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Doing the deal: Legal and regulatory aspects of the evolving CCS regime in the USA

From EOR to CCS

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Wisdom from the past

- *“What’s in a name? That which we call a rose, by any other name would smell as sweet; so Romeo would, were he not Romeo call’d.”*
 - Shakespeare, *Romeo and Juliet* (1597) (Act II, scene 2)
- *“Il y a plus de quarante ans que je dis de la prose sans que j’en susse rien. . .”*
 - Molière, *Le Bourgeois gentilhomme*, (1670) Acte II, scène 4.

« *Il y a plus de quarante ans que je fais de la CCS sans que j'en susse rien* »

- Much of the *legal* and *regulatory* structure for CCS in the US is already in place under another name – Enhanced Oil Recovery (EOR)
- A more-than-embryonic *physical* infrastructure for CO₂ transport and injection is also in place
 - » Over 4,000 CO₂ injection wells
 - » Over 5,000 km of CO₂ pipeline; evolving regional networks
 - » Injections exceed 30 million tonnes per year

THE WAY FORWARD is to *adapt this legal and regulatory regime for the new CCS paradigm*, filling gaps and repairing flaws

What *is* the law? – CCS means multiple legal and regulatory frameworks

- Capture – the purchase and sale of anthropogenic CO₂
- Transport – siting and regulation of CO₂ pipelines;
- Injection for storage –
 - » Acquisition of property rights
 - » Unitization
 - » Permitting

Elements of EOR regulation apply to CCS

- **CO2 Sources** -- ownership, contracts, leasing, etc.
- **CO2 Pipelines** – right of way access; eminent domain/condemnation; access and rates for transportation; “contract carriage”, “common carriage” and variants;
- **CO2 Injection for EOR** – permitting for EOR, not for storage
- **Post-EOR injection phase – not addressed**
- **Post-closure “storage” phase – not addressed**

40 Years of CO₂-based EOR – *CO₂ supply sources*

- Initial sources were *anthropogenic* (captured from natural gas production)
- Replaced by naturally-occurring CO₂ in 1980s
 - » Developed like oil or natural gas reserves – trillions of cubic feet of proved reserves in inventory
- New anthropogenic sources include old coal-to-gas plant (North Dakota) and gas processing (Labarge)
- Next phase (2007-2012) anthropogenic sources will be fertilizer, ammonia, Coal-to-Liquids (CTL),
Power plant CO₂ will have to compete with established base of lower-cost supplies

