Environmental Quality

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

February 26, 2018

Docket ID No. EPA-HQ-OAR-2017-0545
Administrator Scott Pruitt
Environmental Protection Agency
EPA Docket Center (EPA/DC)
1200 Pennsylvania Ave. NW
Washington, DC 20460

Subject: Comments on Advance Notice of Proposed Rulemaking: State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units

Dear Administrator Pruitt:

The North Carolina Department of Environmental Quality (NCDEQ) is providing comments on the Environmental Protection Agency's (EPA) Advance Notice of Proposed Rulemaking "State Guidelines for Greenhouse Gas (GHG) Emissions from Existing Electric Utility Generating Units" published in the *Federal Register* on December 28, 2017 (82 *FR* 61507).

NCDEQ protects North Carolina's environment and natural resources by administering regulatory and public assistance programs aimed at safeguarding the state's air, water, waste, land resources, coastal fisheries, and the public's health while advancing energy strategies that ensure a sustainable and affordable energy future for its citizens. As the lead agency charged with implementing the Clean Air Act (CAA), NCDEQ is committed to protecting and improving ambient air quality for the health, benefit and economic well-being of all North Carolina's citizens.

With over 3,375 miles of shoreline, and a robust economy dependent on agriculture and forestry resources, tourism, and coastal estuaries, North Carolina is particularly vulnerable to the effects of climate change. These effects have been felt, in varying degrees, from the mountains to the sea and across every sector of the state's economy in the form of hurricanes, sea level rise, heat waves, droughts, heavy precipitation, salt water intrusion, flooding and fire events. These phenomena pose serious public health risks, especially to vulnerable populations such as the elderly and children, disadvantaged communities located in vulnerable areas, and local economies most affected by weather events. Although a single event may not be fully attributed to climate change, a collection of these events over an extended period of time leads to an economy-wide impact, including damage to our built environment and infrastructure system (transportation, housing, water resources, energy generation/distribution/use, dams and water management, farming and forestry, and coastal resources).

The current and anticipated impacts of climate change in North Carolina are supported by a broad scientific consensus. Multi-disciplinary scientific data, analysis, and predictive modeling have shown that the climate system is changing rapidly primarily due to human activities.[1,2] Early actions to curb GHG

[1] *USGCRP: Climate Science Special Report: Fourth National Climate Assessment, Volume 1, U.S. Global Change Research Program, Washington, DC, USE 470 pp, (2017).*
[2] *The National Academies of Sciences and the Royal Society, "Climate Change: Evidence & Causes," (February 27, 2014), http://nas-sites.org/americasclimatechoices/events/a-discussion-on-climate-change-evidence-and-causes/.*

emissions are needed to stabilize global temperatures, and effective mitigation activities must be implemented to achieve the desired emission reductions.

Unlike criteria pollutants, the effects of GHGs are felt regionally, nationally, and globally over a span of generations. Meaningful federal action with respect to regulating the largest stationary source of carbon pollution is necessary to address the health and welfare of all Americans. To ensure the health and welfare of North Carolina's citizens, the environment and the state's natural resources, we express the following overarching concerns with the Advance Notice.

I. EPA's Endangerment Finding is in effect, and EPA must regulate GHG emissions from existing power plants.

NCDEQ agrees with EPA's finding that anthropogenic GHG emissions into the atmosphere threaten the public health and welfare of current and future generations. In light of its Endangerment Finding, EPA has a statutory obligation to regulate GHG emissions from stationary sources [3] and must establish emission standards under Section 111 for categories of stationary sources that endanger public health or welfare.[4] The Advance Notice does not demonstrate a serious effort to achieve meaningful reductions in GHG emissions.

It has been over ten years since the Supreme Court recognized EPA's authority to regulate GHG emissions from new motor vehicles. Also during this time, EPA issued an advance notice of proposed rulemaking under Section 111, following the D.C. Circuit's remand of the power plant rulemaking at issue in *New York v. EPA*. EPA's current Advance Notice unnecessarily delays the agency's fulfillment of its obligations and commitments to the nation. Electric utilities and energy service providers have emphasized the need for regulatory certainty related to electricity system planning and operations. Many have acted in good faith based on court rulings and previous EPA commitments, and have incorporated the cost of carbon reductions into their long-term planning and investments. However, in the Advance Notice, EPA states that it is merely "consider[ing] the possibility of replacing certain aspects of the Clean Power Plan (CPP)." NCDEQ disagrees with EPA's delay in addressing the need to reduce GHG emissions, and we are very concerned about the agency's reluctance to fulfill its legal responsibilities.

II. EPA is incorrect in its interpretation that emission guidelines under section 111(d) can be nonbinding.

In the Advance Notice, EPA suggests that emission guidelines are nonbinding unless EPA "in an exercise of discretion, chooses" to make them binding and that states "have authority and discretion to establish less stringent standards where appropriate." EPA also questions whether the agency should refrain from establishing "broadly applicable, presumptively approvable emission limitations" and, instead, "allow the states to set unit-by-unit broader emission standards." As explained in more detail in the attached technical comments, EPA appears to misunderstand and/or misrepresent the agency's role in regulating air pollutants. Indeed, EPA's unprecedented approach in this Advanced Notice is contrary to virtually every prior CAA regulation.

By establishing a mandatory federal baseline or a "regulatory floor", EPA rules ensure that air pollution is effectively addressed in all parts of the country. The CAA was enacted to reduce and prevent pollution endangering the health and welfare of all Americans and to eliminate the potential for a regulatory "race

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[3] *See Massachusetts v. EPA, 549 U.S. 497, 528-29, 533 (2007).*

[4] *See AEP v. Connecticut 564 U.S. at 426-427 (2011); No. 06-1322 (D.C. Cir., filed Sept. 13, 2006); 75 FR 82,393 (Dec. 30, 2010)*

to the bottom" where states are discouraged from unilaterally loosening pollution standards in order to attract industry. EPA is obligated to establish a federal baseline for GHG emission reductions from existing power plants and to ensure that states develop satisfactory plans to achieve those reductions. In doing so, EPA's regulation must establish binding emission guidelines and ensure state plans are at least as stringent. The binding nature of EPA's emission guidelines is apparent in the language and structure of the CAA, where it is EPA, and not the states, that is required to issue guidelines based on the level of emission reduction it determines is achievable based on the Best System of Emission Reductions (BSER). In short, non-binding emission guidelines would not result in meaningful emission reductions and would fail to achieving the goals of the CAA and protecting the public from CO_2 pollution.

