Comments on EPA's Proposed Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units

Executive Summary

I. Introduction

EPA proposed carbon pollution standards for new fossil fuel-fired electric utility generating units ("EGUs"), including both coal and gas-fired units, under Section 111(b) of the Clean Air Act ("CAA" or the Act) on January 8, 2014.[1] The Sierra Club, Clean Air Task Force, Environmental Defense Fund, Natural Resources Defense Council, Earthjustice, Environmental Law and Policy Center, Southern Environmental Law Center, and the National Wildlife Federation submitted a comprehensive set of comments ("Joint Comments") on the proposed rule. Sierra Club also submitted separate comments that further elaborate on certain issues addressed in the Joint Comments and discuss other issues that those comments did not address. Unless otherwise specified, this document provides a summary of the main issues covered in the Joint Comments.

II. Climate Science and the Role of the Power Sector in Greenhouse Gas Emissions Reductions

The threat of climate change provides a compelling justification for strict limits on greenhouse gas ("GHG") emissions from power plants, which represent almost 40 percent of annual carbon dioxide ("CO_2") emissions in the United States. In our Joint Comments, we provided extensive information on the impacts of GHG emissions that underlie EPA's 2009 Endangerment Finding,[2] including threats to public health and welfare, ecosystems and biodiversity, and the world's oceans. We also discussed climate research and assessment reports published after the Endangerment Finding (including the Third National Climate Assessment), providing further evidence that these threats are intensifying. A strong standard to reduce carbon pollution from power plants is thus critical and will require controlling emissions not only from coal plants, but also from gas plants, which emit significant amounts of CO_2 as well.

In recent years, the electricity sector has shifted away from coal-fired generation toward natural gas-fired generation (which today provides almost 30 percent of net power generation in the country) and renewable generation. Recent forecasts project that growing energy demand in the coming years will be met by new natural gas combined cycle plants ("NGCC," also known as combined-cycle gas turbines or "CCGT"), zero-emitting renewable generation, and energy efficiency investments. With the possible exception of a small number of projects already under development, new coal-fired generating capacity will neither be needed nor economically viable over the next decade, regardless of EPA's GHG performance standards for fossil fuel-fired EGUs.

[1] 79 Fed. Reg. 1430 (Jan. 8, 2014). This proposal replaces an earlier one that EPA issued in 2012 that would have set a combined standard for natural gas and coal-fired intermediate and baseload power plants based on emissions from a natural gas combined cycle plant. EPA received more than 2.5 million comments supporting the 2012 proposed rule. The new version proposes setting separate standards for new coal-fired and natural gas-fired plants.
[2] 74 Fed. Reg. 66,496 (Dec. 15, 2009).

III. Legal Basis for EPA's Carbon Pollution Standards under the Clean Air Act

Section 111 of the CAA requires EPA to publish, and to periodically revise, a list of *categories* of stationary sources (e.g., industrial facilities) that, in the agency's judgment, cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. After listing a source category, EPA must set standards of performance for those sources (also known as New Source Performance Standards, or "NSPS") covering *new* and *modified* sources under section 111(b). The Act also permits EPA to distinguish among classes, types, and sizes within categories (i.e., *subcategories*) of new sources. NSPS apply to all sources in a regulated category that commence construction after the standard is proposed. Electric utility steam generating units and stationary gas turbines were listed as source categories under section 111 in the 1970s. The former category covers coal plants, including integrated gasification combined cycle ("IGCC") units, while the latter covers stationary gas turbines, including NGCCs and simple cycle combustion turbines. In the proposed rule, EPA proposes CO_2 performance standards for *new* units within these source categories, with a number of exceptions, but not for modified sources (which EPA will cover in a separate rule).

The CAA defines "standard of performance" as a standard of emissions of air pollutants that reflects the degree of emission limitation achievable through the application of the best system of emission reduction ("BSER") which, taking into account costs, environmental impacts, and energy requirements, EPA determines has been adequately demonstrated. The legislative history of section 111(b) indicates that Congress intended NSPS to reflect the most effective emission reduction systems that are technically and economically feasible, including new pollution control technologies that are not in routine use today. Relevant D.C. Circuit case law also holds that section 111 "looks toward what may fairly be projected for the regulated future, rather than the state of the art at present,"[3] and affirms the "technology-forcing"[4] nature of the CAA. EPA must establish performance standards under section 111(b) that reflect the technological vanguard and achieve the greatest emission reductions possible in light of the relevant statutory factors.

