Main Pass Energy Hub™
Approved Deepwater Natural Gas Port

Marine Technology Society
Houston, TX
May 24, 2007
Location
McMoRan Exploration

Freeport-McMoRan’s natural resources companies have a long history of global operations dating back to early 1900s.

Headquarters located in New Orleans, Louisiana.

Record of success in finding and developing complex, world-class projects.
- Freeport has owned and operated major offshore facilities since 1958
- Main Pass facilities – previously permitted as a sulphur mine and oil and gas production and processing facility
- Received MARAD approval for MPEH™ on January 3, 2007
US LNG Demand-Supply

Source: Energy Information Agency AEO 2005
U.S. Production vs. Consumption

- Actual demand is cyclical and **exceeds** supply during certain periods of time and in certain regions of the U.S.
LNG – Production to Market Flow Schematic & Chain Valuation

FLOW

Natural Gas

Condensate

Liquefaction (Convert to LNG)

LNG to U.S.

LNG Regas at MPEH™

Natural Gas

U.S. Pipeline Grid

Ethane, Propane & Butane Gases Removed to Reduce Btu Content

Typical LNG Chain Cost

$/MMbtu

<table>
<thead>
<tr>
<th></th>
<th>E&amp;P</th>
<th>Liquefaction</th>
<th>Shipping</th>
<th>Ter. Regas</th>
<th>Total</th>
<th>p/l to Mkt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$.50</td>
<td>$2.00</td>
<td>$1.00</td>
<td>$0.50</td>
<td>$4.00</td>
<td>HH – NY $1.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HH – FL $0.50</td>
</tr>
</tbody>
</table>
Conventional vs. Integrated Storage

Conventional Regas Facility

1.0 bcf/d

Main Pass Energy Hub™

Regas 1 bcf/d
Gas Conditioning
Gas Cavern Storage

3.1 bcf/d Peak

Gas Conditioning
Gas Storage

Distribution to Consumers
Project Advantages

- Key processes and systems are combined into one facility.
  - LNG surface storage
  - Conventional vaporization
  - On-site gas conditioning
  - Integrated, high capacity salt cavern gas storage
  - Premium pipeline header to tie into premium U.S. gas markets
MPEH™ Technical Specifications

**Terminal Capacity**

- Annual LNG Throughput Capacity 350 Bcf
- LNG Surface Storage Capacity
  - Liquid 145,000 cm
  - Vapor Equivalent 3.1 Bcf
- Salt Cavern Storage Capacity 28 Bcf

**Terminal Deliverability**

- LNG Vaporizer (max) 1.6 Bcf/day
- Cavern Storage (max) 1.5 Bcf/day
- Peak Deliverability 3.1 Bcf/day

*12 Hr offload capability*
MPEH™ Pipeline Deliveries

3.1 Bcf/d Takeaway
8 Pipeline Connects
with Broad / Liquid Market Access

Main Pass Energy Hub™
Optimal location east of constraints
Major Pipeline Networks Served
Project Timing

- License application deemed complete in mid 2004.
  - March 2006 received final EIS from MARAD/USCG
  - May 5, 2006 LA Governor vetoed use of “open loop” vaporization
  - MPEH DWP “closed loop” vaporization “Amended” Application submitted 5/31/06
  - USCG/MARAD published “closed loop” EA 9/19/06
  - MARAD favorable Record Of Decision issued 1/3/07

- Continuing to progress commercialization of project.

- Existing structures allow a 40 month design and construction schedule.

- In advanced discussions with certain LNG suppliers.
Shipping Lanes and Gas Pipelines
Access Route from Shipping Lane

MAIN PASS DEEPWATER NATURAL GAS PORT – CARRIER ACCESS
Carrier Access Circuit from Shipping Lane
Current Configuration
Location Advantages

- **Location:**
  - Federal waters
  - 210-foot (64 m) water depth
  - 38 miles (61 km) east of Venice, Louisiana
  - 16 miles (26 km) east of the mouth of the Mississippi River
  - Near existing pipeline infrastructure
  - Deepwater access for ships
  - Near shipping lanes
  - 2-mile (3.2 km) diameter salt dome capable of accommodating numerous caverns having an estimated storage potential of +500 million barrels (80 MM m³)
Liquefied Natural Gas (LNG) Processing System

- **Gas Pipelines:**
  - To South Pass Block-55
  - To Main Pass Block-298
  - To Main Pass Block-164
  and on to Coden, AL and other interconnect locations

- **NGL Pipeline to Venice**

- **LNG Vaporization**
  - WHR

- **Comp**

- **3 NG Caverns**

- **Gas Conditioning Plant**

- **Surface Storage**

- **Dehydration**
Main Pass Energy Hub™
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FACILITY LAYOUT