III. EPA must consider all available emission reduction strategies, including those being utilized by states and utilities today, to define the "best" system and to achieve meaningful CO_2 reductions.

Section 111(d) of the CAA requires EPA to identify BSER that is adequately demonstrated and available to limit pollution and to set guidelines for states to reflect the BSER in their plans. Section 111(a)(1) defines "standard of performance" as "a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated".

In the CPP, EPA found that power plants could reduce CO_2 emissions at individual units through heat rate improvements, co-firing with natural gas, implementation of carbon capture and storage (CCS), or conversion to natural gas. EPA previously determined that co-firing and CCS do not constitute BSER because sources can achieve greater reductions in CO_2 emissions through less expensive means such as generation shifting. EPA also concluded that generation shifting measures of building blocks two and three collectively constitute BSER based on the statutory considerations of degree of reductions achieved, costs, energy requirements, and non-air quality health and environmental impacts.

In using EPA's new interpretation in the Advance Notice, where BSER represents "measures that can be applied at or to individual sources", EPA is "primarily focused on opportunities for heat rate (or efficiency) improvements" at electric generating units (EGUs) as constituting the BSER. EPA should reevaluate developing emissions guidelines by including a combination of heat-rate improvements and co-firing and CCS methods that the Agency previously ruled out based on the availability of those less expensive measures. If EPA deems that only inside the fence line BSER are applicable, then it must re-examine both the feasibility and associated costs of these potential control measures. EPA does consider partial CCS as a viable control measure in its regulation of new units. The 240 MW Perta Nova coal-fired power plant in Houston Texas with partial CCS is now operating as well as several international power plants with CCS. While retrofit of CC with either storage or usage on an existing fossil fuel power plant is more complex and more costly than on a new power plant, the EPA is still required to re-assess its feasibility and cost-effectiveness as a BSER control option for any rulemaking.

Furthermore, EPA must consider systems of emission reduction that are widely and cost-effectively deployed in the real world, such as generation shifting and reductions in the utilization of higher-emitting sources as part of the BSER under the new interpretation. Both the "inside the fenceline" approach and dispatching to natural gas and renewable energy (RE) resources have been successfully applied and tested in North Carolina. The following text demonstrates North Carolina's experiences in applying multiple strategies that achieved significant emission reductions.

Power Plant Efficiency Improvements in North Carolina

Heat rate improvements at North Carolina's coal and natural gas plants occurred in concert with compliance activities related to the state's Clean Smokestacks Act, EPA Mercury and Air Toxics Standards, other policy and regulatory actions, and market forces. In 2012, the state's coal plants had the lowest CO_2 emission rate in the country. In 2013, according to a July 17, 2014 Power Engineering article, two of the top five most efficient coal plants in the country operated in North Carolina.

The Advance Notice points to a proposed rule submitted by NCDEQ in 2015 as a "useful example" of an "inside the fenceline" unit-by-unit heat-rate improvement analysis. Initiated under prior leadership of our agency, NCDEQ's analysis was restricted to examining heat rate as a means of compliance. No other technically feasible measures were examined, or provided as compliance options to the affected sources. NCDEQ determined in 2015 that CO_2 emissions reductions achievable from heat-rate improvements in North Carolina were far less than the 4% targeted by EPA -- only 0.4% relative to 2012 levels. Thus, NCDEQ's analysis in its 2015 proposal demonstrates that, far from the "best" system of emissions reductions, heat-rate improvements on their own constitute a completely inadequate system for addressing CO_2 emissions from power plants. Heat rate improvements alone cannot serve as the Best System. NCDEQ would like to emphasize that this approach results in minimal reductions in CO_2 emissions; therefore, it cannot be used as a stand-alone approach to BSER. It may be included as a component of BSER or as one among multiple methods of compliance. EPA must consider all available emission reductions strategies that can be applied at or to a source, including co-firing and CCS.

Although not directly experienced in North Carolina, in certain cases, improving power plant heat rate could result in a "rebound" effect where the most efficient and cost effective units are called upon more frequently to generate more electricity. This rebound effect has been studied recently and reported to worsen air quality, cause public health issues, and increase air emissions, undermining the very intent of the regulation.[5]

Generation Shifting in North Carolina

North Carolina also provides an example of achievable carbon dioxide emission reductions through generation shifting. The CSA's emissions caps on coal-fired units, the state's Renewable Energy and Energy Efficiency Portfolio Standard (REPS) and market forces have resulted in the retirement of over 3,000 MW of coal capacity and replacement with highly efficient and cleaner burning natural gas combined cycle (NGCC) plants from 2010 to 2014. By 2020, coal retirements will increase by another 1,300 MW, most of which will be replaced by new NGCC plants. In 2016, North Carolina had over 7.5 million megawatt hours in documented RE generation and EE avoided generation under the REPS. Additional private sector RE and energy efficiency (EE) actions are not included in this value.

