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U.S. Environmental Protection Agency
EPA Docket Center
U.S. EPA, Mail Code 28221T
1200 Pennsylvania Ave, NW
Washington DC 20460
Attn: Docket No. ID EPA-HQ-OAR-2017-0355

Re: Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Generating Units; Revisions to Emission Guideline Implementing Regulations; Revisions to New Source Review Program, 83 Fed. Reg. 44,746 (Aug. 31, 2018).

Clean Air Task Force (CATF), Clean Air Council (CAC), and Clean Wisconsin (CW) respectfully submit these comments on the U.S. Environmental Protection Agency's ("EPA" or "Agency") proposed Affordable Clean Energy Rule ("ACE" or "Proposal") portion of the above-captioned proposal. Founded in 1996, CATF seeks to help safeguard against the worst impacts of climate change by working to catalyze the rapid global development and deployment of low carbon energy and other climate-protecting technologies, through research and analysis and public advocacy leadership.

Clean Air Council is a non-profit environmental health organization headquartered at 135 South 19th Street, Suite 300, Philadelphia, Pennsylvania 19103, with more than 8,000 contributing members and 30,000 activist members in Pennsylvania. For 50 years, Clean Air Council has fought to improve the air quality across Pennsylvania. Clean Air Council works to protect everyone's right to a healthy environment.

Since 1970, Clean Wisconsin has been the voice for the environment, working for clean air, clean water and clean energy and to protect the places we all love. To achieve this, we work on a wide range of issues and in a number of venues to protect our natural resources and the health of all Wisconsinites, now and for generations to come.

Along with the comments below, focusing primarily on the technical aspects of EPA's proposed best system of emission reduction for carbon dioxide (CO_2) from existing electric utility generating units ("EGU" or "power plant"), CATF, CAC and CW join in various sets of comments filed in this

docket today.[1] Those comments (1) describe the legal infirmities of ACE's proposed system of emission reduction, which omits better systems, fails to sufficiently reduce emissions from affected sources, and provides no standard at all by which to measure a satisfactory implementation plan; (2) the problematic treatment of forest-biomass emissions; (3) the failure to include carbon capture and sequestration in the best system of emission reduction; (4) the improper and unreasonable changes to EPA's longstanding Clean Air Act (CAA) section 111(d) implementing regulations; (5) the illegal revisions to New Source Review, which would allow affected sources to evade the program even when actual emissions increase; (6) critique of the flawed Regulatory Impact Analysis accompanying the Proposal, and (7) update the science on the escalating climate crisis. CATF also attaches its comments submitted to the advanced notice for this proposed rulemaking, as they remain highly relevant.[2]

I. Summary of Comments

1. EPA must set an emission limit based on the *best* system of emission reduction.
2. EPA's Proposal fails to comply with Clean Air Act section 111's mandate to reduce pollution to the greatest degree practicable by disregarding the requirement to determine the *best* system and instead focusing on what is "technically feasible and appropriate."
3. Reduced generation, co-firing and carbon capture and sequestration can achieve significant emission reductions at reasonable costs and the Agency fails to ground its rejection of these measures in reasoned decisionmaking. The Proposal fails to develop a record supportive of its determination and fails to overcome the Clean Power Plan record.
4. Heat rate improvements are not the best system of emission reduction as they lead to emission increases at affected sources. EPA also unreasonably failed to account for the dramatic emission increases associated with the life extensions resulting from these projects.
5. EPA may not include trading for compliance in the final rule unless that flexibility is built into the best system of emission reduction and the stringency of the emission limit.

II. Introduction

The Proposal is EPA's transparent attempt to illegally extend the lives of old, highly-polluting, coal-fired power plants in lieu of fulfilling its statutory mandate to address the damage that the affected sources are inflicting on public health and the environment. This mandate requires the Administrator to set an *emission limit* based on the *best* system of emission reduction. ACE fails to set a limit at all, and its purported "best system" is merely a non-binding list of minimal heat rate improvement measures that states must evaluate. Moreover, improving a power plant's heat rate will

[1] *See* Joint Environmental Comments on Framework Regulations; Joint Environmental Comments on Regulatory Impact Analysis; Joint Environmental Comments on BSER Issues; Joint Environmental Comments on NSR Issues; CATF & NRDC Comments on Biomass; CATF & NRDC Comments on Carbon Capture and Sequestration; Joint Comments on Climate Science.

[2] Clean Air Task Force Comments, and Attachments, on State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units, Doc. No. EPA-HQ-OAR-2017-0545-0391 (Feb 26, 2018) (Attach. A).

generally lead to *increased* emissions at specific plants, as well as overall emissions from the power sector.

Meanwhile, the system of emission reduction underlying the Clean Power Plan – reduced generation at the highest-emitting plants – keeps getting cheaper. And in line with the trends leading up to the Clean Power Plan, reducing generation at higher-emitting sources continues to be the industry's method of choice to reduce CO_2 from the affected sources. As described in comments previously submitted to this docket, the Agency's proposal to repeal the eminently reasonable Clean Power Plan is based on a reading of section 111(d) that is entirely baseless and counter to the statute.[3] There is nothing in the Clean Air Act or its history that limits the eligible section 111(d) systems of emission reduction to those that can be "applied to or at an individual affected source."[4] EPA's erroneous claim that the Clean Air Act *precludes* basing a section 111(d) standard on shifting generation renders the repeal and the replacement illegal. EPA's error regarding its own statutory authority fatally taints the decision to repeal.[5] The Agency's failure to consider generation shifting as the best system for the proposed replacement is arbitrary and capricious because EPA neglects to supply "good reasons for the new policy," fails to engage with the "facts and circumstances… underl[ying]" the Clean Power Plan and leaves "unexplained inconsistenc[ies]" between the previous record and the Proposal.[6]

Regardless, the Clean Power Plan, and more importantly, reducing generation at the affected sources, is "source-oriented," as EPA defines this term.[7] There are various systems of emission reduction, including reduced generation, co-firing with natural gas, and carbon capture and sequestration, that this Proposal casually dismisses without engaging in the "hard look" required for reasonable rulemaking.[8]

EPA fails to take that "hard look" or ground its determination of the *best* system in the relevant factors for section 111 rulemaking, including the amount of emission reductions achievable. The climate is in crisis and coal-fired power plants are "the largest single stationary source category of

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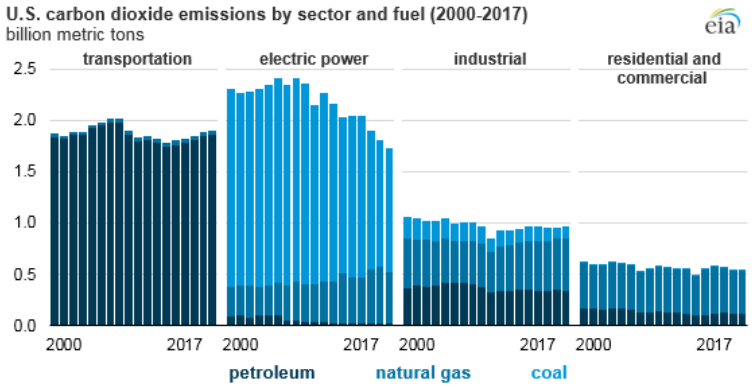
[3] Comments of Clean Air Task Force, *et al.* on Proposed Repeal of Carbon Pollution Emission Guidelines, Doc. No. EPA-HQ-OAR-2017-0355-19872 (Apr. 26, 2018).
[4] 82 Fed. Reg. at 48,039.
[5] *Prill v. NLRB*, 755 F.2d 941, 947 (D.C. Cir. 1985). "An agency regulation must be declared invalid, even though the agency might be able to adopt the regulation in the exercise of its discretion, if it was not based on the [agency's] own judgment but rather on the unjustified assumption that it was Congress' judgment that such [a regulation is] desirable." *Id.* at 948 (internal citations omitted); *see also U.S. Postal Serv. v. Postal Regulatory Comm'n*, 640 F.3d 1263, 1264 (D.C. Cir. 2011) (remanding the Commission's interpretation of the Postal Accountability and Enhancement Act of 2006 because it incorrectly concluded the plain meaning of the statutory language required a particular result); *see also NextEra Desert Ctr. Blythe v. FERC*, 852 F.3d 1118, 1122 (D.C. Cir. 2017) (remanding order to Commission because its decision rested "on an erroneous assertion that the plain language of the relevant wording is unambiguous"); *and* Order, *The Regents of the Univ. of Cal. v. DHS*, No. 17-05211, Doc. 234, at 29, 38 (Jan. 9, 2018) (enjoining repeal of DACA because the action "was based on a flawed legal premise (citing *Massachusetts*, 549 U.S. at 532)); *see generally* Daniel J. Hemel & Aaron L. Nielson, *Chevron Step One-and-a-Half*, 84 U. CHI. L. REV. 757 (2017) (analyzing cases holding that agency errors about the nature of their own authority must be rejected and subject to remand).
[6] *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2125-26 (2016).
[7] As explained Comments on the Proposed Repeal, the term "source-oriented" or support for a "source-oriented" approach finds no support in the Act, its purposes, or legislative history.
[8] *See Motor Vehicles Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

emissions of CO_2 by far."[9] The record underlying the Proposal indirectly recognizes the climate crisis but fails to propose a meaningful rule in response. EPA recognizes that the adverse impacts associated with elevated concentrations of greenhouse gases and power plants' contribution necessitates regulation, citing the Endangerment Finding[10] and acknowledges that increasing emissions are a major contributor to the warmest period in the history of modern civilization, and that these trends are accelerating.[11]



Source: EIA, "U.S. energy-related CO2 emissions fell slightly in 2017" (Sept. 5, 2018).

The National Climate Assessment finds that the global average sea level has risen three inches since 1995 and is expected to rise several more inches in the next 15 years.[12] Heavy rainfalls are increasing in intensity, while extreme heat waves are becoming more frequent.[13] The last few years have seen record-breaking, climate-related, extreme weather and the frequency of such events is only expected to increase.[14] Just this past summer, the country saw record rainfall and high temperatures, while other parts of the country saw record low temperatures and significant drought leading to wildfires and reduced crop yield. *See* Figure A below.

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[9] 83 Fed. Reg. at 44,751; EPA, Regulatory Impact Analysis for the Proposed Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guideline Implementing Regulations; Revisions to New Source Review Program, at 1-4, 2-27 tbl. 2-5 (Aug. 2018) [hereinafter "RIA"] (the electric power industry accounted for 29% of total nationwide greenhouse gas emissions in 2015).
[10] RIA 4-1 – 4-2.
[11] *Id.* (citing Donald J. Wuebbles, *et al.*, U.S. Global Climate Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment, Volume I*, at 10 (2017), *available at* : https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf.
[12] *Id.* at 10.
[13] *Id.* at 11.
[14] *Id.*

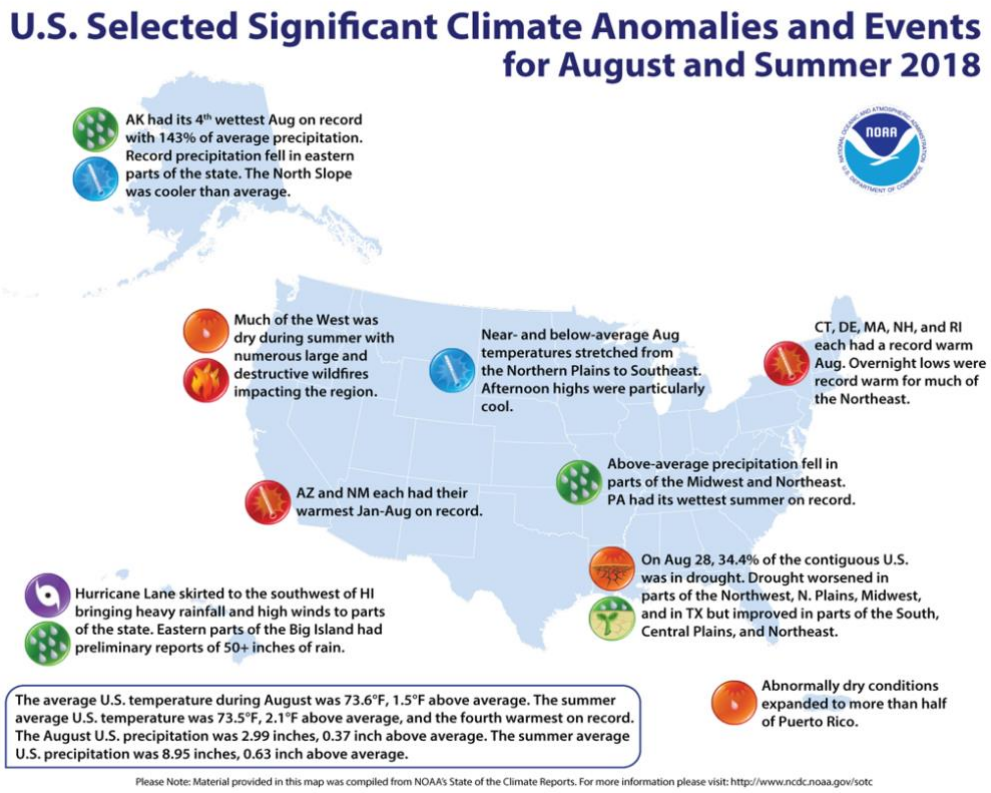

Fig. A. Source: NOAA, "Assessing the U.S. Climate in August 2018" (Sept. 6, 2018).

This year has seen 11 weather and climate disaster events with losses exceeding $1 billion each across the U.S, including wildfires, drought, hail, tornados and hurricanes. *See* Figure B.

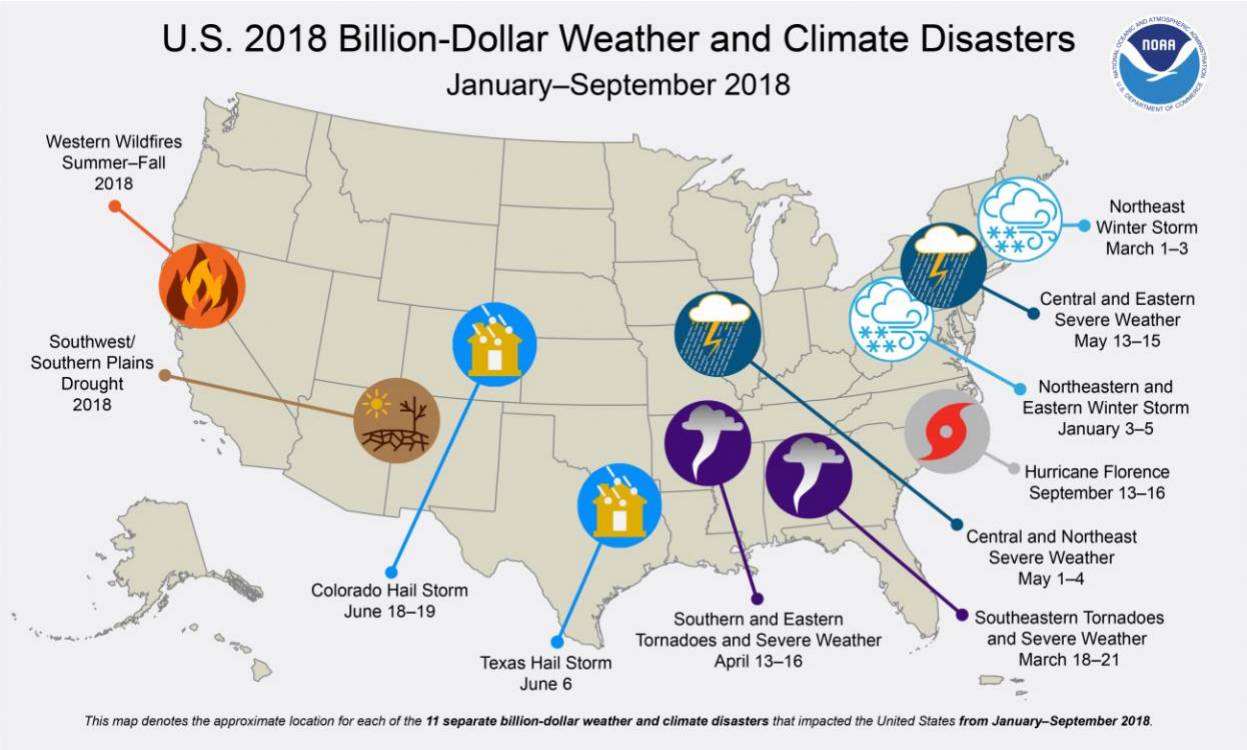

Fig. B. Source: NOAA, "Assessing the U.S. Climate in September 2018," (Oct. 9, 2018).

