Regulatory and Legal Considerations for CCS

Carbon Capture and Sequestration
Public Workshop
June 10, 2010
Sacramento, CA
Sarah Wade
Take Home Points

• Enormous Societal Value to the CCS Option – Large Scale Projects Key
• Existing Regs Sufficient for Safe CCS
• Gaps: Driver / Financial Risk Management; Siting; Long-Term Stewardship; Completion of Regulatory Framework
• Significant Effort Underway to Close Gaps
CCS Project Issues

Capture
- CO2 Limits
- Compliance Mechanisms
- Financial

Transport
- Safety
- Siting
- Rate Setting /Access
- Financial

Storage
- Siting
- Permitting
- Operation
- Closure
- Long Term Stewardship
- Financial
Zen
and the Art of CO2 Capture Regulation

• Is a cap on CO2 necessary and/or sufficient for CCS deployment?
• Challenges for CO2 limits:
  – No cap without cost-effective technology and slow to no improvements in cost-effectiveness without a cap
  – Timing of investment need out of sync with likely incremental increases in CO2 limits
CO2 Pipelines – A Mature Technology

Key Dimensions
• Safety
• Siting
• Rate Setting and Access
The Issues Storage Presents

• Safety
  – Human Health and Environment
  – Drinking Water
  – Climate
• Long Term Stewardship
• Property Rights
• Financial Risk Management
Federal Oversight of CO2 Injection

- Safe Water Drinking Act (SWDA) passed in 1970’s
- Underground Injection Control (UIC) regs promulgated in 1980’s
- Purpose of UIC: ensure that injection activities and injected fluids do not contaminate or endanger Underground Sources of Drinking Water (USDWs)
## Classes of UIC Well

<table>
<thead>
<tr>
<th>UIC Well Class</th>
<th>Purpose of Well</th>
<th>Number of U.S. Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Injection of hazardous wastes, industrial non-hazardous wastes, or municipal wastewater</td>
<td>~550</td>
</tr>
<tr>
<td>Class II</td>
<td>Injection of brines and other fluids associated with oil and gas production, and hydrocarbons for storage</td>
<td>~143,950</td>
</tr>
<tr>
<td>Class III</td>
<td>Injection of fluids associated with solution mining of minerals (including salt)</td>
<td>~18,500</td>
</tr>
<tr>
<td>Class IV</td>
<td>Injection of hazardous or radioactive wastes into a USDW; such wells are banned unless permitted for use in an authorized site remediation project</td>
<td>32 Sites</td>
</tr>
<tr>
<td>Class V</td>
<td>All other wells; typically shallow injection of non-hazardous fluids, but there are also some deep wells and experimental technology wells</td>
<td>400,000 - 600,000</td>
</tr>
<tr>
<td>Class VI</td>
<td>Injection of CO2 for geologic sequestration</td>
<td>Proposed Class</td>
</tr>
</tbody>
</table>
## RCSP Phase II: Validation Phase
### Small-Scale Geologic and Terrestrial Tests