These changes in the electricity sector have had a dramatic impact on CO_2 emissions in North Carolina. In 2016, emissions from North Carolina's affected sources under the CPP were within 10% of the CPP 2030 mass target for the state while an estimated 3 million tons of CO_2 emissions were avoided due to the REPS.[6] Between 2005 and 2016, North Carolina's CO_2, NOx, and SO_2 emissions from EGUs decreased

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[5] *Charles T. Driscoll at al., "US Power Plant Carbon Standards and Clean Air Health Co-benefits," Nature Climate Change (May 4, 2015), 4.*

[6] *Annual Report Regarding Renewable Energy and Energy Efficiency Portfolio Standard in North Carolina Required Pursuant to G.S. 62-133.8(J), Submitted by The North Carolina Utilities Commission, October 1, 2017, http://www.ncuc.commerce.state.nc.us/reports/repsreport2017.pdf*

by 32%, 55%, and 90%, respectively,[7] mainly due to the retirement of coal plants. In 2016 alone, North Carolina's REPS resulted in avoided emissions of over 2,200 tons NOx and 2,600 tons of SO_2 in 2016, which is equivalent to a 700 MW coal plant retirement.

Together, these programs have spurred remarkable growth in North Carolina's clean energy industry. Between 2007 and 2016, approximately $10 billion was invested in clean energy development in the state.[8] North Carolina is now home to over 34,000 clean energy jobs.[9] It is the second-largest producer of electricity generated from solar photovoltaics among the states.[10] And in 2017, a 208 megawatt wind farm came online in North Carolina, making the state home to the largest wind farm in the Southeast.[11] According to a recent report, between 2000 and 2014, North Carolina reduced its total CO_2 emissions by 14.6%, with minimal impact on electricity rates while growing the state's GDP by 26.3%.[12]

The combination of low-cost abundant natural gas, more efficient and flexible NGCC generation, an aging coal plant fleet, and the declining cost of RE technologies has shifted power markets toward low- and zero- emission sources. One factor contributing to this significant change in power generation, was the long-term planning efforts by power companies, which assumed that EPA would regulate carbon in the near future. North Carolina's experience demonstrates that our power plants can and do reduce emissions, including CO_2, by replacing higher-emitting generation with lower-emitting generation, or generation shifting based on the interconnected nature of the power grid. This allows them to reduce both long-term costs and risks along with reducing CO_2 emissions.

Based on our state's experience, it is apparent that even when the more expensive BSER measures are used to establish emissions guidelines, generation shifting would be the most likely and primary means of compliance. Such an outcome in other states would not cause a radical departure from current market trends in the power sector, and, conversely would yield positive economic impacts and emission reductions. There is now historical evidence that generation shifting to cleaner, more efficient generation has become a primary means of compliance with various regulations that established emission limits or caps based on traditional controls. EPA should now consider generation shifting not just a low-cost means of compliance but the best system of emissions reductions as chosen by the electric power industry.

In summary, EPA must use robust technical and economic data, consider the increasing pace of technological innovation in the electricity sector, and update its assessment of the state of technology and cost of all available emission reduction strategies in BSER determination and future rulemaking. EPA must also issue binding emission guidelines that establish a "regulatory floor" of emissions reductions or percent reduction required of all states. NCDEQ supports the development of a rule that results in meaningful CO_2 reductions, allows flexibility in achieving those reductions in a cost-effective manner, and allows power providers to respond to changing markets and technologies, regardless of whether

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[7] *Energy Information Administration, 1990-2016 U.S. Electric Power Industry Estimated Emissions by State (EIA-767, EIA-906, EIA-920, and EIA-923). (December 2017).*

[8] RTI International, *Economic Impact Analysis of Clean Energy Development in North Carolina – 2017 Update*, (Oct. 2017), https://energync.org/wp-content/uploads/2017/10/Summary-Findings_Economic-and-Rate-Impact-Analysis-of-Clean-Energy-Development-in-North-Carolina%E2%80%942017-Update-October-Version.pdf

[9] U.S. Climate Alliance, *2017 Annual Report*, https://static1.squarespace.com/static/5936b0bde4fcb5371d7ebe4c/t/59bc4959bebafb2c44067922/1505511771219/USCA_Climate_Report-V2A-Online-RGB.PDF; *RTI International, Economic Impact Analysis of Clean Energy Development in North Carolina – 2017 Update*, (Revised October 2017)

[10] *Solar Industry Data, Solar Energy Industries Association, https://www.seia.org/solar-industry-data (Last visited Jan. 4, 2018).*

[11] *State Profiles and Energy Estimates: North Carolina, U.S. Energy Information Administration https://www.eia.gov/state/?sid=NC (Last updated Aug. 17, 2017).*

[12] *Devashree Saha & Mark Muro, Brookings Institute, Growth, carbon, and Trump: State progress and drift on economic growth and emissions 'decoupling' (Dec. 8, 2016) https://www.brookings.edu/research/growth-carbon-and-trump-state-progress-and-drift-on-economic-growth-and-emissions-decoupling/#fullreport.*

BSER is within the fence line or outside the fence line. In the attached document, we provide additional comments to specific technical areas identified in the Advance Notice.

Thank you again for the opportunity to comment on this Advance Notice. I trust that the comments will be considered as the EPA moves forward to address this very important air pollutant and environmental concern. If you have any questions regarding our comments, please contact Sheila Holman, DEQ's Assistant Secretary for the Environment at (919) 707-8619 or sheila.holman@ncdenr.gov.

Sincerely,

Michael S. Regan,
Secretary, NCDEQ

MSR/ssm

cc: The Honorable Roy Cooper
Mr. Josh Stein, NC Attorney General
Chairman Edward Finley, NCUC
Mr. Christopher J. Ayers, Public Staff-NCUC
Chairman J.D. Solomon, NCEMC
Ms. Sheila Holman, NCDEQ
Mr. Bill Lane, NCDEQ

Attachment

ANPRM Technical Comments

Comment (1) Roles and responsibilities of the States and the EPA in regulating existing EGUs for GHGs.

(1a) the suitability of provisions of the EPA's regulations that set forth the procedures and requirements for States' submittals of, and the EPA's action on, state plans for controlling emissions under CAA section 111, as applied in this context of regulating existing EGUs for GHG.