Just this month, the IPCC concluded that global warming will reach 1.5°C in merely twelve years, threatening several hundred million lives.[15] Failing to transition to a fossil-free world in the short-term results in at least a 2.0°C increase and presents an existential crisis.[16]

Faced with a statutory duty to address the increasingly catastrophic effects of climate change and the contribution from the largest stationary source of emissions, EPA's Proposal attempts to reverse market trends favoring natural gas and renewable energy in order to extend the lives of old, dirty, coal plants. As seen *infra* at Section V, heat rate improvements *increase* emissions. Under EPA's own analysis, as compared to the Clean Power Plan, ACE increases CO_2 emissions from the source category by at least 117 MM short tons in 2030.[17] In fact, as explained in detail later in these comments, EPA's own analysis demonstrates that the Proposal is "generation-shifting" as well, and would reverse the current trend towards reliance on cleaner sources of electricity to more reliance on coal generation.

The Proposal "runs counter to the evidence before the agency,"[18] – which substantiates the climate crisis and supports meaningful emission reductions through generation shifting, co-firing and carbon capture and sequestration - and fails to satisfy the Clean Air Act's requirements, rendering it entirely

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[15] *See generally* Myles Allen, *et al.*, IPCC, *Global Warming of 1.5 °C: an IPCC special report on the impacts of global of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (Oct. 8, 2018) *available at*: http://www.ipcc.ch/report/sr15/.

[16] *Id.*

[17] RIA ES-8, tbl. ES-5.

[18] *State Farm*, 463 U.S. at 43.

"arbitrary, capricious, an abuse of discretion, [and] not in accordance with law."[19] The only reasonable course of action for EPA to undertake is to withdraw the Proposed Repeal and the woefully deficient ACE Proposal and pivot its efforts toward implementing and strengthening the Clean Power Plan.

III. The Clean Air Act demands that EPA establish an emission limit based on the *best* system of emission reduction for CO_2 from existing power plants.

In enacting the Clean Air Act, Congress "established a rigorous program for the regulation of existing and new sources of pollution."[20] A primary goal of the Act, in addition to promoting the public health and welfare, is to promote actions for pollution prevention,[21] defined as "the reduction or elimination, *through any measures*, of the amount of pollutants produced or created at the source."[22] Clean Air Act section 111 was designed to control affected sources "to the greatest degree practicable" to achieve the "national goal of a cleaner environment."[23] A Proposal calling on states to merely "evaluate" a voluntary menu of minor heat rate improvements entirely fails to meet this standard.

a. EPA must set an emission limit.

Section 111(d) requires EPA to develop regulations under which states establish a standard of performance for existing sources, and apply it taking into consideration "among other factors, the remaining useful life of the existing source to which such standard applies."[24] A "standard of performance" is defined as "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 nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated."[25]

As Courts have confirmed, this language

> require[s] that EPA identify the emission levels that are 'achievable' with 'adequately demonstrated technology.' After EPA makes this determination, it must exercise its discretion to choose an achievable emission level, which represents the best balance of economic, environmental, and energy considerations.[26]

EPA must set an emission limit. *See* Joint Environmental Comments on Framework Regulations. A menu of voluntary heat rate improvements of varying and unquantified effectiveness fails to fulfill the Administrator's duties under section 111. Moreover, it provides no benchmark by which the

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[19] 42 U.S.C. § 7607(d)(1).
[20] *Ala. Power Co. v. Costle*, 636 F.2d 323, 346 (D.C. Cir. 1979).
[21] 42 U.S.C. § 7401(c).
[22] *Id.*, at § 7401(a)(3) (emphasis added).
[23] *Essex Chem. Corp. v. Ruckelshaus*, 486 F.2d 427, 434, n. 14 (D.C. Cir. 1973) (citing S. Rep. No. 1196, 91st Cong., 2nd Sess. 16 (1970)).
[24] 42 U.S.C. § 7411(d)(1).
[25] *Id.* at § 7411(a)(1).
[26] *Sierra Club v. Costle*, 657 F.2d 298, 330 (D.C. Cir. 1981).

Administrator can judge whether the states' implementation plans are "satisfactory" as required by the statute.[27]

This has been EPA's longstanding position since 1975 when it stated that:

> [a]gainst [the] background of Congressional firmness, the overriding purpose of which was to protect public health and welfare, it would make no sense to interpret section 111(d) as requiring the Administrator to base approval or disapproval of State plans solely on procedural criteria. Under that interpretation, States could set extremely lenient standards – even standards permitting greatly increased emissions – so long as EPA's procedural requirements were met. Given that the pollutants in question are (or may be) harmful to public health and welfare, and that section 111(d) is the only provision in the Act requiring their control, it is difficult to believe that Congress meant to leave such a gaping loophole in a statutory scheme otherwise designed to force meaningful action.[28]

As described in Joint Environmental Comments on Framework Regulations, EPA provides no "good reasons"[29] for overturning this longstanding position and as such the Proposal is arbitrary and capricious. Section 111 *requires* EPA to set a numerical standard by which to judge state implementation of the program and failing to do so is unlawful.

b. The best system of emission reduction must reflect the latest measures available to reduce pollution to the greatest degree practicable.

EPA must interpret the statutory terms in section 111(d) to further the purposes of the Clean Air Act.[30] The Clean Air Act and its amendments reflect a bold and aggressive response to the threats from air pollution. Describing the related Clean Air Act section 110 program in 1970, Senator Muskie recognized that it was Congress's "responsibility to establish what the public interest requires to protect the health of persons [and] [t]his may mean that people and industries will be asked to do what seems to be impossible at the present time."[31] The legislative history and purposes of the Act demand a vigorous application of the *best* system of emission reduction to combat pollution problems.[32] The choice of heat rate improvements of varying degrees of effectiveness does not reflect the bold approach Congress intended, instead it represents a safe haven for old, coal-fired power plants to avoid the serious pollution controls required by section 111.

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[27] 42 U.S.C. § 7411(d)(2)(A).

[28] 40 Fed. Reg. at 53,343; *see also Alaska Dep't of Envtl. Conservation v. EPA*, 540 U.S. 461, 487 (2004) (recognizing that the Court "will normally accord particular deference to longstanding agency interpretations" (quoting *Barnhart v. Walton*, 535 U.S. 212, 220 (2002)).

[29] *FCC v. Fox Television Stations, Inc.*, 129 S.Ct. 1,800, 1,808 (2009).

[30] "[S]tatutes always have some purpose or object to accomplish, whose sympathetic and imaginative discovery is the surest guide to their meaning." *Pub. Citizen v. DOJ*, 491 U.S. 440, 454-55 (1989) (internal citations omitted) (citing *Cabell v. Markham*, 148 F. 2d 737, 739 (CA2), aff'd, 326 U.S. 404 (1945)).

[31] *Union Elec. Co. v. EPA*, 427 U.S. 246, 258-59 (1976).

[32] "Congress did not intend to permit continuance of pollution by industries which have failed to cope with and attempt to solve the problem of pollut[ion]." *NRDC v. EPA*, 804 F.3d 149, 165 (2nd Cir. 2015).

The Clean Air Act is a technology-forcing statute.[33] Therefore, for the purposes of section 111, "[a]n adequately demonstrated system is one which has been shown to be reasonably reliable, reasonably efficient, and which can reasonably be expected to serve the interests of pollution control without becoming exorbitantly costly in an economic or environmental way. An achievable standard is one which is within the realm of the adequately demonstrated system's efficiency and which, while not at a level that is purely theoretical or experimental, need not necessarily be routinely achieved within the industry prior to its adoption."[34] EPA's proposed interpretation of section 111 as requiring the Administrator to determine "what is technically feasible and appropriate,"[35] fails to respect the urgency and words Congress chose to express in the statute, and as such is plainly unlawful.

The Clean Air Act is designed to internalize the costs of pollution back onto the sources that have otherwise been imposing their costs on public health and the environment, and section 111(d) is designed to reduce emissions to the greatest degree practicable.[36] The cost of regulation is therefore appropriate so long as it is not "exorbitant."[37] It is unavoidable that national standards will impose greater burdens on some plants than others, but this does not undermine the reasonableness of the standards.[38] These burdens are all the more reasonable in the section 111(d) context where EPA sets an emission limit based on the best system of emission reduction and states then set a standard of performance for individual plants, which can, upon required demonstration and approval of an application,[39] take into account the plant's remaining useful life.[40] *See* Joint Environmental Comments on Framework Regulations.

As EPA recognizes, the "interpretation of [best system of emission reduction must] incorporate the amount of air pollution as a relevant factor to be weighed when determining the optimal standard…"[41] Yet, EPA's Proposal requires no emission reductions at all and threatens to increase pollution. As described in more detail below, under EPA's own flawed analysis, *see* Joint Environmental Comments on Regulatory Impact Analysis, 18 states see cumulative CO_2 emission increases during the modeled period equaling 193 million tons, as compared to no rule at all.

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[33] "The state of the art has tended to meander along until some sort of regulation took it by the hand and gave it a good pull." *Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 622-23 (D.C. Cir. 1973). Congress expected EPA's standards of performance to "press for the development and application of improved technology," *NRDC v. EPA*, 655 F.2d 318, 331 (D.C. Cir. 1981) (citing S.Rep. No. 1196, 91st Cong., 2nd Sess. 24 (1970)).
[34] *Essex Chem. Corp.*, 486 F.2d at 433-34.
[35] 83 Fed. Reg. at 44,749.
[36] *Id.*; *see also* RIA at 1-3.
[37] *Lignite Energy Council v. EPA*, 198 F.3d 930 at 933 (D.C. Cir. 1999); *see also Portland Cement Ass'n v. Train*, 513 F.2d 506, 508 (D.C. Cir. 1975) (upholding standards where "[t]he industry has not shown inability to adjust itself in a healthy economic fashion").
[38] *See Weyerhouser Co. v. Council*, 590 F.2d 1011, 1054 (D.C. Cir. 1978) (upholding EPA effluent limitations that were more difficult for some mills to meet).
[39] 40 C.F.R. § 60.24(f).
[40] 42 U.S.C. § 7411(d).
[41] *Sierra Club*, 657 F.2d at 326.

The Proposal "rests on reasoning divorced from the statutory text"[42] fails to advance the purpose of the Clean Air Act[43] and as such EPA falls well short of meeting its statutory mandate.

IV. EPA's conclusory rejection of reduced generation as the best system of emission reduction is based on a fundamental misunderstanding of the Clean Air Act and the affected sources and is unsupported.

EPA maintains its erroneous position that the Clean Air Act *requires* a "source-specific approach to regulation."[44] The Agency goes on to conclude that the generation-shifting measures underlying the Clean Power Plan are not "source specific" and therefore it must be repealed.[45] EPA's conclusory statements are wrong on their face and the Agency has provided no supporting analysis for its about-face from the Clean Power Plan. As described in comments submitted to this docket, there is no such "source specific" limitation in section 111, and even if there were, generation-shifting, which requires reduced generation at higher-emitting sources leading lower-emitting generation to substitute for that generation *is* "source specific."[46]

These cascading errors led to a fatal flaw in the Proposal: EPA fails to consider the "significant and viable and obvious alternative[]"[47] of basing the best system of emission reduction on reduced generation, by providing a "reasoned explanation…for disregarding the facts and circumstances that underlay" the Clean Power Plan, and avoiding "unexplained inconsistency."[48] As such the Proposal is "an arbitrary and capricious change."[49]

a. EPA's brief rejection of reduced generation is based on a mischaracterization of the Clean Power Plan record and a misunderstanding of section 111(d).

EPA's cursory rejection of reduced generation is insufficient to satisfy the requirements of reasonable decisionmaking,[50] and even so, its treatment of it is unsound. EPA first explains that reduced generation does not fit within its historical approach to the best system of emission reduction.[51] Even if this were true, it certainly does not preclude the use of the measure. Section 111 was intentionally designed with broad language in order to "confer the flexibility necessary to forestall…obsolescence."[52] As the industry has evolved and pollution problems have changed, it is EPA's duty to tailor the best system of emission reduction to the particular characteristics of the

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[42] *Massachusetts v. EPA*, 127 S. Ct. 1438, 1462 (2007).
[43] *Pub. Citizen*, 491 U.S. at 454-55 (1989) (internal citations omitted) (statutory interpretation must further the purpose of the statute).
[44] 83 Fed. Reg. at 44,752; *see supra* note 5.
[45] *Id.*
[46] *See* Comment of Appalachian Mountain Club, *et al.*, Doc. No. EPA-HQ-OAR-2017-0355-20656 (Apr. 26, 2018); Comments of Clean Air Task Force, *et al.* Doc. No. EPA-HQ-OAR-2017-0355-19872 (Apr. 26, 2018); Dan Farber, LegalPlanet, "The Off Switch is Inside the Fenceline," (Dec. 26, 2017), http://legal-planet.org/2017/12/26/the-off-switch-is-inside-the-fenceline/; *see also* Comment Submitted by D. Farber & K. Engel, (Jan. 15, 2018), EPA-HQ-OAR-2017-0355-16293.
[47] *Nat'l Shooting Sports Found. v. Jones*, 716 F.3d 200, 215 (D.C. Cir. 2013).
[48] *Encino Motorcars,* 136 S.Ct. at 2126 (internal citations omitted).
[49] *Id.*
[50] *See State Farm,* 463 U.S. at 43.
[51] 83 Fed. Reg. 44,752.
[52] *Massachusetts,* 549 U.S. at 532.

pollutant and the source category.[53] So while, as described in earlier comments,[54] EPA has considered and relied upon reduced generation in various regulations, even if it had not, that does not preclude it from being the best system here. "A given term…may take on distinct characters from association with distinct statutory objects calling for different implementation strategies."[55]

Further, EPA mischaracterizes the Clean Power Plan's consideration of reduced generation.[56] EPA found that it would be inappropriate to limit the aggregate amount of *electricity* generation, *not* as the Proposal suggests, to limit the amount of generation from the highest-polluting affected sources.[57]

Next, EPA claims that basing the standard on reduced generation would "inappropriately inject the Agency into an owner/operator's production decisions."[58] This position is untenable, as any regulation increases the costs of operation because it internalizes the costs of pollution back onto the plant, which affects the owner/operator's production decisions. For example, an emission guideline based on a "bolt on" control such as 90% carbon capture and sequestration would affect production decisions to a greater degree than one based on 10% reduced generation. Moreover, the system of emission reduction is translated into an emission limit, which is then the basis of a state-established standard of performance. An owner/operator then can comply with the standard of performance by virtually any means. At the end of the day one 1,400 lbs. CO_2/MWh standard could be based on reduced generation, and another 1,400 lbs. CO_2/MWh standard could be based on heat rate improvement and both have the same effect on the owner/operator's production decisions.

