

Clean Tech Advisory

An informational newsletter from Goodwin Procter's Clean Tech Group

EPA Proposes Rule Creating Framework for Carbon Sequestration

The United States Environmental Protection Agency (“EPA”) has begun to pave a road that could lead to significant reductions in greenhouse gas emissions emitted from fossil fuel power plants. On July 25, 2008, EPA published a proposed rule that provides a regulatory structure for companies to inject carbon dioxide (“CO₂”) into the ground after it has been captured and separated from emissions sources, a process known as carbon capture and storage (“CCS”).¹ In theory, CCS is a boon to both coal producers and environmentalists alike, enabling Congress to enact strict greenhouse gas emissions rules and creating jobs through large infrastructure projects while preserving coal as a primary fuel for electric power generation. However, CCS must overcome significant technological, economic and legal barriers before it can be widely implemented.²

Background on CCS Technology

CCS is a process for isolating CO₂ from fossil fuel combustion emissions, transporting it to a storage location and permanently isolating it from the atmosphere. The first stage involves “capturing” CO₂ from emissions sources and pressurizing it into a “supercritical” liquid roughly the consistency of oil. This liquid is then transported to its final storage location. Permanent storage can be accomplished through a variety of novel, largely still experimental methods. In general, the challenge with storage is finding an environment that can either keep the liquid CO₂ in a pressurized state or otherwise isolate it from the atmosphere for hundreds of years.

One solution to the carbon storage problem is “geological sequestration” – the subject of EPA’s new proposed rule. Geological sequestration involves injecting the liquid several hundred meters below ground where temperature and pressure are sufficient to preserve the liquid state of the CO₂. Many geological formations may be suitable for CO₂ storage, including saline formations (deep rock layers saturated with brine and overlain with an impermeable layer), oil and gas fields, or unminable coal beds. Injected CO₂ may be trapped via physical processes – such as trapping the CO₂ below an impermeable layer or in the pore spaces of rocks – or geochemical processes – such as injecting it into a layer of minerals that convert the CO₂ into a solid carbonate.

EPA's Proposed Regulation of CCS

EPA is proposing to use its authority under the Safe Drinking Water Act ("SDWA") to regulate the injection of CO₂ for geological sequestration.³ The SDWA requires EPA to regulate "underground injection which endangers drinking water sources." EPA is using this regulatory authority as a means to ensure that injected CO₂ does not escape to groundwater sources or the atmosphere.

EPA will regulate the geological sequestration of CO₂ through its existing Underground Injection Control ("UIC") program. Currently, CO₂ injection is governed by existing regulations for existing well classes. CO₂ injected to enhance oil and gas recovery is governed by Class II regulations, while experimental sequestration wells have fallen under Class V. Under the proposed regulatory scheme, injection for oil and gas production will continue under Class II, while injection for new sequestration wells will be governed by new Class VI regulations. Existing sequestration wells may be grandfathered under the old regulations at the discretion of EPA.

The Class VI regulations will govern almost all stages of geological sequestration well development, including siting, construction, operation, monitoring and testing, and closure. For example, even before well construction, companies must identify geologic sites and ensure that they meet regulatory standards intended to prevent CO₂ from escaping the injection area. Further, within a certain "Area of Review," a driller must demonstrate that there are no faults, fractures or artificial penetrations that would facilitate CO₂ escape. Other requirements relate to corrosion-resistance and monitoring of wells, injection pressure, mechanical integrity, closure, financial responsibility and a myriad of other design and maintenance issues. In general, the regulations seek to systematically minimize risks associated with all stages of geological sequestration.

It should be noted that EPA's proposed regulations do not address several important issues relating to geological sequestration. For example, they do not address whether and how sequestration might be used to meet potential CO₂ reduction requirements under the Clean Air Act or potential emissions from the CCS process. Further, the proposed regulations do not address liability for the escape of stored CO₂, property rights relating to the ownership of the stored CO₂ and subsurface strata where it is stored, or related insurance and financial responsibility requirements.

Limitations of CCS

Despite its promise, CCS currently has a number of serious limitations. These relate to technology, risks and financial feasibility.

Technological uncertainty spans the CCS process. As a threshold matter, it can be difficult to "capture" CO₂ in the first place. Unlike conventional air pollutants from power plants like sulfur dioxide and particulates that are removed from stacks with filters and scrubbers, CO₂ is a gas that is difficult to isolate and remove from emissions. Current separation and capture techniques consume considerable energy,

can reduce a power plant's efficiency by 10 to 30 percent, and may increase the emissions of other pollutants such as nitrogen oxides, ammonia, or methane. In addition, while certain types of physical trapping utilize well-developed technology, others – such as geochemical trapping and trapping in coal beds – are still in early phases of development. Furthermore, the scale of CCS implementation that would be required to materially reduce global CO₂ emissions is immense. EPA estimates that certain areas of the United States have enough storage potential for CO₂ for 1,000 coal plants for 1,000 years, but the suitable geologic areas are not necessarily near urban centers and power plants. The world's biggest existing CCS project, in Norway, can store only one-tenth of the emissions of a large power plant. Thus, much uncertainty surrounds attempts to scale up today's experimental projects to their full potential. Finally, there is uncertainty as to whether storage is really "permanent" or whether stored CO₂ will leak back into the atmosphere – either in the short run or over hundreds of years.

