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COMMENT

The Layered Approach to Liability for Geologic Sequestration of CO_2

by Fred Eames and Scott Anderson

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Does the brief history of carbon capture and sequestration ("CCS") teach that we need to make wholesale changes in liability rules to make sure people do it right, or that we need favorable economic conditions within a normal liability framework to get people to do it at all? The arguments of Professors Adelman and Duncan[1] proceed from the former notion; we submit the latter.

CCS is viewed as essential if mankind is going to make a serious attempt to limit atmospheric CO_2 emissions.[2] Yet despite the fact that the technology of both carbon capture and sequestration have been shown at demonstration scale, we have only a limited number of permitted geologic sequestration projects in the United States and internationally. There are many oil and gas wells into which CO_2 has been injected, and will in most cases remain, for enhanced recovery. We set those aside for this discussion because in those wells, something goes in and something comes back out. They do not pose significant groundwater contamination risks from brine displacement. The Adelman-Duncan article focuses on brine displacement from saline aquifers.

Adelman and Duncan argue for ranking potential sequestration sites based on risk factors, and imposing strict liability—i.e., liability even in the case of exemplary conduct—for what they term "lower-quality sites (such as sites with poor cap rock or valuable overlying aquifers)."[3]

There are many reasons we don't yet have a facility permitted to inject CO2 into a deep saline aquifer under the U.S. Environmental Protection Agency's Class VI Underground Injection Control rules (the principal rules that apply to geologic sequestration of CO_2 in the U.S.), but in the opinion of some observers the reasons include the specter of liability and that the Class VI rules are viewed as onerous, particularly the rules regarding site selection.[4]

But let us not argue that industry views are the proof of sufficiency. Adelman and Duncan posit that industry concerns are unfounded. Without agreeing or disagreeing, we contend that there are means to encourage safe geologic sequestration. Let us first state the facts about the UIC Class VI regulatory structure. Following that, we will discuss a liability structure we helped devise several years ago.

I. UIC Class VI Regulatory Structure

Professors Adelman and Duncan premise their recommendations on a view that the EPA's UIC Class VI regulatory structure, which the EPA has described as a set of "minimum Federal requirements,"[5] is insufficient to ensure that sequestration will be done safely. In particular, they believe that sites may be selected that are not sufficiently safe to prevent contamination of underground sources of drinking water ("USDWs").

We acknowledge there may be compelling incentives for selection of a geologic sequestration site that meets Class VI standards that is near an industrial source, even if a site with additional indicia of safety (thickness of caprock, absence of USDWs nearby) may be available further away. It has become exceedingly difficult to construct linear infrastructure in many areas, and geologic sequestration of CO2 will need to rely on pipelines from industrial sources to sequestration facilities. Shorter pipelines are easier and cheaper to build than longer ones.

However, the description of Class VI UIC standards as "minimum standards" can be misleading. Many major federal environmental laws are written so that States may administer the federal law, or their own law in lieu of the

1. David E. Adelman & Ian J. Duncan, *The Limits of Liability in Promoting Safe Geologic Sequestration of CO_2*, 22 Duke Envtl. L. & Pol'y F. 1 (2011).
2. "The Intergovernmental Panel on Climate Change (IPCC) has concluded that CCS can contribute between 15-55% of the cumulative emission reduction effort to 2100, providing it with a central role within a portfolio of low carbon technologies needed to address climate change." *The Role of CCS*, World Coal Ass'n, http://www.worldcoal.org/coal-the-environment/carbon-capture-storage/the-role-of-ccs/ (accessed Mar. 18, 2013).
3. Adelman & Duncan, *supra* note 1, at 53.
4. To be fair, in most circumstances there also is little economic motivation for such projects at present. Also, a small number of Class VI permit applications are pending.
5. Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells, 75 Fed. Reg. 77230, 77233, (Dec. 10, 2010).

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federal one, so long as State law is no less stringent than federal law, and so long as EPA approves their administration and enforcement program. The UIC program operates in this manner.