Finally, EPA once again claims that it is limited to considering the affected source in isolation, and cannot consider the system within which the source it operates, because its expertise is "control of emissions" not "electricity management."[59] EPA's renunciation of authority and expertise is belied by the Clean Air Act, which *requires* it to consider "energy requirements."[60] Moreover, emissions from an affected source and the integrated electric system within which the source operates cannot be "hermetically sealed from each other."[61] In fact, to attempt to do so would be unreasonable. EPA cannot blind itself to the reality that the affected sources are individual cogs located within a massive synchronous machine, which includes regulated and unregulated sources that interact with one

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[53] *EPA v. EME Homer City Generation*, 134 S. Ct. 1584, 1594 (2014) (regulators must take into account that particular characteristics of the pollution problem they face when designing a solution).
[54] Comments of Clean Air Task Force, *et al.* Doc. No. EPA-HQ-OAR-2017-0355-19872 (Apr. 26, 2018).
[55] *EDF v. Duke Energy Corp.,* 549 U.S. 561, 574 (2007).
[56] 83 Fed. Reg. 44,752 (quoting 80 Fed. Reg. at 64,762).
[57] 80 Fed. Reg. at 64,762, n. 468 ("this rulemaking presents a unique set of circumstances, including the global nature of CO[2] and the emission control challenges that CO[2] presents (which limit the availability and effectiveness of control measures), combined with the facts that the electric power industry (including fossil fuel-fired steam generators and combustion turbines) is highly integrated, electricity is fungible, and generation is substitutable (which all facilitate the generation shifting measures encompassed in building blocks 2 and 3). Our interpretation of section 111 as focusing on limiting emissions without limiting aggregate production must take into account those unique circumstances.").
[58] 83 Fed. Reg. at 44,752.
[59] *Id.* at 44,753-54.
[60] 42 U.S.C. § 7411(a)(1).
[61] *FERC v. EPSA*, 136 S.Ct. 760, 776 (2016).

another. Therefore, any proper application of section 111(d) must consider the affected source in this context and cannot treat the affected power plant as an island.[62]

This brief, and easily refuted, dismissal of reduced generation as the best system of emission reduction is incomplete and does not meet the standard for reasonable decisionmaking,[63] especially in light of the voluminous record underlying the Clean Power Plan. The rejection of the primary means by which the affected sources are actually reducing their CO_2 emissions must be supported by a rationale and record of evidence vastly more substantial than vague policy preferences untethered to the statute. The record *should* include, *inter alia*, how sources shift generation, the achievable emissions reduction, the cost and impact of shifting generation, the amount of generation that has historically shifted and is available, and the energy impacts. These metrics must all then be compared to other available measures in order to choose the *best* measure(s). The failure to substantiate rejecting generation shifting, itself, renders the Proposal arbitrary and capricious.

b. EPA fails to overcome the massive record supporting the Clean Power Plan.

In 2015, EPA demonstrated that the best means of reducing emissions from the affected sources included substituting generation from higher-emitting affected units with increased generation from lower-emitting units, and that this could be accomplished merely by reducing generation at affected sources.[64] EPA considered the record of devastating climate change, the affected sources contribution to it, how the affected sources operate, the history of regulating the industry, the trends and trajectory of the industry, the challenges associated with controlling CO_2, and the means by which the sources reduce emissions, including carbon capture and sequestration, co-firing, heat rate improvement and shifting generation.[65] The Agency considered all of the means by which shifting generation could be achieved, the degree to which the shift was cost reasonable and would not negatively impact electric reliability and prices, and the impact on jobs.[66] Further, to sset the emission guideline, the Agency determined an appropriate amount of reduced utilization available considering costs and energy requirements.[67] This analysis was bolstered by hundreds of studies and reports, various technical support documents, a regulatory impact analysis, and extraordinary public input.[68]

When an Agency does an about-face from its prior position, it must "show that there are good reasons for the new policy."[69] EPA "cannot simply disregard contrary or inconvenient factual determinations that it made in the past."[70] However, that is precisely what EPA does here. The Proposal *entirely* fails to engage with this unprecedented record of support for determining that

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[62] *See generally* Br. of *Amici Curiae* Grid Experts, *West Virginia v. EPA*, 15-1363, ECF 1606654 (Apr. 1, 2016). "The usage of any individual generator is…dependent on – and to a large extent, dictated by – the performance of other components of the machine." *Id.* at 2.
[63] *See e.g. NRDC v. EPA*, 804 F.3d 149, 166 (2nd Cir. 2015) (remanding effluent limits for failing adequately explain why it could not base them upon the best available technology).
[64] 80 Fed. Reg. at 64,667.
[65] *See generally* 80 Fed. Reg. 64,662.
[66] *Id.*
[67] *Id.* at 64,730-31.
[68] *See generally* Docket No. EPA-HQ-OAR-2013-0602, https://www.regulations.gov/docket?D=EPA-HQ-OAR-2013-0602.
[69] *Encino Motorcars*, 136 S.Ct. at 2126 (internal citations omitted).
[70] *Fox Television Stations*, 556 U.S. at 537 (Kennedy, J., concurring).

reducing generation at affected sources is the best system of emission reduction. EPA may not merely deem the Clean Power Plan illegal and ignore the underlying facts, science, circumstances, reasoning and record supporting it, or the system it settled on after exhaustive analysis.[71] "New presidential administrations are entitled to change policy decisions, but to meet the requirements of the APA they must give reasoned explanation for those changes… Failure to do so is arbitrary and capricious."[72]

c. The Proposal runs counter to the evidence of an ongoing shift in generation before the Agency.

Not only does the Proposal's record fail to support rejecting reduced generation as the best system or overcome the massive record supporting the Clean Power Plan's reliance on reduced generation, it actually contains the affirmative case *for* shifting generation from higher-emitting sources to lower-emitting sources. The Agency's own analysis shows the historical trend - that is expected to continue - of coal-fired power plants reducing their generation due to age and market conditions and being replaced by natural gas-fired plants and renewable energy.[73] As such, the Proposal fails to ground its rejection on "the relevant factors" or "articulate a rational connection between the facts found and the choice made."[74] The rejection of reduced generation as the best system "runs counter to the evidence before the agency,"[75] which highlights the "industry trends away from coal-fired generation and toward low- and zero-emitting generation sources,"… "which are expected to continue."[76] Additionally, despite Congress's expectation that power plants would retire at 30 years of age,[77] EPA understands the average age of a coal-fired power plant in the United States is 48, and that "by 2025, over 50 percent of the total existing coal generating capacity will have been in service for more than 47 years." EPA requests comment on how to take these trends into account.[78] The answer could not be clearer: base the system of emission reduction on them!

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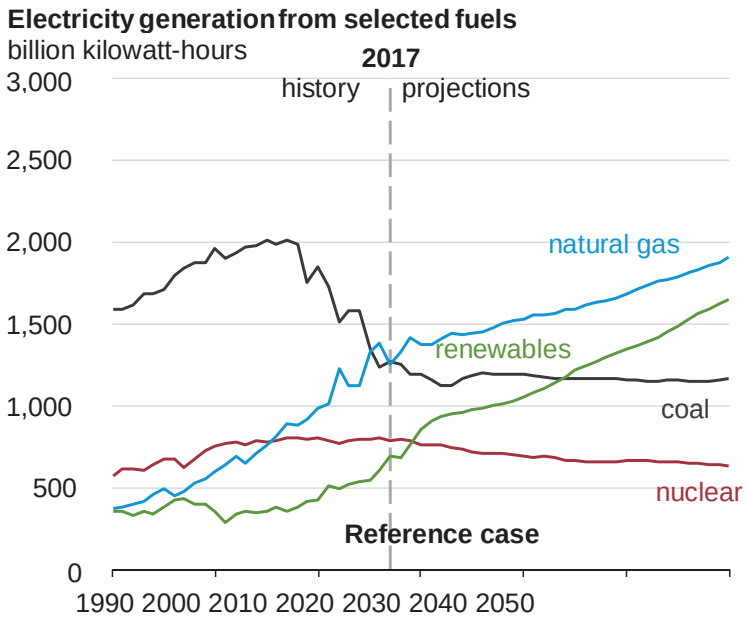
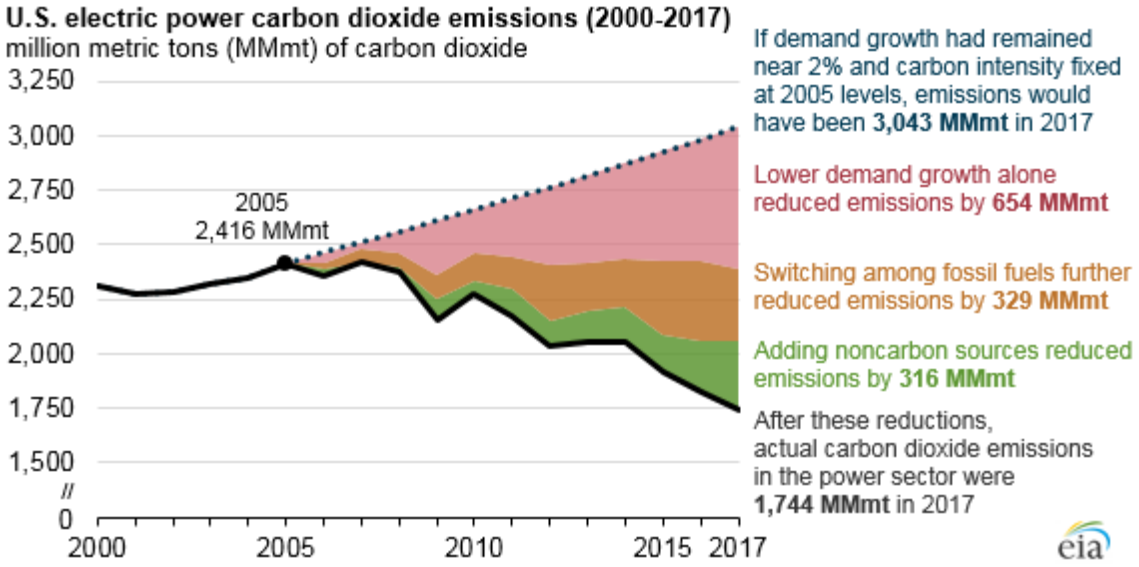
[71] William W. Buzbee, *The Tethered President: Consistency and Contingency in Administrative Law*, 98 B.U.L. Rev. 1358 (Oct. 2018).
[72] Order Granting Ps. Mot. For Summary Judgment at 19-20, *California v. BLM*, No. 3:17-cv-03804-EDL, Doc. No. 95 (N.D. Cal. Oct. 4, 2017).
[73] 83 Fed. Reg. at 44,750-51.
[74] *State Farm*, 463 U.S. at 43 (internal citations omitted).
[75] *Id.*
[76] 83 Fed. Reg. at 44,750.
[77] 1990 CAA LEG. HIST. 731, 791 (Nov. 1993) (discussing history of 1970 Clean Air Act).
[78] 83 Fed. Reg. at 44,751.



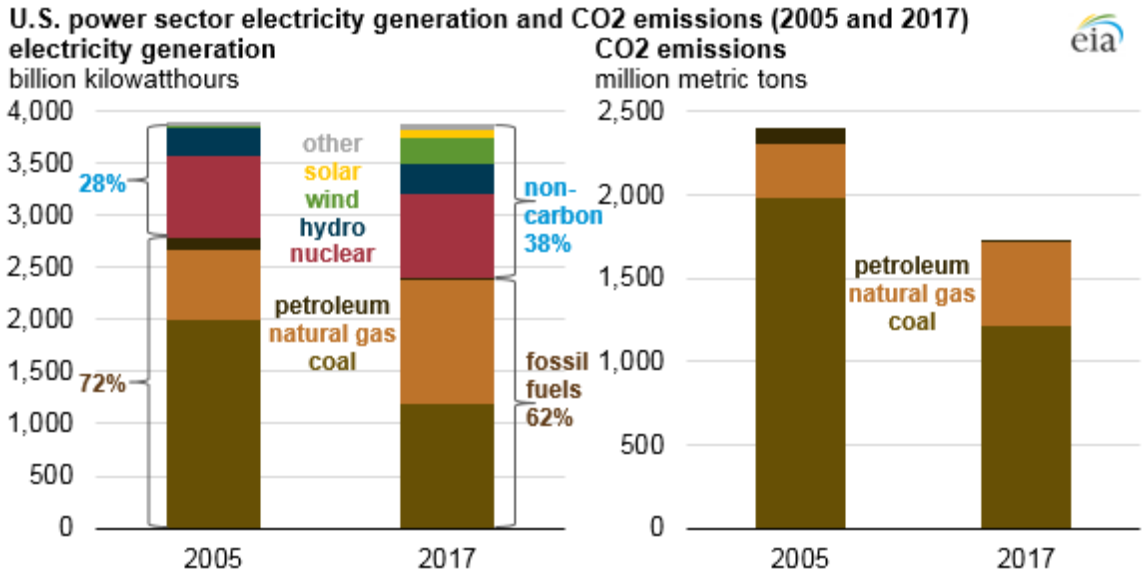
Source: EIA, Annual Energy Outlook 2018, at 83 (Feb. 6, 2018).

The U.S. electric power sector CO_2 emissions have declined by 28% since 2005 as a result of lower demand growth and substituting coal-fired generation with natural gas-fired and renewable generation. EIA concludes that these changes have been market and state policy-driven.[79] Notably, none of emissions decline is attributable to heat rate improvements – EPA's proposed best system of emission reduction.[80]



Source: EIA, "Carbon dioxide emissions from the U.S. power sector have declined by 28% since 2005," (Oct. 29, 2018).

[79] U.S. EIA, "Carbon dioxide emissions from the U.S. power sector have declined by 28% since 2005," (Oct. 29, 2018) https://www.eia.gov/todayinenergy/detail.php?id=37392.
[80] *Id.*

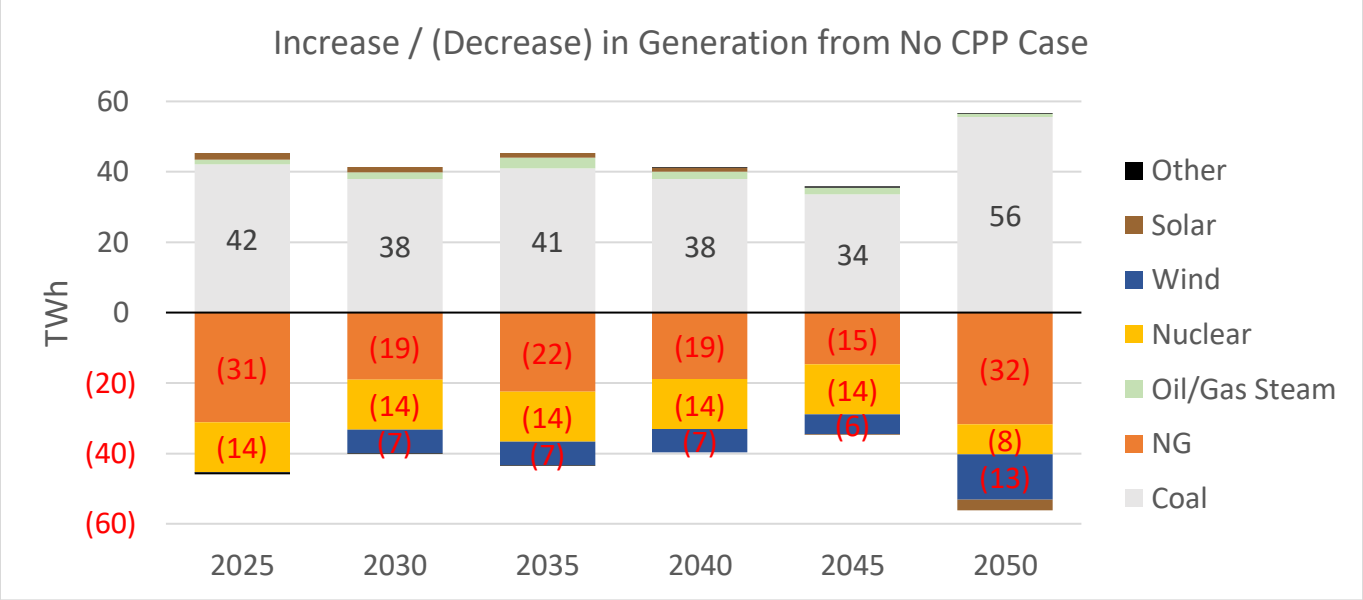


Source: EIA, "Carbon dioxide emissions from the U.S. power sector have declined by 28% since 2005," (Oct. 29, 2018).

