Risk Assessment for Geologic Carbon Sequestration in Pennsylvania

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Key Technical Analysis Included:

- Inventory of primary and secondary rock units in the Greater Allegheny Plateau Geologic Province
- Potential contamination of shallow aquifers of stations of CO₂ using geological modeling
- Storage capacity to support low and high potential injection
- Potential for leakage from CO₂ and monitoring low volume of CO₂
- Potential for surface water recharge
- Potential for secondary containment for large-scale storage
- Potential for the site to attenuate or dissipate CO₂ from the primary formation
- Secondary containment and secondary containment wells

Example using Screening and Ranking Framework (SRF) (Oldenburg, 2008)

<table>
<thead>
<tr>
<th>Release source</th>
<th>Exposure Scenario</th>
<th>Potential Pathway</th>
<th>Impact (Human)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection well</td>
<td>Outdoor exposure</td>
<td>Air</td>
<td>Low</td>
<td>No ecological risk</td>
</tr>
<tr>
<td>Injection well</td>
<td>Indoor exposure</td>
<td>Air</td>
<td>High</td>
<td>Ecological risk</td>
</tr>
</tbody>
</table>

Example Site Analysis for Geologic Sanctions Formation

- Target the geologic formation of interest and secondary formations that address issues of specific concern

Potential Geologic Storage Formations to Pennsylvania

- Oil and gas wells at depths of greater than 2500' are plentiful, and may offer conduits for leakage
- Many dry oil and gas wells that could generate the seal and storage formation need to be in contact with sufficient Pennsylvania (PA DCNR database) CO₂ leakage from these sites could occur
- Due to the long history of oil and gas exploration in Pennsylvania, many abandoned wells may exist
- Fractures and faults throughout much of Pennsylvania, particularly in eastern counties. Fractures and faults in rock formations need to be investigated and information collected
- Site-specific data needed for detailed evaluation
- Injection wells have been known to intensify storage sites

Potential for Subsurface Releases after Injection

- Injection well with depth of lesser than 2000' are plentiful, and may offer conduits for leakage
- Site-specific data needed for detailed evaluation

US EPA’s Vulnerability Framework

- A useful tool to evaluate the sites for their impacts to human health and the environment

Potential for Secondary Containment if CO₂ Injection

- Appropriate site selection is key to reducing potential risks
- Potential for surface water recharge
- Due to the long history of oil and gas exploration in Pennsylvania, many abandoned wells may exist
- Fractures and faults throughout much of Pennsylvania, particularly in eastern counties. Fractures and faults in rock formations
- Site-specific data needed for detailed evaluation
- Injection wells have been known to intensify storage sites

Potential for Surface Water Recharge if CO₂ Injection

- Due to the long history of oil and gas exploration in Pennsylvania, many abandoned wells may exist
- Fractures and faults throughout much of Pennsylvania, particularly in eastern counties. Fractures and faults in rock formations
- Site-specific data needed for detailed evaluation
- Injection wells have been known to intensify storage sites