Response

The EPA is suggesting a reinterpretation of 1) the roles and responsibilities of states and EPA and 2) the role of EPA in establishing "broadly applicable, presumptively approvable" emission limits for this specific pollutant, source sector, and rule. NCDEQ finds this approach to allow states complete freedom to interpret and establish their own CO_2 emissions guidelines, what constitutes BSER, and implementation of the rule troublesome. It is a full retreat from EPA's obligation to establish a mandatory, federal baseline for greenhouse gas emission reductions from existing power plants as ordered by the D.C. Circuit Court in 2007.[13] The EPA is required to set this standard to protect public health and the environment for the entire country, not just for select states that opt to regulate emissions such that it provides that protection. This state-level "Wild West" approach does not create binding, nation-wide, legally defensible CO_2 emissions reductions and creates high uncertainty for all stakeholders, including the most important stakeholder, the public.

The EPA's longstanding model of establishing mandatory emissions guidelines has proved to be legally defensible, to result in positive outcomes, and to be cost-effective. It allows sufficient flexibility while ensuring protection of the public and environment. It requires all states to meet a minimum standard, creating a fair playing field for each state. It allows for more stringent measures to be applied as needed or desired by individual states.

Allowing states to establish completely independent emissions standards creates regulatory uncertainty. Many power providers operate in multiple states. They must cater their approach to compliance, and how their competitors might approach compliance in multiple states, to be cost-effective with no "set of rules" for economic or technical assumptions. In fact, the economies of scale disappear under this approach.

Finally, it would be virtually impossible for EPA to conduct a legally defensible regulatory impact analysis for this state-level approach to setting emissions guidelines.

(1b) the extent of involvement and roles of the EPA in developing emission guidelines, including, but not limited to, providing sample state plan text, determining the BSER, considering existing or nascent duplicative state programs, and reviewing state plan submittals; the roles of the States in this endeavor, including determining the scope of most appropriate emissions standards, e.g., setting unit-by-unit or broader-based standards; and joint considerations, such as the form of the emission standard, i.e., rate- or mass-based, and compliance flexibilities, such as emissions averaging and trading.

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[13] *EPA Final Brief in West Virginia v. EPA, D.C. Cir. No. 15-1363 (Doc. #1609995, filed April 22, 2016), at 61.*

Response

On a national level, NCDEQ supports both rate and mass based approaches due to the varying EGU source types in each state and specifically to accommodate states with significant amounts of nuclear power. NCDEQ strongly supports compliance flexibility including emissions averaging and trading since there are existing programs successfully operating in multiple states. These early state actions should be supported by EPA and integrated into the development of emissions guidelines.

Comment 2) Application, in the specific context of limiting GHG emissions from existing EGUs, of reading CAA section 111(a)(1) as limited to emission measures that can be applied to or at a stationary source, at the source-specific level.

Response

EPA must consider all available emission reduction strategies, including those being utilized by states and utilities today, to define the "best" system and to achieve meaningful CO_2 reductions.

In the CPP, EPA found that power plants could reduce CO_2 emissions at individual units through heat rate improvements, co-firing with natural gas, implementing CCS, or conversion to natural gas. EPA previously determined that co-firing and CCS do not constitute BESR because they are more expensive than generation shifting or are capable of achieving far less reduction in CO_2 emissions. EPA also concluded that generation shifting measures of building blocks two and three collectively constitute BSER based on the statutory considerations of degree of reductions achieved, costs, energy requirements, and non-air quality health and environmental impacts.

In using EPA's new interpretation in the Advance Notice, where BSER represents "measures that can be applied at or to individual sources", EPA is "primarily focused on opportunities for heat rate (or efficiency) improvements" at electric generating units (EGUs) as constituting the BSER. EPA must consider developing emission guidelines by including a combination of heat-rate improvements and co-firing and CCS methods that the Agency previously ruled out based on the availability of those less expensive measures. Furthermore, EPA must consider systems of emission reduction that are widely and cost-effectively deployed in the real world, such as generation shifting and reductions in the utilization of higher-emitting sources as part of the BSER under the new interpretation. Both "inside the fenceline" measures and dispatching to natural gas and renewable energy (RE) sources have been successfully applied and tested in North Carolina. The following describes North Carolina's experiences in applying multiple strategies that have achieved significant emission reductions.

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The Advance Notice points to a proposed rule submitted by NCDEQ in 2015 as a "useful example" of an "inside the fenceline" unit-by-unit heat-rate improvement analysis. NCDEQ's analysis was restricted to examining heat rate as a means of compliance. No other technically feasible measures were examined, or

provided as compliance options to the affected sources. NCDEQ determined in 2015 that CO_2 emissions reductions achievable from heat-rate improvements in North Carolina were far less than the 4% targeted by EPA -- only 0.4% relative to 2012 levels. Thus, NCDEQ's analysis in its 2015 proposal demonstrates that, far from the "best" system of emissions reductions, heat-rate improvements on their own constitute a completely inadequate system for addressing CO_2 emissions from power plants. Heat rate improvements alone cannot serve as the Best System. NCDEQ would like to emphasize that this approach results in minimal reductions in CO_2 emissions; therefore, it cannot be used as a stand-alone approach to BSER. It may be included as a component of BSER or as one among multiple methods of compliance. EPA must consider all available emission reductions strategies that can be applied at or to a source, including co-firing and CCS.

Although not directly experienced in North Carolina, in certain cases, improving power plant heat rate could result in a "rebound" effect where the most efficient and cost effective units are called upon more frequently to generate more electricity. This rebound effect has been studied recently and reported to worsen air quality, cause public health issues, and increase air emissions, undermining the very intent of the regulation.[14]

Generation Shifting in North Carolina

North Carolina also provides an example of achievable carbon dioxide emission reductions through generation shifting. The CSA's emissions caps on coal-fired units, the state's Renewable Energy and Energy Efficiency Portfolio Standard (REPS) and market forces have resulted in the retirement of over 3,000 MW of coal capacity and replacement with highly efficient and cleaner burning natural gas combined cycle (NGCC) plants from 2010 to 2014. By 2020, coal retirements will increase by another 1,300 MW, most of which will be replaced by new NGCC plants. In 2016, North Carolina had over 7.5 million megawatt hours in documented RE generation and EE avoided generation under the REPS. Additional private sector RE and energy efficiency (EE) actions are not included in this value.