EPA's own record shows, in line with the trends shown above, that from 2006 to 2016, coal-fired power plant generation decreased by 38%, natural gas-fired power plant generation increased by 69%, wind increased by 754%, and solar by 6997%.[81] But instead of leveraging these trends, EPA's own analysis demonstrates that the Proposal puts a thumb on the scale, as seen below, increasing generation from coal-fired power plants by 4%, while reducing natural gas-fired power plant generation by 8.2% and non-hydro renewables by 0.7%.[82] Under EPA's own modeling, as compared to No-Policy, the Proposal shifts generation from natural gas-fired units, nuclear and wind to coal-fired power plants each year from 2025 to 2050.

[81] RIA 2-5, tbl. 2-2.
[82] *Id.* at 3-25, tbl. 3-25.

Fig. C: Net Generation Increase and Decrease by Generating Source under the 4.5% Heat Rate Improvement at $50/kWh Scenario as Compared to the No CPP Case



Source: SSR spreadsheets accompanying RIA

Ironically, as seen above, despite EPA protestation that shifting generation is an improper measure upon which to base the best system of emission reduction, its own modeling shows that the Proposal encourages a shift from lower- and zero-emitting natural gas and nuclear plants to higher-emitting coal plants. The Proposal results in shifting generation, but in the opposite direction from the trends and trajectory of the affected sources and toward increased emissions. That is, EPA's modeling, when inspected closely, reveals the Agency's true intent is to shift the power sector back to reliance on coal.[83]

Even more alarming, the vast majority of what few CO_2 emission reductions (from the No CPP base) the Agency estimates in its emission impacts analysis for ACE, occur at gas plants due to this generation shift. EPA reports the emission changes under each policy scenario in its RIA, stating that as compared to the CPP, ACE increases CO_2 emissions by 60MM tons in 2030.[84] However, coal plants are actually increasing CO_2 emissions by 80MM tons in 2030, while gas plants, which are not subject to the Proposal, decrease their emissions by 20 tons.[85] As compared to No CPP, EPA claims that ACE reduces CO_2 emissions by 14MM tons in 2030,[86] however 60% of those emission reductions come from uncovered gas plants running less.[87] The numbers are even more stark in 2035 where EPA reports a 7MM tons decrease in CO_2 emissions as compared to No CPP, yet the affected coal plants *increase* emissions by 3MM tons.[88] That is, all of the CO_2 reductions EPA

[83] 83 Fed. Reg. at 44,753 (as EPA admits, it "is not the expert agency with regard to electricity management").
[84] RIA ES-8, tbl. ES-5.
[85] *Id.* at 3-19, tbl. 3-13. Table 3-13, which reports projected CO_2 emissions by generation source, includes two categories: "coal" and "all other." The "all other" category is primarily made up of natural gas combined cycle and combustion turbine units.
[86] *Id.* at ES-8, tbl. ES-6.
[87] *Id.* at 3-19, tbl. 3-13.
[88] *Id.* at ES-8, tbl. ES-6; 3-19, tbl. 3-13.

estimates for 2035 occur at gas plants. Looking across the three model run-years for which EPA projects emissions by generation source, coal reduced emissions by 6MM tons as compared to No CPP, while gas plants reduced emissions by 35MM tons.[89] Thus, even though it insist on a "source-oriented" approach to 111(d), the Agency is claiming the CO_2 reduction benefits from generation shifting away from sources (gas plants) that are not "affected sources" under the Proposal.

A best system of emission reduction based on reducing generation at higher-emitting affected sources is "achievable because it has been achieved" and continues to be achieved to great effect.[90] "The Clean Air Act requires EPA to look to the future."[91] It is antithetical to the statute for EPA to Propose a rule that slows, or even reverses, the trend toward lower-emitting electricity by forcing the country to rely more heavily on the outdated affected sources. EPA regulation must advance the state of the art, not suppress it.[92]

V. Heat rate improvements increases emissions from individual plants and the source category overall and therefore cannot legally be the *best* system of emission reductions.

EPA determined that a list of seven heat rate improvement measures of varying impact, including "technologies, equipment upgrades, and operating and maintenance practices" are the best system of emission reduction for the steam-generating power plants.[93] "States are expected to evaluate each of the BSER HRI measures in the candidate technologies in establishing a standard of performance for any particular source."[94] The Agency explains that "a large number of HRI measures have been identified"[95] but does not provide public notice of the identified measures. The Agency goes on to say that "some of those identified technologies have limited applicability and many provide only negligible HRI."[96] However, it is nowhere explained how the applicability is limited, where the measures would be applicable or what the Agency deems negligible. Instead, EPA identifies a list of measures identified as "most impactful," never explaining what that means or how it comports with the section 111(d) factors. This abbreviated and incomplete decisionmaking is insufficient for public notice[97] and does not reflect the "complex balancing"[98] required under section 111(d).

Notwithstanding, heat rate improvements cannot be the best system of emission *reduction* because not only are the expected emission reductions insufficient in light of the pollution crisis and the source category's contribution, especially as compared to other available and cost-reasonable options, but because they *increase* emissions.[99] As such, the Proposal is plainly unlawful.

EPA warned as much in the Clean Power Plan record:

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[89] *Id.* at 3-19, tbl. 3-13.
[90] *Nat'l Lime Ass'n v. EPA*, 627 F.2d 416, 432-33 (D.C. Cir. 1980).
[91] *See e.g. NRDC v. EPA*, 655 F.2d at 328.
[92] *See Int'l Harvester Co.*, 478 F.2d at 622-23 ("the state of the art has tended to meander along until some sort of regulation took it by the hand and gave it a good pull").
[93] 83 Fed. Reg. at 44,756.
[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] 5 U.S.C. § 553(b); 42 U.S.C. § 7607(d)(3).
[98] *Am. Elec. Power Co.*, 564 U.S. at 427.
[99] *Sierra Club,* 657 F.2d at 326.

> limiting the BSER to building block 1 measures would be unreasonable and contrary to the CAA. The BSER underlying the final Rule is a combination of the three building blocks that, when implemented, result in an achievable and significant degree of CO_2 emission reductions from the utility power sector. 80 FR 64,663; *see also id.* at 64,924 (projecting, by 2030, a 32% reduction in CO_2 emissions from 2005 levels). One of the factors that EPA must consider under section 111 is an assessment of the amount of emission reductions that can be achieved through applying a system of emission reduction. *See* 80 FR 64,721 (discussing *Sierra Club v. Costle*, 657 F.2d 298, 326 (D.C. Cir. 1981)). Excluding building blocks 2 and 3 would severely undercut the projections expected by 2030; in fact, reductions from building block 1 alone would be grossly insufficient to address the public health and environmental impacts from CO_2 emissions and limiting the BSER to efficiency measures might actually "exacerbate the insufficiency of the emission reductions." 80 FR 64,787; *see also id.* at 64,748 (expressing concern "that implementation of building block 1 in isolation not only would achieve insufficient emission reductions ... but also has the potential to result in a 'rebound effect.'"). Thus, in light of the significant CO_2 emission reductions attributable to building blocks 2 and 3, it would be unreasonable to limit the BSER to building block 1 measures alone. 80 FR 64727 ("heat rate improvements are a low-cost option that fit the criteria for the BSER, except that they lead to only small emission reductions for the source category.").[100]

EPA fails to overcome its previous record, merely concluding that while "emissions might increase at some generators,"[101] "system-wide emission decreases from heat rate improvement will likely outweigh any potential emission increases."[102] That emissions might increase at some generators automatically disqualifies heat rate improvement as the best system of emission reduction under EPA's own terms, where the "system" is "source-oriented" and states must evaluate the best system each individual plant on a case-by-case basis.

Even when examining only the system-wide effects, EPA fails to consider the full extent of "rebound." EPA must analyze all dimensions of emissions rebound to truly discern whether the Proposal will lead to increased emissions. There are two primary forms of emissions rebound: operational rebound and longevity rebound.

- <u>Operational Rebound</u> – Heat rate improvements at coal plants will reduce fuel costs and make short term, variable operations more cost competitive with other power plants in the same region. This may allow some coal plants to increase their generating output which would increase their emissions. The increase in emissions can be quantified on either a plant or system basis.
    - <u>Plant Utilization</u> – At the plant level, operational rebound reflects the additional emissions from increased generating output excluding the emission reductions caused directly by heat rate improvements at those plants. Since this measure does

[100] EPA, *Basis for Denial of Petitions to Reconsider and Petitions to Stay the CAA section 111(d) Emission Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units*, at 55, n. 75 (Jan. 11, 2017); *see also* 80 Fed. Reg., at 64,787; and 82 Fed. Reg., at 48,039, n.5 (acknowledging that the Clean Power Plan building block one cannot stand on its own).
[101] RIA 3-19, n. 18; 83 Fed. Reg. 44,761 ("under certain assumptions, sources that adopt HRI may increase generation, due to their improved efficiency and relatively improved economic competitiveness.").
[102] 83 Fed. Reg. at 44,756, n. 17, 44,761.

not reflect the impact of higher coal plant utilization on plant operations and emissions in the rest of the electric system, it is a partial measure of the emissions impact of heat rate improvements.

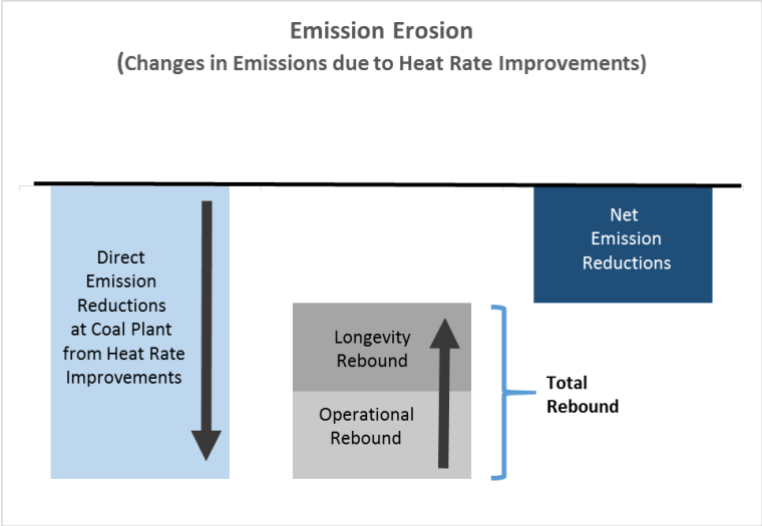
  - System Operations – On a system level, operational rebound reflects the net increase in system-wide emissions resulting from additional generating output at coal plants and reduced generating output from other power plants in the system. Because it captures the impact of increased coal plant utilization on emissions elsewhere in the system, it is a more complete measure of operational rebound.

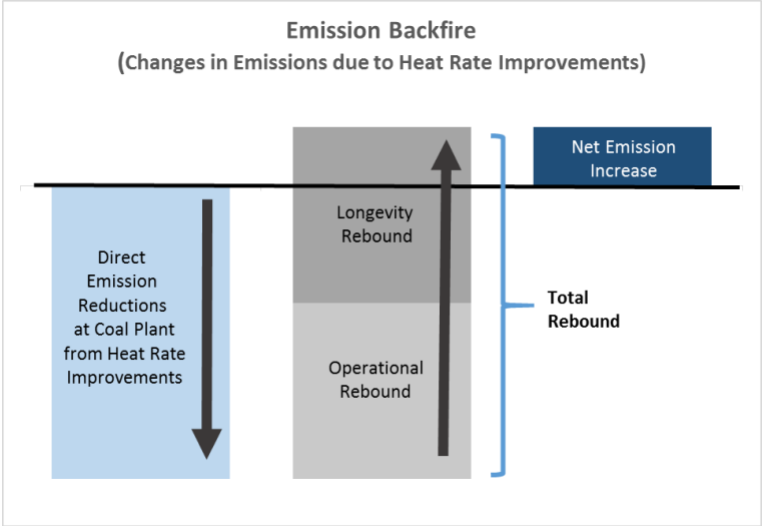
- Longevity Rebound – By making coal plants more cost competitive in comparison to other power plants in the same region, heat rate improvements may cause coal plants to operate for a longer period of time. This increases their generating output and emissions on a lifetime basis. As with operational rebound, this second form of rebound can be quantified on a plant or system basis. Since the term "life extension" often describes major capital investments that extend the lives of power plants for many years, this form of rebound might better be described as "longevity rebound".
  - Plant Life – At the plant level, longevity rebound reflects the incremental emissions from coal plants that result from their longer operating lives. As with operational rebound, this measure, limited as it is to the emissions from coal plants themselves, is a partial measure of longevity rebound.
  - Lifetime Mix – On a system basis, longevity rebound reflects the net impact of additional lifetime coal emissions and the emissions avoided at other power plants due to the longer lives of coal plants. Because it captures the system impacts of longer coal plant lives, it is a more complete measure of longevity rebound.

These forms of rebound can be compared to the emission reductions stemming directly from coal plant heat rate improvements to determine whether heat rate improvements cause total system emissions to increase or decrease. This can be done with the following terminology:

- Emissions "backfire" describes situations where total net system emissions increase relative to the system emissions without the heat rate improvements.
- Emissions "erosion" describes situations where total net system emissions decrease compared to system emissions without the heat rate improvements, but the decrease is less than what would be expected without emission rebound.

Graphically, these can be illustrated as follows:





On a percentage basis, emissions rebound can be expressed as:

$$\frac{[Direct\ Coal\ Plant\ Reductions - Net\ Reduction\ in\ Emissions]}{Direct\ Coal\ Plant\ Reductions}$$

With this convention, rebound between 0-100% of direct coal plant emission reductions yields net emissions reductions and rebound greater than 100% of direct coal plant emission reductions corresponds to net emissions increases, or backfire.

a. EPA entirely failed to consider the impact of total rebound at the plant utilization and plant life level.

Even though the Agency insists that heat rate improvement must be evaluated on a unit by unit basis,[103] it failed to consider the total rebound (operational and longevity) associated with individual

[103] 83 Fed. Reg. at 44,756.

plants operating more and longer, and the impact the increased pollution could have on the local population. EPA's own analysis concludes that the Proposal *will* result in an overall increase in generation from highly-polluting coal steam units,[104] and that "emissions might increase at some generators."[105] These admitted facts alone disqualify heat rate improvement from the best system of emission reduction, given that under the Proposal each unit would have its own determination.[106]

b. Operational Rebound: Heat rate improvements improve the economics of coal power plants and can move them up in the dispatch order leading to emissions erosion and backfire at the level of plant utilization and systems operation.

"[A] reduction in variable costs due to efficiency improvements can be expected to increase utilization."[107] This is because the change in generation costs at a coal plants affects the relative competitiveness of generation sources and therefore changes the generation mix. Emissions erosion and backfire result from higher-emitting, coal generation substituting for lower-emitting generation sources, as seen above at Fig. C. CATF performed its own analysis and an analysis of EPA's modeling to determine the potential operational rebound in response to the Proposal.

i. A screening analysis of operational rebound potential shows significant emission erosion and some emission backfire.

The NorthBridge Group (NorthBridge)[108] conducted a high-level screening analysis for CATF to identify regions and states where expected emission reductions are eroded or even undone (emissions backfire) by increased generation from high-emitting, affected sources. NorthBridge identified five regions and ten states where emission erosion is substantial, while one region experiences an emissions backfire.

This screening was conducted by dividing the United States into 18 regions which tend to dispatch jointly. Using publicly available hourly unit generation and fuel consumption data, as well as reported or estimated delivered fuel costs, an average annual dispatch price was calculated for each existing coal- and gas-fired unit. Within each region, the generating units were ordered into a dispatch stack with dispatch costs in ascending order. The dispatch prices of the existing coal units were then changed to reflect the fuel cost savings of specific heat rate improvement and the dispatch stack was reordered accordingly. The operational rebound is then estimated by comparing the baseline dispatch stack to the post-heat-rate-improvement dispatch stack. The increased utilization and emissions were calculated at a unit level and aggregated by state and region.

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[104] RIA 3-22.

[105] *Id.* at 3-19, n. 18; 83 Fed. Reg. 44,761 ("under certain assumptions, sources that adopt HRI may increase generation, due to their improved efficiency and relatively improved economic competitiveness.").

