

Legal Framework for Achieving Commercial-Scale Carbon Capture and Sequestration in the U.S.

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Overview of Presentation

- The technology
- Status of the technology
- Need for CCS
- Barriers to CCS
- Legal overview
- Focus of our work:
 - Liability
 - Access to pore space
 - Capturing CO₂ from existing emitters
- Q&A

CCS: The Technology

- Capture of CO₂ before emission
- Purification and compression to supercritical fluid
- Transport to sequestration site
- Injection into a deep and secure geological formation either on-shore or off-shore

Status of the Technology

- Worldwide, only five commercial-scale projects (>1 MtCO₂/yr) are in operation
- None involve coal-fired power plants
- One uses naturally occurring CO₂

Existing Commercial-Scale Projects Worldwide

Project	Location	Capture type	CO ₂ sequestered	Storage type
Weyburn-Midale	N. Dak. – Saskatchewan	Pre-combustion (coal gasification plant in N. Dak.)	1+ MtCO ₂ /yr	Pipeline to EOR in Canada
Sleipner	North Sea, Norway	Natural gas processing	1 MtCO ₂ /yr, over 11 MtCO ₂ total since 1996	Geological (saline aquifer below seabed)
In Salah	Algeria	Natural gas processing	1 MtCO ₂ /yr	Geological (sandstone)
Snøhvit	Barents Sea, Norway	Natural gas processing	0.7 MtCO ₂ /yr	Geological (sandstone below seabed)
Cranfield	Mississippi	Naturally occurring CO ₂ is piped to the sequestration site	1 MtCO ₂ (total)	“Stacked” storage (EOR, then geological in deeper saline aquifer)

Proposed Large-Scale CCS Projects in the U.S.

Project	Location	Capture type	Size	Storage type
AEP Mountaineer	W. Virginia	Retrofit In validation phase	235 MW 1.5 MtCO ₂ /yr	Geological (saline aquifer)
AEP Northeastern	Oklahoma	Retrofit	200 MW 1.5 MtCO ₂ /yr	EOR
Southern Company	Alabama	Retrofit	160 MW 1 MtCO ₂ /yr	Pipeline to geological (saline aquifer)
Basin Electric	N. Dakota	Retrofit	120 MW 1 MtCO ₂ /yr	Pipeline to EOR
Taylorville	Illinois	IGCC	730 MW TBD	TBD (EOR or geological)
Tenaska Trailblazer	Texas	IGCC	730 MW 4.3 MtCO ₂ /yr	EOR

Proposed Large-Scale CCS Projects in U.S. (cont'd)

Project	Location	Capture type	Size	Storage type
Conoco-Phillips	Texas	IGCC or SNG	683 MW 5 MtCO ₂ /yr	Possible EOR or geological (depleted oil and gas field)
Southern California Edison	Utah	IGCC	600 MW 3 MtCO ₂ /yr	TBD (EOR or geological)
Summit	Texas	IGCC	400 MW 2.7 MtCO ₂ /yr	EOR
FutureGen	Illinois	IGCC	275 MW 1+ MtCO ₂ /yr	Geological (saline aquifer)
Hydrogen Energy	California	IGCC	250 MW 2 MtCO ₂ /yr	EOR and geological

Proposed Large-Scale CCS Projects in U.S. (cont'd)

Project	Location	Capture type	Size	Storage type
Denbury Onshore/Leucadia	Louisiana	New petcoke-to-methanol project	n/a 4 MtCO ₂ /yr	Pipeline to EOR
Mississippi Gasification/Leucadia	Mississippi	New petcoke-to-substitute natural gas plant	n/a 4 MtCO ₂ /yr	TBD
Air Products & Chemicals	Texas	Steam methane reformer waste streams	n/a 1 MtCO ₂ /yr	EOR
C6 Resources	California	"Preferably" from coal-fired power plants in the Bay Area (retrofits?)	n/a 1 MtCO ₂ /yr	Pipeline to geological storage (saline formation)
CEMEX	TBD	Cement plant	n/a 1 MtCO ₂ /yr	TBD