FIRST PHASE of anthropogenic purchases

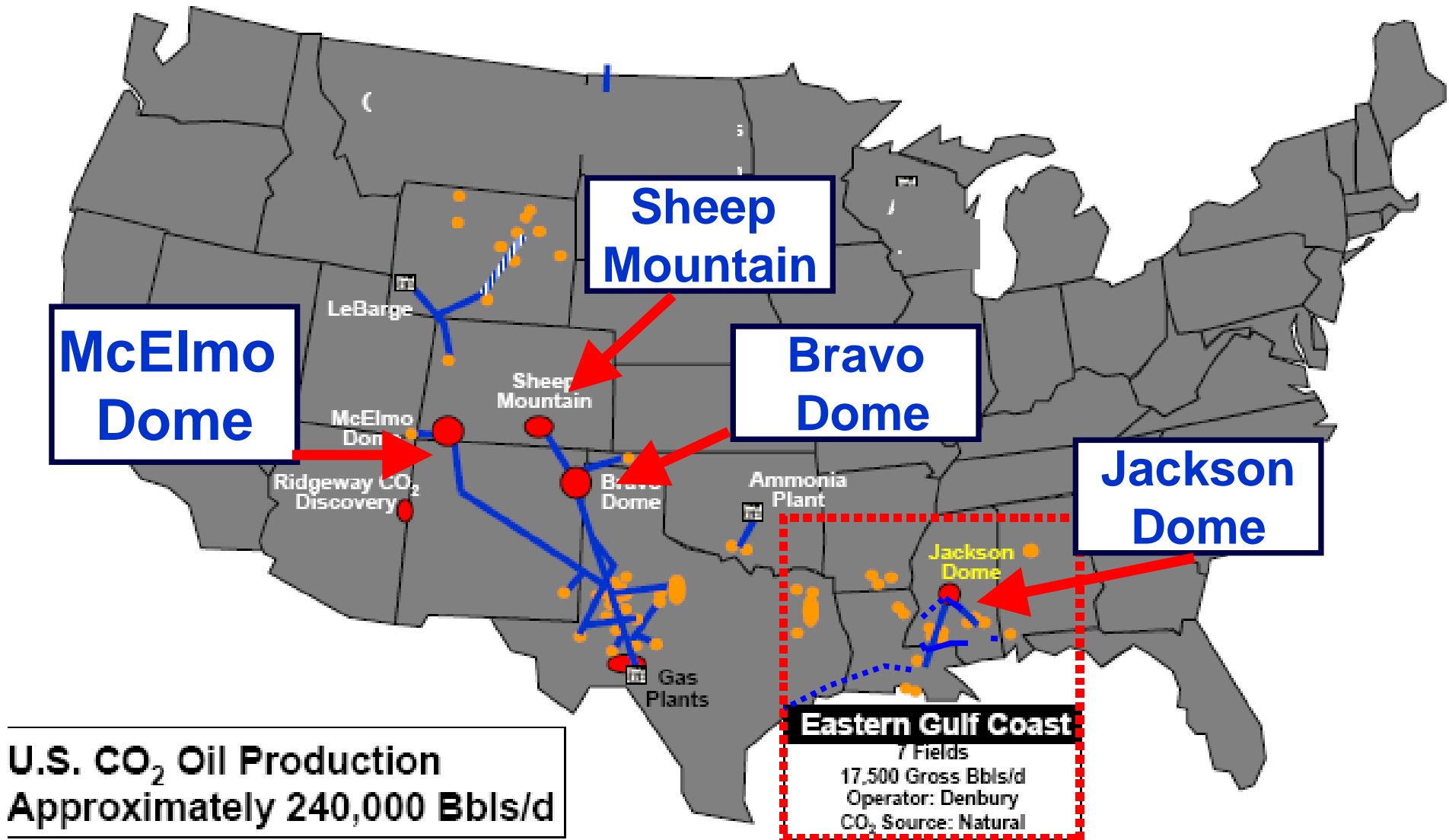
– Natural Gas Processing Plants

- Pennzoil's SACROC unit in Permian basin (1973)
- 170 mile pipeline (about 50 MMcd/d)
- Val Verde gas processing plants in west Texas
- ExxonMobil's Labarge Gas Plant facility (Wyoming) (currently sells 200+ MMcf/d high-quality CO₂ for injection and vents about same amount of low-grade gases (~65% CO₂))

SECOND Phase –naturally occurring reserves developed like natural gas reserves

- McElmo Dome (southwestern Colorado)
 - » Kinder Morgan & ExxonMobil
 - » 10 trillion cubic feet (Tcf) reserves (roughly 1 Bcf/d)
- Jackson Dome (Mississippi)
 - » Denbury Resources
 - » 5.5 Tcf proved reserves (> 500 MM cf/d)
- Bravo Dome (NE New Mexico/Texas/Oklahoma panhandle)
 - » Kinder Morgan, Occidental, Amerada Hess
 - » 8 Tcf of initial reserves (~ 400 MM cf/d from 350+ wells)
- Sheep Mountain (southern Colorado)
 - » BP, ExxonMobil
 - » about 2 Tcf reserves