<table>
<thead>
<tr>
<th>Partnership</th>
<th>Geologic Provinces Location</th>
<th>Geologic</th>
<th>Terrestrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia Basin</td>
<td>0°</td>
<td>2,500 – 4,000</td>
<td>69 Mt over 20 years</td>
</tr>
<tr>
<td>North Central MT</td>
<td>1,000</td>
<td>3,200</td>
<td>10 Mt over 10 years</td>
</tr>
<tr>
<td>Eastern WY</td>
<td>2,700°</td>
<td>1,548</td>
<td>645 – 1,640 Mt over 80 years</td>
</tr>
<tr>
<td>Region-wide</td>
<td>0°</td>
<td>6,650 – 7,000</td>
<td>840 Mt over 80 years</td>
</tr>
<tr>
<td>Laudon Oil Field</td>
<td>&lt;50</td>
<td>1,550</td>
<td>25 Mt over 20 years</td>
</tr>
<tr>
<td>Muntford Hills Oil Field</td>
<td>4,600°</td>
<td>1,548</td>
<td>110 Mt over 20 years</td>
</tr>
<tr>
<td>Sugar Creek Oil Field</td>
<td>100</td>
<td>1,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Illinois Basin</td>
<td>100</td>
<td>1,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Appalachian Basin</td>
<td>100</td>
<td>5,900 – 8,200</td>
<td>25 Mt over 20 years</td>
</tr>
<tr>
<td>Cincinnati Arch</td>
<td>1,000</td>
<td>3,200 – 3,500</td>
<td>TBD</td>
</tr>
<tr>
<td>Michigan Basin</td>
<td>60,000</td>
<td>3,200 – 3,500</td>
<td>TBD</td>
</tr>
<tr>
<td>Region-wide</td>
<td>30,000</td>
<td>5,000</td>
<td>14.4 Mt</td>
</tr>
<tr>
<td>Region-wide</td>
<td>440</td>
<td>10,000 – 10,500</td>
<td>TBD</td>
</tr>
<tr>
<td>Cambridge, MD</td>
<td>90</td>
<td>1,600 – 1,600</td>
<td>TBD</td>
</tr>
<tr>
<td>Keg River Formation</td>
<td>30,000</td>
<td>5,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Daperow Formation</td>
<td>10,000 – 10,500</td>
<td>1,600 – 2,300</td>
<td>TBD</td>
</tr>
<tr>
<td>Williston Basin</td>
<td>475,000</td>
<td>5,600</td>
<td>TBD</td>
</tr>
<tr>
<td>Great Plains wetlands complex (PPR)</td>
<td>18,430</td>
<td>3,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>500,000</td>
<td>10,304</td>
<td>TBD</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>10,400</td>
<td>10,400</td>
<td>TBD</td>
</tr>
<tr>
<td>Mississippi Coastal Plain</td>
<td>3,002</td>
<td>8,600</td>
<td>TBD</td>
</tr>
<tr>
<td>Central Appalachian</td>
<td>1,000</td>
<td>1,600 – 2,300</td>
<td>TBD</td>
</tr>
<tr>
<td>Black Warrior Basin</td>
<td>0°</td>
<td>1,500 – 2,500</td>
<td>TBD</td>
</tr>
<tr>
<td>Paradox Basin–Aneth Field</td>
<td>250,000</td>
<td>5,600 – 5,600</td>
<td>TBD</td>
</tr>
<tr>
<td>Permian Basin</td>
<td>475,000</td>
<td>5,600</td>
<td>TBD</td>
</tr>
<tr>
<td>San Juan Basin</td>
<td>18,430</td>
<td>3,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Region-wide</td>
<td>475,000</td>
<td>5,600</td>
<td>TBD</td>
</tr>
<tr>
<td>San Juan Basin Coal Ferry (Navajo City, NM)</td>
<td>18,430</td>
<td>3,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Sacramento Basin</td>
<td>0°</td>
<td>8,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Colorado Plateau</td>
<td>0</td>
<td>4,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Shasta County, CA Lake County, OR</td>
<td>4,000 Mt over 80 years (CA)</td>
<td>900 Mt over 80 years (OR)</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Federal Oversight of CCS wrt/ to Climate Change Impacts

• EPA Promulgated 40 CFR Part 98 - GHG Reporting Rule in October 2009
• April 2010 – EPA Proposed part RR – GHG Reporting for Injection and Geologic Sequestration of CO2
• Requires all injectors to report, enables opt-in as GS facilities
Federal Gaps

• Pore space ownership
  – Who owns it?
  – How much is needed?

• Financial assurance requirements
  – Coverage: potential impacts to public health and the environment, trespass, and tort liability
  – Timing and lack of actuarial experience = uncertainty
  – Government support for early movers?

• Long-term Stewardship
  – Increasing call for proactive management of properly permitted and closed sequestration facilities for continued record keeping, monitoring, maintenance, and mitigation if needed
  – Could be endowed with funds collected life of projects
State Oversight of CO2 Storage

• More than half states are active with legislation and regulations.

• Some see CO2 storage as an important energy and economic initiative.

• State programs tend to consider the full array of injection and legal issues related to CO2 storage.
Wyoming

• Pore space ownership: Vests title with surface owners; allows for unitization
• Liability: O/O owns the injected CO2; pore space owner not be liable for any injection effects
• Established basic regulatory framework
• Work group developed recommendations on financial assurance and duration of post-injection monitoring period
Texas

• Tax and financial incentives for storage of anthropogenic CO2
• Gave Texas Railroad Commission (TRRC) authority to regulate CO2 storage in oil and gas fields and brine formations directly above or below oil and gas fields
• O/O “owns” injected CO2
• Establishes an industry-funded trust fund for LT care
• TRRC to complete rules by March 2010
North Dakota

- Pore Space title vests with surface owner
- Provisions for eminent domain for siting
- Establishes that permitted stored CO2 is not a pollutant or nuisance
- Creates a Carbon Dioxide Trust Fund for long-term monitoring and management
- Project operators retain title and liability for stored CO2 until certificate of project completion, then transfers to the State.
New York – Proposal

• Pore Space title vests with surface owners
• NY DEC authority to permit projects
• Provides conditional eminent domain authority
• Operational liability rests with the project owner; stipulates financial assurance
• Post closure liability after demonstrating no migration, (and after at least 10 years) liability shall be transferred to the state of New York
Take Home Points

• Enormous Societal Value to the CCS Option – Large Scale Projects Key
• Existing Regs Sufficient for Safe CCS
• Gaps: Near-term Driver / Financial Risk Management; Siting; Long-Term Stewardship; Completion of Regulatory Framework
• States are leading way on the big picture
• Significant Effort Underway to Close Gaps