With respect to cost considerations, the D.C. Circuit has held that EPA's choice of BSER will be upheld "unless the environmental or economic costs of using the technology are exorbitant."[5] That is, section 111(b)'s cost inquiry functions as a safety valve to ensure that the costs an NSPS imposes are not "greater than the industry could bear and survive,"[6] and the D.C. Circuit has never invalidated an NSPS for being too costly.

Once EPA issues final standards of performance for GHG emissions from new sources, section 111(d) requires the agency to issue standards for *existing* sources for certain pollutants, including greenhouse gases, provided that an NSPS would apply if the existing source were a new source. Under Section 111(d) and its implementing regulations, EPA issues a binding emissions guideline, and the states submit state implementation plans ("SIPs") for existing sources that comply with the EPA guideline.

[3] *Lignite Energy Council v. EPA*, 198 F.3d 930, 934 (D.C. Cir. 1999) (quoting *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375, 391 (D.C. Cir. 1973)).
[4] *Sierra Club v. Costle*, 657 F.2d 298, 364 (D.C. Cir. 1981).
[5] *Lignite Energy Council*, 198 F.3d at 933.
[6] *Portland Cement Ass'n. v. Train*, 513 F.2d 506, 508 (D.C. Cir. 1975).

IV. Comments on EPA's Proposed New Source Rule

A. Categories of Power Plants

In its proposed rule, EPA presented two alternative approaches to source categories and their codification in Part 60 of the Code of Federal Regulations:

1. **Primary proposal:** maintain the two source categories that EPA has already listed (steam generating EGUs and stationary combustion turbines) and codify the new CO_2 standards in the same subparts that include the standards of performance for conventional pollutants: subpart Da for steam generating EGUs and IGCC facilities, and subpart KKKK for stationary combustion turbines.

2. **Co-proposal:** combine the two source categories for purposes of regulating CO_2 emissions (but not for regulating emissions of criteria pollutants), and codify the standards in a new subpart TTTT.

We urged EPA to follow the second approach and establish a single category for all fossil-fuel fired EGUs, and to make separate BSER determinations for two subcategories within the larger group—steam EGUs/IGCC facilities, on the one hand, and stationary combustion turbines on the other hand. We noted, however, that if EPA finalizes a new category TTTT, it should reorganize its existing regulations to also cover emissions of criteria pollutants under category TTTT in order to facilitate coordinated reviews and updates of all performance standards. A single category will pull together all listed sources that serve the same function—electricity generation—and will simplify the design and implementation of the forthcoming section 111(d) carbon pollution standards for existing plants.

B. Applicability Provisions

EPA proposed to amend subparts Da (steam EGUs and IGCC units) and KKKK (stationary combustion turbines) under 40 C.F.R. Part 60. Our Joint Comments described the currently existing applicability provisions for these subparts, which base emission limits for criteria pollutants on a source's maximum heat input capacity. Under the current regulations, the source, permitting and enforcement authorities, and the public know in advance whether a source is subject to the NSPS. These limits also serve as the floor for the best available control technology ("BACT") determination that will be made during preconstruction permitting under the CAA's Prevention of Significant Deterioration ("PSD")/New Source Review ("NSR") program. We provided detailed comments on the proposed applicability provisions, highlighting various potential loopholes they create (as well as other loopholes that exist in the current regulations), as shown in the table below. Because the proposed applicability provisions are based on a plant's frequency of operation (which is variable), rather than its maximum potential heat input (which is fixed), no one would know whether a particular plant would be subject to the NSPS until years after the CO_2 emissions had occurred, and plants operating near the threshold could move in and out of the regulatory system from one month to the next. The inability to determine applicability from the outset would create significant compliance and enforcement problems, and would add unnecessary burdens to the Title V and PSD permitting process.

