Fifth Annual Conference on Carbon Capture & Sequestration

Steps Toward Deployment

The Evolving Regulatory Scheme for Governing the Capture and Geological Sequestration of Carbon Dioxide Emissions

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How Does the Regulatory Status of Carbon Dioxide from Various Sources Affect the Regulation of Geological Sequestration?

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Questions Addressed

- What are Carbon Dioxide Emissions—A Resource, A Pollutant, A Waste?
- Does EPA's Deep Well Injection of Hazardous Waste Regulatory Program Provide a Useful Model?
- How State Regulations Could Apply to Carbon Storage/Sequestration
- Initiatives Underway to Focus on Developing Regulatory Frameworks

What are Carbon Emissions—
A Resource, A Pollutant, A Waste?

Carbon Dioxide is:

- A naturally occurring gas
- A component of produced natural gas
- A valuable commodity for many uses, including for enhanced hydrocarbon recovery operations and human consumption
- Produced, purified and transported via pipeline, barge, rail and truck in the same way as other natural gasses

CO_2 = Natural Gas?

- Such factors have caused carbon dioxide to be defined by regulatory agencies and upheld by courts as a "natural gas" under specific circumstances and for specific purposes
  - Apply severance taxes on "natural gas" or "oil and gas"
  - Gas reserved for government ownership in federal land patents
  - Natural gas for pipeline right-of-way regulation as common carrier
- Yet other agencies with court approval have found that carbon dioxide is not "natural gas"
  - Pipeline transport not under Natural Gas Act jurisdiction of FERC
  - Not for injecting fluids brought to surface in CO_2 production
- US EPA has determined with court approval that CO_2 is not "natural gas" under the UIC program

Covered by SDWA UIC Program

- Significance of CO_2 not being "natural gas" is UIC Program coverage of CO_2 injection
- The UIC Program covers all injection of "fluids" except:
    1. "Natural gas" injected for storage and
    2. Non-diesel fluids used for hydraulic fracturing

- Fluids include materials or substances which flow or move, including any "semisolid, liquid, sludge, **gas**, or any other form or state."

Not All Fluids Are Equal

- Even if CO_2 is a fluid whose injection is covered by the UIC program, this information alone will not dictate the regulatory pathway
- Labeling CO_2 as a "waste" or "pollutant" is neither necessary nor advisable for regulating CO_2 injection under the UIC program
- For UIC purposes, CO_2 is not defined as either a waste or a pollutant

Does EPA's Deep Well Injection of Hazardous Waste Regulatory Program Provide a Useful Model?

- Simple answer: NO
- For UIC purposes, CO_2 has not been defined as a waste at all, or a pollutant, let alone a "hazardous waste"
- So far, it is a fluid injected for its usefulness in enhanced recovery operations
- Forcing regulation under UIC Class I hazardous waste provisions—or any Class I provisions—would be a mistake

UIC Well Classes

- **Class I wells are technologically sophisticated and inject hazardous and non-hazardous wastes below the lowermost underground source of drinking water.**
- **Class II wells are oil and gas production brine disposal and other related wells.**
- **Class III wells are wells that inject super-heated steam, water, or other fluids into formations in order to extract minerals.**
- **Class IV wells inject hazardous or radioactive wastes into or above underground sources of drinking water. These wells are banned unless used for remediation.**
- **Class V wells are injection wells that are not included in the other classes.**