CO₂ Sources –naturally occurring



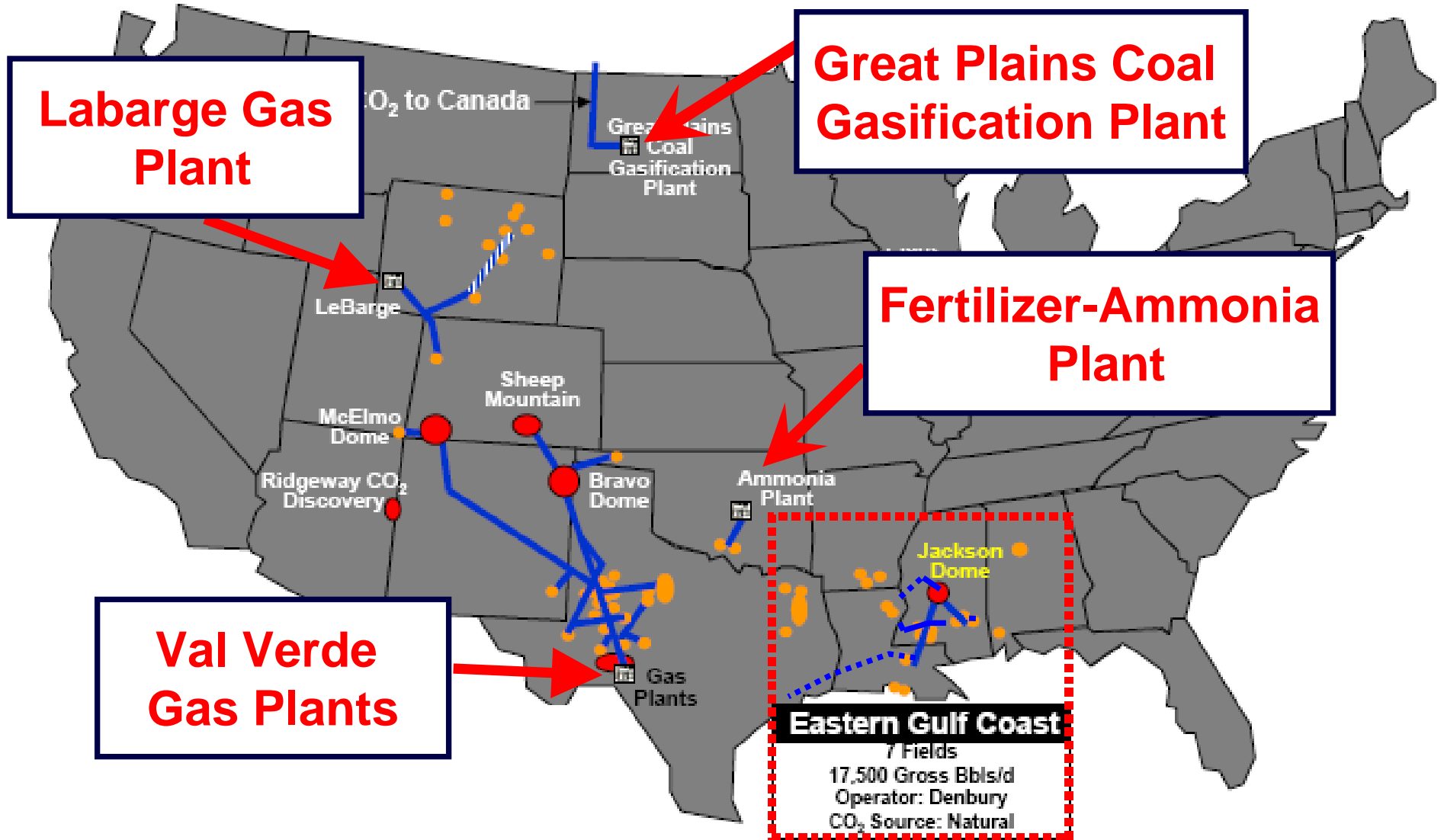
Source: Denbury Resources, Inc. (Sept 2007)

THIRD PHASE was anthropogenic purchases

- “Synfuels” coal-to-gas plant

- Developed under Carter Administration in late 1970s; commenced operation in 1984
- Synthesized methane to offset natural gas shortages
- About 160 MM Dth/d of CH₄
- CO₂ byproduct sold for EOR (Weyburn Project)
 - 10 million+ tonnes injected since 2000