Current Applicability Provisions for Criteria Pollutant NSPS	Proposed Applicability Provisions for GHG NSPS	Loopholes/Comments on Proposed Subparts Da/KKKK
Subpart Da: applies to steam EGUs and IGCC units that: (a) exceed 73 MW; and (b) are constructed for the purpose of supplying more than one third of their potential electric output capacity and more than 25 MW net electrical output to the grid.	**Subpart Da** would cover only steam, EGUs/IGCC units that: (a) actually supply more than one-third of their potential electric output and more than 219,000 MWh (net) to the grid on an annual basis; and (b) actually combust more than 10 percent fossil fuel during three consecutive calendar years on a heat-input basis. (c) Under the proposed subpart TTTT, the regulations would only cover plants that exceed 73 MW, and the 10 percent fossil fuel indicator would be determined on a three-year rolling average basis.	EPA's proposal to apply the standard to EGUs that derive **at least 10 percent of their heat input from fossil fuels** is appropriate in the case of **biomass-fired EGUs** that derive more than 10 percent of their heat input from fossil fuels for flame stabilization. These should be regulated as fossil-fuel burning stationary sources under the standard. Requiring that regulated units **actually supply** more than one third of their potential electric output and more than 219,000 MWh annually would exempt **peaking units** and many **load-following units**, including nearly all combustion turbines, as well as the new fast-start CCGTs designed to support renewables. If this provision applied to existing sources, it would also exempt many coal-fired plants. Requiring that a regulated EGU combust more than 10 percent fossil fuel **during three consecutive calendar years** would permit sources large enough to require NO_x and/or SO_2 emission limitations immediately upon commencement of operations to defer the applicability of the CO_2 emissions limits for three years until the first average can be calculated, with the result that the standard may or may not apply in subsequent years, depending on the use of the facility in the relevant averaging period. **Combustion turbines** would avoid regulation under Subpart KKKK if they co-fired more than 10 percent of a fuel other than natural gas, such as oil, blast furnace gas, or landfill methane. Some of these plants would still be regulated under subpart Da—namely, those burning more than 50 percent
Subpart KKKK: applies to stationary combustion turbines that have a heat input at peak load of 10 MMBtu/hr or greater.	**Subpart KKKK** would only apply to stationary combustion turbines (whether simple cycle or combined cycle) that: (a) Have a design heat input to the turbine engine in excess of 73 MW; (b) combust over 90 percent natural gas on a three-year rolling average basis; (c) actually combust more than 10 percent fossil fuel during three consecutive calendar years on a heat-input basis; and (d) are constructed for the purpose of supplying, and actually supply, more than one-third of their potential electric output and more than 219,000 MWh (net) annually to the grid on a three-year rolling average basis.	

Current Applicability Provisions for Criteria Pollutant NSPS	Proposed Applicability Provisions for GHG NSPS	Loopholes/Comments on Proposed Subparts Da/KKKK
		synthetic gas, which would **qualify as IGCC units**. However, those burning between 0 and 50% synthetic gas, or between 0 and 90% of some fuel other than natural gas, would escape regulation under both subparts.

We urged EPA to retain the current definitions for affected facilities under subparts Da and KKKK and proposed certain revisions to close all potential loopholes. With regard to peaking plants, we recommended that EPA abandon its proposed definition and apply the performance standards to *all* EGUs that supply or were constructed for the purpose of supplying *any* electricity for sale to the grid. This would ensure regulation of peaking plants under the rule. Under this scenario, EPA should adjust the applicable emission limits according to different tiers of operating hours, as our proposal for gas plants outlines (*see* Section IV.E below).

C. BSER for Coal-Fired Plants

In determining BSER for coal plants, EPA proposed the following emissions limits for steam EGUs and IGCC units based on the source's selected compliance period and the partial implementation of carbon capture and storage ("CCS") technology:

- 1,100 lb CO_2/MWh (gross output basis) over a 12-operating month period; or
- 1,000-1,050 lb CO_2/MWh (gross) over an 84-operating month (7-year) period.

