



NATURAL RESOURCES DEFENSE COUNCIL

Comments on

**Standards of Performance for
Greenhouse Gas Emissions for New
Stationary Sources: Electric Utility
Generating Units**

77 Fed. Reg. 22,392 (April 13, 2012)

**Comments on Measures Needed to Assure the Integrity of
Carbon Capture and Storage in the
Power Plant New Source Performance Standards**

submitted by

Natural Resources Defense Council

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I. Introduction

We thank the Environmental Protection Agency (EPA) for the opportunity to comment on the proposed carbon pollution standards for new power plants. These comments are directed to requirements needed to assure the integrity of carbon capture and storage (sequestration) as a compliance option under the rule.

The Natural Resources Defense Council (NRDC) is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington D.C., San Francisco, Los Angeles, Chicago and Beijing.

II. Treatment of CCS under the proposed rule's compliance obligations

(1) General discussion

The proposed rule defines CCS as follows: "Carbon capture and storage (CCS) means a process that includes capture and compression of CO₂ produced by an electric utility generating unit before release to the atmosphere; transport of the captured CO₂ (usually in pipelines); and storage of that CO₂ in geologic formations, such as deep saline formations, oil and gas reservoirs, and unmineable coal seams".¹ The proposed rule clearly lists CCS as a compliance option and lists specific standards to be met by the EGU in the case that CCS is used towards compliance.²

We submit that EPA's standards must include provisions to address the risk of CO₂ leakage after CO₂ captured at the plant site leaves the site to be transported to, and disposed of in, a sequestration facility. To this end, the standards need to include (directly or by reference) requirements that captured CO₂ must be transported through approved pipelines to approved sequestration sites, where both the pipelines and sequestration sites are subject to appropriate requirements for preventing emissions, and for monitoring, quantifying, and reporting to detect and correct any such emissions. The standards must specify that an EGU source may subtract captured CO₂ from its reported CO₂ emissions only if these provisions are complied with.

CCS systems necessarily involve equipment and facilities beyond the EGU plant site. It would be utterly unacceptable for an EGU to capture CO₂ and pipe it off-site, only to have it released from the open end of a pipe across the fence-line. Thus, at a minimum, an EGU must not be allowed to deduct captured CO₂ from its emissions unless it has, and complies with, an

¹ 77 Fed. Reg. 22439.

² 77 Fed. Reg. 22436-22437.

enforceable commitment to ship that CO₂ by a pipeline operating in compliance with containment, monitoring, and reporting requirements, to a sequestration facility that in turn operates in compliance with containment, monitoring, and reporting requirements.

Accordingly, unless the owners and operators of the receiving pipelines and sequestration facilities are subject to obligations to monitor and report CO₂ emissions and are subject to noncompliance penalties no less stringent than those applicable to covered NSPS facilities under the Clean Air Act, any release from such pipelines and sequestration facilities of CO₂ produced by a covered EGU must be attributed to the covered EGU for NSPS compliance purposes.

Further, EPA needs to adopt, directly in this rule or by reference, appropriate and specific standards for containing, monitoring, quantifying and reporting emissions from pipelines and sequestration facilities. Only upon compliance with such requirements shall the EGU be allowed to deduct sequestered CO₂ from its own emissions.

(2) EPA's Greenhouse Gas Reporting Rule and compliance with the proposed rule

With appropriate improvements, the CCS-related requirements of EPA's Greenhouse Gas Reporting Rule could form the basis of the provisions needed in the standards to set forth the compliance obligations of EGU sources that employ CCS systems. While EPA has adopted a general Greenhouse Gas Reporting Rule, that rule is not adequate on its own to assure compliance with the NSPS for EGUs. We address some of the needed improvements below.

Subparts UU and RR of the Greenhouse Gas Reporting Rule apply to facilities that inject and geologically sequester CO₂ respectively.

We do not consider reporting under subpart UU to be sufficient to assure compliance with the proposed NSPS, given that it amounts to no more than reporting meter readings and does not consider the potential for emissions from sequestration sites. EPA should not accept reporting under subpart UU of the Greenhouse Gas Reporting Rule by itself as sufficient for the purposes of compliance of CCS facilities under the proposed rule.

Subpart RR applies to facilities that geologically sequester CO₂ and includes additional obligations over subpart RR to identify CO₂ leakage pathways (including likelihood, magnitude and timing), delineate the monitoring area, identify a strategy for detecting and quantifying any surface leakage of CO₂, and identify a strategy for establishing expected baselines for monitoring CO₂ surface leakage.

