td>15%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Port Pelican</td>
<td>GC</td>
<td>800</td>
<td>10%</td>
<td>F, A</td>
<td>2009</td>
</tr>
<tr>
<td>Cabrillo Port</td>
<td>WC</td>
<td>800</td>
<td>5%</td>
<td>F</td>
<td>2009</td>
</tr>
<tr>
<td>Pascagoula - Casotte Landing</td>
<td>GC</td>
<td>1,300</td>
<td>50%</td>
<td>F</td>
<td>2010</td>
</tr>
<tr>
<td>Creole Trail LNG</td>
<td>GC</td>
<td>3,300</td>
<td>15%</td>
<td>F</td>
<td>2010</td>
</tr>
<tr>
<td>Broadwater Energy</td>
<td>EC</td>
<td>1,000</td>
<td>25%</td>
<td>F</td>
<td>2010</td>
</tr>
<tr>
<td>Beacon Port</td>
<td>GC</td>
<td>1,500</td>
<td>15%</td>
<td>F</td>
<td>2010</td>
</tr>
<tr>
<td>Quoddy Bay</td>
<td>EC</td>
<td>500</td>
<td>15%</td>
<td>F</td>
<td>2010</td>
</tr>
<tr>
<td>Northeast Gateway</td>
<td>EC</td>
<td>400</td>
<td>10%</td>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Gulf LNG - Pascagoula</td>
<td>GC</td>
<td>1,000</td>
<td>10%</td>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>Skipanon LNG</td>
<td>WC</td>
<td>500</td>
<td>10%</td>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>Pelican Island</td>
<td>GC</td>
<td>1,200</td>
<td>15%</td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Somerset LNG</td>
<td>EC</td>
<td>650</td>
<td>15%</td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Weaver's Cove</td>
<td>EC</td>
<td>600</td>
<td>15%</td>
<td>F</td>
<td>2012</td>
</tr>
<tr>
<td>Dorado HiLoad LNG</td>
<td>GC</td>
<td>1,400</td>
<td>5%</td>
<td>F</td>
<td>2012</td>
</tr>
<tr>
<td>St. Helen's LNG</td>
<td>WC</td>
<td>700</td>
<td>15%</td>
<td>F</td>
<td>2014</td>
</tr>
<tr>
<td>Neptune LNG</td>
<td>EC</td>
<td>400</td>
<td>15%</td>
<td>F</td>
<td>2014</td>
</tr>
<tr>
<td>Coos Bay</td>
<td>WC</td>
<td>130</td>
<td>15%</td>
<td></td>
<td>2014</td>
</tr>
<tr>
<td>High Rock LNG/Seafarer</td>
<td>GC</td>
<td>1,000</td>
<td>0%</td>
<td></td>
<td>2008</td>
</tr>
</tbody>
</table>
A Catalyst for Growth in Downstream LNG

- Excelerate Energy
  - A new player in the LNG Industry
  - Focused on adding regasification infrastructure to growing markets for natural gas
  - Recently completed successful commissioning & commercial operations of the first off-shore regasification in the world, and the first new regasification terminal to serve the US in more than 20 years
Energy Bridge is a Flexible, Floating Pipeline

Initial fleet of three vessels can link supplies from anywhere in the world to the important and growing United States market.
Gulf Gateway
Technical Specifications

World’s First LNG Regasification Vessel Excelsior
Docked at the World’s First LNG Deepwater Port

Peak vaporization capacity
- 690 mmcf/d open-loop mode
- 450 mmcf/d closed-loop

Storage tank capacity
- 138,000 cubic meters
  Equivalent to roughly 3.0 Bcf of natural gas

Ships meet or exceed all U.S. and international standards for LNG carriers

Commissioned March 17, 2005
Gulf Gateway required a metering platform given its dual connection to the Sea Robin and Blue Water Pipelines. Other locations will likely not require such a platform.
Construction completed February 2005
- Available 3+ years ahead of other new projects; On time, on budget
- Total construction time – 6 winter months
- Excelsior, Excelerate’s first Energy Bridge vessel arrived on March 17
  - Successfully docked to the buoy the same day
  - Commissioning and test flows followed
  - Commercial gas flows commenced March 22
  - Discharge successfully completed on March 30
- Performance now proven
  - Maximum throughput rate of 690 mmcf/d in open-loop
  - Maximum throughput rate of 450 mmcf/d in closed-loop
View of the Deepwater Port When no Vessel is Present

Marker Buoys

Messenger Line

Buoy Submerged Approximately 100 feet Below The Surface
What’s On The Horizon?
North American Potential Project Portfolio

- **Gulf Gateway**: Offshore Louisiana, West Cameron 603, Capacity: 800 to 1,000 mmcf/d, Online: 2007
- **Pacific Gateway**: Offshore Mexico, Capacity: 600 to 1,000 mmcf/d, Online: 2010
- **Northeast Gateway**: Massachusetts Bay, Capacity: 400+ mmcf/d, Online: Spring 2007
- **Golden Gateway**: Northern California, Capacity: 600 to 1,000 mmcf/d, Online: 2009
- **Southeast Gateway**: Florida / Bahamas, Capacity: 400+ mmcf/d, Online: 2009

**Liberty Gateway (Potential)**
- Location: Offshore NY / NJ
- Capacity: 400+ mmcf/d
- Online: 2009 - 2010

*Image shows a map with various gateway locations marked.*
Global Potential - Countries Expressing Interest in Energy Bridge
What Might the Future Hold?
A 2010 Regasification Scenario

Many of the current regas projects should get built

- Current terminals plus expansions 5 Bcf/day
- 10 facilities at 1 Bcf/day each 10 Bcf/day
- Total regasification capacity potential 15 Bcf/day

LNG could represent 20% of Demand by 2010
The Potential for an Impactful Decade

2000 – 0.6 Bcf/day of LNG Imports

2010 – 15.0 Bcf/day of LNG Imports

Over 33 liquefaction trains from 12 countries successfully replace declining US production with a diverse import portfolio.
But… It Won’t be Easy

- Aligning investment decisions and commitments
- Protecting against Henry Hub price collapse
- Fighting resistance to infrastructure construction
- Competing with push for “Domestic” alternatives
- Allaying safety concerns
Excelerate is Contributing to the Solution