In our Joint Comments, we supported EPA's proposal to set an emissions limit for coal plants that reflects implementation and operation of partial CCS.[7] We also agreed with the agency's conclusion that geologic sequestration is available and adequately demonstrated for the minimal number of new coal plants expected, and that characterizing each potential storage site is essential to ensure safe and permanent storage. Although we agreed that as a legal matter, the agency may take into account revenues generated from enhanced oil recovery ("EOR") when determining the costs and benefits of its BSER determination, in our separate comments we emphasized that Sierra Club does not endorse the practice of EOR to sequester CO_2 recovered from power plants.

We supported partial CCS as BSER for coal plants for the following reasons:

- **Availability/transferability:** Carbon capture technologies have been used in gas processing and other industrial applications for decades. This experience is transferable to projects in the power generation sector, several of which are currently being planned or under construction. In

[7] In our Joint Comments we emphasized that, while we agree with EPA that any new coal plant must employ partial CCS to control its CO_2 emissions, we did not intend our comments to serve as an endorsement of a particular coal project or to support the continued use of coal in any capacity as a source of electricity generation.

our Joint Comments, we described some pre- and post-combustion CCS projects and commercial scale capture projects that support EPA's proposal.[8]

- **Acceptable costs:** EPA calculated that the partial CCS standard would result in a 12-to-20 percent increase in the cost of electricity per MWh at the individual plant level, which is not exorbitant from an industry-wide perspective. Industry can accommodate this increase with little to no noticeable impact on electricity prices, as very few (if any) new coal power plants will be built in the future irrespective of the NSPS.[9]
- **Benefits/co-benefits:** The modest industry-wide costs of the proposed NSPS are even less significant in light of the social cost of carbon. Although EPA need not conduct a traditional cost-benefit analysis under section 111, it is worth noting that the benefits of the proposed rule are stark in comparison to the costs. The proposed standard would reduce CO_2 emissions by 22 percent in supercritical pulverized coal boiler ("SCPC") plants and by 18 percent in IGCC plants. It would also result in significant co-benefits from reduced emissions of other pollutants, including NO_x, SO_2, and $PM_{2.5}$.

Our Joint Comments also noted that the proposed rule raises concerns with respect to sequestration. First, it does not contain sufficient enforceable requirements for permanent sequestration. For example, if a geologic storage facility reports high leakage rates, the rule does not require any action on the part of the EGU that was the source of the CO_2 in question. We strongly urged EPA to work with the relevant federal and state authorities to establish a comprehensive regulatory structure governing sequestration of captured CO_2. In addition, we proposed revisions to certain rule provisions in order to better ensure that facilities using partial CCS (and particularly those planning to sell CO_2 for use in EOR) report under subpart RR of the Greenhouse Gas Reporting Rule.

In our separate comments, we raised Sierra Club's concern that, through the practice of EOR, CCS could generate low cost CO_2 that would increase the production and use of oil globally. We urged EPA to evaluate the CO_2 emissions associated with the entire life cycle of power generation and downstream processing of the oil produced through recovery in order to understand to what extent these additional emissions would offset the reductions targeted under the proposed rule.

D. Net vs. Gross Standard

There are two ways of measuring a plant's electricity: a gross-output measure (which EPA's rule adopts) and a net-output measure. Gross output refers to the total quantity of electricity produced by the plant's generator, including both electricity sold to the distribution system as well as the source's parasitic load, which encompasses any electricity produced on-site that is used to power the source's pollution controls and any other internal equipment or process. By contrast, a plant's net output refers only to the electricity that is sold to the distribution system—it does not include the source's parasitic load.

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[8] The Energy Policy Act of 2005 imposes limitations on EPA's ability to rely on CCS projects in the U.S. as part of its BSER determination.

[9] For this same reason, in our Joint Comments we disagreed with EPA's conclusion that the costs of full CCS are too high for BSER purposes at this time. These costs for a small number of new coal plants are not exorbitant on an industry-wide basis, and requiring all new coal plants to install and utilize full CCS would satisfy section 111's standards for BSER.

