NETL Well Integrity Workshop:
Identifying well integrity research needs for subsurface energy infrastructure

Session 4: What are unique concerns for well integrity in challenging environ

Moderated by Douglas Blankenship

May 25, 2021
# AGENDA (all times Eastern Daylight Time or UTC-4)

<table>
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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>12:10–14:10</td>
<td>Session 4: <em>What are unique concerns for well integrity in challenging environments?</em></td>
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<tr>
<td>12:10–12:20</td>
<td>Introduction and Session Charge</td>
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<td>D. Blankenship (US DOE/GTO)</td>
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<td>12:20–12:35</td>
<td>Cementitious Materials for High-Temperature Geothermal Wells – Recent Advances and Future Challenges</td>
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<td>Tatiana Pyatina (BNL)</td>
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<td>12:35–12:50</td>
<td>Hydrogen Storage in Offshore Sandstone Reservoirs – SINTEF’s HyStorm Project</td>
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<td>Pierre Cerasi (SINTEF)</td>
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<td>12:50–13:05</td>
<td>Casing Deformation at the Big Hill SPR Site</td>
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<td>Barry Roberts (SNL)</td>
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<td>13:05–13:25</td>
<td>Session 4: Q&amp;A</td>
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<td>D. Blankenship (US DOE/GTO)</td>
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<td>13:25–14:10</td>
<td>Guided Breakout Discussions</td>
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<td>14:10–14:20</td>
<td>Closing Remarks</td>
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<td>Bob Dilmore (NETL)</td>
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Geothermal

- Applications across temperature ranges and applications
- Temperature derating of casing
- Cement tolerance to temperature and chemistry
- Thermal Cycling
- Corrosive fluids – exotic materials
- All casing cemented to Surface
- Large diameters
Hydrocarbon Storage

- Gas storage in salt beds/domes & depleted reservoirs/aquifer
  - ~400 facilities across in US, 80% in depleted reservoirs. Majority use repurposing of old wells ~80% constructed before 1980.
  - Post Aliso Canyon, there was a renewed emphasis on system integrity
    - Interagency Task Force on Natural Gas Storage Safety provided recommendations (to deal with the unique nature of reservoir storage operations)
- Liquid Storage largely in salt beds/domes –
  - SPR – USG ~700MMbbl, Private capacity, much on the surface, ~500MMbbl.
  - LOOP ~60MMbbl
  - Many failed efforts in mined HR caverns
Hydrogen?

Salt Cavern Storage
- Commercial today
  - A couple site for underground storage in US salt domes
  - Salt cavern storage in UK

Reservoir
- Some pilot studies in sedimentary systems
- Look forward to hearing about the issues

- Speculation of some issues
  - Containment
  - Chemical - highly reactive & flammable
  - Biology
  - Compression costs/BTU
  - Casing materials
Well Integrity Affects All