Carbon Capture and Sequestration Projects Benefit From Enhanced Oil Recovery

by Marc Campopiano and Tim Henderson

Marc Campopiano and Tim Henderson are associates at Latham & Watkins LLP.

Carbon capture and sequestration (CCS) has long been touted as a potentially critical means for reducing greenhouse gas (GHG) emissions from carbon-intense industrial sources. High costs, complex regulatory schemes, and decreasing governmental incentives, however, have hindered the widespread development of CCS projects. But a growing trend of deriving multiple revenue streams from the carbon dioxide (CO_2) associated with CCS projects—particularly using captured CO_2 for enhanced oil recovery (EOR)—is helping to spur CCS development.[1] Indeed, the U.S. Department of Energy (DOE) has praised CO_2 EOR as an "un-mined gold story for energy and job[s]" by increasing domestic oil production and boosting economic development while sequestering CO_2.[2]

I. What Is CCS?

CCS is a process where CO_2 from a stationary source is captured, transported, and permanently sequestered, typically in underground formations. CCS primarily involves combining existing and proven technologies in new ways. For example, CO_2 may be captured from an existing power plant or other industrial facility, transported by pipeline to an injection well for underground sequestration, and used for EOR to mobilize previously trapped oil reserves.[3]

II. Benefits of CO_2 EOR

EOR has been used successfully since the early 1970s to recover additional oil from existing sources, allowing 30-60% more production than without EOR. In the past, the CO_2 used for EOR has come from natural sources. However, combining CCS with CO_2 EOR increases supplies of CO_2 and offers expanded use of CO_2 EOR for sites not close to natural supplies.[4]

The Energy Information Administration (EIA) estimates that domestic use of CO_2 EOR will produce over four billion additional barrels of oil between 2011 and 2035.[5] DOE estimated CO_2 EOR, over 30 years, could potentially spur $10 trillion in economic development, create 2.5 million jobs, and drive a 30-40% reduction in imported oil.

EOR using CO_2 captured from a CCS project can also offer significant financial benefits while facilitating long-term geologic sequestration of the CO_2. For example, a power plant using CCS can sell its captured CO_2 for EOR purposes and gain a significant revenue stream that would not otherwise be available to the plant. Indeed, EOR represents only one possible revenue stream, and CCS projects may produce multiple valuable byproducts in addition to electricity, such as fertilizer from sulfur derivatives.[6]

1. *See* U.S. Department of Energy (DOE), *International Carbon Storage Body Praises Department of Energy Projects* (Nov. 8, 2012), http://www.fossil.energy.gov/news/techlines/2012/12051-CSLF_Praises_DOE_Carbon_Storage_Pr.html (last visited Jan. 22, 2013).
2. U.S. DOE, Office of Fossil Energy, Chai D. McConnell presentation, *Ensuring America's Energy Security*, *available at* http://www.netl.doe.gov/publications/proceedings/11/utsr/pdf/tue/mcconnell_utsr_102511.pdf.
3. Global CCS Institute, *Understanding CCS: What Is CCS and Why Is It Important*, http://www.globalccsinstitute.com/ccs/what-is-ccs (last visited Jan. 22, 2013); Montana Environmental Information Center, *Carbon Capture and Sequestration in Montana*, http://meic.org/issues/montana-coal-facts/coal-plants-in-montana/carbon-capture-and-sequestration-in-montana/ (last visited Jan. 22, 2013).
4. U.S. DOE, *Enhanced Oil Recovery/CO_2 Injection*, http://www.fossil.energy.gov/programs/oilgas/eor/index.html (last visited Jan. 22, 2013).
5. *Id.*; National Energy Technology Laboratory, *Carbon Dioxide Enhanced Oil Recovery: Untapped Domestic Energy Supply and Long-Term Carbon Storage Solution* (Mar. 2010), *available at* http://www.netl.doe.gov/technologies/oil-gas/publications/EP/CO2_EOR_Primer.pdf; U.S. EIA, *Annual Energy Outlook 2012 With Projections to 2035*, 95 (June 2012), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf. *See generally* Enhanced Oil Recovery Institute, http://www.uwyo.edu/eori/ (last visited Jan. 22, 2013).
6. *See* Clean Coal Technology Foundation of Texas, http://cctft.org/technology/environment/emissions-control-technology/igcc/by-products.html (last visited Jan. 22, 2013).

III. CCS Regulatory Framework

The federal Safe Drinking Water Act (SDWA)[7] requires an injection well permit for geologic sequestration of CO_2. The U.S. Environmental Protection Agency (EPA) has created a new "class" of injection wells for CO_2 injection for geologic sequestration.[8] The Class VI well requires the use of materials compatible with geological sequestration and ensures that financial responsibility requirements are in place. Class VI wells must also comply with certain Monitoring, Reporting, and Verification (MRV) requirements as part of EPA's GHG Mandatory Reporting Rule program.[9] Currently, no states have been delegated Class VI permitting authority by EPA.[10]

Alternatively, Class II injection well permits have authorized EOR activities for many years.[11] Some CCS projects may rely upon Class II injection wells for both EOR and sequestration purposes, provided drinking supplies are not adversely impacted. Most states have permitting authority over Class II wells based on delegation from EPA. Use of a Class II well does not require EPA approval of an MRV, although facilities may choose to opt into EPA's MRV program.