To determine a plant's rate of carbon pollution, one must calculate how much CO_2 the source emits for every unit of electricity it generates. Because a plant's net output is always less than its gross output, an emission rate calculated on a net basis will always be greater than one determined on a gross basis.[10] The greater the plant's parasitic load, the wider the difference between the two calculations will be. Because CCS systems require a large parasitic load, the difference between the net and gross calculations for emissions from a coal plant with partial CCS is quite significant. By contrast, since traditional coal-fired units have lower parasitic loads, there is less of a difference between a net-based and a gross-based calculation of the CO_2 emissions from these facilities.

In our Joint Comments we explained that a gross-based standard provides an advantage to plants that waste more electricity on large parasitic or auxiliary loads, and hence operate less efficiently. In contrast to those EGUs, current IGCC or ultra-supercritical ("USC") coal plants are able to achieve net-based emission rates of 1,600 lb CO_2/MWh using 100 percent coal and no capture technology, and forthcoming advanced ultra-supercritical ("AUSC") plants are projected to achieve emission rates of less than 1,500 lb CO_2/MWh on a net-output basis. These units could not comply with EPA's proposed gross-output emission rate of 1,100 lb CO_2/MWh, since their smaller parasitic loads would correspond with a gross-out emission rate between 1,400 and 1,500 lb CO_2/MWh. However, a plant with partial CCS could meet EPA's 1,100 lb CO_2/MWh gross-based limit while emitting approximately 1,400 lb CO_2/MWh on a net basis: the large parasitic load from the CCS system accounts for the wide difference between this unit's gross- and net-based emission rates. By using a net-based standard rather than a gross-based one, EPA could set an appropriate and realistic emission limit for coal plants without encouraging the development and use of less efficient technologies. EPA should not favor coal plants with CCS over other technologies, such as more efficient AUSC units, that achieve similar net emission rates with lower auxiliary loads. By adopting a net-output standard rather than a gross standard, EPA can avoid giving an unnecessary and wasteful advantage to less efficient coal plants.

E. BSER for Gas-Fired Plants: Joint Environmental Commenters' Proposal

EPA determined that modern, efficient CCGT without CCS is BSER for gas plants, and proposed the following performance standards by subcategory:

Subcategory	**Emission Limit (gross-output basis)**
Large turbines (heat input >850 MMBtu/hr)	1,000 lb CO_2/MWh
Small turbines (heat input ≤ 850 MMBtu/hr)	1,100 lb CO_2/MWh

We agreed with EPA that BSER for natural gas plants should be based on efficient CCGT for intermediate and baseload units. However, we disagreed with EPA's proposed standards for these plants. EPA's own data show that 96 percent of existing CCGT units built between 2000 and 2011 currently meet these emission limits. As such, they are plainly technology-following, rather than technology-forcing, as Congress intended. In addition, the proposed limits do not reflect (but should consider) the performance of the newest and most efficient CCGT designs and other new technologies that are now available, such as fast-response CCGT or concentrated solar power ("CSP")/CCGT hybrids. The standard is insufficiently robust to meet the technology-forcing requirements of the CAA.

[10] Because the denominator, or MWh, in the lbs/MWh rate is lower when calculated on a net basis, and the numerator remains constant, the rate is higher.

We proposed a stronger, three-tiered system that would establish separate performance standards for peaking, intermediate/load-following, and baseload gas-fired plants under subpart KKKK (including both simple cycle units - or simply CTs - and combined cycle units), based on annual operating hours, as follows:

Subcategory	Emission Limit (net-output basis)
Baseload units (> 4,000 hours annually)	825 lb CO_2/MWh
Intermediate and load-following units (1,200-4,000 hours per year)	875 lb CO_2/MWh
Peaking units (< 1,200 hours per year)	1,100 lb CO_2/MWh

We expect that baseload and intermediate load functions would be met by combined cycle units, while simple cycle turbines would serve as peaking units. Our recommended limits reflect the fact that, if a unit operates less than a few hours per day, emissions during start-up or warm idle can result in situations where CTs and fast-start CCGTs are more efficient and emit less CO_2 than CCGTs designed for baseload applications.

