OVERVIEW: Oil & Natural Gas Program

James R. Ammer, Director, NGOPMD
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Oil & Natural Gas Program
Comprehensive R&D Portfolio

Petroleum Technology

Methane Hydrates

Environmental Solutions

EPAct 2005 Title IX, Subtitle J
Strategic Center for Natural Gas & Oil

Implement science and technology programs that resolve the environmental, supply and reliability constraints of oil and natural gas resources to enhance our energy security

• Create public benefits by investing in research that industry would not take on itself

• Deliver a balanced portfolio of technology to:
  – Enable Independents to efficiently produce discovered resources
  – Conduct long-term/high risk R&D - develop entirely new sources of supply
  – Minimize environmental impact

A multi-discipline, long-term, high-risk, and high-reward endeavor that will only occur through Federal involvement.
Significant Residual and Unconventional Oil Resource Remains to be Developed (Billion Barrels)

<table>
<thead>
<tr>
<th>U.S. Oil Resource Base (end 2006)</th>
<th>1145</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves (end 2006) (^1)</td>
<td>21</td>
</tr>
<tr>
<td>Total Resource Remaining (^2)</td>
<td>1124</td>
</tr>
<tr>
<td><em>(includes undiscovered, reserve growth, and residual oil)</em></td>
<td></td>
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<tr>
<td>Conventional (^2)</td>
<td>963</td>
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<tr>
<td>Heavy oil (^2)</td>
<td>81</td>
</tr>
<tr>
<td>Oil sands (tar sands) (^2)</td>
<td>80</td>
</tr>
<tr>
<td>Oil shale (high grade Green River only) (^3)</td>
<td>1500 to 1800</td>
</tr>
</tbody>
</table>

Source: \(^1\) EIA; \(^2\) ARI 2006 report; \(^3\) Utah Heavy Oil Program report, Sept. 2007
Current estimates put the North American shale gas resource at 1,200 trillion cubic feet total gas in place

Source: E&P Oil and Gas Investor; Hart Energy Publishing.
The Gas Hydrates Resource Pyramid

*Distribution of huge in-place resource*

- **Arctic sandstones under existing infrastructure (~10’s of Tcf in place)**
- **Arctic sandstones away from infrastructure (100s of Tcf in place)**
- **Deep-water sandstones (~1000s of Tcf in place)**
- **Non-sandstone marine reservoirs with permeability (unknown)**
- **Massive surficial and shallow nodular hydrate (unknown)**
- **Marine reservoirs with limited permeability (100,000s Tcf in place)**

- Increasing in-place
- Decreasing reservoir quality
- Increasing technical challenges
- Decreasing % recoverable

**Data Sources**
- B: MMS, 2008
- C: Unassessed (India, Korea expeditions)
- D: Unassessed
- E: Collett, 1995
Independents’ Role Continues to Grow

5,000 Independent Producers Drill 90% of U.S. Wells, Own Growing Share of Domestic Reserves, But Do Not Have Individual Resources to Invest in R&D
Energy Policy Act of 2005
Title IX, Subtitle J

- **Sec 965 - DOE Traditional Oil and Gas Program**
  - DOE conduct a program of Oil & Gas RD&D
    - E&P; oil shale; environmental

- **Sec 968 - Methane Hydrate Research**
  - DOE-led multi-agency program
    - Resource, safety, environmental impacts

- **Sec 999 - Ultra-deepwater & Unconventional Program**
  - Royalty trust fund ($50 million/year)
  - Research at NETL (*Complementary program*)
  - Consortium-administered R&D
Traditional Program Overview

- 69 Current Projects (excludes Section 999 projects)
- $124 MM Total Value ($84 MM Gov’t. Share, $40 MM Cost-Share)
- Robust, Balanced Portfolio
  - Fracture Flowback & Produced Water Treatment and Mgmt. (18 projects, $9.2 MM)
  - Environmental Impact Mitigation (10 projects, $18.8 MM)
  - Water Resources Management (4 projects, $2.5 MM)
  - Enhanced Oil Recovery (9 projects, $13.1 MM)
  - Unconventional Oil Production (4 projects, $6.9 MM)
  - Increasing Domestic Oil and Gas Production (3 projects, $8.6 MM)
  - Reservoir Characterization (6 projects, $5.9 MM)
  - Drilling/Completion/HPHT Downhole Tools (7 projects, $4.7 MM)
  - Seismic Technology (3 projects, $2.3 MM)
  - Oil and Gas Infrastructure-Related (4 projects, $7.9 MM)
  - Technology Transfer (1 project, $4 MM)
EPACT 2005, Subtitle J, Section 999

• Consortium-administered portion
  – Ultra-deepwater
  – Unconventional natural gas
    • Low permeability sands
    • Gas-filled shales
    • Coalbed methane
  – Technologies for small producer
EPACT 2005, Subtitle J, Section 999

- NETL Complementary R&D
  - Extreme Drilling (HT/HP)
  - Unconventional oil and EOR
  - Environmental impacts
  - Resource assessment
  - Planning and analysis
The Methane Hydrate Program

*NETL’s R&D Effort*

- **Marine:** Multi-site drilling and coring program
  - Logging and coring
  - Testing exploration concepts/technologies
  - Assessment of potentially recoverable gas

- **Arctic:** Long-term production testing with environmental monitoring
  - Prudhoe Bay project
  - North Slope Borough
  - Methane-CO₂ exchange

- **Technology development/modeling**
  - Field sampling and analysis tools
  - Numerical models (molecular to field scale)
  - Exploration & production systems

- **International collaborations**
Comprehensive Technology Transfer

**Brochures**

**Conference Exhibits**

**Presentations**

**Newsletters and Journals**

**NETL Website**