U.S. Perspectives on Exploiting Tight Gas Resources

Tight Gas Workshop, 19 Sept. 2006

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Definition of “Tight Gas”

- U. S. Government, 1970’s (tax regulations): expected reservoir permeability < 0.1 md (0.1 μm$^2$)
- More useful (Holditch, 2006): reserves “that cannot be produced at economic rates ... unless the well is stimulated by a large hydraulic fracture treatment or produced by use of a horizontal wellbore or multilateral wellbores.” May depend on more than just permeability
Size of Resource in U.S. - GTI Estimate

Total U.S. production $\sim 20$ TCF ($560$ B m$^3$)
Current Tight-Gas Production in U.S.
Size of Resource Worldwide

- Probably underestimate; less exploration in rest of world than in U.S.
- Holditch (2006) suggest permeabilities in all basins distributed log-normally; can estimate tight reserves from what found now

7.4 TCF ~ 210 B m³
Technology Needs

• Identified in series of meetings (GTI, N Mexico Tech) with producers around U.S.; grouped needs by priority and region
<table>
<thead>
<tr>
<th>Topic</th>
<th>San Juan</th>
<th>Permian</th>
<th>Mid continent</th>
<th>Appalachians</th>
<th>Rocky Mts.</th>
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<tr>
<td>Reservoir characterization, imaging, fracture assessment, desorption data</td>
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<td>Data mining, data collection</td>
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<td>Producibility models</td>
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<td>Handling, treating and disposal of produced water</td>
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<td>Extending well life</td>
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<td>Advanced drilling technologies, drilling cost reduction</td>
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<td>Completion strategies for horizontal wells</td>
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<td>Expert systems and best practices</td>
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<td>Processing of low-BTU gas</td>
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<td>Removal of liquids from deep gas wells</td>
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<td>Core drilling/evaluation</td>
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<td>Production performance monitoring and evaluation</td>
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1 = Top Priority  • = major priority
Technology Needs (Holditch)

• Reservoir characterization; properties at depth
• Well tests may take years to reach effective reservoir boundary
• Mechanical properties of formation (fracturing)
• Better stimulation (fracturing) technology: fracturing gels that break at < 250°F (120°C)
Ways to Improve Fracture Performance (Sharma)

- Hybrid fracture treatments
- Optimizing fluid rheology and rates
- Small or lightweight proppant
- Minimizing impact of water blocking in tight sands
- Multi-stage fracture treatments
- Reverse hybrid fractures

Reference: http://www.pge.utexas.edu/faculty/sharma.cfm
Research and Development

- U.S. 2004 Energy Bill authorized $150MM/yr for 10 years for oil and gas R&D research, 30% ($45MM/yr) for "unconventional gas"
- RPSEA was sole bidder to administer this program
- Fate of previous federal oil and gas R&D program in doubt
Resources on Web

- RPSEA web site  www.rpsea.org
- GTI Unconventional Gas Technology Roadmap  
- Article "Tight Gas Sandstones," Stephen Holditch, Texas A&M  
- Article "Optimal Stimulation Treatments of Tight Gas Sands" by Holditch  
  SPE paper 96104, from spe e-library, www.spe.org
- AAPG article on unconventional gas  
- Testimony of GTI CEO Riordan to US House of Representatives  