NCDENR
North Carolina Department of Environment and Natural Resources

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Governor

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May 9, 2014

EPA Docket Center
U.S. Environmental Protection Agency (EPA)
Mail Code 2822T
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Attn: Docket No. EPA–HQ–OAR–2013–0495

Subject: Comments on Proposed Rulemaking – Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units

Dear Sir/Madam:

The North Carolina Division of Air Quality (NC DAQ), within the Department of Environment and Natural Resources (DENR), is providing comments on the proposed rule "Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units" (EGU GHG NSPS) published in the *Federal Register* on January 8, 2014 (79 *FR* 1430).

The NC DAQ is concerned with the large scale impact this rulemaking will have on the future of the electricity market in the State and nation particularly given EPA's conclusion that this rule will provide negligible environmental benefit. There is general agreement both within the EPA and the states that many of the conclusions regarding carbon capture and storage (CCS) are erroneous resulting in a number of flaws in the proposed rule. Our comments are divided into the following key areas:

1. Basis of the emission limits for carbon dioxide (CO_2),
2. Feasibility of CO_2 sequestration in large-scale geologic storage areas in North Carolina,
3. Additional energy requirements and air pollutant emissions with CO_2 separation, transportation, compression, and injection,
4. Non-air public health related environmental impacts resulting from partial CCS,
5. Uncertainty and lack of definition in implementing the proposed emission fee structure,
6. Lack of demonstration that the proposed rule secures a balanced solution,
7. Absence of experience with at least one commercial scale coal-fired CCS system, and
8. Clarifications on permitting thresholds for GHG in both PSD and Title V.

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1. Emission limits for coal-fired utility boiler and Integrated Gasification Combined Cycle (IGCC) units are based on partial CCS technology that does not meet Clean Air Act section 111(b) criteria for the Best System for Emission Reduction (BSER).

The EPA considered the following factors in its BSER determination: (technical) feasibility, costs, extent of emission reductions and technology.[1] The proposed EGU GHG NSPS rule contains standards for new affected fossil fuel-fired EGUs and stationary combustion turbines. The rule proposes a separate performance standard for fossil fuel-fired EGUs and IGCC units that burn solid fossil fuels based on partial implementation of CCS as the BSER. It also proposes standards for natural gas-fired combustion turbines based on modern, efficient natural gas combined cycle technology as BSER. While the proposal has a certain degree of merit perhaps at some future time, it is premature at this time, given that full scale commercial units with "partial capture" CCS are not yet operational.[2]

The proposed NSPS would require new coal-fired power plants to achieve an emission limit of 1,100 pounds of CO_2 per megawatt/hour (lbs CO_2/MWh) based on a 12-month rolling average compliance period. Alternatively, coal-fired power plants could achieve an emissions limit between 1,000-1,050 lbs CO_2/MWh based on an 84-month rolling average compliance period. The EPA estimates the approximate rates of capture for IGCC and conventional coal-fired utility boilers are 25% and 50%, respectively. EPA's conclusion that CCS is the BSER is contradicted by the acknowledgment that there are no commercially operating coal-fired power plants using CCS.

Clean Coal Technology Alternatives.
The EPA proposal considered three *alternatives* in its BSER analysis of new fossil fuel-fired (*i.e.,* coal-fired) *utility boilers and IGCC units* for evaluating available technologies to control EGU CO_2 emissions. The BSER analysis is to identify *any viable* technologies, and if there are ones, then determine their emission reduction performance level and estimate the full cost of ownership. The three *alternatives* with some form of coal initially considered are:

(1) highly efficient new generation that does not include CCS technology,
(2) highly efficient new generation with ''full capture'' CCS, and
(3) highly efficient new generation with "partial capture" CCS.

The EPA eliminated the first alternative (supercritical, ultra supercritical, or IGCC design) because these designs result in only very small reductions (several percent) in CO_2 emissions, especially in contrast to those achieved by the application of CCS if CCS were in fact feasible. Given there are no projects underway involving the second alternative with full capture without enhanced oil recovery (EOR), EPA stated that the cost of full capture CCS without EOR is outside the cost range companies are considering for comparable generation and therefore should not be considered BSER for CO_2 emissions for coal-fired power plants.