CO2 Sources – Anthropogenic



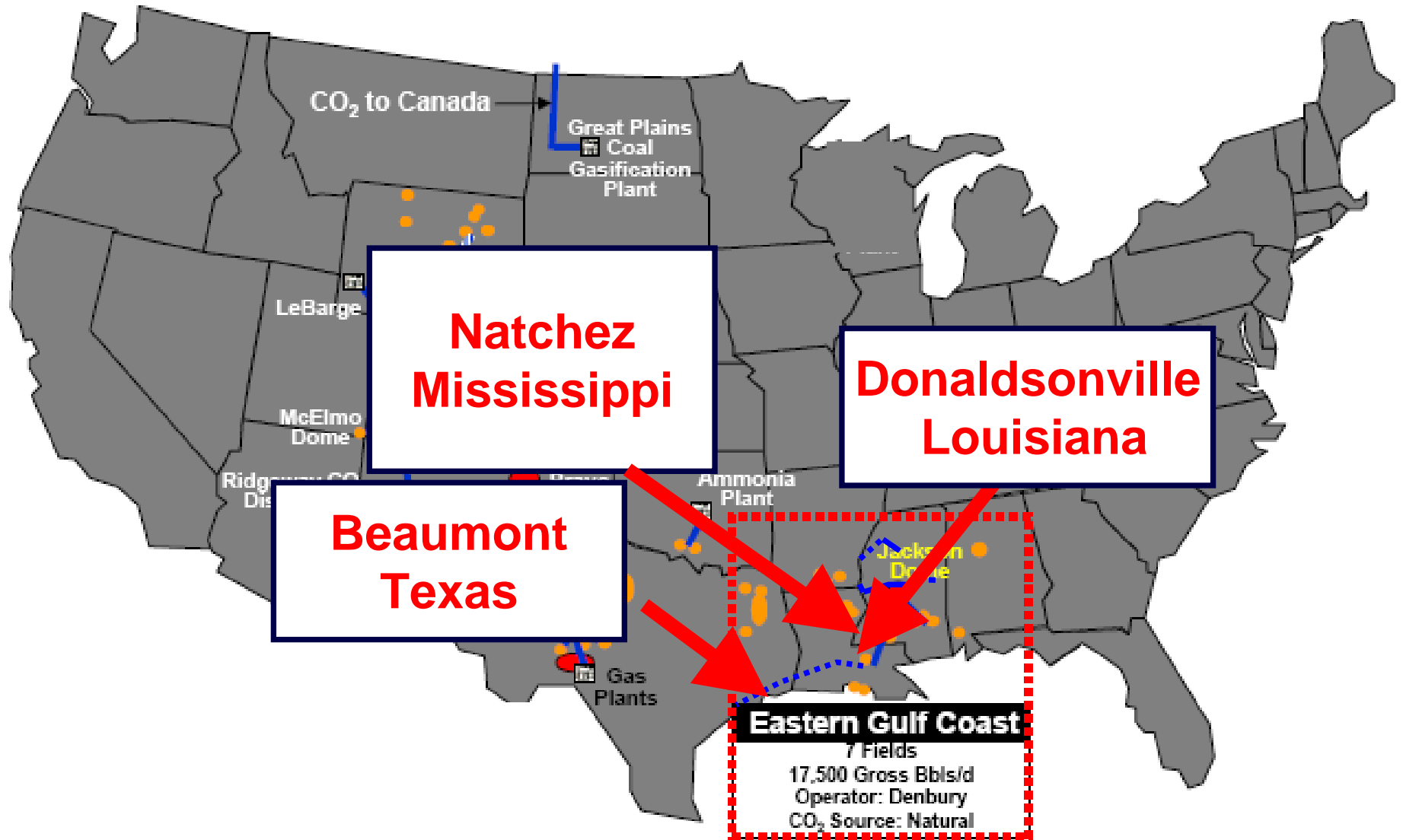
Source: Denbury Resources, Inc. (Sept 2007)

FOURTH PHASE will be anthropogenic purchases of industrially-produced CO₂

- Fertilizer plants (Oklahoma)
- Petroleum coke to ammonia plant
- Coal-to-liquids facilities
- Natural gas processing
- Ethanol (small quantities)

Power plant CO₂ will be a FIFTH supply wave (depending on technology and economics)

Anthropogenic sources – industrial sources



Source: Denbury Resources, Inc. (Sept 2007)

40 Years of CO₂-based EOR – *Injection and oil production operations*

- Over 4,000 CO₂ injection wells
- Recycling CO₂ (~ 50 percent of initial injections)
- Developed ownership rules, contracts, leases, permitting and environmental standards for injection and for plugging and abandoning wells following oil production
- Existing permitting and standards for trillions of cubic feet of natural gas storage facilities
- Existing regulatory agencies and experienced staff

40 Years of CO₂-based EOR – *Pipeline infrastructure*

- Several thousand miles of existing CO₂ pipeline
 - » Multiple pipelines in Permian Basin (West Texas)
 - » Pipelines from Labarge gas plant (Rocky Mountains)
 - » Denbury's Jackson Dome Header System (Mississippi and Louisiana)
 - » North Dakota coal gasification plant to Weyburn site (Saskatchewan, Canada)
- Major expansions announced by Denbury to link anthropogenic sources to EOR projects
 - » Conversion of existing natural gas pipeline
 - » "Green Line" from Louisiana to Texas Gulf Coast

State, not federal, law governs purchase and sale of CO₂

- CO₂ is a “good” thing
 - » Uniform Commercial Code (UCC) Section 2-105: “goods” are “all things ... which are movable at the time of identification to the contract for sale”
- UCC Section 2-107 specifically governs sales of minerals, including “oil and gas” to be removed from realty – but sale of reserves in the ground is subject to law governing sales of real property
- Natural-source CO₂ probably under 2-107 while anthropogenically-sourced CO₂ probably under 2-105