Source: http://www.epa.gov/safewater/uic/classes.html

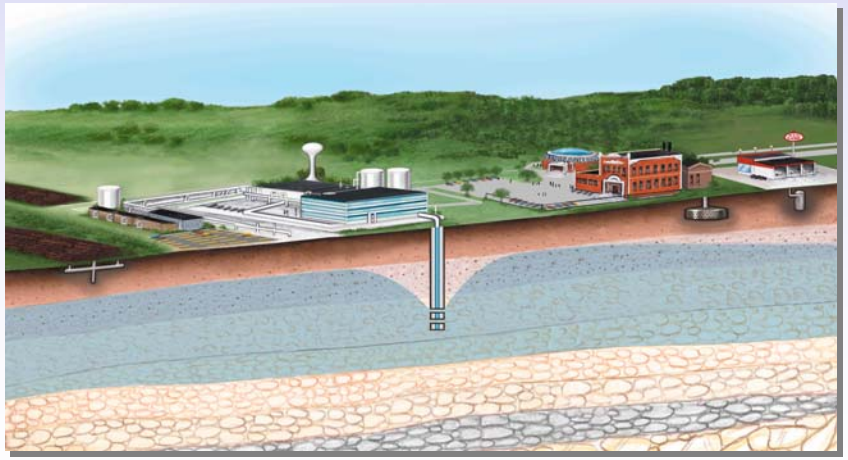
UIC Well Classes

Class I

Class II

Class III

Class V



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Well Classification Issue

The well classification issue centers on 3 choices

- CO_2 enhanced recovery wells are—and should continue to be—regulated under Class II
- Some suggest CO_2 geosequestration wells be regulated as Class I waste disposal wells
- But Class V, which has been—and will be—used for the pilot project "experimental" wells, is appropriate for all non-EOR wells because CO_2 is not a waste
- Alternatively, a new class could be developed for storage wells (but not for Class II EOR operations)

Problems with Class I well regulations

- Class I was developed to apply to specific types of **waste disposal wells** and impose specific restrictions (industrial, municipal, hazardous waste)
- Impose the most stringent construction and siting requirements, which are geared to waste disposal
- Procedural requirements at federal and state levels sometimes impose lengthy administrative processing
- Hazardous waste "no migration" demonstrations can take 2 years and involve very costly modeling
- EPA believes its UIC rules impose absolute fluid movement restriction on Class I, but not Class V wells

Framework for CO_2 Injection

Best framework is provided by the UIC program regulations that address most of the key issues:

- Siting and containment considerations
- Well construction requirements
- Operation of the injection wells and projects
  - Maximum injection pressure (above or below fracture pressure)
  - Injection rate and volume
  - Interactions between injectate, formations, and formation fluids
  - Injection for sequestration/storage vs. use for EOR

Framework for CO_2 Injection (cont.)

- Monitoring during operational phase
- Closure and long-term monitoring
  - Plugging and securing
  - Long term maintenance and liability issues
  - Financial assurance
- State Primacy for program implementation

Class V Regulation

- During the early stages of geosequestration authorization, Class V will provide the most flexibility to adapt authorizations or permits to specific geosequestration projects
- Class V regulations prohibit movement of fluid into USDWs that might cause endangerment
- Also authorize UIC program Director to impose other requirements, which could include monitoring, analysis, and data collection when requisite to prevent endangerment
- States have authority to establish additional or more stringent requirements if truly needed

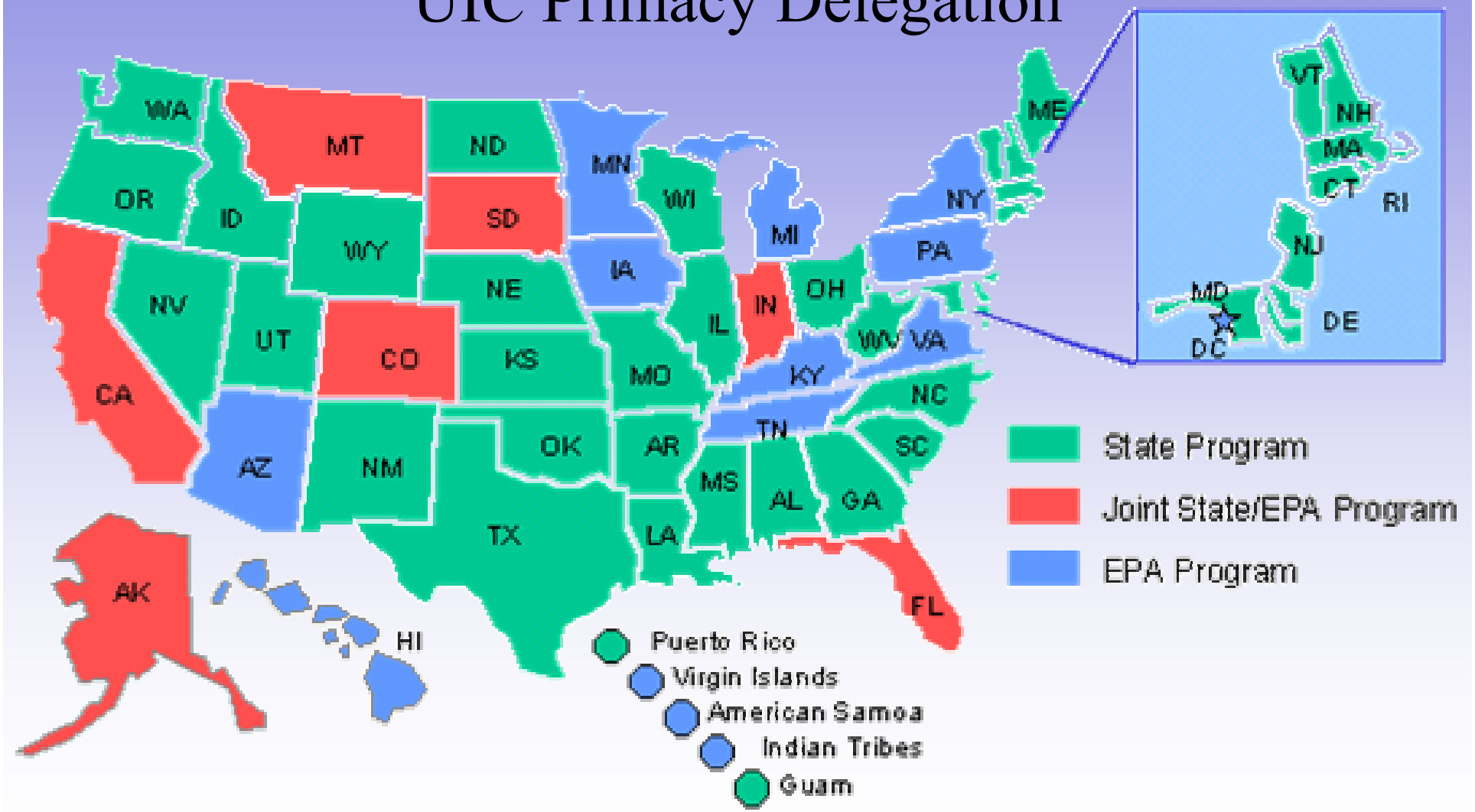
Current State Regulations that Could Apply to Carbon Storage/Sequestration