These changes in the electricity sector have had a dramatic impact on CO_2 emissions in North Carolina. In 2016, emissions from North Carolina's affected sources under the CPP were within 10% of the CPP 2030 mass target for the state while an estimated 3 million tons of CO_2 emissions were avoided due to the REPS.[15] Between 2005 and 2016, North Carolina's CO_2, NOx, and SO_2 emissions from EGUs decreased by 32%, 55%, and 90%, respectively,[16] mainly due to the retirement of coal plants. In 2016 alone, North Carolina's REPS resulted in avoided emissions of over 2,200 tons NOx and 2,600 tons of SO_2 in 2016, which is equivalent to a 700 MW coal plant retirement.

Together, these programs have spurred remarkable growth in North Carolina's clean energy industry. Between 2007 and 2016, approximately $10 billion was invested in clean energy development in the

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[14] *Charles T. Driscoll at al., "US Power Plant Carbon Standards and Clean Air Health Co-benefits," Nature Climate Change (May 4, 2015), 4.*
[15] *Annual Report Regarding Renewable Energy and Energy Efficiency Portfolio Standard in North Carolina Required Pursuant to G.S. 62-133.8(J), Submitted by The North Carolina Utilities Commission, October 1, 2017, http://www.ncuc.commerce.state.nc.us/reports/repsreport2017.pdf*
[16] *Energy Information Administration, 1990-2016 U.S. Electric Power Industry Estimated Emissions by State (EIA-767, EIA-906, EIA-920, and EIA-923). (December 2017).*

state.[17] North Carolina is now home to over 34,000 clean energy jobs.[18] It is the second-largest producer of electricity generated from solar photovoltaics among the states.[19] And in 2017, a 208 megawatt wind farm came online in North Carolina, making the state home to the largest wind farm in the Southeast.[20] According to a recent report, between 2000 and 2014, North Carolina reduced its total CO_2 emissions by 14.6%, with minimal impact on electricity rates while growing the state's GDP by 26.3%.[21]

The combination of low-cost abundant natural gas, more efficient and flexible NGCC generation, an aging coal plant fleet, and the declining cost of RE technologies has shifted power markets toward low- and zero- emission sources. One factor contributing to this significant change in power generation, was the long-term planning efforts by power companies, which assumed that EPA would regulate carbon in the near future. North Carolina's experience demonstrates that our power plants can and do reduce emissions, including CO_2, by replacing higher-emitting generation with lower-emitting generation, or generation shifting based on the interconnected nature of the power grid. This allows them to reduce both long-term costs and risks along with reducing CO_2 emissions.

Based on our state's experience, even when the more expensive BSER measures are used to establish emissions guidelines, generation shifting would be the most likely and primary means of compliance. Such an outcome in other states would not cause a radical departure from current market trends in the power sector, and, conversely would yield positive economic impacts and emission reductions. There is now historical evidence that generation shifting to cleaner, more efficient generation has become a primary means of compliance with various regulations that established emission limits or caps based on traditional controls. EPA should now consider generation shifting not just a low-cost means of compliance but the best system of emissions reductions as chosen by the electric power industry.

Comment (3a) Under a source-specific reading of CAA section 111(a)(1), how does EPA identify the BSER that can be implemented at the level of an affected source, including aspects related to efficiency (heat rate) improvement technologies and practices, as well as other systems of emission reduction?

Response

I. BSER for Combined Cycle and CHP

In the CPP, BSER for combined cycle turbines and combined heat and power combustion turbines was determined to be efficient operation and maintenance of combustion turbine and heat recovery steam generator using natural gas as fuel during normal operations. These units are inherently low-emitting units by their design and further decreases in emissions are not cost-effective under EPA's current social cost of carbon. NCDEQ agrees with this assessment of BSER for these units.

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[17] RTI International, *Economic Impact Analysis of Clean Energy Development in North Carolina – 2017 Update*, (Oct. 2017), https://energync.org/wp-content/uploads/2017/10/Summary-Findings_Economic-and-Rate-Impact-Analysis-of-Clean-Energy-Development-in-North-Carolina%E2%80%942017-Update-October-Version.pdf

[18] U.S. Climate Alliance, *2017 Annual Report*, https://static1.squarespace.com/static/5936b0bde4fcb5371d7ebe4c/t/59bc4959bebafb2c44067922/1505511771219/USCA_Climate_Report-V2A-Online-RGB.PDF; *RTI International, Economic Impact Analysis of Clean Energy Development in North Carolina – 2017 Update*, (Revised October 2017)

[19] *Solar Industry Data, Solar Energy Industries Association, https://www.seia.org/solar-industry-data (Last visited Jan. 4, 2018).*

[20] *State Profiles and Energy Estimates: North Carolina, U.S. Energy Information Administration https://www.eia.gov/state/?sid=NC (Last updated Aug. 17, 2017).*

[21] *Devashree Saha & Mark Muro, Brookings Institute, Growth, carbon, and Trump: State progress and drift on economic growth and emissions 'decoupling' (Dec. 8, 2016) https://www.brookings.edu/research/growth-carbon-and-trump-state-progress-and-drift-on-economic-growth-and-emissions-decoupling/#fullreport.*

II. BSER for Coal and Natural Gas Steam Boilers

Under the final CPP, co-firing and CCS options were eliminated as BSER based on the availability of less expensive, "outside the fence line" measures that result in significant reductions of CO_2 emissions. In using EPA's new interpretation of 111(d), where BSER is applied directly to a source, EPA must now consider developing emission guidelines for fossil fuel steam boilers that include heat rate improvements, co-firing of low emitting fuels and CCS methods. The EPA cannot eliminate these options without evaluating them for BSER. These BSER technologies are discussed in depth below.