However, reporting under subpart RR is not mandatory for all CO₂ injection facilities – only for wells that inject CO₂ under Class VI of the Underground Injection Control Program (UIC). Furthermore, compliance with subpart RR by itself does not guarantee that adequate standards are met in order to satisfy the higher level of compliance requirements that are needed to effectively enforce the proposed rule, for several reasons. First, the requirements under

subpart RR are general, and could be implemented very differently depending on the discretion of the Administrator. Second, Monitoring, Reporting and Verification (MRV) plans are reviewed on an individual basis and are not made public until finalized, with only an ex-post option for appeal to the Environmental Appeals Board for interested parties. Third, reporting under subpart RR does not require or guarantee that geologic sequestration sites are sited, operated and decommissioned in a way that will aim to prevent or minimize leaks to the atmosphere. The requirement is merely to report any emissions.

For these reasons, EPA should not accept reporting under subpart RR of the Greenhouse Gas Reporting Rule by itself as sufficient for the purposes of compliance of CCS facilities under the proposed rule. The informational and general nature of the Reporting Rule renders it unsuitable by itself for compliance with the proposed rule.

(3) UIC well classes and compliance with the proposed rule

We do believe that reporting under subpart RR could be used for compliance under the NSPS if combined with other EPA regulatory requirements. In particular, we believe that EGUs should be allowed to subtract from their on-site atmospheric emissions quantities of CO₂ that are being injected and sequestered (minus any leaks) in wells permitted under UIC Class VI (which makes reporting under subpart RR compulsory). However, we do not believe that the same should be allowed if CO₂ is being injected in Class II wells.

Class II dates back several decades and is used for injecting brines, CO₂ and other fluids associated with oil and gas production, and hydrocarbons for storage.³ Class VI is a new injection well class, which was designed specifically for and applies to wells that inject CO₂ for geologic sequestration.⁴ Class VI rules are far more recent than Class II rules, and were promulgated in December 2010.

³ 40CFR144.6(b) defines Class II wells as “[w]ells which inject fluids:

- (1) Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
- (2) For enhanced recovery of oil or natural gas; and
- (3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

⁴ 40CFR 144.6(f) defines Class VI wells as “[w]ells that are not experimental in nature that are used for geologic sequestration of carbon dioxide beneath the lowermost formation containing a USDW; or, wells used for geologic sequestration of carbon dioxide that have been granted a waiver of the injection depth requirements pursuant to requirements at §146.95 of this chapter; or, wells used for geologic sequestration of carbon dioxide that have received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to §§146.4 of this chapter and 144.7(d).”

Regulatory requirements for Class VI are more comprehensive than for Class II on many counts. Below we summarize some key differences:

- The information that needs to be submitted at the time of a permit application is more extensive under Class VI. For example, key geological, geomechanical, lithological and geochemical properties of the confining zone, information on faults or fractures that may interfere with confinement, seismic history, and information on wells within the area of review have to be submitted under a Class VI permit application. Class II does not have such requirements, or requires only information on known wells that is of public record rather than the use of methods to discover orphaned or abandoned wells.
- Class VI siting requirements include an injection zone with sufficient properties to receive the total anticipated volume of CO₂ injectate, a confining zone big enough to contain injected *and* displaced fluids, and with sufficient integrity to allow injection without initiating or propagating fractures. Class II requires only a confining zone that is free of transmissive faults and fractures.
- Monitoring requirements for Class II are limited to analyzing injected fluids with sufficient frequency to yield data representative of its chemical and physical characteristics, as well as injection rate, pressure and volume measurements. Class VI requirements include an extensive testing and monitoring plan that covers operational parameters for the well, direct and indirect methods to track the extent of the CO₂ plume and the area of elevated pressure, water quality measurements, as well as surface monitoring if required by the Director.
- Class VI requirements for a well plugging plan are tailored to individual situations rather than requiring off-the-shelf methods to be used.
- Class II lacks any post-injection site care and site closure requirements. Class VI requires post-injection monitoring for fifty years, or an alternative period if it can be shown that it is sufficient, in order to establish the evolution of the injected CO₂ and displaced fluids, and that no USDWs are being endangered. Once no endangerment established, then the Director may authorize site closure, at which point financial responsibility obligations cease.
- The area of review and corrective action requirements for Class VI are broader. The actual area of review does not rely on default distances, needs to be updated at least every five years, requires modeling of certain specifications to determine the extent of the CO₂ plume and displaced fluids, and more extensive identification of penetrations within the area of review. A revision of the area of review also may require revision of other required plans.
- Financial responsibility obligations under Class VI are more comprehensive than under Class II.