As our analysis shows, our proposed standards are adequately demonstrated; indeed, half or more of currently existing gas plants already meet them. These standards would not significantly increase costs for the industry or for individual units, or raise the price of electricity, because there is no significant upfront cost difference between more efficient and less efficient CCGTs/CTs within the same size range, and operating costs are lower at more efficient units. In addition, the applicability of the NSPS to a certain source would be known at the time the unit commences operation, and not at a later date, because the source would commit to one of the three emission limits at the time of its Title V permitting. Moreover, by covering virtually all gas-fired plants that supply, or are designed to supply some electricity to the grid, our approach would help clarify coverage for a broader range of sources under the section 111(d) standards for existing power plants.[11]

In Sierra Club's separate comments, we also noted that at this time, CCS is demonstrated and commercially available for all EGUs, including gas-fired plants regulated under subpart KKKK. Recognizing the need to improve our understanding of geologic sequestration, however, the Club endorsed EPA's decision to defer the question of whether CCS is BSER for gas-fired EGUs to the next phase of NSPS revisions. We noted that CCS may be BACT at individual new gas plants, and EPA and state permitting agencies should evaluate on a plant-by-plant basis whether to require CCS at gas-fired units during PSD permitting. During the next NSPS review, EPA should assess the experience of CCS deployment in gas-fired plants in response to plant-specific BACT determinations.

F. Monitoring, Compliance, and Enforcement

On the whole, EPA's proposed monitoring and compliance scheme provides a workable system. We particularly agreed with the requirement that the performance standards apply at all times, including during "startup, shutdown, and malfunction" ("SSM") events.

[11] Our approach would retain the existing exemption for very small turbines (i.e., those with a maximum heat input under 10 MMbtu/hr).

However, the program does have several shortcomings that EPA must address to achieve transparency and ensure robust enforceability of the proposed rule:

- EPA's proposed affirmative defense to civil penalties for any source that violates the standards due to a malfunction event unlawfully strips courts of their authority established under the CAA and weakens citizens' rights and remedies. The D.C. Circuit recently struck down a nearly identical affirmative defense in the context of section 112 of the CAA, and the provision in the proposed NSPS is equally unlawful.
- The proposed rule provides inadequate safeguards to ensure that sources will comply with the standards. Under EPA's proposal, the initial compliance demonstration would not occur for months or even years after commencement of operation. EPA must require early initial performance tests for all regulated units.
- EPA must ensure that penalties are sufficient to deter violations, and that sources come into compliance as soon as possible. In addition, EPA must clarify how penalties will be assessed.
- EPA should require *all* sources to install continuous emission monitoring systems ("CEMS") to monitor CO_2 emissions, which has been shown to be a feasible and inexpensive means of monitoring compliance. EPA's current proposal allows coal-fired units to estimate their emissions based on fuel consumption data, a technique that excludes periods of ramping and low load activity and is demonstrably less accurate than CEMS.
- EPA's proposed record retention requirements, which would require sources to retain records on-site for only two years, pose potential obstacles to EPA's compliance investigations. These requirements must be strengthened to facilitate the expeditious review of needed information.

G. Applicability of NSPS to Sources under Development that Have Not Yet Begun Construction

Under the CAA, NSPS apply to all sources in a regulated category that commence construction after the standard is proposed. *See supra*, Section III. In EPA's 2012 proposal, however, the agency sought to exempt "transitional sources"—new sources that had obtained a valid PSD permit and were set to begin construction—so long as construction commenced within one year of publication of the proposal. In our earlier comments, we objected to this proposed exemption, as nearly all of those transitional sources were unlikely to begin construction. Today, most of those sources have announced cancellation or have converted to natural gas projects. In September 2013, when EPA first published this proposal, there were still four units purportedly under development as coal-fired power plants, one of which has since announced its cancellation.[12] The agency's current proposal discusses the remaining three plants, whose developers have represented to EPA that they have already commenced construction. In our Joint Comments, we provided extensive evidence that the record does not support this claim; thus, these plants should be covered under the proposed rule.

[12] These plants are Wolverine (MI), Washington County (GA) (also known as "Plant Washington"), Holcomb (KS), and Two Elk (WY). Wolverine announced its cancellation in December 2013.