CO2 Pipeline regulation – generally regulated by States, not Federal government

- Non-jurisdictional under Interstate Commerce Act
 - » *Cortez Pipeline Co.*, 46 Fed. Reg. 18805 (1981) (Interstate Commerce Commission (now Surface Transportation Board) concludes that pipeline transportation of CO2 “is not subject to its jurisdiction”)
- Non-jurisdictional under Natural Gas Act:
 - » *Cortez Pipeline Co.*, 7 FERC ¶ 61,024 (1979) (pipeline to carry 98 % CO2 with traces of methane not subject to Federal Energy Regulatory jurisdiction)
- CO2 pipelines across Federal lands may be subject to a common carrier obligation under 1920 Mineral Leasing Act
 - » *Exxon v. Lujan*, 970 F.2d 757 (10th Cir. 1992)

CO2 Pipeline regulation – State approaches vary

- Private carriers
- “Common carriers”
- Grant of Eminent Domain – ability to condemn land
- No regulation

Geologic sequestration is not accepted under any current carbon regulation scheme

- Clean Development Mechanism
 - » Basic policy issued to be discussed at Bali meeting (December 2007)
 - » Methodology Panel
- European Union ETS (Guidance in Nov. '07?)
- US Regional Greenhouse Gas Initiative (RGGI)
- US legislative proposals
 - » Bingaman – Specter July 11, 2007 Draft
 - » Other proposals

Requirements for “paradigm shift” from EOR to CCS

- Remove uncertainties in ownership (surface, subsurface, sales, transport, and injection; quality specifications)
- Protocols for “post-injection” phase
- Protocols for the “post-closure” or “storage” phase
 - » Who bears *operational* responsibility?
 - » Who bears the *financial* responsibility (for both *ordinary* and *extraordinary* problems?)
- Qualification standards for offset or reduction for *compliance* market
 - » CDM
 - » EU ETS
 - » US regional plans (e.g. RGGI, WCI)
 - » US Federal legislation

“Build-out” of legal and regulatory infrastructure -- IOGCC Model Statute & Rules

- “Published by “Interstate Oil and Gas Compact Commission” (September 26, 2007)
([http://www.iogcc.state.ok.us/docs/MeetingDocs/Master-Document-September-252007-FINAL-\(2\).pdf](http://www.iogcc.state.ok.us/docs/MeetingDocs/Master-Document-September-252007-FINAL-(2).pdf))
- For adoption by USA State Governments and Canadian Provinces
- Detailed rules based on existing regulations for EOR, natural gas storage, and acid gas injection
- Ownership, permitting, liability, verification, monitoring, remediation and remediation funding
- Industry financed Mitigation Fund will assure mitigation
- State governments will choose whether or not to adopt the IOGCC models, modify them – or just ignore them

The key to the IOGCC approach

- » *“Together, the EOR, natural gas storage, and acid gas injection models provide a technical, economic, and regulatory pathway for long-term CO₂ storage”*

IOGCC – *What is regulated?*

- Anthropogenically-sourced CO₂
 - » “including CO₂ generated from oil and gas production and processing operations
- Quality standard is a *performance* standard not a percentage standard:
 - » “of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir”
 - » administered by State Regulatory Agency
- Contaminants (e.g. H₂S, NO_x and SO_x) remain regulated under existing law

IOGCC – *Who is the regulator?*

- State Regulatory Agency (“SRA”), not new Federal agency
 - » Typically an *existing oil & gas regulatory agency* for drilling, permitting, unitization, etc.
 - » States may designate public utility commission (economic regulator) or environmental regulatory agency
- **Not** the Federal Environmental Protection Agency

IOGCC – *How would CCS be regulated?*

- **“CF”:**
 - » “CO₂ Facility” includes surface and subsurface infrastructure (with flow lines but not including the main CO₂ pipeline)
- **“GSU”:**
 - » “Geological Storage Unit” is the subsurface reservoir
- **“CSP” or “CO₂ Storage Project”**
 - » CO₂ Facility; plus the
 - » Geological Storage Unit
- **“CSP Permit”:**
 - » State Regulatory Agency permit to operate a CSP

IOGCC – CSP Permit Requirements (§ 4.0)

- Must have “necessary and sufficient” property rights
- Availability of compulsory mechanisms
 - » Eminent domain
 - » “Forced unitization”
- Define boundaries
- Full technical evaluation
- Public safety and emergency response plan
- Detailed worker safety plan
- Corrosion monitoring and prevention plan
- Leak detection and monitoring plans
 - » for all wells and surface facilities
 - » for subsurface GSU (storage unit)