That does not mean the standards are minimal. The Class VI UIC rule requires "a detailed assessment of the geologic, hydrogeologic, geochemical, and geomechanical properties of the proposed [sequestration] site to ensure that . . . wells are sited in appropriate locations and inject into suitable formations."[6] Among numerous other things, permit applicants must submit:

- A map showing "location of all injection wells, producing wells, abandoned wells, plugged wells or dry holes, deep stratigraphic boreholes, State- or EPA-approved subsurface cleanup sites, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells, other pertinent surface features, including structures intended for human occupancy, State, Tribal, and Territorial boundaries, and roads. The map should also show faults, if known or suspected."[7]
- "Information on the compatibility of the carbon dioxide stream with fluids in the injection zone(s) and minerals in both the injection and the confining zone(s), based on the results of the formation testing program, and with the materials used to construct the well."[8]
- A demonstration of mechanical integrity, which must show among other things that there is no significant fluid movement into a USDW, and must include continuous monitoring to evaluate the absence of significant leaks.[9]

This and other information submitted by applicants must be sufficient to "demonstrate that the geologic system comprises . . . [a]n injection zone(s) of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipate volume of the carbon dioxide stream [and] [c]onfining zone(s) free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream *and displaced formation fluids* and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zone(s)."[10]

In many respects the Class VI regulations are similar to or were modeled after EPA's Class I regulations applicable to underground injections of hazardous wastes. Injections of CO_2 justify risk controls similar to those for injections of hazardous waste in some respects (the need to limit injection pressure, for example). In some important respects CO_2 injections pose much less risk than hazardous waste injections.[11] The bottom line is that the Class VI rules are quite robust, including in aspects related to site selection.

Furthermore, ordinary business incentives encourage appropriate site selection. Sequestration facilities must be financed, and lenders and investors insist on precautions to ensure that they get their money back with interest. Sequestration site owners/operators are required to provide financial assurances to regulators in one of several forms, such as sureties, insurance, letters of credit, or self-insurance. Issuers of such instruments likewise want low-risk sites. Risk management has a valuable function in directing developers toward lower-risk sites, truncating higher-risk sites from the market. This is especially true with a fledgling and very large-scale industrial activity, arguably the first to come along in the era of modern environmental law.

Nevertheless, we concur that there is room to provide additional incentives for good site selection, which we will discuss below as we describe the CCS risk management structure we helped devise.

II. The "Layered Approach"

With similar aims, we proceed with a carrot where Professors Adelman and Duncan proceed with a stick. We want to encourage good site selection for geologic sequestration and to minimize risk. We do not want to incite "moral hazard" and thus favor maintaining alignment between risk-generating behavior and its consequences. However, we also emphasize that the liability and regulatory atmosphere should not deter safe geologic sequestration as an option to reduce atmospheric carbon emissions. Furthermore, we believe that risk management for geologic sequestration should be economically efficient.

Our approach applies layers of risk management obligations that address risks across all phases of geologic sequestration (operation, post-injection site care, and post-closure). For projects initiated during a period when the data necessary for a mature risk management market is still emerging, the approach provides both developers *and* the government with incentives to assure safe *and* economically efficient siting, operation, and post-injection management of sequestration facilities.

The Layered Approach institutes a structure under which the Secretary of Energy may enter into cooperative agreements with owners/operators of roughly 80 sequestration facilities to manage risk. Under a cooperative agreement, the Secretary agrees to share risk at the site throughout all phases, rather than solely in the post-closure phase. However, the Secretary's liability would be dollar limited, and would arise only if an incident caused damages in excess of the initial layers, for which first the facility owner/opera-

6. *Id,* at 77247.
7. 40 C.F.R. §146.82 (2010).
8. *Id.*
9. *Id.* §§146.82, 146.89.
10. *Id.* §146.83.

11. We are thinking here about risks to the local environment. The potential for large scale loss of carbon dioxide to the atmosphere is certainly a risk unique to Class VI injections, but the International Panel on Climate Change believes that well-selected, well-managed locations will retain at least 99 per cent of the injectate for 1,000 years.

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tor and then cooperative agreement holders collectively would be responsible. Thus, one might think of the Layered Approach as liable parties in a vertical stack that share responsibility over time, as opposed to horizontally-linked time periods that allocate liability to industry in the earlier phases and the government after a closure certificate is issued.

