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CO_2 TRANSPORTATION AND REGULATION, CCS, AND EOR IN THE US

I. Introduction

As the United States decides whether it wants to embrace utility scale carbon capture and storage (CCS), one fact that is frequently overlooked is that CCS will require massive new investments in CO_2 pipeline systems. This pipeline infrastructure, especially if it is devoted exclusively to moving captured CO_2 from existing power plants and injecting it underground, will be controversial. The CCS projects are the great hope for the coal fired power industry, but they are likely far into the future (15-20 years).

Less controversial, and with ambitious expansion plans, are new investments to capture and deliver CO_2 from natural or man-made sources for enhanced oil recovery (EOR). These projects have the incidental benefit of sequestering CO_2. Other forces driving this development may be the construction of clean coal facilities and power plants using IGCC technology, which will produce high quality CO_2 streams that are useable for EOR and are required to be sequestered in order to meet air permitting limitations. This paper reviews the current CO_2 transportation and regulatory system in the US, discusses the related issues of CO_2 use for EOR , notes the counter intuitive fact that there is a shortage of CO_2 in the US for use in old oil fields and what is being done to address that challenge.

The CO_2 pipeline system in the US is small, only about 3600 miles. In contrast, the natural gas pipeline system is over 500,000 miles.[1] For purposeful CCS to work on any scale to

[1] From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage. P.M. Marston and P.A. Moore, 29 Energy Law J. 421(2008). Mr. Marston is one of the

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move large quantities of CO_2 from power plants to sequestration sites, the US will have to build a new infrastructure delivery system. How that will be designed, regulated, financed, permitted and constructed is under discussion, but there is little policy direction from the Federal or State governments in mid 2010.

II. Current Regulatory Scheme for CO_2 Pipelines

In a country that likes to regulate everything, particularly all infrastructure development, CO_2 pipelines are an anomaly. Despite the best efforts of various commentators to suggest that several federal agencies might regulate interstate CO_2 pipelines, the truth is that no agency does, at least for rate setting, planning, design, siting, permitting and construction.[2] The Federal Energy Regulatory Commission has expressly disclaimed jurisdiction over CO_2 pipelines under the Natural Gas Act (NGA). The decision arose in the context of an application by the Cortez Pipeline, which transports CO_2 from Colorado to New Mexico and Texas. The FERC held that CO_2 is not a natural gas, and therefore the NGA did not confer jurisdiction over the pipeline.[3]

The implications of this decision for CO_2 pipeline developers are that no centralized planning and siting authority exists at the Federal level. The potential downside of this lack of regulation is that there is no right of federal eminent domain, which is a power conferred on

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leading scholars and lawyers on these subjects. *See*, www.marstonlaw.com. See also, Report of the Interagency Task Force on Carbon Capture and Storage, US EPA, August 2010. http://www.epa.gov/climatechange/policy/ccs_task_force.html

[2] Regulation of CO_2 Sequestration Pipelines: Jurisdictional Issues (CRS Report to Congress, April 15, 2008); CO_2 Pipelines for Carbon Sequestration: Emerging Policy Issues (CRS Report to Congress, January 17, 2008); Legal Issues Associated with the Development of Carbon Dioxide Sequestration Technology (CRS Report to Congress, March 19, 2010).

[3] *Cortez Pipeline Company*, 7 FERC ¶ 61,024 (1979).

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natural gas pipelines that are subject to FERC jurisdiction. That may not be a large tradeoff, since many states grant condemnation authority to any corporation building a pipeline.[4]

The Interstate Commerce Commission, which is the predecessor to the current Surface Transportation Board (STB), decided that its jurisdiction over rates does not extend to CO_2 pipelines.[5] The STB can regulate rates if a party complains but the agency has no proactive rate regulatory jurisdiction.

CO_2 pipelines are regulated from a safety standpoint by the Department of Transportation (DOT).[6] CO_2 pipelines are treated as hazardous liquids pipelines and DOT applies the same scrutiny to CO_2 pipelines as it does to crude oil, gasoline and anhydrous ammonia.[7] But the regulatory hand is light, the danger to the public of CO_2 pipelines is small and there have been no reported incidents of pipeline failure causing injury or property damage.