[1] Interpretation by EPA of the meaning of the BSER factors is self-evident except for technology. For technology, EPA considers whether the system promotes the implementation and further development of technology.
[2] Neither Southern Company's Kemper County Energy Facility or SaskPower's Boundary Dam CCS Project are completed much less operational. The only relevant information that can be used in this analysis is the substantial economic cost associated with CCS.

The third alternative technology is work-in-progress at two sites in the U.S. and expected – but not assured – to be fully operational in 2014. As is the case for new technologies, it will need to go through refinements before completion. The utility co-sponsoring the technology development recently announced a cost overrun and schedule delay, the nature of such cutting-edge projects before development is completed.[3] As with other new technologies, cost is expected to be higher for the first CCS projects and decline thereafter as the technology matures and advances. Given its work-in-progress status, evidence of its long-term cost of ownership, performance and reliability on a full-scale commercial EGU is not available. Table 1 presents the performance and cost summary for the three coal-fired new, BSER alternative technologies.

Natural Gas Technology Alternatives.
EPA considered two alternatives in evaluating BSER for new fossil fuel-fired (*i.e.,* natural gas-fired) *stationary combustion turbines*: (1) natural gas combined cycle (NGCC) units without CCS and (2) NGCC with full capture CCS.

NGCC units are the most common type of new fossil fuel-fired units being built today. NGCC is an inherently lower CO_2-emitting technology with approximately 50 percent less CO_2 per megawatt hour (MWh) than a comparable new coal-fired plant. The design is technically feasible, and experience shows that NGCC units are currently the lowest-cost, most efficient option for new power generation. By contrast, NGCC with CCS is not a configuration that is being built today, and EPA concluded that NGCC with CCS could not meet the BSER criteria since it has not been adequately demonstrated. Table 1 presents the summary performance and cost summary for the two gas-fired combustion turbine BSER alternative technologies.

Table 1. Summary of Performance and Cost for BSER Alternative Technologies[a]

New Efficient Technology	CO_2 Emission Rate, lb CO_2/MWh	Levelized Electricity Cost, $/MWh
Coal		
- Without CCS	1,723-1,768	92-97
- With full capture (90%) CCS	~175	136-147
- With partial capture (40%) CCS[b]	1,100	92-110
Natural Gas		
- Without CCS[b]	1,000 -1,100	59-86
- With CCS	100-110	No data

[a] Based on data presented in the preamble of the proposed rule, p.1476.
[b] Considered BSER technology in proposed rule.

In summary, EPA concludes that only two of their five BSER alternative technologies meet the BSER criteria consisting of feasibility, costs, extent of emission reductions and technology.

We conclude that presently only one of the five alternatives meet the BSER criteria, that being NGCC without CCS. The only coal-fired technology -- highly efficient new generation with partial capture CCS -- to meet the EPA proposed CO_2 emission standards according to EPA is in an intermediate stage of development without being proven to work on full-scale commercial

[3] "Mississippi Power revises dates, cost of Kemper plant project," http://www.mississippipower.com/kemper/news_oct29-2013.asp

facilities burning U.S. coal. Based on these facts, we conclude that the highly efficient new generation with partial capture CCS technology alternative is:

- Not adequately demonstrated
- Not widely available
- Not shown to be technically feasible, and
- Not shown to be economically feasible.

We believe that the final EGU GHG NSPS rule should be delayed until the technology is demonstrated on more than one type of coal and plant size in order to establish clarity on its cost, performance, reliability, and applicability. Given these facts, the basis for the proposed EGU GHG NSPS rule is premature and untimely, independent of whether any commercial coal-fired EGUs will be built in the near future and required to use CCS.