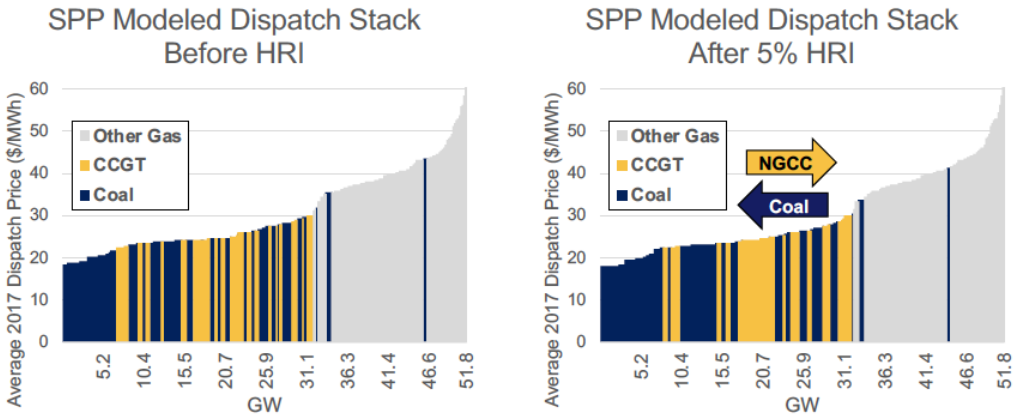
[106] 80 Fed. Reg. at 44,753 (Ironically, EPA criticizes the Clean Power Plan for regulating "at the level of an entire industrial sector," and "electric power writ large," while focusing on assumed sector-wide emission reductions under the Proposal rather than the potential emission increases at individual sources).

[107] Joshua Linn, *et al.*, *Regulating Greenhouse Gases from Coal Power Plants under the Clean Air Act*, 1 J. OF THE ASS'N OF ENVT'L AND RESOURCE ECONOMISTS 97, 100 (May 28, 2014).

[108] The NorthBridge Group is an economic and strategic consulting firm serving the electric and natural gas industries, including both regulated utilities and companies active in the competitive wholesale and retail markets. See http://www.northbridgegroup.com/. CATF commissioned NorthBridge to conduct an analysis of the potential for "rebound" from the Proposal.

Emission rebound occurs in regions that have a diverse generation mix, where a shift in dispatch costs could lead coal-fired generation to leapfrog over lower-emitting sources, run more frequently, and erode, if not reverse emission reductions associated with heat rate improvement. Some regions are not expected to have operational rebound due to a lack of coal capacity (California, New England, New York), a lack of gas-fired capacity (MISO East), or inexpensive coal units (Rockies).[109] However, in regions where the coal and gas fleet have similar capacity factors increased generation from coal-fired power plants is expected, leading to emission erosion or backfire. See for example, the Southwest Power Pool, below:

Fig. D: Southwest Power Pool Dispatch Order Before and After Applying 5% Heat Rate Improvement



Source: NorthBridge analysis of CEMS, ICE/10x, EIA Form 860 and EIA Form 923 data, via ABB Velocity Suite

Depending on the gas prices assumed, and the fleet-wide heat rate improvement implemented, assuming today's fleet, the emission rebound could erode up to 86% of expected emission reductions in some regions, with four regions seeing over 50% erosion. This means that, for example, a 4.5% heat rate improvement in the Southeast will be eroded to a 1.125% improvement under AEO 2025 fuel prices. Nationally, the 4.5% heat rate improvement would be eroded to a 3.6% improvement.

[109] This does not, however, mean that affected units in those regions will not be susceptible to increased emissions associated degradation of efficiency improvements or life extension.

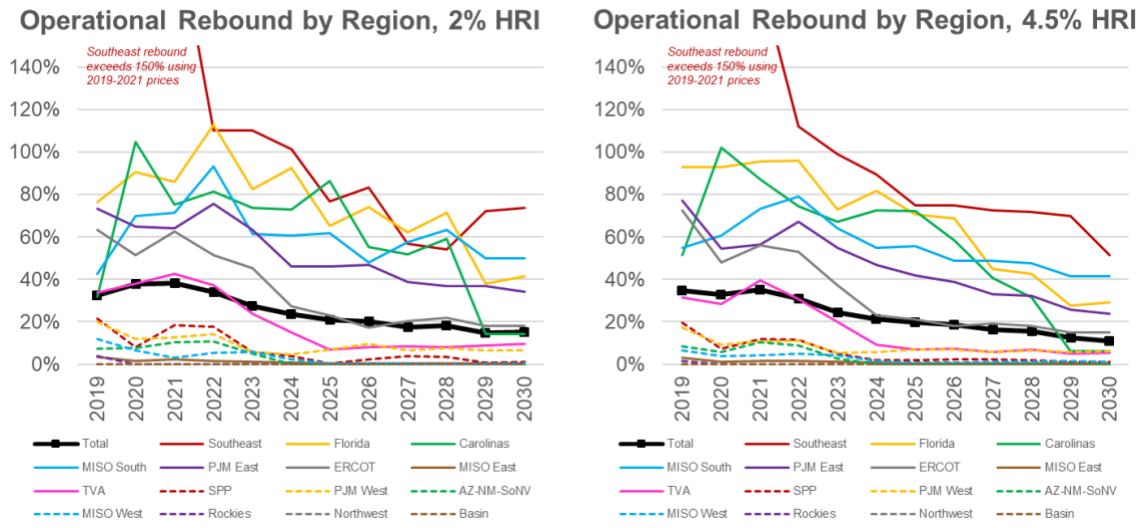
Fig. E: Emissions Erosion by Region with 2%, 4.5% and 6% Heat Rate Improvement Applied

Fuel Prices:	2017 Historical			NYMEX (2025)			NYMEX (2030)			AEO18 (2025)			AEO18 (2030)		
HRI Level:	**2%**	**4.5%**	**6%**	**2%**	**4.5%**	**6%**	**2%**	**4.5%**	**6%**	**2%**	**4.5%**	**6%**	**2%**	**4.5%**	**6%**
AZ-NM-SoNV	40%	34%	26%	32%	43%	47%	14%	13%	12%	0%	0%	0%	0%	0%	0%
Basin	4%	3%	2%	1%	1%	2%	5%	6%	5%	0%	0%	0%	0%	0%	0%
Carolinas	0%	3%	13%	0%	1%	4%	34%	19%	16%	86%	72%	64%	14%	6%	4%
ERCOT	29%	30%	29%	19%	23%	25%	32%	32%	35%	23%	21%	20%	18%	15%	15%
Florida	5%	11%	16%	3%	3%	5%	33%	40%	36%	65%	71%	66%	41%	29%	27%
MISO East	8%	7%	7%	5%	6%	6%	7%	6%	6%	0%	0%	0%	1%	0%	0%
MISO South	14%	19%	20%	1%	4%	5%	26%	30%	31%	62%	56%	51%	50%	41%	37%
MISO West	15%	11%	11%	14%	18%	17%	11%	10%	10%	0%	1%	1%	1%	1%	1%
Northwest	3%	5%	5%	0%	0%	1%	12%	6%	8%	0%	0%	0%	0%	0%	0%
PJM East	17%	16%	18%	5%	7%	9%	25%	21%	20%	46%	42%	38%	34%	24%	23%
PJM West	14%	13%	12%	8%	6%	6%	7%	10%	10%	7%	7%	6%	7%	6%	6%
Rockies	6%	5%	5%	6%	5%	5%	4%	7%	6%	0%	0%	0%	0%	0%	0%
Southeast	31%	29%	30%	39%	34%	36%	32%	24%	28%	77%	75%	75%	74%	52%	42%
SPP	28%	26%	23%	18%	23%	23%	27%	23%	20%	0%	2%	2%	1%	1%	1%
TVA	34%	26%	27%	6%	13%	11%	47%	35%	30%	7%	7%	5%	9%	5%	4%
US Average	**17%**	**16%**	**16%**	**11%**	**12%**	**13%**	**18%**	**16%**	**16%**	**21%**	**20%**	**19%**	**15%**	**11%**	**10%**

Source: NorthBridge modeling based on CEMS, ICE/10x, EIA Form 860, EIA Form 923, and NYMEX futures data, via ABB Velocity Suite, and EIA Annual Energy Outlook 2018 data

Using the 2018 EIA Annual Energy Outlook's forecasted natural gas prices delivered to the electric power sector by Electric Market Module region shows even higher operations rebound potential, especially before 2025. Fuel prices delivered to the electric sector vary by year in the Annual Energy Outlook, and future fuel prices are highly uncertain, thus these figures show the range of estimated operational rebound by region that could occur under a range of fuel price scenarios. That is, although ACE may not be in place in 2021, the operational rebound estimated for 2021 are relevant should actual delivered fuel prices in 2023 or later resemble the 2021 projection in the Annual Energy Outlook. As compared to no rule, a 2% heat rate improvement can lead to emissions backfire from operational rebound alone in three regions, and in two regions with a 4.5% improvement.

Fig. F: Emissions Erosion and Backfire at all Years (2019-2030) in the AEO Forecast for each Region after Applying a 2% and 4.5% Heat Rate Improvement



Source: NorthBridge modeling based on CEMS, EIA Form 860, and EIA Form 923 data, via ABB Velocity Suite, and EIA Annual Energy Outlook 2018 data

This high-level analysis is supported by two studies, which found similar national erosion of heat rate improvement due to increased utilization. One found that a 5% heat rate improvement was eroded by 22% across the fleet due to increased generation.[110] The other modeled an 8% heat rate improvement, which resulted in a 4% increase in coal generation, eroding 35% of expected emission reductions.[111]

Recently, Resources for the Future modeled a 4% heat rate improvement and found that it leads to an increase in coal generation and a *net increase* (emissions backfire), ranging from 2,000 to 1.5 million tons, in CO_2 emissions – which will likely be accompanied by increases in other, locally harmful air pollutants – in 2030 in eight states: Arizona, Florida, Idaho, Mississippi, New Jersey, Nevada, Oregon and Washington.[112]

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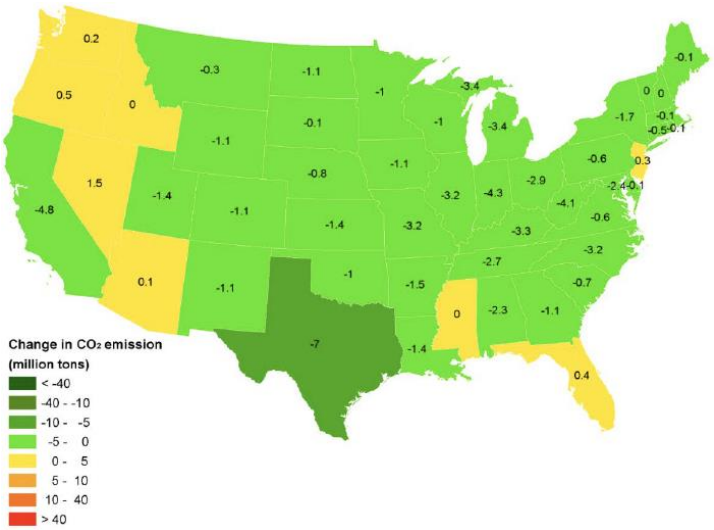
[110] Joshua Linn, *et al.*, *Regulating Greenhouse Gases from Coal Power Plants under the Clean Air Act*, 1 J. OF THE ASS'N OF ENVT'L AND RESOURCE ECONOMISTS 97, 130-31 (May 28, 2014).

[111] Peter Hansel, Duke Nicholas Inst., *Heat Rate Reductions and Carbon Emissions*, at 22 (Apr. 2014), *available at*: https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/8508/Heat%20Rate%20Reductions%20and%20Carbon%20Emissions%20-%20Peter%20Hansel%20MP%20Final.pdf;sequence=1.

[112] Amelia T. Keyes, *et al.*, Resources for the Future, *Carbon Standards Examines: A Comparison of At-the-Sources and Beyond-the-Source Power Plant Carbon Standards*, at 6 (Aug. 2018), *available at*: http://www.rff.org/files/document/file/RFF%20WP%2018-20.pdf.

Fig. G: Change in Estimated CO_2 Emissions in 2030 for an At-the-Source Scenario Compared to a No-Policy Reference Scenario

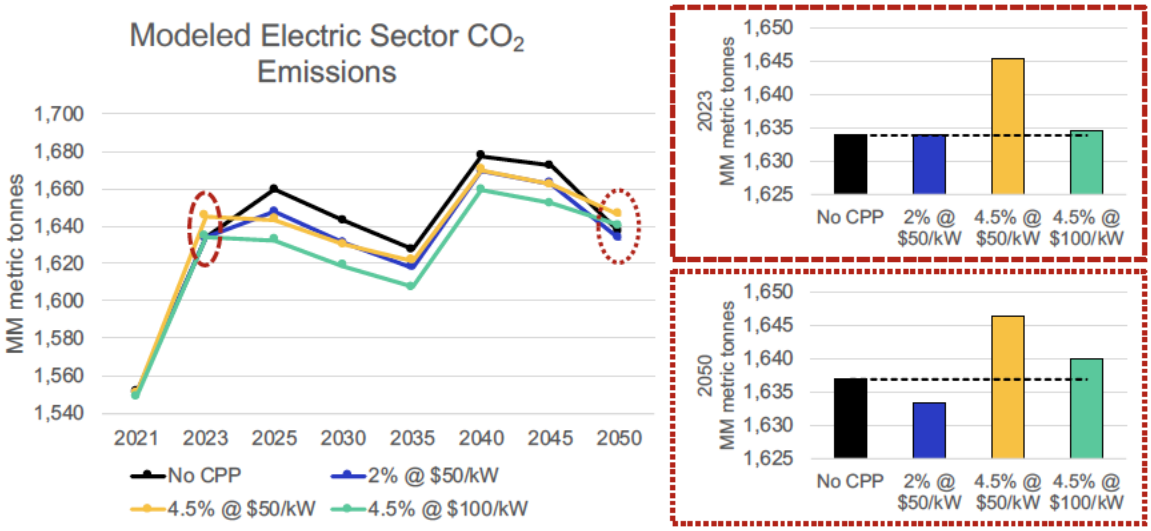


Source: Amelia T. Keyes, et al., Resources for the Future, Carbon Standards Examines: A Comparison of At-the-Sources and Beyond-the-Source Power Plant Carbon Standards, at 6 (Aug. 2018).

ii. EPA's own modeling shows significant operational rebound.

EPA's own modeling of the Proposal confirms NorthBridge's high-level screening analysis. In 2023, each of EPA's modeled policy scenarios leads to nationwide emissions backfire as compared to no rule at all. In 2050, the two scenarios which include New Source Review rollbacks lead to emissions backfire as well.

Fig. H: EPA's IPM Modeling Results, Comparing CO_2 Emissions under EPA's Three Policy Scenarios



Source SSR spreadsheets accompanying RIA

Moreover, over the 28-year policy modeling horizon (2023-2050), there are 18 states that are projected to have higher total emissions under the 4.5% heat rate improvement at $50/kW scenario, resulting in 193 million tons of additional CO_2, as compared to no rule at all. There are 13 states that experience cumulative emission increases under every modeled scenario. Forty states experience emission backfire during at least one of the modeled years.