In the Western US, where it is not possible to build a pipeline of any magnitude without crossing Federal land, the Federal land management agencies exercise power over the development of any CO_2 pipeline project. The Bureau of Land Management (BLM) and the Forest Service (USFS) control vast tracks of land, and they will allow use of that land only after compliance with the National Environmental Policy Act (NEPA) and with the laws that govern

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[4] *See*, Wyo. Stat. Ann. §§ 1-26-801 *et. seq.* (2009) (granting a number of industries, including pipeline companies, the right of eminent domain).

[5] *Cortez Pipeline Company – Petition for Declaratory Order – Commission Jurisdiction Over Transportation of Carbon Dioxide by Pipeline*, 46 Fed. Reg. 18805 (March 26, 1981).

[6] 49 U.S.C Sec. 601.

[7] DOT regulates the design, construction, operation, maintenance, and spill response planning for liquid pipelines. 49 C.F.R. Sec. 190, 195-199.

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grants of rights of way, such as Federal Land Policy Management Act (FLPMA) and the Mineral Leasing Act (MLA). The BLM can grant rights of way under either land management act. If the permit is granted under the MLA, the pipeline will have obligations to act as a common carrier, which means that it must publish tariffs and allow any party that wants to ship CO_2 on its line to do so. CO_2 pipelines that are developed for EOR purposes are typically permitted under the MLA.[8]

In the absence of federal regulation it falls to the states and local governments to regulate siting, environmental impacts and rates. However, regulation is not the norm, and many states have either exempted pipelines or regulate only certain aspects, such as common carrier status. For example, in Wyoming, the Industrial Siting Administration regulates the development of all major industrial facilities that have a projected construction cost of $175.5 million. But, all pipelines, except coal slurry pipelines, are exempted from the act.[9] In Montana, CO_2 pipelines are regulated common carriers, but they are not subject to extensive regulation by the State.[10]

Given the lack of comprehensive federal regulation and the desire of most states to encourage the development of pipeline infrastructure, the developer of a multi-state CO_2 pipeline will primarily have to deal with state and local governments. Land access will be acquired from private landowners by negotiation or condemnation (where available), and permits for the use of public land will be controlled by federal, state and local governments. Where Federal lands are involved the extensive requirements of NEPA will add years to the planning of any project.

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[8] Marston and Moore, 'From EOR to CCS'.

[9] Wyo. Stat. Ann. § 35-12-119(c)(iii).

[10] HB 338, Section 69-13-101, MCA (2009).

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State and local governments generally act much more quickly. In Wyoming, where the State controls more than 3 million acres mostly in isolated sections (640 acres), the State government will negotiate a lease and right of way across its lands. The final business deal must be approved by the State Land Board, comprised of the five statewide elected officials. Although this process has a political dimension, generally it is viewed as a commercial transaction, unless the project has controversy associated with it that draws the concern of the elected officials.

The August 2010 Report of the Interagency Task Force on CCS includes an extensive discussion of the siting issues for CO_2 pipelines.[11] The report analyzes different models for siting under existing and proposed Federal and State regulatory schemes. Changing the status quo will require national and state policy makers to forge a consensus on the best way to regulate the development of this new and essential infrastructure.

III. EOR and Incidental CO_2 Sequestration

In the worldwide debate over the safety, cost, and the environmental utility of intentional CCS, it is ironic that the oil and gas industry has been using CO_2, and sequestering much of it, for EOR for more than four decades. While the EU, China and the US are starting to spend vast sums to study potential CCS sites and do the analysis to determine if the sites are good candidates for CCS, the EOR industry in the US continues to actively develop new tertiary recovery fields. Interstate CO_2 pipelines deliver massive quantities of naturally occurring and man-made CO_2 over hundreds of miles, with nary a flicker of interest from the general populace nor protest from the environmental community. This process has gone on primarily in oil and

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gas states, where tertiary recovery is seen as just an attribute of the existing oil and gas industry that is the foundation of the economies of these states. The amount of CO_2 that is used in EOR projects and incidentally stored dwarfs by orders of magnitude the volume of CO_2 that is being purposefully injected in CO_2 projects worldwide. Annual injection of CO_2 is about 50 million metric tons. More than half of the injected gas remains in storage. There are about 6100 active CO_2 injection wells. This injection makes possible the production of about 245,000 barrels of oil/day (BBD).[12]

The great majority of the EOR projects are in the central Rockies, Texas and states bordering Texas. For example, Exxon Mobil produces refined CO_2 at its Shute Creek Gas Plant in southwest Wyoming by processing a gas stream comprised primarily of CO_2 (65%) and H_2S, with a small quantity of methane. The CO_2 is purified, liquefied and compressed to 2000 psi and piped to Colorado and central Wyoming for EOR. In Colorado, the McElmo Dome field produces naturally occurring CO_2 and sends it to Texas and New Mexico.