Platform No.1
LNG Offloading,
LNG Vaporization and
Gas Conditioning Facilities

Platform No.2
Gas Storage Systems
Compression

Platform No.3
LNG Vaporization and
Power Generation

Storage Platforms 5 & 6
LNG Storage

BS-Y7
Quarters, Shop
Warehouse

Soft Berth™
(Patent Pending)

Storage Caverns

CARRIER

36” Pipeline to Coden, AL

16” Pipeline to MP298

20” Pipeline to SP55

FACILITY LAYOUT
Soft Berth™ - Compliant Mooring System
Design Advantages of Soft Berth™

- **Steel Structures**
  - Complies with existing platforms
  - Designed to survive Cat 5 Hurricane

- **210-foot Water Depth**
  - Sufficient depth to permit use of tuned moorings
  - Adequate keel clearance for LNG carriers
    - Reduces blockage effects
    - Eliminates ground effects

- **Compliant Berths**
  - Reduces environmental concerns during berthing of LNG carriers
  - Greatly reduces loads between LNG carriers and berth
Soft Berth™ Load

Wave Induced Loads on LNGC

- Beam Seas Excitation Force on LNGC
- Beam Seas Inertia Load by LNGC (including added mass)
- Difference between Excitation and Inertia Load in Beam Seas

Wave Period (sec)

Wave Induced Loads on LNGC

Sway (kips/ft amplitude)

- Wind
- Mean Drift
- Slow Drift
- Current
- 1st order Wave

95.5%
0.8%
1.3%
1.5%
0.9%
Key Points

- Berth structures are compliant.
  - Only second order environmental loads between ship and berth.
  - Berths free to move due to first order loads.
- Berths designed for 160,000 m³ carrier.
- Can be upgraded for 250,000 m³ carriers.
- Long-term data history indicates weather and sea conditions allow 95% operability for offloading ships.

Soft Berth™ – Patent Pending
BERTH OPERABILITY DESIGN APPROACH

- Objective – high availability/operability
- Determine MP 299 predominate seas
- Design berth to accommodate LNGCs in predominate MP 299 seas
- Confirm design model including operability in marine basin tests
NDBC Buoy Near MPEH™

From National Data Buoy Center web site at www.ndbc.noaa.gov
MPEH™ Proximity to NDBC Buoy

MPEH™ 29.30N 88.77W

NDBC Station 42040
29.21N 88.20W
Validity of Buoy Data at MPEH™

MPEH™ ~38 miles Buoy 42040
214 ft Depth 780 ft Depth
# NDBC Buoy Data

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>WIND DIR.</td>
<td>Ten-minute average wind direction.</td>
</tr>
<tr>
<td>WIND SPEED</td>
<td>Ten-minute average wind speed values.</td>
</tr>
<tr>
<td>WIND GUST</td>
<td>Maximum 5-second peak gust during the measurement hour.</td>
</tr>
<tr>
<td>WAVE HEIGHT</td>
<td>Average height of the highest one-third of the waves during a 20 minute sampling period.</td>
</tr>
<tr>
<td>WAVE PERIOD</td>
<td>Average period of the highest one-third of the waves observed during a 20 minute sampling period.</td>
</tr>
<tr>
<td>WAVE DIR.</td>
<td>Mean wave direction corresponding to the highest one-third of the waves observed during a 20 minute sampling period.</td>
</tr>
</tbody>
</table>

From National Data Buoy Center web site at [www.ndbc.noaa.gov](http://www.ndbc.noaa.gov)
Wind and Wave Probability Distribution
Weather Data – 8 years
Weather Data – 1 year
Weather Data – 3 Months
Weather Data – 2 Weeks

Hs = 10 ft

Hs = 8 ft

Hs = 6 ft

Hs = 4 ft

Hs = 2 ft
# Tasks and Durations

<table>
<thead>
<tr>
<th>Task #</th>
<th>Condition</th>
<th>Duration (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ingress</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>Berthing</td>
<td>1.5</td>
</tr>
<tr>
<td>3</td>
<td>Connect Unloading Arm</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>Unloading (up to &quot;Stoppage of Cargo Transfer)</td>
<td>13.0</td>
</tr>
<tr>
<td>5</td>
<td>Normal Disconnect of Unloading Arm and Mooring &amp; Berthing lines/Tugs Moving LNGC off Berth</td>
<td>3.0</td>
</tr>
<tr>
<td>6</td>
<td>Egress</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Total (Excluding W.O.W.)</td>
<td>20.0</td>
</tr>
</tbody>
</table>
Operability Study