Fig. I: States with Emission Increases under EPA's IPM Modeling of the Three Policy Scenarios

Cumulative 2023-2050 Emissions Increase	2% at $50/kW	4.5% at $50/kW	4.5% at $100/kW
Arkansas	6.9 MM tons, 0.7%	21.6 MM tons, 2.1%	13.5 MM tons, 1.3%
California	6.5 MM tons, 0.5%	33.8 MM tons, 2.6%	31.8 MM tons, 2.5%
Connecticut	1.6 MM tons, 0.7%	1.1 MM tons, 0.5%	2.1 MM tons, 1.0%
District of Columbia	0.0 MM tons, 1.3%	0.0 MM tons, 0.8%	0.0 MM tons, 14.3%
Florida	5.1 MM tons, 0.2%	15.1 MM tons, 0.5%	12.3 MM tons, 0.4%
Idaho	0.6 MM tons, 0.4%	0.1 MM tons, 0.0%	2.6 MM tons, 1.6%
Maine	0.9 MM tons, 1.2%	0.2 MM tons, 0.3%	0.9 MM tons, 1.2%
Maryland	3.7 MM tons, 1.6%	6.0 MM tons, 2.6%	8.7 MM tons, 3.7%
Massachusetts	1.3 MM tons, 0.5%	0.8 MM tons, 0.3%	2.4 MM tons, 0.9%
Nevada	1.0 MM tons, 0.2%	0.7 MM tons, 0.2%	1.6 MM tons, 0.4%
North Carolina	7.8 MM tons, 0.6%	18.1 MM tons, 1.5%	17.3 MM tons, 1.4%
Ohio	0.2 MM tons, 0.0%	20.8 MM tons, 0.9%	16.2 MM tons, 0.7%
Oregon	0.1 MM tons, 0.0%	0.2 MM tons, 0.1%	0.4 MM tons, 0.2%
Georgia	2.2 MM tons, 0.1%	12.4 MM tons, 0.8%	
Kentucky	3.2 MM tons, 0.3%		0.2 MM tons, 0.0%
New York	0.8 MM tons, 0.1%	0.2 MM tons, 0.0%	
Wisconsin		32.6 MM tons, 3.0%	2.7 MM tons, 0.2%
Alabama		20.9 MM tons, 1.4%	
Kansas	3.4 MM tons, 0.4%		
Rhode Island			0.0 MM tons, 0.0%
Tennessee		8.4 MM tons, 1.1%	
Washington			3.8 MM tons, 2.1%
Total	**45 MM tons, 0.3% in 17 states**	**193 MM tons, 1.2% in 18 states**	**116 MM tons, 0.9% in 17 states**

13 states

Source: State Emissions spreadsheets accompanying RIA

Operational rebound is estimated to exceed 60% in every modeled year for the 4.5% at $50/kW scenario, eroding the small emission benefits from heat rate improvements significantly. And, according to EPA's own analysis, in 2050, coal-fired power plants are being utilized so much more that the nation experiences a net overall emission increase as compared to no policy at all.

Fig. J: Calculating Operation Rebound in EPA's IPM Modeling[113]

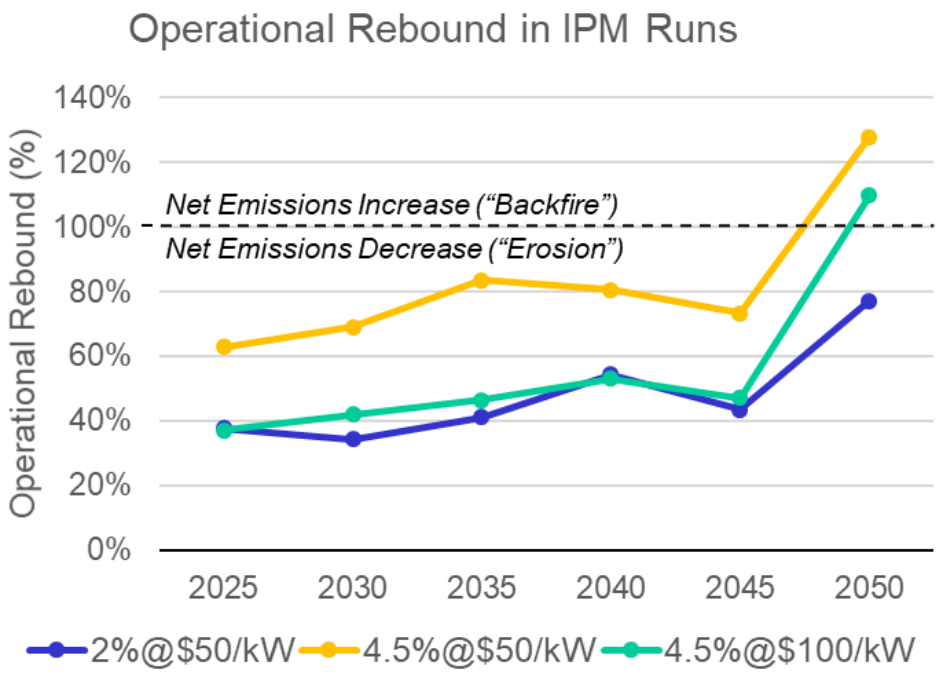


Fig. X. NorthBridge analysis of RPE spreadsheets accompanying RIA

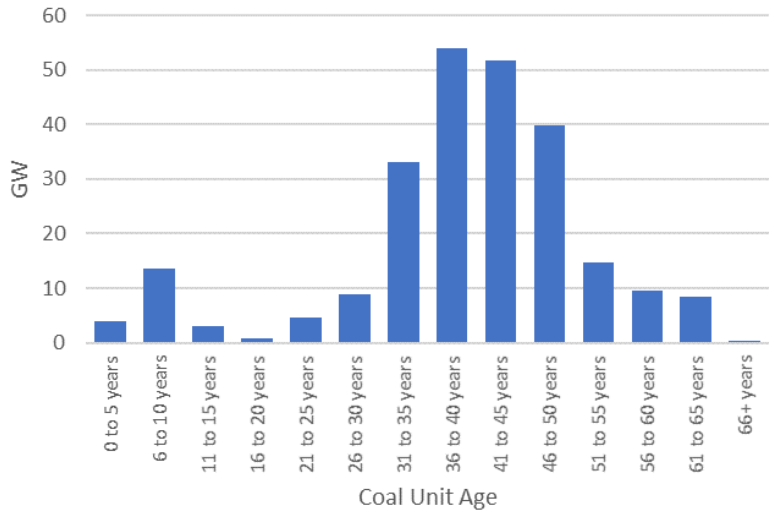
c. **Longevity Rebound: Heat rate improvements improve the economics of coal power plants and extend their lives leading to months or years of increased emissions.**

i. **Power plants are typically retired for economic reasons rather than on the basis of their engineering or accounting lives.**

The book accounting life of a new coal plant today is commonly around 40 years and the operational engineering life is generally close to 30 years. After that, coal plants will typically begin to need additional capital expenditures to replace and upgrade equipment in order to continue to run efficiently. However over 50% percent of the current coal fleet is at least 40 years old (as measured from the first in-service date), as shown in Figure K below, confirming the fact that coal plants are not usually retired on the basis of their engineering or accounting lives.

[113] Using the detailed IPM output, NorthBridge calculated CO_2 emissions rebound as follows: 1) Compare emission rates from the No CPP case and a given policy scenario to identify units undergoing heat rate improvements; 2) Calculate expected system-wide savings by applying heat rate improvement to No CPP emissions; 3) Compare expected emissions reductions to modeled reductions, accounting for increases in coal generation and decreases at other sources of generation.

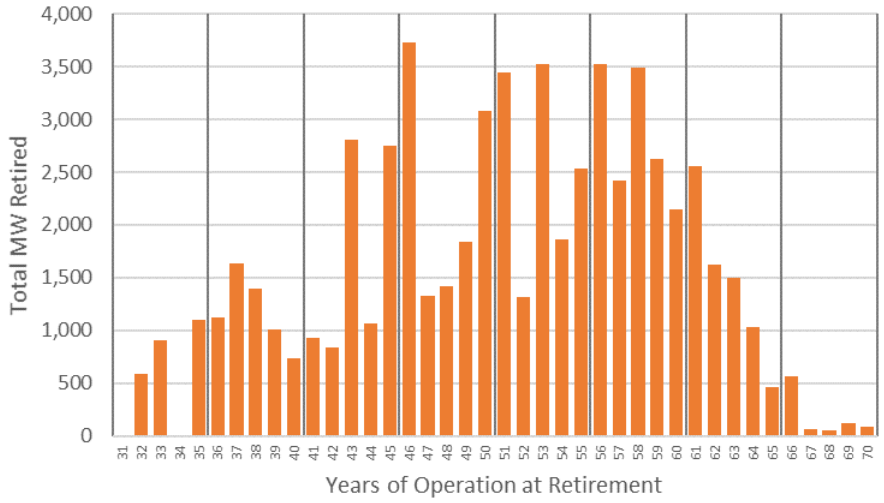
Fig. K: Distribution of Age in Currently Operating U.S. Coal Fleet



Source: NorthBridge analysis of ABB Velocity Suite data

Further, the coal plants currently in the fleet may continue to operate for a number of years beyond their current life. Over 50% of coal capacity that retired since 2008 was over 50 years old at the time, as demonstrated in Figure L below.

Fig. L: Coal Unit Age at Time of Retirement, Coal Units Retired 2008-Q3 2018



Source: NorthBridge analysis of ABB Velocity Suite data

This suggests most coal plants are operated for as long as they have economic value. For merchant power plants in competitive power markets, this means their profitability (the revenues they earn in the competitive power market less the costs of operating the plants). For power plants owned by rate regulated utilities, it means their value to ratepayers (the cost of the power supplies that would otherwise be needed to serve ratepayers less the cost of operating the coal plants). In this sense, power plants are similar to cars, home hot water heaters and many other consumer products that, once bought, are then used until they no longer have material value to their owners.

ii. The cost of operating coal plants and the time when owners typically decide to retire them are strongly influenced by the efficiency with which they convert fuel into electricity.

The efficiency with which power plants convert fuel into electricity is commonly referred to as a plant's heat rate, measured in the number of BTUs required to produce a kWh of electricity. Changing a power plant's heat rate will alter its total operating costs, as shown in the illustrative example in Table M below. A coal plant with $3.00/MMBtu coal, a 10,000 Btu/kWh heat rate and O&M costs of $5/MWh will have a total operating cost of 3 * 10 + 5 = $35/MWh, with fuel representing 85% of total operating costs. A 6% reduction in heat rate lowers its operating costs to $33.20/MWh, a 5% reduction. Conversely, a 6% increase in heat rate raises its operating costs by 5%.

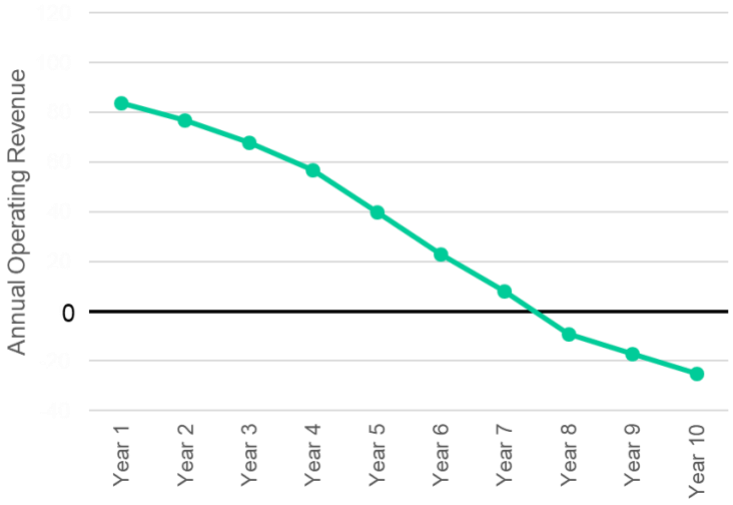
Table M: Illustration of Effect of Heat Rate on Operating Costs

Fuel Cost ($/MMBtu)	Heat Rate (Btu/kWh)	Variable O&M ($/MWh)	Total Operating Costs ($/MWh)
[A]	*[B]*	*[C]*	*= [A]*[B]/1000 + [C]*
$3.00	10,000	$5.00	$35.00
$3.00	9,400 (6% decrease)	$5.00	$33.20 (5.1% decrease)
$3.00	10,600 (6% increase)	$5.00	$36.80 (5.1% increase)

Typically, throughout the operating life of a coal plant, heat rates and O&M costs tend to increase as the efficiency of the fuel conversion process declines and the plant's original capital equipment starts to need replacement. This increase in fuel and O&M costs will make the plant less competitive with other, perhaps newer and more efficient, power plants in the same market region, causing the coal plant to operate fewer hours of the year, reducing its capacity factor. Variable operations, in turn, further increases, the plant's heat rate (because of the additional fuel needed to cycle boilers), raise total and average O&M costs, and reduce sales revenues.

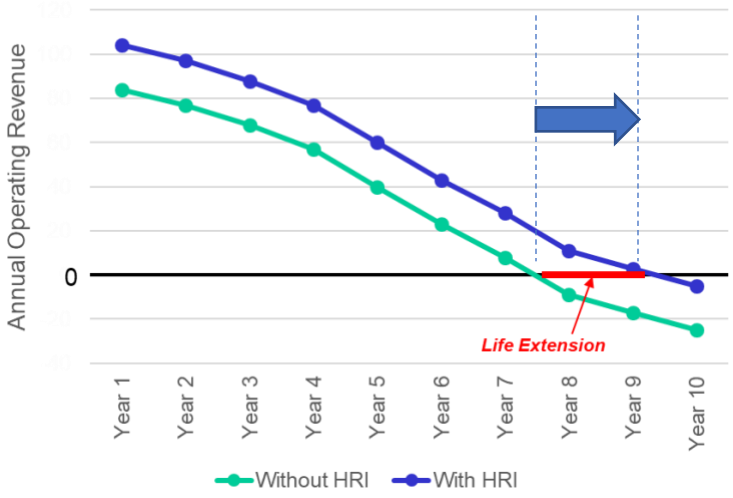
When total operating costs rise, and market revenues decline to the point where revenues are no longer sufficient to fully cover total operating costs, the plant is not profitable to its owners or producing savings to a utility's ratepayers. And when plant owners do not expect that condition to improve sufficiently over time, the plant is typically retired. An illustrative version of this dynamic is shown in Figure N below where a coal unit might expect to retire after seven years of operations before expecting to incur net operating losses.

Fig. N: Illustrative Annual Coal Unit Economics



Reducing a coal plant's heat rate increases its economic value in two ways, first by directly reducing its fuel costs per lWh generated and then also, as a consequence of its lower variable operating costs, by making it more competitive with other regional power plants. This can lead it to operate more hours of the year, increasing its capacity factor and sales revenues (and emissions). The reduction in costs and increase in revenues together increase the plant's profitability, if it is a merchant plant, or its ratepayer value, if it is owned by a regulated utility. Either way, this will tend to cause the plant to operate for a longer period of time. As shown by the blue line in Figure O below, the improved profitability or ratepayer value would allow this hypothetical coal unit to operate for nine years instead of seven.

Figure O: Illustrative Annual Coal Unit Economics



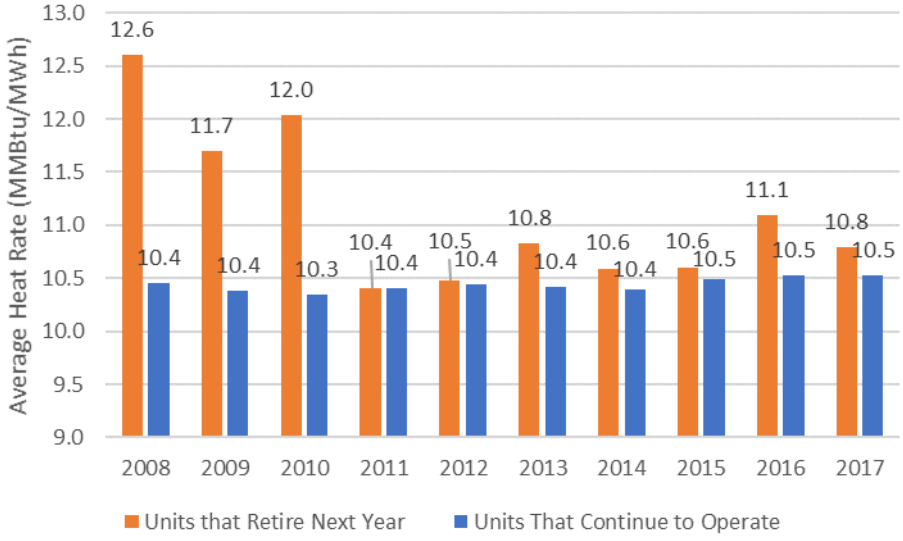
As a consequence, coal plants with relatively high heat rates and low capacity factors are more likely to retire and, conversely, coal plants with relatively low heat rates and high capacity factors are more likely to continue to operate.

iii. **This basic dynamic – that coal plants with relatively high heat rates and low capacity factors are more likely to retire, while coal plants with relatively low heat rates and high capacity factors are more likely to operate – is borne out by patterns seen in the U.S. coal fleet over the last ten years.**

The following charts consider the operating characteristics – namely heat rate and capacity factor – over the last ten years of coal units that retire and the remaining fleet that continues to operate. For a given year in each graph, the average operating characteristic is compared for coal units that retired in the next year and those that continued to operate for at least another year. For example, in the bars labeled "2008" the graph will compare the heat rate of the coal units that retire in 2009 to the heat rate of the coal units that operate in 2009 and beyond. The operation of coal units that retire in 2008 is not included in the 2008 data sample. By considering plants that will retire in the next year rather than in the current year, the comparison can avoid irregularities in operation that may occur in the last few months of a coal unit's operating life (e.g., operating more or less often to manage the remaining coal pile) and can consider a full year of operating data across the sample.