Our message is consistent to what EPA's Science Advisory Board (SAB) stated to the Administrator and what EPA has said:

- *EPA's SAB Workgroup questioned the sufficiency of DOE's studies as a basis for determining that CCS is the BSER. The Work Group found "that the scientific and technical basis for carbon storage provisions is new science and the rulemaking would benefit from additional review."*[4]
- *EPA states in the preamble that the proposed rule will not achieve significant reductions in CO_2 emissions.*

2. Sequestration of CO_2 in large-scale geologic storage areas is not an option for North Carolina, particularly in areas where coal-fired EGUs are located.

After meeting the emission limits, another integral part of the proposed EGU GHG NSPS rule requires transport and storage after carbon capture. In the preamble EPA states that "a review of the 500 largest CO_2 point sources in the U.S. shows that 95 percent are within 50 miles of a possible geologic sequestration site.[5]" Even if this statement is true, it is unclear if a pipeline that would be needed to transport CO2 could receive the necessary permits to allow construction. See, http://www.epa.gov/compliance/nepa/keystone-xl-project-epa-comment-letter-20130056.pdf.

North Carolina reviewed the 2012 U.S. Geological Survey (USGS) National Assessment of Geologic CO_2 Storage Resources[6] to identify where large-scale geologic storage areas were located in or near North Carolina. However, we did not find any suitable sites in North Carolina. Our review determined the following:

- No definitive evidence that there are reservoir and seal formations that satisfy USGS's specific requirements for assessing CO_2 storage resources in the following

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[4] December 5, 2013 review of EPA's 2013 regulatory agenda by the EPA Science Advisory Board, http://4cleanair.org/Documents/EPA-SAB-2013-Review.pdf

[5] Proposed EGU GHG NSPS Rule, p. 1472, referencing footnote 193.

[6] National Assessment of Geologic Carbon Dioxide Storage Resources – Results, U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, http://co2public.er.usgs.gov/viewer.

two basins located in North Carolina: Eastern Mesozoic Rift Basins – Dan River Danville Basin, and Deep River Basin.
  - The Atlantic Coastal Plain region stretching from Rhode Island to Florida was identified to contain only 0.5% of national storage capacity across this vast area.
  - No estimates were generated for North Carolina portion of the Eastern Mid-Continent Region which contains the Appalachian Basin, Black Warrior Basin, Illinois Basin, and the Michigan Basin.

In a separate study, the Electric Power Research Institute (EPRI) estimated that a modest size 1,000 MW EGU will produce about 7.8 million metric tons of CO_2/yr, requiring 3.1 million metric tons of CO_2 to be captured and stored annually. Over a 40 year EGU life span, total CO_2 tonnage to be stored would exceed 120 million metric tons. Based on a DOE study of reservoir storage capacity in the Gulf Coast region, injection of 120 million tons of CO_2 into a 210 ft thick saline reservoir at a depth of 8,500 feet would create a CO_2 plume with a surface area of over seven square miles.[7] This example illustrates the subsurface area occupied by the injection of CO_2 from a single EGU. Without these projects being tested on a commercial scale, it is very concerning to think of the large scale geographic impact (surface and subsurface) associated with CCS for North Carolina's current coal-fired EGU capacity of 13,000 MW.

We agree with EPA's conclusion in the proposed rule that there is not sufficient information and knowledge about the geologic sequestration. "EPA recognizes the need to continue to advance the understanding of various aspects of the technology, including, but not limited to, site selection and characterization, CO_2 plume tracking and monitoring. On-going Federal government efforts such as DOE/NETL's activities to enhance the commercial development of safe, affordable, and broadly deployable CCS technologies in the United States, including: Research, development, and demonstration of CCS technologies and the assessment of the country's geologic capacity to store carbon dioxide, are particularly important[8]." These statements confirm that this technology is not BSER.

3. EPA must consider additional energy requirements associated with CO_2 separation, transportation, compression, and injection along with non-CO_2 emission controls.