CCS projects are potentially affected by several other regulatory programs. At the federal level, the Clean Air Act (CAA)[12] governs new source review and new source performance standards. The National Environmental Policy Act (NEPA)[13] and state equivalents, such as the California Environmental Quality Act, also present regulatory hurdles. State and local agencies have permitting requirements for large industrial sources that may employ CCS technology.[14]

IV. CCS Growth: Slow but Progressing

CCS remains an emerging technology. As of September 2012, there were eight large-scale integrated CCS projects operating or under construction in the United States, with another 16 in planning or development, the majority of which are using or plan to use CO_2 EOR.[15] Internationally, there are eight large-scale integrated CCS projects in operation or under construction, with additional growth expected. Forty-three large-scale integrated projects are in development outside the United States, including 11 in China, 19 in Europe, four in Canada, four in Australia and New Zealand, three in the Middle East, and two in other parts of Asia.[16]

V. Drivers and Constraints to CCS

While CCS is expanding, constraints remain. First, costs associated with CCS need to be reduced to make it more competitive with non-CCS technologies. Second, financing has been hampered by the financial downturn. Third, the development of climate change policies and governmental incentives that could encourage CCS have moved forward in fits and starts.[17] Fourth, still-developing carbon markets have resulted in some uncertainty over carbon prices, raising some challenges with evaluating the financial value of certain carbon credits.[18]

Despite the constraints, multiple factors continue to drive wider CCS development domestically and internationally. Funding through grants/loan guarantee programs and demonstration project programs remain integral to CCS development, with the long-term expectation that such incentives will not be needed as economies of scale make CCS cost-competitive with comparable non-CCS technologies. State and federal tax credits can be available to some CCS facilities.[19] Increasing regulatory certainty will provide a more stable atmosphere for growth and should enhance the competitiveness of CCS projects as carbon markets mature. New technologies will also reduce costs and raise revenue, likely facilitating even greater oil production from CO_2 EOR.[20]

VI. Conclusion

CCS has a high potential to reduce GHG emissions from industrial sources, but continues to be an emerging tech-

7. 42 U.S.C. §§300f to 300j-26, ELR Stat. SDWA §§1401-1465.
8. *See* 40 C.F.R. §§124, 144, 146 et al.; 75 Fed. Reg. 77230 (Dec. 10, 2010).
9. *See* 40 C.F.R. §98, subpt. RR (Geologic Sequestration of Carbon Dioxide).
10. U.S. EPA, *Geological Sequestration Class VI Wells*, http://water.epa.gov/type/groundwater/uic/class6/gsclass6wells.cfm (last visited Jan. 22, 2013).
11. *See* 40 C.F.R. §144.
12. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618.
13. 42 U.S.C. §§4321-4370h, ELR Stat. NEPA §§2-209.
14. U.S. EPA, *Regulatory Impact Analysis for the Proposed Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units* (Mar. 2012), *available at* http://www.epa.gov/carbonpollutionstandard/pdfs/20120327proposalRIA.pdf; U.S. EPA, *EPA Proposes First Carbon Pollution Standard for Future Power Plants/Achievable Standard Is in Line With Investments Already Being Made and Will Inform the Building of New Plants Moving Forward* (Mar. 27, 2012), http://yosemite.epa.gov/opa/admpress.nsf/79c090e81f0578738525781f0043619b/9b4e8033d7e641d98 52579ce005ae957!OpenDocument; U.S. EPA, *EPA FACT SHEET: Proposed Carbon Pollution Standard for New Power Plants*, *available at* http://www.epa.gov/carbonpollutionstandard/pdfs/20120327factsheet.pdf.
15. Global CCS Institute, *The Global Status of CCS: 201*, 24 (4th ed. 2012), *available at* http://cdn.globalccsinstitute.com/sites/default/files/publications/47936/global-status-ccs-2012.pdf.
16. *Id.* at 24-28.
17. *Id.* at 24-28, 44-47.
18. *Id.* at 44-47.
19. *See, e.g.*, §§45Q and 48A of the Internal Revenue Code; *see also* Texas House Bill 469.
20. Global CCS Institute, *supra* note 15, at 47-53. *See also* U.S. DOE Loan Programs Office, https://lpo.energy.gov/?page_id=31 (last visited Jan. 22, 2013); Patrick Falwell, *An Energy Solution With True Bipartisan Support*, Center for Climate and Energy Solutions (Oct. 22, 2012), http://www.c2es.org/blog/falwellp/energy-solution-with-true-bipartisan (last visited Jan. 22, 2013); Southeast Regional Carbon Sequestration Partnership and Southern States Energy Board, *Carbon Capture and Sequestration Legislation in the United States of America* (July 2011), *available at* http://www.sseb.org/files/ccs-legislation-full-version.pdf.

nology. CCS projects that obtain multiple revenue streams from captured CO_2 can gain cost advantages not otherwise available to non-CCS projects, helping to increase the cost-effectiveness of CCS. In particular, CO_2 EOR can increase domestic oil production and boost economic development, while advancing climate change polices to sequester CO_2.[21]

21. U.S. DOE, *supra* note 2.