As expected, Figure P shows that the coal plants that retired over the last 10 years, on average, had higher heat rates than the coal plants that continued to operate during this period.

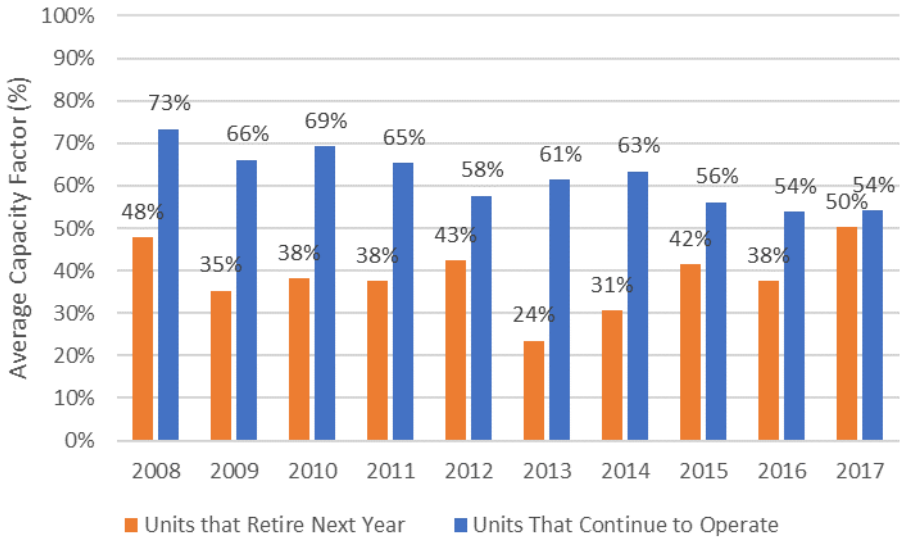
Fig. P: Average Heat Rate at Coal Units Nearing Retirement and Coal Units Continuing to Operate



Source: NorthBridge analysis of ABB Velocity Suite data

Similarly, Figure Q shows that the coal plants that retired over the last 10 years had lower capacity factors, on average, than the coal plants that continued to operate.

Fig. Q: Average Capacity Factor at Coal Units Nearing Retirement and Coal Units Continuing to Operate



Source: NorthBridge analysis of ABB Velocity Suite data

iv. Analysis shows that even short delays in the retirement of coal plants – measured in just a few months up to several years – can increase overall lifetime plant emissions.

In addition to the operational rebound discussed previously, the Proposal is susceptible to another type of emissions rebound that will reverse any potential CO_2 emissions reduction – increased emissions due to delayed retirement of coal units, or "longevity rebound." This occurs when a coal unit, on account of its reduced operating costs, delays its retirement and continues to generate output and emission for months or years when it would otherwise be shut down.

To demonstrate this concept, consider an illustrative coal unit that would be expected to operate for five years before retiring absent any heat rate improvement. For ease of computation, assume that coal unit generates 50 megawatt-hours in every month and has a CO_2 emission rate of 1 ton per megawatt-hour.[114] Also assume that this unit then undergoes a 2% heat rate improvement and, for ease of illustration, that it does not experience operational rebound (i.e., its generation does not increase after the heat rate improvement).

[114] Among the coal units modeled in the 2021 No CPP IPM run, the median CO_2 emission rate is 1.12 tons per megawatt-hour. A one ton per megawatt-hour average CO_2 rate would place a unit in the 95th percentile of modeled coal unit emission rates. NorthBridge analysis of "No CPP RPE File.xlsx" downloaded from Illustrative No CPP Scenario at https://www.epa.gov/airmarkets/analysis-proposed-ace-rule.

Table R: Generation and Emissions at Illustrative Coal Unit

	Before Heat Rate Improvement		After 2% Heat Rate Improvement		
	Generation (MWh)	CO_2 Emissions (tons)	Generation (MWh)	CO_2 Emissions (tons)	Change in Emissions (tons)
Per Month	50	50	50	49	-1
Per Year	600	600	600	588	-12
Over 5 Years	3,000	3,000	3,000	2,940	-60

This coal unit could potentially reduce its CO_2 emissions by 60 tons over the five years of its planned remaining life. If, however, the improved operating economics resulting from the heat rate improvement entice the coal unit's owner to delay retirement of the unit beyond its expected five years, then the 60-ton reduction could be quickly offset by emissions from the coal unit during its extended life.

As Table S shows below, the 60-ton emission reduction over the coal unit's planned operating life can be reversed in as little as one to four months of additional operating life. The precise breakeven number of months depends on the type of generation that would have otherwise operated had the coal unit retired on schedule. As a first example, suppose that a regulated utility owns the coal unit, and in choosing to extend the life of the coal unit, it chooses to delay the construction of a new zero-emissions generating resource that would have replaced the retiring coal unit's output.[115] In that case, each incremental megawatt-hour of coal generation increases system emissions by 0.98 tons over the zero-emissions alternative that would have otherwise produced power. Since the coal unit produces 50 megawatt-hours in each month in this example, it would take just over one month of additional coal unit operations to create 60 incremental tons of CO_2, completely offsetting the reductions of the previous five years.

A second example involves a merchant owner delaying retirement of a coal unit in an ISO like PJM, where the ISO schedules generators based on cost-based offers. In the absence of the coal unit, the ISO would have scheduled some mix of other coal, gas, oil, or zero-emissions resources, which, in the case of PJM in 2017, had an approximate average CO_2 emission rate of 1,300 lbs./MWh or 0.65 tons/MWh.[116] Operating the coal unit would increase system CO_2 emissions, albeit to a lesser extent than the first example, but would still reverse the savings of the previous five years in less than four months of additional operating life. This is shown in the following table.

[115] Projections of new capacity additions in the EPA's IPM data support this assumption. In the No CPP scenario, 87% of cumulative capacity additions by 2030 are hydro, wind, or solar resources. "No CPP SSR File.xlsx" downloaded from Illustrative No CPP Scenario at https://www.epa.gov/airmarkets/analysis-proposed-ace-rule.

[116] PJM's Internal Market Monitor reports that in 2017, coal was the marginal fuel in 32.3% of hours, gas in 53.3% of hours, oil in 5.5% of hours, and zero-emissions resources in the remainder of the hours. Using approximate CO_2 emissions rates of 2,100 lbs./MWh for coal, 1,000 lbs./MWh for gas, and 1,650 lbs./MWh for oil yields an estimated marginal system CO_2 emission rate of 1,300 lbs./MWh or 0.65 tons/MWh. Data downloaded from http://www.monitoringanalytics.com/data/marginal_fuel.shtml.

Table S: Illustrative Emissions Increase Induced by Delayed Retirement

Alternative to Coal Generation	Average CO_2 Emission Rate of Displaced Generation (tons/MWh)	Coal Unit CO_2 Emission Rate after 2% HRI (tons/MWh)	Increase in System CO_2 Emissions Per Additional Coal MWh (tons)	MWh from Coal Unit Needed to Produce Additional 60 tons of CO_2	Months Needed to Produce Additional 60 tons of CO_2
	[A]	[B]	[C] = [B]–[A]	[D]= 60/[C]	=[D]/50
Zero Emissions Resource	0.00	0.98	0.98	61.2	1.22
PJM Marginal Resource Mix	0.65	0.98	0.33	181.8	3.64

In either case, a short increase in the operating life of a coal unit can reverse and negate all of the CO_2 reductions that accrue over a longer period of time. To illustrate the robust nature of this conclusion, Table T below extends this illustrative example to a coal unit with a 5-, 10- or 20-year expected life under a 2%, 4.5%, or 6% heat rate improvement using a zero emissions resource and the marginal PJM fuel mix as the representative displaced resources.[117]

Table T: Illustrative Minimum Life Extension Needed to Reverse CO_2 Emissions Reductions from Heat Rate Improvements (No Operational Rebound)

		2% HRI		**4.5% HRI**		**6% HRI**	
		Displacing Zero Emissions Resource	*Displacing PJM Average Marginal Resource Mix*	*Displacing Zero Emissions Resource*	*Displacing PJM Average Marginal Resource Mix*	*Displacing Zero Emissions Resource*	*Displacing PJM Average Marginal Resource Mix*
Expected Life:	**5 years**	1.2 months	3.6 months	2.8 months	8.9 months	3.8 months	12.4 months (1.0 years)
	10 years	2.4 months	7.3 months	5.7 months	17.7 months (1.5 years)	7.7 months	24.8 months (2.1 years)
	20 years	4.9 months	14.5 months (1.2 years)	11.3 months	35.4 months (3.0 years)	15.3 months (1.3 years)	49.7 months (4.1 years)

The results on this table are predictable and demonstrate both EPA's true objective and the unlawfulness of the Proposal.[118] Delayed retirement of coal plants, measured in just months, not years, has the potential to undo any of the emission reductions that accrued on account of heat rate improvements during the original planned operating lives of the coal plants.

[117] While it is possible that the resource mix displaced by the extended life of a coal unit could have a higher CO_2 emission rate than what is shown here, if current trends favoring construction of natural gas combined cycles, solar, and wind continue, the resources displaced in the future become more and more likely to have a lower CO_2 emission rate.
[118] *See* Joint Environmental Comments on NSR Issues.

As mentioned earlier, this example assumed that the illustrative coal unit experienced no increase in its annual generation as a result of its heat rate improvement. This understates the risk that the Proposal will increase emissions over a plant lifetime basis. If there were an increase in the unit's capacity factor, as may well occur, an even shorter delay in retirement would be sufficient to create a net increase in lifetime emissions. This is because, as discussed before, emission rebound includes both the rebound from delayed retirements ("longevity rebound") and rebound from increasing capacity factors at coal units ("operational rebound"). Table U below recreates the results of Table T but now incorporates the approximate level of operational rebound tied to the dispatch in the 2025 IPM results. As shown earlier in Figure J, an approximately 35% operational rebound is embedded in the 2% HRI scenario and an approximately 60% operational rebound is embedded in the 4.5% HRI at $50/kW scenario.

Table U: Illustrative Minimum Life Extension Needed to Reverse CO_2 Emissions Reductions from Heat Rate Improvements (with Operational Rebound)

		2% HRI		**4.5% HRI**	
		35% Operational Rebound		60% Operational Rebound	
		Displacing Zero Emissions Resource	*Displacing PJM Average Marginal Resource Mix*	*Displacing Zero Emissions Resource*	*Displacing PJM Average Marginal Resource Mix*
Expected Life:	**5 years**	0.8 months	2.4 months	1.1 months	3.5 months
	10 years	1.6 months	4.7 months	2.3 months	7.1 months
	20 years	3.2 months	9.5 months	4.5 months	14.2 months (1.2 years)

Further, to experience a nationwide net CO_2 emission increase due to a combination of operational and longevity rebound does not require that every coal unit delay retirement by this modest amount but only that the coal fleet on average operate over a longer period of time. Long delays at a small subset of the coal fleet can have an outsized impact on the average coal fleet life. The data used in Figures K and L show that the average age of the currently operating U.S. coal fleet is 39 years, and the average age of coal units that have recently retired is 49. Therefore, ten years is a reasonable expectation of the average remaining life of the coal fleet. According to Table U, extending the average life of the fleet by two to seven months in the 4.5% HRI at $50/kW policy case could create total system emissions backfire. Table V below illustrates a few feasible pathways by which the coal fleet could achieve these average lifetime increases.

Table V: Scenarios That Produce a 2.3 Month or 7.1 Month Average Increase to Coal Fleet Operating Lives

2.3 Month Average Increase *(Tied to 4.5% HRI at $50/kW with lifetime extensions displacing zero emissions resource)*	**7.1 Month Average Increase** *(Tied to 4.5% HRI at $50/kW with lifetime extensions displacing PJM average marginal resource mix)*
• 30% of MW extend by 8 months Or • 5% of MW extend by 12 months, and • 30% of MW extend by 6 months Or • 2% of MW extend by 2 years, and • 5% of MW extend by 1 year, and • 20% of MW extend by 6 months Or • 4% of MW extend by 5 years	• 30% of MW extend by 2 years Or • 5% of MW extend by 4 years, and • 20% of MW extend by 2 years Or • 2% of MW extend by 5 years, and • 10% of MW extend by 3 years, and • 19% of MW extend by 1 year Or • 3% of MW extend by 10 years, and • 7% of MW extend by 3 years, and • 8% of MW extend by 1 year

v. Analysis shows that the magnitude of additional emissions resulting from this "longevity" rebound can be very large in absolute terms, perhaps exceeding the annual emission reductions forecasted by EPA in support of the proposed rule.

A coal plant may of course extend its life beyond these minimum breakeven periods, and this can result in substantial increases in lifetime emissions. There are a couple ways to think about how to put these potential emissions increases into perspective.

First, consider a hypothetical 500 MW coal unit with operating characteristics similar to the median coal unit in the 2021 No CPP case: a 55% capacity factor and a 1.12 tons/MWh CO_2 emission rate.[119] This generator would emit around 2,700,000 tons of CO_2 in a typical year without any heat rate improvement, or 2,580,000 tons at this level of utilization after a 4.5% heat rate improvement. Delaying retirement by one year and operating the coal unit in place of zero emissions resources would then add approximately 2,580,000 tons of emissions to the system, or more if the unit's capacity factor increased.

To put this potential CO_2 emissions increase in perspective, note that compared to the No CPP case the 4.5% HRI at $50/kW scenario is modeled in IPM to deliver nationwide CO_2 reductions of approximately 18 million tons in the 2025, 14 million tons in 2030, and 7 million tons in 2035.[120] Yet, as seen in the example above, one extra year of operating life at this typical coal generator can add about 2.6 million tons of CO_2 emissions to the system in the year of previously unplanned operation. Longevity rebound at a single, typical coal generator can put a significant dent into the

[119] NorthBridge analysis of "No CPP RPE File.xlsx" downloaded from Illustrative No CPP Scenario at https://www.epa.gov/airmarkets/analysis-proposed-ace-rule.
[120] SSR files downloaded from Illustrative No CPP Scenario and 4.5% HRI at $50/kW Scenario at https://www.epa.gov/airmarkets/analysis-proposed-ace-rule.

projected CO_2 emissions reductions for the entire nation, and the actions of several coal units can quickly undo projected nationwide emission reductions.

A second point of comparison would be the emission reductions achieved by this hypothetical 500 MW coal plant in the years it operated with the heat rate improvement but before its planned retirement was delayed. In these years a 4.5% heat rate improvement could reduce annual unit emissions by 120,000 tons assuming no operational rebound, but with a 60% operational rebound the system-wide CO_2 reductions would be approximately 50,000 tons each year.

