

(Federal) Regulatory options for CCS – injection in shifting (political) sand

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What's my job?

- Science and Technology Policy Fellow
- American Association for the Advancement of Science (AAAS)
- Self-employed consultant/grantee working with (not for) US EPA
- Position consulting the National Program Directors for Global Change and Drinking Water Research



Context of Research at the USEPA

- Agency Mission: protect human health and the environment
- Technical staff include: engineers, scientists, and policy analysts, legal, public affairs, financial, information management and computer specialists
- Research mission
 - assess environmental conditions
 - identify, understand, and solve current and future environmental problems
 - advance the science and technology of risk assessment and risk management

Nexus of Drinking Water and Global Change

- Research across programs requires interdisciplinary studies
 - Engineering
 - Public health
 - Environmental science
 - Economics
- Topics in this research intersection
 - Human health risk from source water
 - Changing water supply sources and needs
 - Injection of carbon dioxide into subterranean resources (geologic sequestration)



So, How to Regulate CO2 Injection?

Precedents:

- Class I – Industrial waste (hazardous and non-hazardous)
- Class II – Oil and Gas related wells
- Class V – Experimental wells

• Issues:

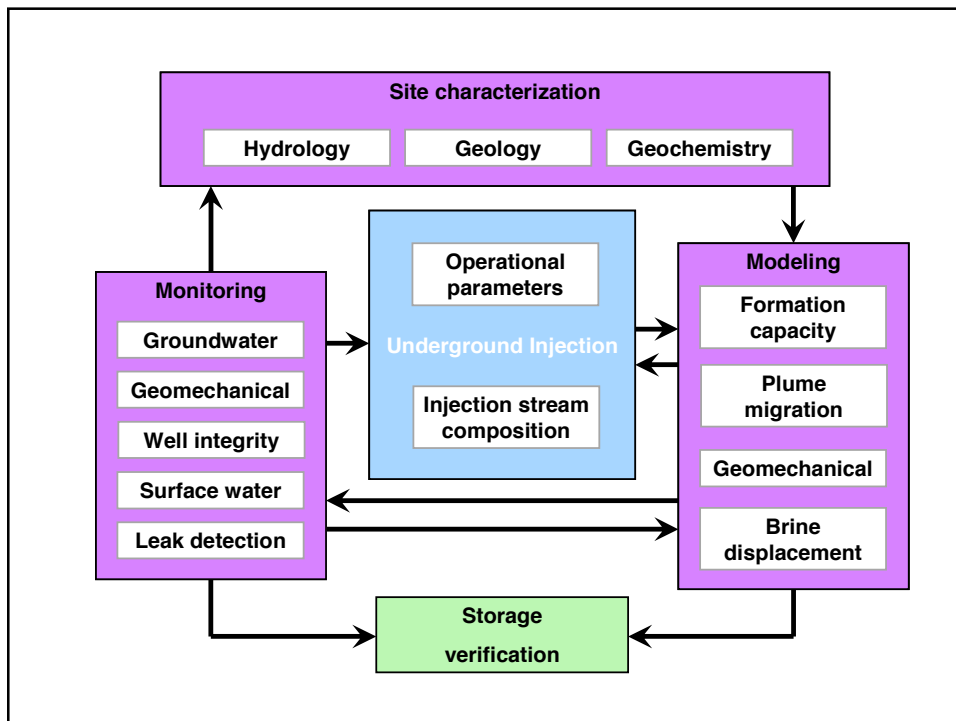
- Category of injection
 - {commodity} for EOR or {waste} for storage
- Jurisdiction
 - some reservoirs are stacked oil fields and saline reservoirs
 - some reservoirs cross state boundaries
 - some states split authority between agencies
- Minimum standards
 - Class I has different standard requirements than Class II, yet CO2 injection could take place under both

Regulatory Philosophy

- Command-and-control
 - Based on numeric or technology standards
 - Requires regulator to know enough about technologies and environmental response to set standards
 - Often allows exemptions
 - Used for State UIC for all classes except oil & gas
- Performance-based
 - Sets performance goals, not “black and white” requirements
 - Allows regulator to exercise discretion – can be hard to make adequate demonstration of performance
 - Used for State UIC for oil & gas wells

Emerging Options

- Interstate Oil and Gas Compact Commission (IOGCC) issued model rules and statute for CO₂ injection (including property rights, injection and long-term care)
- Several states have or are in process of developing regulations: WA, KS, WY, KY, NM, many more
- Regional GHG programs contemplating CCS
- EPA proposed Class VI rule
- Federal Cap and Trade for GHG



Key Aspects of EPA Rule

- Requires injection zones to be below lowermost USDW, potentially excluding some oil fields and coal seams
- AoR based on computational modeling, not fixed radius, of CO2 plume and formation fluids
- Financial responsibility for corrective action, well plugging, post-injection site care and site closure, and remedial response
- Well casing must extend and be cemented from surface to injection zone, materials must resist corrosion
- Continuous MIT
- Injectate must be tested in order to ensure does not trigger RCRA; if so, Class I Hazardous permit required
- Default period for post-injection site care is 50 years or until it can be demonstrated that CO2 plume and pressure front do not endanger USDWs
- Rule mentions Vulnerability Evaluation Framework (VEF) assessing other risks in addition to risks to USDWs