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[11] See Footnote 1, Appendix M.

[12] Marston and Moore, 'From EOR to CCS'.

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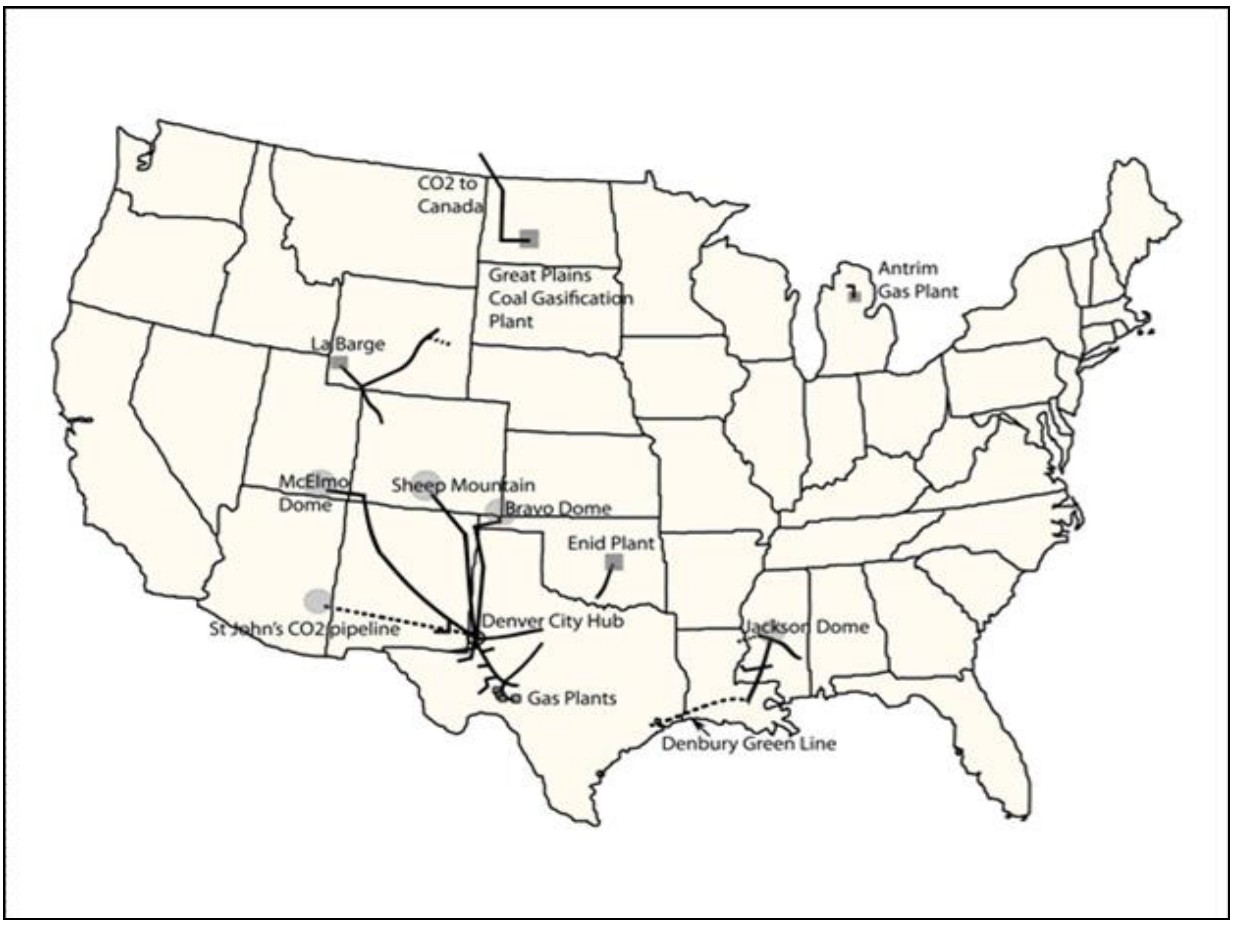