40CFR146.81(d) states that “Geologic sequestration means the long-term containment of a gaseous, liquid, or supercritical carbon dioxide stream in subsurface geologic formations. This term does not apply to carbon dioxide capture or transport.”

- Class VI emergency and remedial response provisions require actions by the owner or operator to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. Class II has no such requirements.
- Construction requirements, as well as requirements for logging, sampling and testing, go further in Class VI than they do in Class II.
- The standard for granting primacy to states for the implementation of the program is weaker for Class II wells, and consists of a general effectiveness demonstration as opposed to meeting individual stringency and adequacy criteria.

Class VI therefore contains comprehensive requirements tailored to geologic sequestration projects that aim to ensure that CO₂ does not contaminate groundwater. Preventing groundwater contamination serves the purpose of reducing the likelihood that injected CO₂ will enter the atmosphere. On the other hand, injection under Class II permits combined with reporting under subpart RR could leave substantial gaps in terms of safeguards for effective sequestration of CO₂, which would seriously compromise compliance under the proposed rule.

EPA should allow EGUs to show compliance with the standards of the proposed rule by subtracting from their atmospheric emissions CO₂ that is being injected and sequestered (minus any leaks) in wells permitted under UIC Class VI and that report their emissions under subpart RR.

Further, EPA should consider establishing a compliance demonstration pathway for sequestration facilities that are not covered by Class VI permits.

We believe that EPA should propose and finalize requirements to classify carbon dioxide that is captured and injected during enhanced hydrocarbon recovery operations as geologically sequestered if it determines that conditions for site selection, operation, mitigation, remediation, monitoring, reporting and abandonment are met that will ensure minimum risk of, and appropriate response to, potential leakage from the intended carbon dioxide confinement zone.

EPA regulations establishing requirements for qualifying carbon dioxide injected in Enhanced Hydrocarbon Recovery operations as geologic sequestration should include but not be limited to the following:

- A demonstration that sites are capable of long-term containment of carbon dioxide;
- Identification and characterization of potential natural and man-made leakage pathways, and appropriate risk management and corrective actions;
- Design, construction and operation parameters to prevent, mitigate and remediate the creation or activation of leakage pathways, or and the migration of CO₂ or fluids into any zone in a manner not authorized by the Administrator (or pursuant to a State program approved by the Administrator as meeting the requirements of these regulations);

- Minimizing fugitive CO₂ emissions from project operations;
- Monitoring and modeling to predict and confirm the position and behavior of the CO₂ and other fluids in the subsurface during and after injection;
- Accounting and reporting of CO₂ quantities sequestered, injected, recycled, leaked, vented, and any other categories as appropriate; and,
- Post-injection site closure and financial responsibility requirements that ensure the long-term containment of injected CO₂.

Pending the promulgation or revision of such regulations by EPA, the Agency should approve applications for qualification of carbon dioxide injected in Enhanced Hydrocarbon Recovery operations as geologically sequestered for the purposes of the proposed rule pursuant to guidelines that conform to the requirements above.

(4) Carbon Capture and Storage Needs to be Further Defined to Assure Permanent Sequestration

As noted above, EPA needs to refine the definition of carbon capture and storage to assure permanent sequestration. We suggest that EPA add the word “permanent” to the proposed definition of CCS:

Carbon capture and storage (CCS) means a process that includes capture and compression of CO₂ produced by an electric utility generating unit before release to the atmosphere; transport of the captured CO₂ (usually in pipelines); and *permanent* storage of that CO₂ in geologic formations, such as deep saline formations, oil and gas reservoirs, and unmineable coal seams.

Further, EPA should define geologic sequestration consistently with its Safe Drinking Water Act regulations to mean the permanent containment of a gaseous, liquid, or supercritical carbon dioxide stream injected in subsurface geologic formations that are shown to have the suitable characteristics necessary to provide such containment, under operating and abandonment conditions, and requirements designed to ensure and verify such containment, as determined by the Administrator.

III. Conclusion

We thank EPA for the opportunity to comment on the proposed rule. NRDC continues to believe strongly that geologic sequestration of CO₂, correctly implemented, must be a component of the U.S. climate mitigation portfolio. However, the proposed carbon pollution standards for new power plants must ensure that the technology is deployed safely and effectively, and must not create a precedent whereby emitters are allowed to treat carbon dioxide that is captured, transported and sequestered without the appropriate safeguards that will ensure that it is not emitted to the atmosphere and that it does not endanger human health or the environment.