1) Heat Rate Improvements

Heat rate improvements involve measures that lower the heat energy input (in Btu) required to produce a unit of electrical power (in kWh). Heat rate improvements generally result in a decrease in fuel use for each unit of power generated, therefore these improvements may be low-cost or even result in a cost-savings. Since they are an "inside the fence line" measure and are low cost, EPA has apparently pre-determined that this is BSER for power plant CO_2 emissions.

The basic problem with utilizing heat rate improvements to lower CO_2 emissions is that steam boiler power plants have an upper limit on how efficiently they can generate electricity. Older coal power plants have limits on their efficiencies of about 35% while modern plants can achieve efficiencies of about 40%. In addition, power plants routinely asses plant energy efficiency since fuel costs are a large portion of the operating costs. Therefore, opportunities for heat rate improvements are very limited and do not result in significant decreases in CO_2.

Only small improvements of 4% or less can generally be made to the efficiency of a given boiler steam system in a cost-effective manner. Since fuel use and CO_2 emissions have a one-to-one relationship, this means the largest reduction of CO_2 at an inefficient plant is only 4%. At well run plants that routinely improve performance, this value drops to 1% or less. (See North Carolina's heat rate improvement exercise in Comment 4.)

Larger improvements in plant heat rate would require a more complex redesign of the boiler-steam system or replacement of major equipment components. These more substantial improvements may be cost prohibitive or be deemed a "major modification" and trigger NSR/PSD/NSPS. Triggering NSR/PSD/NSPS could require the installation of new pollution control devices and add considerably to the cost to the project.

A second problem with implementing this approach is that there is no limit on CO_2 emissions. Unlike other pollutants, the CO_2 emission rate is not much of a concern as the total emitted. Heat rate improvements do not limit emissions. In fact, a power plant that is more fuel efficient lowers its operating costs. This makes the plant more competitive in the electricity market and the plant may generate more electricity and end up increasing its annual CO_2 emissions. This rebound effect must be accounted for in increased pollution levels and cost to human health.

Despite these issues which severely limit the ability of heat rate improvements to result in meaningful reductions in CO_2 emissions, this measure is highly cost-effective. For this reason, NCDEQ supports the use of heat rate improvements as one part of BSER for fossil fuel steam boilers. However, NCDEQ cautions EPA on its implementation of this measure. NCDEQ does not recommend assigning a specific heat rate or even a specific percent improvement target, such as a 4% improvement in heat rate as proposed for the CPP. NCDEQ does not consider this approach as being appropriate for the reasons discussed below.

a) Reducing CO_2 emissions from existing fossil fuel power plants using heat rate improvements is highly unit-specific. Existing steam power plants utilize systems that were constructed on site and use many "one of a kind" designs for components and equipment. Improving their heat rate requires analyzing each component in the boiler-steam-generator system and identifying opportunities to improve the efficiency of those components and then developing the associated costs. Only heat rate improvement measures that meet the cost-effectiveness threshold would be implemented.

b) Some power plants have already implemented heat rate improvements to improve the fuel efficiency of their operations. Requiring additional heat rate improvements above those already implemented may not be cost-effective.

c) Many older coal-fired power plants are operating at less than 50% of the maximum design load due to 1) the low cost of natural gas and 2) higher electricity prices than newer plants. A steam power plant is most efficient when it is operated at its design load, generally about 70% to 80% of the full operating load. Operating at lower loads, 50% or less, impacts the thermal efficiency of the boiler-steam system. So, requiring steam power plants to meet a specific heat rate improvement target, such as 4% improvement in heat rate, may limit their ability to generate electricity during periods of lower electricity demand.

d) A steam power plant loses efficiency over time due to various factors including 1) the addition of equipment such as fans and air pollution controls/monitors, and 2) aging or malfunctioning equipment. Therefore, depending on how the regulation was structured, it may require periodic improvements to the plant to maintain the target improvement that was first achieved to comply with the regulation. Studies have documented that failure to provide adequate and routine maintenance can result in degradation of any efficiency improvements made at a power plant.

2) Source-Specific BSER Evaluation of Heat Rate Improvements for North Carolina's Affected Sources

As discussed in comments on the Proposed CPP, North Carolina power plants are already operating very efficiently when compared to other states. The average gross heat rate for North Carolina coal-fired boilers subject to the CPP in 2012 was 9,071 Btu/kWh while the national average was 9,753 Btu/kWh. This state-average heat rate was the lowest in the country. Therefore, NCDEQ supports a source-specific evaluation of heat rate improvements rather than specifying a target percent improvement.

NCDEQ, in conjunction with the affected sources, conducted an exercise to evaluate potential heat rate improvement measures for each source regulated by the proposed CPP.[22] The analysis was a unit-specific approach based on a detailed cost analysis of various measures that were technically feasible, did not result in increases of other pollutants, did not cause non-air quality adverse environmental impacts, and included degradation of the measure over time. The criteria for cost-effectiveness was based on the CPP Social Cost of Carbon value of $23 per ton of CO_2 reduced. The analysis showed an improvement in heat rate of 26 – 80 Btu/kWh, which is a cumulative improvement of 0.4% relative to North Carolina's 2012 baseline. The average reduction in CO_2 emissions for the affected sources was also 0.4%. There was an annual cost-savings of approximately $1,000,000 due to decreased fuel use.

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[22] *Fiscal and Regulatory Analysis for Proposed Adoption Standards of Performance for Existing Electric Generating Units under Clean Air Act Section 111(d), North Carolina Department of Environmental Quality, Division of Air Quality, presented to the Environmental Management Commission on November 5, 2015,* https://deq.nc.gov/about/divisions/air-quality/air-quality-rules/draft-rules.