IOGCC – CSP Permit Application and issuance

- Following issuance of CSP permit, must obtain authorizations for each CO₂ storage well (similar to existing rules) (§ 6.0)
- Underground Sources of Drinking Water (USDW) identified; special drilling and casing protocols
- Proof that casing and cement will confine CO₂ to storage unit (cement bond log or result of fluid movement study, etc.)
- Standards for casing, cement, tubing, corrosion resistance, etc. to insure isolation from USDW
- Down-hole safety shut-off valves for injection wells
- Reporting requirements

IOGCC – CSP Operational Standards (§ 7.0)

- Public safety and worker safety plans
- Leak detectors at all injection and subsurface observation wells (with semi-annual testing)
- Maintain inspection records for 5 years
- Reporting requirements for leaks, pressure changes, lack of containment, etc.
- Quarterly operational reporting (volumes, temperature, pressures, etc.)
- Corrosion monitoring
- Signage/identification at each facility (and each plugged well)

IOGCC – CSP Closure (§ 9.0)

- Monitoring plan submitted to State Agency for approval
- Protocols for plugging wells (individual well bonds released as plugged)
- Operator performance bond released at end of closure period
- Responsibility for monitoring and remediation passes to designated state or federal agency and CSP operator and CO2 generator “released from further SRA regulatory liability”

IOGCC – Post-injection and Post-closure regulation and liability

- **Operator** remains liable for 10 years (or other period) following end of injections (the “Closure Period”)
 - » Each well is bonded; bonds released as wells are plugged
 - » Operator bond (and liability) remains through Closure Period
- **“CSP” or “CO2 Storage Project”**
 - » CO2 Facility; plus the
 - » Geological Storage Unit
- **“CSP Permit”:**
 - » State Regulatory Agency permit to operate a CSP

Select Research Resources

1. New Mexico Energy, Minerals, Natural Resources Department (Oil Conservation Division), "Carbon Dioxide Sequestration: Interim Report on Identified Statutory and Regulatory Issues" (June 27, 2007) (www.emnrd.state.nm.us/OCD/documents/InterimReportCO2Sequestration.pdf);
2. L. Stephen Melzer, "The History and Development of CO2 EOR in the Permian Basin with an Emphasis on Pipelines" (June 26, 2007) (http://eori.gg.uwyo.edu/downloads/Steve_Melzer_%20HistoryofPBCO2EOR.pdf)
3. Xina Xie, "CO2 EOR and Sequestration Potential" (August 24, 2007) (<http://eori.gg.uwyo.edu/downloads/XinaXieBigSky070824.pdf>);
4. Brian Jeffries, "CO2 in Wyoming" (June 26, 2007), ([http://eori.gg.uwyo.edu/downloads/Brian_Jeffries_CO2_Casper_June%2026_2007\(rev\).pdf](http://eori.gg.uwyo.edu/downloads/Brian_Jeffries_CO2_Casper_June%2026_2007(rev).pdf));
5. Odd Magne Mathiassen, CO2 as Injection Gas for Enhanced Oil Recovery and Estimation of the Potential on the Norwegian Continental Shelf (May 2003) (<http://www.co2.no/download.asp?DAFID=28&DAAID=6>)
6. Snell, Dowd, Daly, Nibert, McDavid and Revels, "A Comparative Review of Oil and Gas Law in Texas, Oklahoma, Arkansas, New Mexico Mississippi & Louisiana" (2007) (<http://www.landman.org/content/annmtg07/Comparative%20Oil%20and%20Gas%20Law%202007.pdf>)
7. Holtkamp and Hill, "Regulatory Outlook for Geologic Sequestration of CO2" (2007) (<http://www.psc.state.ut.us/WCPSC%20Conference%202007/Speaker%20Presentations/HoltkampSequestration.pdf>)
8. The Interstate Oil and Gas Compact Commission Task Force on Carbon Capture and Geologic Storage : "Storage of Carbon Dioxide in Geologic Structures A Legal and Regulatory Guide for States and Province" (September 25, 2007) ([http://www.iogcc.state.ok.us/docs/MeetingDocs/Master-Document-September-252007-FINAL-\(2\).pdf](http://www.iogcc.state.ok.us/docs/MeetingDocs/Master-Document-September-252007-FINAL-(2).pdf))

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