Methane Hydrate E&P
Myths and Realities

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Commercializing Methane Hydrates
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What is Gas Hydrate?

Gas hydrate is a crystalline solid consisting of gas molecules, primarily methane, each surrounded by a cage of water molecules.
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Gas hydrate forms when gas and water combine under the appropriate conditions of pressure and temperature.
Why are we interested in Gas Hydrate?

1. When gas hydrate is warmed or depressurized, it reverts back to gas and water (it dissociates)

2. The gas hydrate structure concentrates natural gas

3. There is a lot of gas hydrate in the world
Organic Carbon Distribution

- Soil: 1400 units
- Recoverable and nonrecoverable fossil fuels (coal, oil, natural gas): 5000 units
- Gas hydrates (onshore and offshore): 10,000 units
- Dissolved organic matter in water: 980 units
- Land biota: 830 units
- Peat: 500 units
- Other: 67 units

Units = $10^{15}$ g carbon
Implications

- Seafloor Stability/Safety
- Global Climate Change
- Energy Resource
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The **Wrong** Question:
How many hydrate molecules are there in the world?

The **Right** Questions:
How much hydrate is concentrated in reservoirs where it can be safely & commercially recovered?
How can we locate and develop those reservoirs?
A Term You Will Hear A Lot
During This Conference:

Petroleum System
Industry Perspectives on Gas Hydrate

Old View:

- Not commercial for 20-30 years
- Expensive
- Can’t compete with other resources
- Entirely New technology required
  - “Not what our company does”
- “Not in my lifetime”
A Few Gas Hydrate Myths
Myth #1: The “BSR”

The Myth: Hydrate-bearing sediments can be identified by the presence of a “Bottom Simulating Reflector” on seismic data.
The Problem with a “BSR Hunt”

- BSRs tell us nothing about the concentration of hydrate in sediment
- BSRs are rare in many basins that are known to contain gas hydrates
- The strongest BSRs occur in shales, not with reservoir-quality sands
- Identification of a BSR requires that strata are not parallel to the seafloor
A Valid Role for BSRs

- BSRs define the hydrate/free gas phase boundary
- Finding a BSR allows a validation or invalidation of the assumptions of hydrothermal gradient, geothermal gradient, and gas composition
Fundamentals of Hydrate Prospecting

Petroleum System
Myth #1: The “BSR”

Reality:
Commercial gas hydrate prospects require
- Appropriate P-T conditions
- Reservoir-quality lithology (sand)
- Adequate gas flux

A BSR is not required
Myth #2: The Blake Ridge

The Myth: The best hydrate resources for the U.S. are at the Blake Ridge (Carolina Offshore). The Gulf of Mexico is not very prospective.
Myth #2: The Blake Ridge

Initial Reports from Academia:

- No sands within the HSZ in the Gulf
- Seafloor hydrate mounds and shallow fracture-fill are the only plays
- Strip mining or a new extraction method required

Based on piston cores & submarines
Myth #2: The Blake Ridge

Reality:

- The Gulf of Mexico has all of the components needed for commercial gas hydrate prospects
  - Also abundant infrastructure
  - No moratorium in key areas
Myth #3: The Timeline

The Myth: Commercial Development is 20-30 years away and will involve entirely new technology.
2002 Canadian Production Test
Global Activity
Recent and Current

- **Japan – Drilling Program 2004**
  - 32 wells

- **India – Drilling Program 2006**
  - 39 wells

- **MMS Assessment 2006**
  - Possible impact on lease valuations
Global Activity
Recent and Current

- **Canada & Japan – Arctic Production Test 2006-2007**

- **U.S. North Slope – Hydrate Well 2007 (BP)**

- **Gulf of Mexico – Multi-Well Consortium Drilling Program 2007?**
  - Site selection in progress
Global Activity
Recent and Current

- **Canada & Japan – Extended Production Test 2007-2008**

- **India – Production Test 2008**

- **Seismic Surveys currently being shot specifically for hydrate assessment**
Global Activity
Recent and Current

- China – 2007 Hydrate Drilling Program

- South Korea – 2007 Hydrate Drilling Program
Global Activity
Recent and Current

National Gas Hydrate Programs/Research

• U.S.
• Japan
• India
• Canada
• China

• Korea
• Mexico
• Chile
• Ireland
Key Challenges

- Identifying/Quantifying Prospects
- Production Technology
- Economic Viability
- Transporting “Stranded” Gas

- Ultimate Recovery per Well
- Flow Rates
- Operating Expense
Myth #3: The Timeline

Reality:
All the pieces are coming together very quickly.
Existing technology is being leveraged.
New technology is rapidly emerging.
Myth #4: Hydrates are irrelevant to our current business

The Myth: Hydrates have no net present value so they can be ignored in deepwater lease sales
Myth #4: Hydrates are irrelevant to our current business

Reality: Within the life of a deepwater lease, commercialization of gas hydrates is likely.

Hydrate resources will have value for lease owners.

Hydrate resources will eventually be included in MMS bid assessments.
Changing Industry Perspectives on Gas Hydrate

New View:

- Commercial in 5-10 years
  (limited production sooner)
- More expensive, but not prohibitive
- Existing technology can be leveraged
- Needs to be considered
Critical Questions for this Conference

- Is there room in gas markets for production from hydrate?
- What is the current status of exploration technology and where is it headed?
- What is the current status of production technology and where is it headed?
Critical Questions for this Conference

- What are the business aspects of pursuing hydrate development?

- What is the outlook for the Gulf of Mexico and Alaska?

- What are some key players doing?
Thank You

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