NCDEQ wishes to note that this assessment is only applicable to North Carolina's affected sources and that it was conducted assuming a social cost of carbon of $23 per ton of CO_2 reduced. If EPA revises the social cost of carbon, as proposed in the CPP Repeal proposal, this analysis is no longer applicable.

Secondly, NCDEQ would like to emphasize that this approach results in minimal reductions in CO_2 emissions; therefore, it cannot be used as a stand-alone approach to BSER. It may be included as a component of BSER or as a method of compliance since it is highly cost-effective.

3) Co-firing coal with a lower CO_2 emitting fuel, such as natural gas or biomass, or full conversion of the plant to a lower CO_2 emitting fuel (repowering).

Co-firing and fuel switching have been employed by coal-fired boilers to meet required emissions reductions as a cost-effective control option under various EPA regulatory programs. Co-firing and fuel switching are especially cost-effective as a control if the unit is already designed and permitted to fire the lowering emitting fuel. For these units, increasing use of the lower-emitting fuel may constitute BSER.

For boilers that are permitted to only **fire coal**, co-firing or fuel switching has two complications related to BSER. First, the approach is not applicable to all sources. The cost and feasibility of fuel switching are affected by the boiler design, fuel handling system design, availability of natural gas pipeline capacity, and capital costs and delivered fuel costs. Second, there is the possibility that a repowering project could trigger federal New Source Review, PSD, or New Source Performance Standard (NSPS) requirements. These regulations could be triggered by 1) increasing a regulated air pollutant above the specified threshold or 2) the capital cost of a repowering project exceeding 50 percent of the capital cost that would be required to construct a comparable new facility. NSR/PSD/NSPS could require the installation of new pollution control devices and add considerably to the cost to the project. Therefore, the feasibility and cost-effectiveness of this GHG control option for coal steam boilers is highly source-specific and universal assumptions for its cost and application would not be appropriate. Use of this measure would require a source-specific BSER analysis.

A subset of this option, is firing coal of higher quality to improve the performance of the boiler-steam system. This option may produce low carbon emissions and/or improved efficiency of the boiler-steam system. However, these reductions are expected to be insignificant when compared to natural gas.

There is no lower CO_2 emitting fuel identified for natural gas-fired steam boilers. The carbon neutrality of various biomass fuels has not fully been addressed by the EPA. The EPA issued the Draft Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources but not issue final guidance on this subject.[23] Therefore, co-firing or fuel switching to biomass cannot be considered as a control option for natural gas boilers at this time.

4) Carbon Capture and Storage

Post-combustion carbon capture with storage or usage was not considered BSER under the CPP because it was not adequately demonstrated and too costly when compared to "outside the fence line" BSER options. However, if EPA deems that only inside the fence line BSER are applicable, then it must re-examine both the feasibility and associated costs of this potential control measure. EPA does consider partial CCS as a viable control measure in its regulation of new units. The 240 MW Perta Nova coal-fired power plant in Houston Texas with partial CCS is now operating as well as several international power plants with CCS. While retrofit of CC with either storage or usage on an existing fossil fuel power plant

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[23] *Draft Framework for Assessing Biogenic CO2 Emissions from Stationary Sources, United States Environmental Protection Agency, Office of Air and Radiation, Office of Atmospheric Programs, Climate Change Division, November 2014.*

is more complex and more costly than on a new power plant, the EPA is still required to re-assess its feasibility and cost-effectiveness as a BSER control option for any rulemaking.

5) Expected Response of the Regulated Community to Required CO_2 Emissions Reductions

While heat rate improvements, co-firing and/or fuel switching, and CCS may be considered BSER for fossil fuel steam boilers, NCDEQ does not anticipate that power companies would limit themselves to these approaches to reduce emissions. Affected sources would likely comply using generation shifting to natural gas and renewable energy (RE) as the lower cost option, rather than the proposed "inside the fence line" BSER.

This approach to regulation of criteria has occurred in North Carolina. In 2002, the North Carolina General Assembly enacted the bi-partisan Clean Smokestacks Act (CSA) to reduce emissions of nitrogen oxides (NOx) and sulfur dioxide (SO_2) from coal-fired power plants by 2007 and 2013. In addition, North Carolina enacted the Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in 2007. CSA's emissions caps on coal-fired units, the REPS and market forces resulted in retiring over 3,000 MW of coal capacity that was replaced with highly efficient and cleaner burning NGCC plants from 2010 to 2014. By 2020, coal retirements will increase by another 1,300 MW, most of which will be replaced by new NGCC plants. In 2016, North Carolina had over 7.5 million megawatt hours in documented RE generation and EE avoided generation under the REPS. Additional private sector RE and EE actions are not included in this value.

These changes in the electricity sector have had a dramatic impact on CO_2 emissions in North Carolina. In 2016, emissions from North Carolina's affected sources under the CPP were within 10% of the CPP 2030 mass target for the state while an estimated 3 million tons of CO_2 emissions were avoided due to the REPS. Between 2005 and 2016, North Carolina's CO_2, NOx, and SO_2 emissions from EGUs decreased by 32%, 55%, and 90%, respectively, mainly due to the retirement of coal plants. In 2016 alone, North Carolina's REPS resulted in avoided emissions of over 2,200 tons NOx and 2,600 tons of SO2 in 2016, which is equivalent to a 700 MW coal plant retirement.

North Carolina's experience demonstrates that power plants can and do reduce emissions by replacing higher-emitting generation with lower-emitting generation, or generation shifting based on the interconnected nature of the power grid.

Many states are also undergoing a similar transformation. A new analysis by the Rhodium Group estimates that U.S. electricity emissions are currently on track to fall 27 to 35% below 2005 levels by 2030, within the range of what the CPP originally envisioned. The same group estimated that with CPP in place, 12 to 21 states would have to make deeper reductions than they are currently expected to do without the rule.