The Layered Approach places the site owner/operator with a cooperative agreement in the position of first-dollar liability throughout all phases, up to a per incident dollar limit, including after a facility has received a certificate of closure. If damages result from the sequestration facility, whether they arise 10 years after the site has commenced operation or 100 years after it has received a certificate of closure, the facility owner/operator is potentially liable. The owner/operator can choose to manage the first layer liability by purchasing a commercial risk management product, such as an insurance policy, or by self-insurance.

The second layer binds all cooperative agreement recipients to share liability if damages arise at any cooperative agreement facility that exceed the owner/operator's first layer obligation. For example, if damages caused by the facility are $70 million and the owner/operator's first layer limit is $50 million, each other cooperative agreement holder would pay a pro rata share of the additional $20 million.[12]

The market may develop a risk pool to manage the "second layer" risks in an economically efficient manner. The Layered Approach requires that to enter the cooperative agreement program, an applicant cannot have been rejected from the risk pool. In other words, the Layered Approach builds in a feature whereby the market may register its opposition to a site because it is too risky. Under the Layered Approach, there are thus no fewer than four limits on site selection in addition to the developer's good sense: EPA's Class VI regulations; the financiers and insurers of the project; the Secretary of Energy, who is not compelled to enter into any cooperative agreement, let alone one he deems too risky; and participants in the risk pool, should one develop.

Should damages from an incident exhaust the first and second layers, the federal government would hold third layer responsibility. As with the first two layers, third layer liability is capped at a set amount. However, unlike the first two, the third layer is a "lifetime" limit, rather than a per incident limit. If the government pays $20 million for an incident in year 10, the cap on its obligation is reduced by that amount.

If an incident is so substantial that all of the first three layers are exhausted, any remaining liability is the responsibility of the owner/operator. This is the fourth and final layer.

Owners or operators who enter the cooperative agreement program early receive a better deal than do those who enter later, with the idea that as more experience is gained with geologic sequestration, less incentive will be needed to encourage it. There are many other features to the Layered Approach that we do not have space to discuss here.

The prevailing notion for managing risk from geologic sequestration—holding the government responsible for all risks and establishing a trust fund to pay if any damages should arise—accumulates the most money at a time when risks are widely expected to be lowest. This is not economically efficient. Even if one accepts the contention Adelman and Duncan submit, that brine intrusion is a more likely fortuity than CO_2 leakage, and that brine intrusion may continue many decades after injections have ceased at a facility, society should want to maintain efficient options for dealing with what is still expected to be a low probability outcome.

The Layered Approach was devised in 2010 in a collaborative effort between two of the nation's largest electric utilities, Southern Company and Duke Energy, Environmental Defense Fund, and international insurer Zurich. Each party had different reasons for preferring the Layered Approach to other liability schemes. Other than economic efficiency and prevention of moral hazard, which have been mentioned, one other rationale is of note. Some companies expect that regardless of proposals to relieve them of liability, there always will be attempts to make them pay if damages arise. Thus, a trust fund covering post-closure liabilities may be a cost with little or no benefit.

An essential premise of the Adelman-Duncan structure is that enhanced liability is required because under the prevailing concept for geologic sequestration liability, companies will be let off the hook for post-closure liabilities, and post-closure is a time when they assert liabilities are likely to arise (through brine intrusion). The Layered Approach obviates this premise because owners/operators will remain potentially liable even during post-closure. However, it does not obviate a second Adelman-Duncan premise, which is that even if companies remain liable, post-closure liability is too remote to factor into current decisions. As noted above, the cooperative agreement mechanism of the Layered Approach addresses this concern by requiring the Secretary of Energy's approval to gain the risk management benefits of the approach. A carrot, but only for worthy horses.

12. This "industry pool" concept is modeled after the Price Anderson Nuclear Industries Indemnity Act (42 U.S.C. §2210), which applies to damages caused by commercial nuclear facilities. While geologic sequestration supporters have been hesitant to refer to Price Anderson for fear of unintentionally equating damages from CO_2 sequestration with much more costly potential damages from commercial nuclear operation, nevertheless it is a useful model.