Despite EPA's proposed regulation, residual risks with large-scale underground injection of CO₂ will linger. The premise of EPA's proposed rule is to address risks to groundwater from CO₂ injection, such as injection-induced leaching of contaminants and the migration of impurities in the CO₂ into drinking water. Further, there is a small chance that CO₂ injection could increase seismic activity. Some also speculate about CO₂ escaping storage areas and causing asphyxiation, though EPA dismisses these risks as extremely small. EPA rule is intended to minimize these risks. Whether they are real or not, however, at least some community and special interest groups are bound to seize on these perceived risks in an effort to defeat sequestration projects.

Finally, CCS requires a high price on carbon to be economically viable. Currently, CCS becomes viable only when CO₂ emissions are priced above \$40 per ton. Voluntary carbon markets in the United States currently price carbon well below that level, but the price of CO₂ on the European Emission Trading System market has exceeded \$40. Whether CCS will be viable in the long run depends on the design of the anticipated U.S. cap and trade scheme, the resulting price of carbon, the cost of alternatives to fossil fuel combustion such as renewables, cost reductions in CCS as its technology develops, and certain legal and liability issues outlined below.

Strategic Considerations

CCS is one of a portfolio of technologies that can be utilized to reduce greenhouse gas emissions. The following considerations among others, will be critical in determining the success of CCS and the speed and scale of its implementation:

EPA's proposed regulations reduce uncertainty and risks associated with carbon sequestration, making investment in sequestration projects more reliable. EPA's regulations, when final, should help mitigate concerns regarding risks associated with geological sequestration. The existence of a regulatory scheme should give investors confidence that they are moving forward in compliance with federal laws. When EPA issues final sequestration regulations, there will likely be an uptick in sequestration projects. Developers of projects should beware, however, as states can

still place further restrictions on sequestration that are more stringent than federal ones.

Companies should continue to push for government investment in carbon sequestration research and development. CCS still faces significant technological and economic hurdles before it can be implemented on a large scale. Nonetheless, its potential for use in conjunction with existing, reliable electric generation facilities should make it a priority for R&D investment. While private companies will continue to develop their own CCS technology, the federal government should increase its support for research and development efforts. Doing so may in the long run soften the blow on private industry associated with carbon regulation.

Other legal risks and uncertainties must be addressed to facilitate widespread adoption of CCS. Liability issues regarding potential failure of CCS projects and escape of injected CO₂ need to be addressed to mitigate project risks and boost investor confidence. Also, ownership of the stored CO₂ and subsurface reservoirs need clarification and interstate consistency. Federal liability limitation legislation – similar to the Price-Anderson Act for nuclear power plants – is likely to be necessary to avoid inconsistent state-by-state outcomes on these issues.

Companies engaging in carbon sequestration projects should consider seeking insurance for their projects. Given the uncertainty of the long-term risks associated with CCS, companies engaging in CCS projects should consider obtaining catastrophic incidence insurance similar to that sought ought by nuclear energy providers. Though, like nuclear power, the risks to human health or the environment may be small, insurance may be a way to allay investor concerns regarding CCS risks. To date the insurance industry has yet to develop insurance products addressing the long-duration risks associated with CCS, but such coverage is likely to develop as CCS evolves.

Companies and the federal government must continue to invest in renewables and efficiency. Despite the promise of sequestration, its high costs and legal and technological risks are likely to retard its widespread implementation. Thus, sequestration should not be relied on as the primary means of greenhouse gas reduction, but one of a portfolio of strategies in the transition to a low carbon economy. Instead, companies and policymakers must continue to explore multiple paths for emissions reduction.

Conclusion

Given the extensive use of coal and other fossil fuels for electricity generation in the U.S. and abroad, successful implementation of CCS is critical to reducing GHG emissions and mitigating climate change. CCS technology is not currently well developed nor demonstrated on a large commercial scale. EPA's proposed rule is an important first step in providing a legal framework to facilitate geologic sequestration of CO₂ in the U.S. and thus enabling the large-scale implementation of CCS. This rule, in conjunction with the anticipated cap-and-trade framework expected to be adopted by Congress in the next several years, may facilitate the implementation of CCS. However, it is likely that high carbon prices as well as

federal subsidies and research and development support will be required to permit the widespread implementation of this technology. Moreover, until legal issues including property rights, liability limitation, financial responsibility and insurance coverage are comprehensively resolved, it will be difficult to persuade electric power companies, lenders and investors to make the massive financial commitments necessary to make CCS a viable solution to greenhouse gas emissions from major U.S. fossil fuel combustion sources.

¹ Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geological Sequestration (GS) Wells, 73 Fed. Reg. 43492 (proposed Jul. 25, 2008) (to be codified at 40 C.F.R. pts. 144 and 146).

² See, generally, Goodell, Jeff, *Coal's New Technology: Panacea or Risky Gamble?*, YALE ENVIRONMENT 360 (Jul. 14, 2008), available at <http://e360.yale.edu/content/print.msp?id=2036>.

³ 42 U.S.C. 300h *et seq.* (2008).

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