There is now historical evidence that generation shifting to clearer, more efficient generation has become a primary means of compliance with various regulations that established emission limits or caps based on traditional controls. EPA should now consider generation shifting not just a low-cost means of compliance but the best system of emissions reductions as chosen by the electric power industry.

Comment (3b) considering whether GHG emissions guidelines for existing EGUs should include presumptively approvable limits;
The EPA solicits comment on the role of a State in setting unit-by-unit or broader emission standards for EGUs within its borders, including potential advantages of such an approach (e.g., it provides flexibility to tailor standards that take into account the characteristics specific to each boiler or turbine) and

potential challenges (e.g., the impact that varying requirements could have on emissions and dispatch in such an interconnected system).

Response

The EPA is asking for comment on whether a EGU-specific emission limit or emission rate limit is appropriate for existing fossil fuel EGUs. It cites the example of remaining useful life of older plants and whether those plants can invest in equipment upgrades or controls.

This is not a new issue for this sector. Building a mechanism to "grandfather" older, higher emitting plants has been done in the past but not under recent regulations. This approach inherently rewards power plants that do not operate efficiently and have not invested in upgrades to the EGU. Propping up older, higher emitting, inefficient EGUs is something the CAA sought to avoid through NSR and NSPS regulations that require plants that undergo major modifications to install emissions controls.

Allowing each state to build into the regulation the specific response of an affected EGU in order to limit its cost impact seems to predetermine the outcome of the rule instead of relying on market forces. As stated previously, the response of the power plants to various recent state and federal regulations, specifically in North Carolina where a cap was placed on EGU emissions, has been to install controls on EGUs where it is cost-effective or to shift generation either to 1) existing sources where it is viable to install controls or 2) new cleaner EGUs.

North Carolina's Draft Rule

This request for comment specifically addresses North Carolina's draft rule. North Carolina's draft rule exercise was very limited in scope. It was limited to assessing each individual EGUs ability to improve heat rate within the EPA's $23 social cost of carbon. It did not allow for any other options to reduce emissions. It specified the exact response to the rule for each EGU and resulted in emissions reductions of less than 1%. Our development of the draft rule shows that such a limited approach will most likely result in a minimal reductions of CO_2 and waste public and private resources to implement the rule.

In our comments on 3a, NCDEQ states that any requirement to improve heat rates should allow for a unit by unit approach rather than specifying a target percentage reduction. This response is specifically because power plants in North Carolina have already installed heat rate improvement projects at the majority of its power plants. Few cost-effective opportunities remain. However, this does not imply there should not be a floor of emissions reductions or percent reduction required of all states. It also does not imply that NCDEQ wants to limit the options of the affected units to this very narrow response. In fact, the affected sources provided feedback that this unit-specific/technology-specific approach "may prove to be too limiting as new technologies may arise over time that provide better control/performance."

There are some more detailed issues that resulted from public comments on the draft rule.

- NCDEQ's draft rule did not address useful thermal output for EGUs that operate as combined heat and power units. This was an oversight in the draft rule and should be addressed by US EPA in any approach to emissions reductions. These highly efficient units should be treated as a distinct source category.
- In addition, many EGUS fire multiple fuel types, including biomass, and this should be addressed by any rule proposed by EPA.
- Lastly, the affected sources recommended adding the words "best engineering practices" to several areas of the rule to allow more flexibility for compliance as technologies and operating practices evolve. Allowing "best management practices" in lieu of the prescribed BSER measure

written in a rule presents legal issues in determining whether a source has met its obligation to reduce emissions.

NCDEQ recommends that EPA review all public comments on the draft rule prior to completing a BSER determination.

The EPA requests comment on the burden on states in developing a unit-specific emissions limit or rate. NCDEQ does not recommend this approach. In our draft rule exercise, NCDEQ found that it had to rely on outside consultants to provide assistance with developing the EGU-specific limit. NCDEQ did not have the expertise at the level required to develop the rule. In addition, NCDEQ had to rely on the affected sources to provide a significant amount of information regarding the technical feasibility and costs. This is not an ideal approach to rulemaking and creates inherent bias.

Recommendation
Many states have already enacted measures to limit CO_2 emissions through cap and trade programs or incentive programs such as renewable energy portfolios. There has been much success reducing CO_2 emissions in California, the RGGI states and North Carolina. None of these approaches has resulted electricity prices that impacted the states' economies. The broader approach of these states relied on market forces to determine the outcome. That outcome has created new economic opportunities and has been highly effective at reducing emissions, as demonstrated by North Carolina. The highly prescriptive approach, as modeled by NCDEQ's draft rule exercise, has none of these benefits. It results in business as usual – with limited outcomes.

NCDEQ supports an approach that allows maximum flexibility in the form of cap and trade, emissions averaging, and incentive programs to allow power providers to take advantage of changes in the available technologies, fuels, markets, resources, etc., that become available in the years between the rule being developed and the compliance date. The world of energy is changing at a rapid pace and private power producers need to be able to pivot to survive. Hanging onto business as usual scenarios that reward old inefficient EGUs will stifle the growth of the energy sector in our State and our country.

In short, North Carolina supports the development of a rule that results in meaningful CO_2 reductions and allows flexibility in achieving those reductions in a cost-effective manner and allows power providers to respond to changing markets and technologies, regardless of whether BSER is within the fence line or outside the fence line.

(3c) Carbon Capture and Storage or Use should be re-evaluated for potential use as BSER

Response
See comments in 3a above.

(3d) Criteria for determining affected sources

Response
NCDEQ recommends that a similar approach to establishing affected EGUs adopted in the final CPP be applied to any revision to the rule with one exception. NCDEQ recommends that natural gas single cycle or combined cycle EGUs that can demonstrate historic use as peaking units, rather than base load or intermediate load units, be exempt from the rule.

(4) Potential Interactions of a Possible Rule Under 111(d) with Other Regulatory Programs
(4a) New Source Review
(4b) New Source Performance Standards

Response

See comment in 3a above.