Not all the energy and emissions related effects impacted for the CCS systems by the proposed rule have been identified and incorporated in the rulemaking, as indicated by the following points:

- Parasitic power losses for CCS separation and injection technologies are estimated to be 30 percent at the plant[9]. This does not include additional energy requirements for transport and compression for sites that do not have nearby geologic reserves for storage like those in North Carolina.
- Additional energy usage equates to more fossil fuel being burnt, which results in skewed misconceptions on the true energy and mass balance of a CCS project.

[7] Written statement of Robert C. Trautz, Senior Technical Leader, EPRI, March 12, 2014 Hearing of the House Subcommittee on Environment and Subcommittee on Energy of the Committee on Science, Space, and Technology.
[8] Proposed EGU GHG NSPS rule, p.1472
[9] Written statement of Scott Miller, General Manager of City Utilities of Springfield on Behalf of the American Public Power Association, March 12, 2014 Hearing of the House Subcommittee on Environment and Subcommittee on Energy of the Committee on Science, Space, and Technology.

- At a minimum, EPA must conduct a lifecycle energy consumption and emissions inventory evaluation associated with activities related to CCS. EPA should demonstrate that the 25 percent and 50 percent partial capture rate associated with BSER for IGCC and conventional coal-fired utility boilers, respectively, are based on actual performance levels, and the risks associated with implementing a complex technology that delivers the needed emission reductions.
- Additional energy requirements also mean an increase in criteria air pollutants and toxic air pollutant emissions resulting in an increase in ambient air concentrations, and raise nonattainment concerns while further exacerbating interstate pollution transport concerns.

4. EPA needs to consider non-air public health related environmental impacts in determining that partial CCS is BSER.

Not all the non-air public health related environmental effects impacted by the proposed rule have been identified and incorporated in the rulemaking, as indicated by the following points:

- The EPA notes in the proposal that "non-air environmental effects" of sequestration do not need to be examined or were already examined in a recently issued Underground Injection Control permit rulemaking. The proposed NSPS transfers air pollution to other environmental media and could create imminent harm to public health and the environment.
- On Dec. 4 and 5, 2013, EPA's Science Advisory Board raised concerns regarding the agency's approach to addressing cross-media issues. The SAB encouraged EPA to have the National Research Council review the research and information on sequestration conducted by the agency, DOE, and other sources.[10] EPA should take the necessary time to conduct a meaningful independent peer-review of CCS technology.
- CO_2 is an acid gas with the potential to change the pH of soil. Injection of CO_2 involves substantial quantities of water and movement of large amounts of compressed gases on the movement of groundwater and surface water ecosystems. Altering pressure gradients in various groundwater aquifers could cause numerous human health and environmental impacts, which the EPA does not appear to have studied in the context of permanently disposing vast quantities of compressed gases.
- The amount of land required for a commercial-sized partial CCS system would require significant surface space, which may not be feasible at power plants with limited acreage located near population centers and close to rivers and water ways for cooling water and coal delivery.

5. The proposed rule requirements are too vague and not defined enough for State and local air agencies to comment on the details of EPA's proposed approach for adding GHG "cost adjustment" in the presumptive fee calculation or increasing the per-ton fee rate.

- The EPA is proposing to exempt GHGs from the definition of "regulated pollutant (for presumptive fee calculation)" in order to exclude GHGs from being subject to the statutory fee set for the presumptive minimum Title V fee calculation.

[10] Review of EPA's 2013 regulatory agenda by its SAB.

- Instead of including GHGs in the presumptive fee calculation, EPA is proposing to add a GHG "cost adjustment" to account for GHG program permitting costs.
- The EPA is proposing two alternative options:
    - GHG cost adjustment for the presumptive fee calculated by multiplying the burden hours for each activity by the cost of staff time (in $/hr) as determined by the state. EPA is seeking input on proposed activities and burden hour assumptions. Three general activities area covered under presumed burden hours:
        (1) GHG completeness determination for initial permits or for updated applications estimated to take a permit engineer 43 hours to complete,
        (2) "GHG evaluation for modification or related permit action" estimated to take a permit engineer seven hours to complete, and
        (3) "GHG evaluations at permit renewal" estimated to take a permit engineer ten hours to complete.
    - 7% increase in the per-ton rate used in the presumptive minimum fee calculation. Under this approach, the new presumptive minimum fee would be $50 per ton for each regulated pollutant. EPA is seeking input on proposed level of fee increase or whether it should be higher or lower than 7%.
- There are too many unknowns regarding CCS as a viable BSER for air agencies to provide meaningful, constructive comment related to EPA's approaches. More significantly, it is unclear why EPA is applying the results of the GHG tailoring rule implementation to pre-define CCS related costs, as the two programs are completely different in terms of the expected agency resources required.