Percent operability is based on the following assumptions:

- Berth design availability sea conditions
  - Berth: 6.6’ (2m) seas, 25 knot winds
  - Stay on berth: 8’ (2.4m) seas, 35 knot winds
- 1.0bcf/day base vaporizing rate, 72-hr arrival schedule
- No down time due to equipment maintenance, repair, or failure (i.e., equipment is always operable at rated capacity)
- 8 years of weather data are used to compare environmental and system response operating limits based on the task being attempted in a sequential, hour-by-hour basis from Jan 01, 1996 to Dec 31, 2003

Conclusion: 95%+ operability achieved including times when Tropical Revolving Storms are present in the Gulf of Mexico, this study considers all weather data over the eight year period.
Maritime Research Institute, Netherlands
Marine Basin Model Test Results

- Basin model testing at Marin confirmed computer design models.
- Marin is a recognized as a world leader in marine model testing.
- Scale model tests confirmed a more than adequate operating weather window for Soft Berth™.
- Testing of a critical element – the Carrier motions relative to the allowable operating envelope of the Unloading Arms – confirmed a large window of operability.
- Soft Berth™ performed as expected under both maximum operating and hurricane conditions.
Platform No.3
Upper Deck Elevation

DeNOx Unit (3)
Submerged Combustion Vaporizers (3)
Gas Turbine Generators (3)
Electrochlor Units
Nitrogen Generators
Air Compression
Emergency Generator
LNG Storage Platforms – Perspective View

SPB LNG STORAGE TANKS
100'H x 120'W x 75'L
(3 PER PLATFORM)
Salt Cavern: Geologic Overview

- Wells drilled into the dome 4,000 feet
- Water circulated into the well
- Salt cavern is leached as water "melts" away salt near the well bore
- Gas is injected at high pressures
Salt Dome Storage Cavern Development 101
U.S. Salt Cavern Storage Sites

U.S. Natural Gas Salt Cavern Storage

- Southwest Wyoming
- Red Lake
- Copper Eagle
- Desert Crossing
- Kiowa
- Chiles Dome
- Liberty
- Starks
- Moss Bluff
- North Dayton
- Boling
- Markham
- Clemens
- Stratton Ridge
- Spindletop
- Hackberry
- Jefferson Island
- Egan
- Napoleonville
- Grand Bayou
- Mcintosh
- Southern Pines
- Richton
- Hattiesburg
- MPEH™
- Soronto
- Magnolia

Legend:
- Bedded Salt - Operational
- Bedded Salt - Proposed
- Bedded Salt - Dead
- Salt Dome - Operational
- Salt Dome - Proposed
- Salt Dome - Dead

Main Pass Energy Hub™
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Cavern Design

Main Pass Energy Hub™

Salt Dome Storage Potential

2-Mile (3.2 km) Diameter Salt Dome
Capacity: 39 caverns: 10.7 MM bbls (1.7 MM m³) / 9.3 bcf (263 MM m³) each
Total Volume: 417 MM bbls (66 MM m³) / 363 bcf (10.3 MM m³)

Initial Gas Storage Cavern

Cavern Development Durations

<table>
<thead>
<tr>
<th>General</th>
<th>Engineering/Well Permitting</th>
<th>4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wells 1</td>
<td>Drilling</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Leaching (@ 3500 gpm)</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Desalting</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Total Wells 1 (Indus Gas)</td>
<td>42 months</td>
</tr>
<tr>
<td>Wells 2 &amp; 3</td>
<td>Drilling</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Leaching (@ 3500 gpm)</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Desalting</td>
<td>4 months</td>
</tr>
<tr>
<td></td>
<td>Total Wells 2 &amp; 3 (Indus Gas)</td>
<td>36 months</td>
</tr>
</tbody>
</table>

NOTE: Drilling of wells is consecutive, leaching commences following drilling completion.
Main Pass Energy Hub™

Salt Dome Storage Potential
2-Mile (3.2 km) Diameter Salt Dome
Capacity: 39 caverns: 10.7 MM bbls (1.7 MM m³) / 9.3 bcf (263 MM m³) each
Total Volume: 417 MM bbls (66 MM m³) / 363 bcf (10.3 BM m³)

- Identical in size and storage potential to Mt. Belvieu
- Expandable to 360 Bcf of storage capacity
- Terminal expansion capacity
- Development cost advantages
Pipeline Header and Major Interconnections

The MPEH™ LNG terminal will have direct pipeline access to 8 major interstate pipeline networks serving the Eastern United States markets.