Issues for “debate” in GS rule

- Operational definition of “depleted” for EOR (well transition, plug & abandon)
- AoR definition: re-evaluation, response to anomalies, property ownership
- Aquifer exemptions: existing and new
- Off-shore (US waters) implications (shelf)
- Verification and accounting
- Experimental (V) to Class VI transition {grand-fathering}
- EOR (II) and GS (VI) wells: transitions between classes, potential for sequestering during EOR
- 50 year post-injection site care (with Director’s discretion to shorten/lengthen)
- Liability and ownership

Area of Review

- Footprint of impact of injection: all penetrations in AoR need to be identified/evaluated/remediated
- Models of plume transport used to delineate schedules and strategies
- Surface v. subsurface / mineral v. pore space
- Trespass, property damage, or loss of property due to migration of injected CO₂
- Require operators to demonstrate that they have rights to pore space prior to permit
- Allow phased property rights acquisition based on plume movement

Liability

- Ownership of resource (timing of transfers)
- Duration of responsibility (post-injection care)
- Reporting responsibility/capability
- Potential / need for state or Federal role
- Weighing liability for GS impacts v. liability of emission impacts

LEGAL FRAMEWORK

- **EPA Administrator** to establish Task Force for “*The Study of Legal Framework for Geologic Sequestration Sites*”
 - comprised of subject matter experts, nongovernmental organizations with expertise in environmental policy, academic experts with expertise in environmental law, State officials with environmental expertise, representatives of State Attorneys General, and the private sector
 - risk management tools
 - harm and damage to the environment or public health at closed sites where carbon dioxide injection has been used for enhanced hydrocarbon recovery
 - potential models for assumption of liabilities and financial responsibilities with respect to closed geologic sequestration sites
 - private sector mechanisms, including insurance and bonding, that may be available to manage risk from closed geologic sequestration sites
 - subsurface mineral rights, water rights, or property rights issues associated with geologic sequestration

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Verification v. Accounting

- Storage verification necessary for protecting drinking water
- Monitoring provides leak detection and some confidence of mass budget
- Is this information adequate for a future accounting framework?
 - How is sequestration addressed in climate change programs: avoided emissions or GHG reductions?
 - How is net GHG reduction calculated when considering energy penalty and potential for EOR?
 - How are permits going to be handled if emission sources contract for sequestration?
 - How to address potential or actual leakage?

NEW AIR REGULATION?

EPA Administrator devises Regulations to protect human health and the environment by minimizing the risk of escape to the atmosphere of carbon dioxide emissions into the atmosphere injected for Geologic Sequestration within 2 yrs of enactment

- a process to obtain certification for geologic sequestration under this section
- monitoring, record keeping, and reporting for emissions associated with injection into, and escape from, geologic sequestration sites
- public participation in the certification process that maximizes transparency

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ELIGIBILITY CRITERIA

- Electric generating unit that—
 - applies CCS to flue gas from at least 200 MW of the total nameplate generating capacity
 - derives at least 50% of its annual fuel input from coal, petroleum coke, or any combination of these fuels
 - achieves at least a 50% emission reduction for the treated portion of flue gas from the unit, measured on an annual basis
- Industrial source that—
 - absent CCS, would emit greater than 50,000 tons/y of carbon dioxide
 - achieves at least a 50% emission reduction for the treated portion of flue gas from the unit, measured on an annual basis
 - does not produce a liquid transportation fuel from a solid fossil-based feedstock

DISTRIBUTION OF ALLOWANCES

- The Administrator shall distribute emission allowances to eligible projects (first 6 GW)
 - the number of metric tons of carbon dioxide emissions avoided through CCS
 - a bonus allowance value
 - the average fair market value of an emission allowance during the preceding year.
- The Administrator shall establish a bonus allowance value for emission reduction achieved, from a minimum of \$50 per ton for a 50% and varying directly up to \$90 per ton for an 85%
- For enhanced hydrocarbon recovery, the Administrator shall reduce the bonus allowance to reflect the lower net cost of the project when compared to those solely for purposes of sequestration

Long-Term Care

- At issue: large volume CO₂ and #'s of wells, CO₂ buoyancy, goal of permanent storage call for proactive management of certified closed sites (registry of sites, well maintenance, mitigation)
- Options:
 - IOGCC: create state based funds (i.e. orphan well)
 - MIT: quasi-public corporation to take ownership of closed sites (funded through various means)
 - FutureGen secured state based indemnification
 - Some call for federal or state based indemnification for all projects (Senate Energy Bill)
 - Enviro NGOs and others want operators to bear responsibility

FINANCIAL & POST CLOSURE

- **EPA Administrator** to devise Safe Drinking Water regulations per geologic sequestration wells 1 yr after geologic sequestration regulations are set. Taking into account the current UIC work on geologic sequestration wells, and will include requirements of financial responsibility of for emergency and remedial response, well plugging, site closure, and post-injection site care.
- Financial Responsibility by insurance, guarantee, trust, standby trust, surety bond, letter of credit, qualification as a self-insurer, or any other method satisfactory to the Administrator.

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Take away

- Opportunities and obstacles exist for the construction and enforcement of GHG regulations
- GS rule just first, small step
- Likely large role for EPA in both economic and environmental aspects of GHG regulation