The Need for CCS

- Coal is key energy source worldwide for near-term
- Worldwide, need at least 3,400 CCS projects
 - each storing $> 1 \text{ MtCO}_2/\text{yr}$ by 2050
(IEA 2008)
- By 2050, capture must exceed $10 \text{ GtCO}_2/\text{yr}$
(IEA 2008)
 - $5.5 \text{ GtCO}_2/\text{yr}$ from power generation
 - $4.6 \text{ GtCO}_2/\text{yr}$ from industry and upstream capture

Barriers to CCS in U.S.

- Lack of restrictions on CO₂ emissions
 - Without a “price” on carbon, cost is major deterrent
- Lack of sufficient stream of captured CO₂
- Lack of transportation infrastructure
- Lack of legal liability framework
- Lack of ready access to pore space
- Lack of operational/permitting framework

Legal Framework

Statute(s) enacted by Congress:

- Delegating responsibility for rulemaking to one or more federal agencies
- Delegating enforcement authority to one or more federal agencies
- Appropriating funds
- Specifying role of states
- Specifying liability
 - Who
 - When
 - How much

Legal Framework (cont'd)

– Regulations

Lay out details. How to:

- Apply for a permit
- Appeal decision
- Construct and operate the facility, equipment, wells
- Monitor, measure, test and sample
- Close down the operation and wells
- File reports

Legal Framework for CCS

- No national framework yet
- IOGCC and WRI have proposed regulatory frameworks
- Scattered states
- House and Senate climate change bills

Proposed Federal Climate Change Bills

- Focus on barriers, not legal framework
- Create incentives for CCS
 - Carbon Storage Research Corporation
 - Funded by surcharge on fossil fuel-generated electricity
 - \$1 billion/year for 10 years
 - For five commercial-scale CCS projects
 - Early bonus allowances for 10 years
 - Performance standards for new coal plants equivalent to capturing and sequestering at least 50% CO₂
 - Standards may not apply until 2025

EPA Actions

- July 2008: Proposed rule extending UIC well regulations
 - Not a comprehensive regulatory scheme
 - Wells only; not capture
 - HLS worked with ETIP to submit comments
- Sept. 2009: Proposed GHG tailoring rule
 - Large GHG sources (power plants, refineries, cement plants)
 - In some circumstances, these sources must use best practices and technologies to minimize GHG emissions
- Dec. 2009: Issued “endangerment finding” for GHGs

State Actions

- Some states have enacted legislation
- Key question: should federal or state governments have primacy?

State Actions

State	Action
Idaho	First-of-a-kind permit, requiring a new fertilizer plant to reduce its CO ₂ emissions by 58% within 5 years.
Illinois	5% of electricity utility supply must be from facilities employing CCS, starting in 2015. State goal of 25% of electricity from clean coal by 2025.
Kansas	Permitting rules. Property tax exemptions and accelerated depreciation for CCS machinery and equipment.
Louisiana	Permitting rules. Eminent domain for CCS facilities and CO ₂ pipelines. State takes ownership of GS sites 10 years after injection stops.

State Actions (cont'd)

State	Action
Mississippi	Favorable income tax rates for the sale of CO ₂ for EOR or GS.
Montana	Permitting rules. Declares pore space the property of the surface owner. Provides for unitization. Title to the reservoir and the CO ₂ passes to the state 30 years after CO ₂ injections end.
Texas	Permitting rules for onshore and offshore GS. State accepts liability of offshore GS sites post-closure.

State Actions (cont'd)

State	Action
Washington	New power plants must meet an emissions performance standard ("EPS") equal to the GHG emissions output of a new natural gas plant. New facilities can meet the standards with CCS, but not by purchasing offsets. Electric utilities cannot sign new or renewed long-term contracts with power plants whose GHG emissions don't meet the EPS.
Wyoming	Permitting rules. Declares pore space the property of the surface owner. Provides for unitization.