6. Lack of demonstration that the proposed rule secures a balanced solution.

The EPA states in the preamble that "… even in the absence of this rule, existing and anticipated economic conditions mean that few, if any, solid fossil-fuel EGUs will be built in the foreseeable future…" North Carolina believes that the states and the country must maintain an "all-of-the-above" energy generation mix strategy to allow cost effective, environmentally friendly solutions to its citizens. Overreliance on natural gas, particularly during a period of rising gas prices, jeopardizes electricity reliability and economic prosperity for all. Common sense pathways must be explored that balances the risk to the economy and the environment. The proposal fails to demonstrate this balance among energy, environmental, economic, and health concerns.

7. Absence of experience with at least one complete commercial scale coal-fired, integrated CCS BSER system.

The integration of our comments is that the proposed EGU GHG NSPS rule involves a multiple, complex, interrelated series of CCS technologies that have yet to be tried and tied together successfully. The conspicuous absence of a (successfully) operating commercial scale system incorporating the package of technologies that is proposed to be feasible is fatal to the proposed rule. To be successful, these technologies must work together in synchrony like a machine with multiple moving parts. Unfortunately, not all the moving parts have been studied enough or shown to work in full scale independent of each other, yet alone tied together in one operating system. This rule is far more involved than other EPA air office rules which typically do not deal with the multi-media effects of emission reduction along with the fate of the pollutant(s) in question.[11] Such 'unchartered water' for the EPA air office explains in part why the rule has not addressed all the impacts we have identified above. Much more time and effort is needed not only to develop, integrate, and establish the technologies, but also to set the basis for the corresponding rules for which the affected facilities must comply and state/local agencies must administer. Finally, with all the technical, economical, and environmental impact uncertainty associated with CCS, it perplexes us to accept and understand EPA's own statement in the preamble: "EPA projects that this proposed rule will result in negligible CO_2 emission changes, quantified benefits, and costs by 2022."

8. Clarifications on Permitting Thresholds for GHG in Both PSD and Title V

EPA clarified that the permitting thresholds for GHG in both PSD and Title V do not change, as established in the Tailoring Rule[12], upon promulgation of this NSPS for GHG. See the proposed NSPS rule language at §60.5515(b).

Failure to amend the definition of regulated NSR pollutant will result in GHGs becoming a regulated NSR pollutant with no significant emission rate (i.e. zero). EPA should revise language in both PSD and Title V programs to avoid any ambiguity. For example, for PSD permitting requirements, EPA can simply include the following wordings (included in bold face) in the definition of "Regulated NSR Pollutant" at §51.166(b)(49)(ii).

> (ii) Any pollutant that is subject to any standard promulgated under section 111 of the Act, **except for GHG in accordance with (b)(49)(iv) below;**

EPA can similarly revise the language in Title V regulations.

Sincerely,

Michael A. Abraczinskas for S.H.

Sheila Holman, Director
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c: Don Van der Vaart, DENR Energy Policy Advisor

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[11] For example, the EGU MATS Rule developed under the EPA air office regulates the capture of the hazardous air pollutants for the air pollution benefits; it is not responsible for and does not focus on the non-air hazards, the fate and effects of any residual by-products in the solid waste (ash) or wastewater produced subsequent to capture. Similarly, the proposed rule focuses much more on the capture of the CO_2 as an air pollutant than on the fate and effects of the captured CO_2 during transportation, compression, and injection.

[12] 75 FR 31514 June 3, 2010