In North Dakota there is a unique cross border EOR project that has been operating for ten years. The Great Plains Synfuels Plant produces natural gas and CO_2 from coal. The CO_2 is very pure, about 96%, which meets the needs of the EOR industry for highly purified steams (at least 95%). The CO_2 is piped 205 miles to Weyburn Canada, where it is injected for EOR. This project was planned and executed from it beginnings as an EOR and intentional CO_2 sequestration project. The CO_2 is fully recycled, with long term sequestration as the ultimate goal. Groundwater has also been closely monitored, the EOR flood is more than a mile deep, while the aquifers for potable water are several hundred feet deep or less. No groundwater contamination has been detected, but it will be monitored for the life of the injection project and

well beyond. To date 17.4 million metric tons have been sequestered. Oil production has nearly tripled to 28,000 barrels per day and the CO_2 injection is anticipated to extend the life of the field by thirty years.[13]

The leader in the development of CO_2 floods for EOR is Denbury Resources, Inc., a Texas based publically traded company whose main business objective is to be the largest operator of CO_2 floods for EOR purposes in the US.[14] Denbury recently purchased Encore Acquisition Company, and thereby acquired several large old oil fields in the Rockies and Texas that can utilize CO_2 floods.

Denbury's primary source of CO_2 in the Gulf States is a naturally occurring field, the Jackson Dome in eastern Mississippi. Denbury has developed this field over several decades and pipes the CO_2 to fields in Mississippi, Louisiana and Texas. Denbury is in the process of completing the Green Pipeline from Louisiana to oil fields near Houston, Texas.[15]

[13] www.dakotagas.com; Industrial GHG Solutions, A Decade of Success. June 2010. www.industrialghg.com/article.jsp?article_id=6288

[14] www.denbury.com. Note: In the interests of full disclosure, Denbury is a client of the author's firm.

[15] The Green Line is the future pipeline from Louisiana to Eastern Texas.

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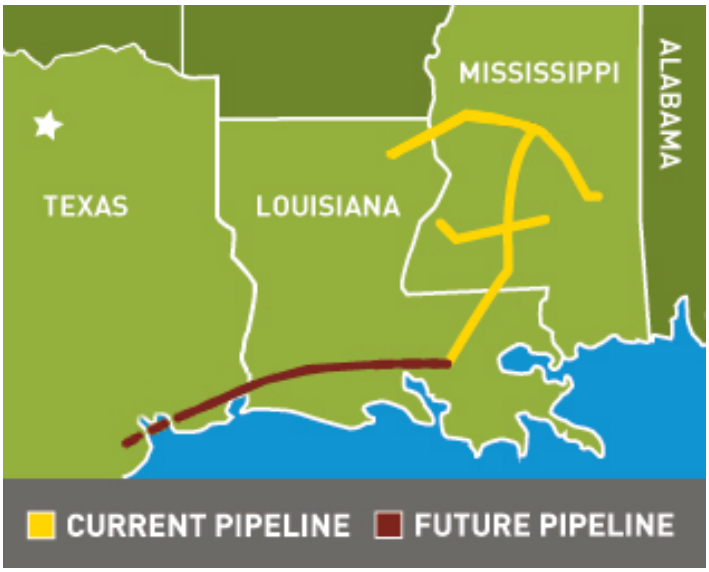

IV. Developing Additional CO_2 Supplies.

Denbury's long term plans highlight an interesting conundrum. In the Rockies and Gulf states there is a shortage of pure CO_2 for EOR injection. There are simply more old oil fields that could benefit from CO_2 injection than there is available CO_2. Denbury is planning to become a leader in the capture of industrial supplies of CO_2 from plants in the Gulf Coast. Denbury is acquiring the rights to capture CO_2 from refineries, gas processing plants, ammonia and cement plants. These projects are in anticipation of the need to acquire supplies of CO_2 as natural supplies are depleted or become more expensive to pipe over long distances. Of course the development of industrial supplies of CO_2 depends in large measure on the action by the federal government to make CO_2 capture economically attractive, in the form of cap and trade legislation, subsidies, renewable energy credits or a carbon tax.