Focus of Our Work

- We will propose:
 - Comprehensive and specific legal liability framework
 - Specific legal solutions for amassing sufficient amounts of pore space for commercial-scale sequestration
 - Legal incentives for capturing CO₂ sufficient to demonstrate large-scale sequestration

Liability

- Responsibility for complying with statutes and regulations
- Responsibility for consequences of operation (negligent and non-negligent), including damages and injuries
 - Bodily
 - Property
 - Natural resource
 - Financial
 - Release of CO₂ to atmosphere (violating contracts and/or allowances, offsets)

Sources of Liability

- Statutes – Federal and State
- Regulations – Federal and State
- Common Law – Federal and State
- Contract

Liability for CCS

- No specific federal statute yet
- Depending on the circumstances, could be asserted under:
 - Common law
 - Superfund
 - RCRA
 - SDWA
 - CWA
 - Various state statutes

Congress can limit liability

- Statutory caps
- Statutory indemnification
- Preemption
- Variety of models
 - Superfund
 - Price-Anderson
 - Oil pollution
 - Other

Obstacles to Acquiring Pore Space

- Varying state and federal property laws
- Competing uses of pore space
- Geology
- Uncertain market value for pore space
- Cross-jurisdictional movement of CO₂

Menu of Legal Options to Support Access

- Centralized national or regional repository
- Federal ownership of pore space below a certain depth
- Geological sequestration overlay zone
- Streamlined valuation procedure for eminent domain
- Unitization (or amended pooling) legislation
- Limit remedies for subsurface trespass

Incentivizing Early Capture

- Existing coal-fired plants
 - Have several decades of life
 - Inexpensive source of power
 - Hurdles to siting and permitting new plants
- Existing industrial facilities
 - Refineries, cement, iron and steel
 - Cost to capture CO₂ may be lower
 - DOE recently allocated several million dollars to industrial CCS projects

Obstacles to Capturing from Existing Facilities

- Inadequate space
- Plant layout
- Lower efficiency of older plants
 - Aggravates the energy penalty problem
- Fewer opportunities for economies of scale
 - Likely no “standard” for retrofit that will lead to savings with multiple deployments
(MIT 2009)

Some Older Plants Being Retired

- N. Carolina utility will retire 11 coal-fired plants (1,500 MW) in next seven years
 - Only 3 coal-fired plants to remain
 - Utility will build new natural gas plants
- Penn. Utility will retire 4 plants (3 coal, 1 natural gas)
 - Shrinking electricity demand cited
- Largest emitter (AEP) expects to retire 25% and install CCS on 75% by 2025

Discussion Questions

- Probably not controversial that we need to *remove legal barriers* to CCS.
- But do we want to *create legal incentives* for CCS?
 - Do incentives for retrofitting coal-fired power plants make sense?
 - CO₂ capture from natural gas processing is relatively inexpensive; is price low enough for market to work without incentives?
 - Should incentives be directed at CCS at industrial facilities or natural gas power plants?
 - How does shale gas phenomenon affect CCS?

Your questions?

Thank you for joining us.



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Roadmap to commercial viability of CCS

1 Secure financial incentives, set up liability framework

- Secure more federal funding
- Provide limited CAA amnesty to generate large captured CO₂ stream
- Provide loan guarantees and tax exempt bonds
- Facilitate access to federal land
- Clarify pore space ownership (States)
- Issue permits under existing regulations
- Streamline NEPA review
- Authorize fixed indemnities and liability caps for earliest projects
- Create National Post Closure Fund

2 Flesh out the details

- Declare national ownership of deep saline aquifers
- Consider national legislation on pore space
- Create federal power of eminent domain
- Collect contributions to Post Closure Fund
- Adjust national liability legislation

3 Establish long term framework

- Target incentives to commercial deployment
- Establish standalone permit regime for CCGS
- Shift operational liability to private sector
- Establish Post Closure Fund claims architecture

12 -18 months

3-4 years

Transition to commercial deployment

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