- Very important to recognize that States have the greatest experience with CO_2 injection (for EOR)
- Variations in State property rights and requirements dictate the need for State lead for geosequestration project review and approval (comparable to approvals for EOR projects and natural gas storage operations)
- Thus, long-term ownership, liability, and monitoring responsibilities will be implemented most effectively by experienced State agencies even under federal regulations

State/Federal Dual Permitting?

- Transforming ER projects into CO_2 geosequestration projects would potentially require repermitting Class II wells as Class V wells under UIC program
- This would be unnecessarily complicated
- Projects designed to transition (or be stacked) could address this up front through dual permitting
- But that should not require dealing with 2 different agencies and 2 different levels (state and federal)

UIC Primacy Delegation



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UIC Class Conflict Avoidance

- Dual permitting for ER wells could be avoided by retaining such wells in Class II even after transition to geosequestration of CO_2
- Dual permitting could also be avoided by providing continuous jurisdiction over such wells by the initial permitting agency notwithstanding any separate classification (e.g., CA DOGGR regulation of Class V geothermal injection wells)

Legal/Policy Issues

- Ownership interests in wells, pore spaces, and fluids
  - Class I and Class II approaches differ greatly
  - FutureGen opting for Natural Gas storage approach
- Long-term maintenance and liability
- Length of time CO_2 must be sequestered
- Credit for CO_2 capture/removal from atmosphere
- Sufficiency of current statutes and regulations

Regulatory Initiatives

- US EPA Geologic Storage Workgroup
- GWPC Workgroup on Geological Sequestration
- IOGCC Geological CO_2 Sequestration Task Force
- DOE Regional Partnership Phase II Projects
- FutureGen Project (permitting 2007-2008)

Carbon Injection Operator Coordination

- Asked to provide injection well operator input for regulatory development
- Longstanding work with injection well operators of many types has provided basis for initial assessments
- Broadening discussions to include potential future geosequestration project operators
- Extending dialogue to Regional Partnerships - Phase II pilot projects may set precedents for permitting requirements

Research vs. Regulation

- Detailed scientific assessments and measurement, monitoring, and verification have multiple functions
- The first function is for government with the help of experts to determine that the technology is safe and effective when properly implemented
- The second function is to determine standards for siting and implementation
- The third is to determine what steps are mandatory to ensure safety and compliance by projects, even while allowing operators to gather additional data as desired

CONCLUSIONS

- Broad deployment of a safe and effective CO_2 geosequestration technology is the objective
- Avoiding burdensome and unnecessary siting and demonstration requirements advances this objective
- Avoiding unnecessary regulatory restrictions designed for entirely different applications of technology also helps
- Retaining regulatory flexibility and fostering application of state experience and expertise in the early stages will prove particularly beneficial

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