An example of Denbury's business model to capture industrial supplies of CO_2 is its proposed development of a 200 mile CO_2 pipeline system starting in central Wyoming and progressing to southeastern Montana. The initial source of the CO_2 is from the ConocoPhillips

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Lost Cabin natural gas processing plant. That plant currently vents 50 million cubic feet per day of CO_2. Denbury will build the technology to capture the CO_2 and compress it to pipeline pressures (where CO_2 liquefies), and pipe the CO_2 to oil fields it owns in the Bell Creek field in SE Montana and eventually up to North Dakota. Along the pipeline route Denbury hopes to acquire rights to inject CO_2 in oil fields in Wyoming, provided it can acquire additional sources of CO_2. Denbury also owns aging oil fields in Northwest Wyoming. To supply all these needs Denbury could easily utilize 500 million cfpd of CO_2 – a staggering amount that is simply not available without the development of substantial new sources.

These new sources may be derived from the development of clean coal plants that are designed to produce electrical power (IGCC technology), or that are built to convert coal into other products, such as gasoline or diesel (coal to liquids or coal gasification). These plants will be built to capture the CO_2 and sequester it or sell it for EOR. In southcentral Wyoming the Medicine Bow Fuels coal-to-diesel plant is being proposed and it could supply CO_2 to Denbury and other oil and gas producers.[16] In the Midwest there are a number of projects on the drawing boards that are potential sources of CO_2 for Denbury or other pipeline systems that will take the CO_2 to oil fields in the Gulf States and Texas.[17]

The potential for development of such projects is the subject of a recent report prepared by a consulting firm for the Natural Resources Defense Council. The report examined the

[16] www.dkrwadvancedfuels.com/fw/main/Medicine-Bow-111.html

[17] Status of Global CCS Projects, Interim Report, August 2010, Global CCS Institute. Figure 5 shows the location of the proposed projects in North America that may generate CO_2 for storage or EOR. http://globalccsinstitute.com/downloads/general/2010/The-Status-of-CCS-Projects-Interim-Report-2010.pdf

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relationship between expanded EOR opportunities and accelerated deployment of CCS. It was written to assess the impacts of the Waxman-Markey bill (H.R. 2454), which passed the House of Representatives in 2009. The legislation is designed to stimulate and help support a substantial number of CCS projects, by encouraging the construction of new power plants and industrial facilities that will capture CO_2 and use it for EOR or purposeful sequestration. The NRDC report concludes that domestic oil production could increase by 3.0 million to 3.6 million barrels per day by 2030, if "all the captured CO_2 is preferentially used for EOR." [18]

The NRDC report is certainly overly optimistic, since Waxman-Markey appears dead and the Congress is nowhere near agreement on climate legislation. However, EOR projects continue to be built, and they are likely to be the source of almost all the CO_2 sequestration that will occur in the country for at least the next five years, if not well into the next decade. Hopefully policy makers in the US will assist this industry, or at least not create roadblocks to its expansion plans. EOR holds substantial promise to meet the twin goals of reducing CO_2 emissions and creating additional domestic oil production.

END

[18] U.S. Oil Production Potential From Accelerated Deployment of Carbon Capture and Storage, Advanced Resources International, Inc., March 10, 2010.

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Biography

Larry Wolfe is a partner in the Rocky Mountain regional law firm of Holland & Hart LLP. Holland & Hart is a firm of about 440 lawyers with offices in seven western states and Washington, D.C. He resides in the Cheyenne, Wyoming office where he practices energy, natural resources, water, and state tax law, including representing coal, oil, natural gas and mining interests, as well as pipeline, wind and electric transmission clients. Wyoming is one of the top energy producing states in the US, leading the nation in the production of coal and uranium, second in the production of natural gas, and seventh in the production of oil.

From 2007 through 2008 Larry was the Managing Partner of Holland & Hart, operating out of its Denver headquarters. He was responsible for the day-to-day operations of the law firm. From 2001 – 2006 he chaired Holland & Hart's Natural Resources practice, which is the largest natural resources and energy law practice in the Rockies. Larry is included in the most recent editions of Best Lawyers, Super Lawyers, and Who's Who of Business Lawyers in International Mining. He is a graduate of the University of California, Davis and the University of Wyoming College of Law.

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