On balance, adding one year to the operating life of a coal unit that would be expected to operate for five years would lead to approximately 2,330,000 tons of increased system CO_2 emissions (250,000 tons of reductions total across five years and an increase of 2,580,000 tons in the sixth year), as seen in the top left entry in Table [O] below. Together, Table [O] and Table [N] show the total system CO_2 emission increases that would be created across a variety of assumptions for the unit's planned life and potential longer lives under a 4.5% heat rate improvement program involving the approximately 60% operational rebound associated with the 2025 IPM run. As shown in those tables, total system emission increase between 40,000 tons and 25,524,000 tons

Table W: Potential Increase in Lifetime System CO_2 Emissions Due to Operational and Longevity Rebound at Typical 500 MW Coal Unit Under 4.5% Heat Rate Improvement at $50/kW Policy (Extended Life of Coal Unit Causes Displacement of Zero Emissions Resources)

		Duration of Additional Operating Life			
		1 year	**3 years**	**5 years**	**10 years**
Expected Life:	**5 years**	2,334,000 tons	7,487,000 tons	12,641,000 tons	25,524,000 tons
	10 years	2,091,000 tons	7,244,000 tons	12,398,000 tons	25,281,000 tons
	20 years	1,605,000 tons	6,759,000 tons	11,912,000 tons	24,795,000 tons

Table X: Potential Increase in Lifetime System CO_2 Emissions Due to Operational and Longevity Rebound at Typical 500 MW Coal Unit Under 4.5% Heat Rate Improvement at $50/kW Policy (Extended Life of Coal Unit Causes Displacement of PJM Average Marginal Resource Mix)

		Duration of Additional Operating Life			
		1 year	**3 years**	**5 years**	**10 years**
Expected Life:	**5 years**	768,000 tons	2,790,000 tons	4,811,000 tons	9,865,000 tons
	10 years	525,000 tons	2,547,000 tons	4,568,000 tons	9,623,000 tons
	20 years	40,000 tons	2,061,000 tons	4,083,000 tons	9,137,000 tons

vi. The IPM model used by EPA in its RIA and many similar electric system models are not designed to analyze heat rate improvement-driven longevity rebound and because of this their modeling results are highly unlikely to capture its emissions impacts.

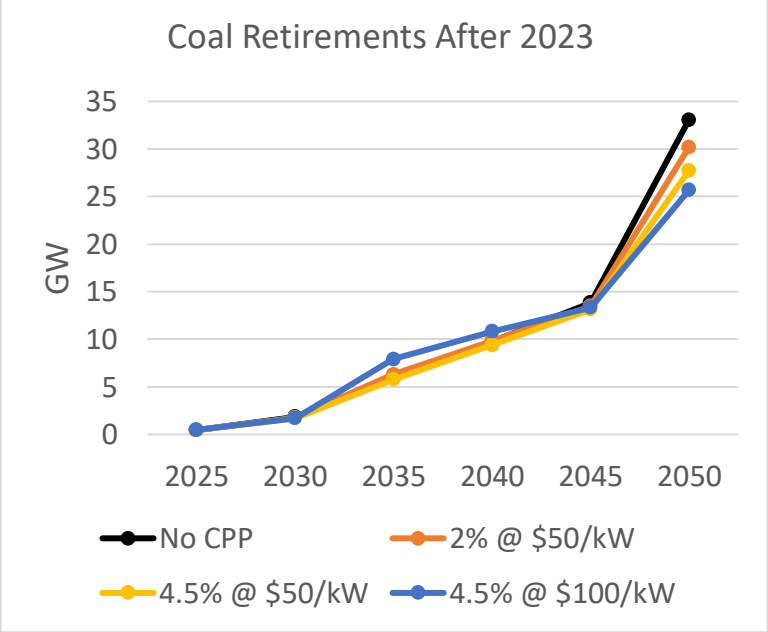
Most of the modeling platforms used by EPA and other parties to analyze the proposed ACE rule are long-term, nationwide capacity expansion models. These models, because of the inherent complexity of representing the national electric grid over several decades, are necessarily simplified representations of the real electric system. Among other simplifications, these models tend to have limited temporal granularity. At best, they analyze each year taken as a whole rather than each season or month individually. So, in effect, they assume all decisions in any given year are made at one point in time during that year, often at the beginning or mid-point of the year. Other models, like the version of IPM used by EPA in its RIA, only analyze one year in every five years, believing the modeled years are fairly representative of the years in between. These design decisions may well be reasonable given the original purposes of these models, but the lack of temporal granularity means they will not capture the relatively short-term retirement dynamic that is central to longevity rebound. As demonstrated, significant longevity rebound may result from delaying the retirement of coal plants by as little as a few months to a few years. This dynamic along with its emissions consequences will not be captured in all these models.

vii. However, EPA's own modeling of the Proposal contains some evidence of coal plants extending their lives.

Even EPA's own modeling shows some evidence that heat rate improvements lower operating costs and delay retirement of coal-fired power plants. As compared to today, with no rule regulating CO_2 pollution from existing power plants, the Proposal results in fewer coal plants retiring in 2050, along with an increase of 21 million metric tons of CO_2. It is possible that these are plants that would have retired, but for the heat rate improvements and exemption from New Source Review that extended

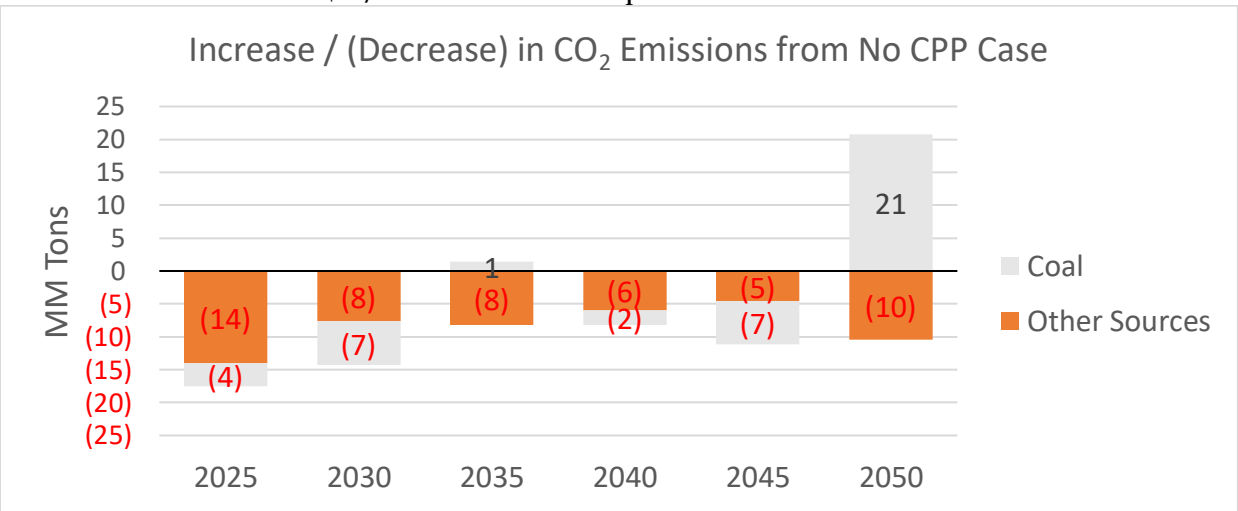
their economic lives. After 2023, coal retirements in the policy cases are between 2.9 to 7.4 GW lower than the No CPP case.

Fig.Y: Comparing Coal Retirements from EPA's IPM Modeling of Various Scenarios



Source: NorthBridge analysis of SSR spreadsheets accompanying RIA

Fig. Z: Net Emissions Increase and Decrease by Generating Source under the 4.5% heat rate improvement at $50/kWh Scenario as Compared to the No CPP Case



Source: NorthBridge analysis of RPE spreadsheets accompanying RIA

d. The combined rebound effect will also lead to increased emissions of criteria and hazardous air pollutants causing dangerous health impacts.

As discussed above, "enhancing plants' thermal efficiency may ironically cause more absolute damage to the climate,"[121] and public health, undermining the purposes of the Clean Air Act and section 111. Power plants with lower heat rates not only tend to produce more generation but also produce enough additional generation to overcome the efficiency improvement and ultimately emit more total tons of CO_2 and other dangerous pollutants with significant health consequences.[122] It is insufficient to analyze nationwide rebound effects, the Agency must analyze and understand the impact of heat rate improvements at specific units on co-pollutant emissions, which have significant consequences for local air quality and public health.

A scenario based on a 4% heat rate improvement across the fleet was modeled in 2015.[123] This scenario resulted in coal-fired power plants increasing generation in 2020 by 1.9% (32 TWh) thereby increasing annual SO_2 emissions by 3%.[124] The scenario also results in increases in annual $PM_{2.5}$ and peak ground level ozone concentrations.[125] Due to the increased pollution associated with the operational rebound effect, this scenario results in an increase in premature deaths and heart attacks.[126] This is in stark contrast with a modeled scenario similar to the Clean Power Plan, which resulted in 3,500 estimated premature deaths *avoided* annually by 2020.[127]

The study's authors released a map, Fig. AA, below, showing that "[i]f EPA replaces the Clean Power Plan with a narrower 'inside the fence line' alternative, it will [also] drive up fine particle pollution."[128]

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[121] Don Grant, *et al.*, *A Sustainable "Building Block"?: The Paradoxical Effects of Thermal Efficiency on U.S. Power Plants' CO_2 Emissions*, 75 ENERGY POLICY 398 (Dec. 2014).
[122] *Id.*
[123] Charles T. Driscoll, *et al.*, *US power plant carbon standards and clean air and health co-benefits*, 5 NATURE CLIMATE CHANGE 535 (June 2015).
[124] *Id.* at 536.
[125] *Id.* at 537.
[126] *Id.* at 538.
[127] *Id.*
[128] Syracuse University, *Study: Clean Power Plan Replacement Worse than Nothing, Costs More than 3,500 Lives and $33B Yearly*, (Oct. 10, 2017) https://news.syr.edu/2017/10/study-clean-power-replacement-worse-than-nothing-costs-more-than-3500-lives-and-33b-yearly/.

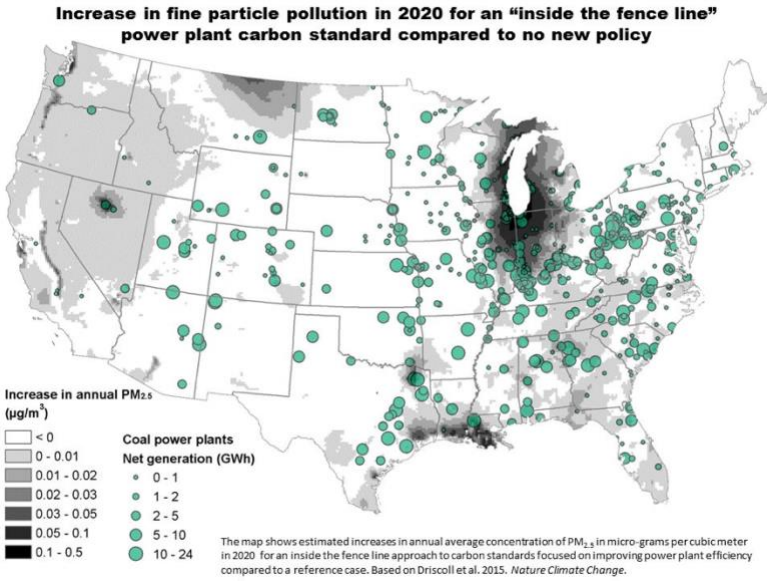

Fig. AA: Syracuse University, Study: Clean Power Plan Replacement Worse than Nothing, Costs More than 3,500 Lives and $33B Yearly, (Oct. 10, 2017).

These results were confirmed in the recent Resources for the Future modeling of a 4% heat rate improvement.[129] They found an increase of 2.7% in national SO_2 emissions in 2030 as compared to a no-policy scenario. "The bottom line is that the 'inside the fence line' approach would do more harm than good. Not only would it cause thousands of extra deaths and cost billions every year compared to the Clean Power Plan, it would inflict more harm than doing nothing at all."[130]

Indeed, even EPA's own flawed analysis recognizes that the Proposal will result in as many as 1,630 premature deaths in 2030 as compared to the Clean Power Plan.[131] EPA fails to disclose the health impacts of the Proposal as compared to no policy, even though it will result in at least 4,000 tons more SO_2 emissions in 2025.[132] The foremost purpose of the Clean Air Act is to "promote the public health and welfare;" a rule that results in additional premature death is patently illegal.

e. Heat rate improvements degrade over time.

Additionally, EPA acknowledges throughout the Proposal that coal plant efficiency degrades over time but fails to take this degradation into account. For example, EPA explains that particulate matter build up "degrades the performance of the heat transfer equipment and negatively affects the efficiency of the plants;"[133] turbine efficiency "degrade[s] over time;"[134] heat transfer devices,

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[129] Amelia T. Keyes, *et al.*, Resources for the Future, *Carbon Standards Examines: A Comparison of At-the-Sources and Beyond-the-Source Power Plant Carbon Standards*, at 11 (Aug. 2018), *available at*: http://www.rff.org/files/document/file/RFF%20WP%2018-20.pdf.

[130] Syracuse University, *Study: Clean Power Plan Replacement Worse than Nothing, Costs More than 3,500 Lives and $33B Yearly*, (Oct. 10, 2017) https://news.syr.edu/2017/10/study-clean-power-replacement-worse-than-nothing-costs-more-than-3500-lives-and-33b-yearly/.

[131] RIA 4-33, tbl. 4-6.

[132] *Id.* at ES-10, tbl. ES-8.

[133] 83 Fed. Reg. at 44,757.

[134] *Id.* at 44,758.

including an economizer "will degrade with time and use;"[135] and a "condenser degrades due to fouling of the tubes and air in-leakage."[136]

Despite the clear acknowledgment of degradation, EPA does not describe the amount of degradation expected or the costs of maintaining the constantly eroding heat rate. Moreover, the regulations do not protect against states finalizing weak standards in anticipation of, or due to degradation. Proposed section 60.24a(e) allows the states to apply a standard differently to an individual plant based on several factors. Further, upon degradation states have the option of replacing the source's standard of performance in a plan revision.[137]

That EPA's chosen system of emission reduction is constantly degrading undermines its credibility as the best system, and EPA's failure to consider degradation and protect against it in the implementing regulations, renders the Proposal unreasonable. Moreover, EPA fails to analyze or consider an important aspect of its proposed "system."

VI. EPA's rejection of co-firing as the best system of emission reduction is entirely unsupported, fails to overcome the record underlying the Clean Power Plan and neglects the trends within the source category.

EPA fails to overcome the record on the availability of co-firing developed in the Clean Power Plan; fails to support its rejection of co-firing as part of the best system in the record accompanying this Proposal; and fails to recognize the reality that many affected sources are co-firing with natural gas or converting to gas and reducing emissions to a greater degree than available from heat rate improvements and at a reasonable cost. These multiple failures render the Proposal arbitrary, capricious and unlawful.

In the Clean Power Plan rulemaking, the Agency determined that "co-firing and CCS[138] measures are technically feasible and within price ranges that the EPA has found to be cost effective in the context of other GHG rules, that a segment of the source category may implement these measures, and that the resulting emission reductions could be potentially significant"[139] However, EPA did not finalize emission guidelines based upon co-firing or CCS because it determined that it was unlikely that affected units would comply with the performance standards through these measures "rather, the EGUs would rely on the lower cost options of substituting lower- or zero-emitting generation or, as a related matter, reducing generation."[140] EPA made this determination after significant analysis. EPA evaluated the trends in the industry, the costs and performance impacts of switching from coal to gas, the potential emission reductions and the cost of reductions.[141]

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[135] *Id.*
[136] *Id.*
[137] *Id.* at 44,809 (proposed 40 C.F.R. § 60.5755(e)).
[138] *See* CATF & NRDC Comments on Carbon Capture and Sequestration submitted to this docket today.
[139] 80 Fed. Reg. at 64,727; *see also id.* at 64,756 ("Most coal-fired EGUs could be modified to burn natural gas instead, and the potential CO[2] emission reductions from this measure are large--approximately 40 percent in the case of conversion from 100 percent coal to 100 percent natural gas, and proportionately smaller for partial co-firing of coal with natural gas.").
[140] *Id.* at 64,728.
[141] *See generally*, EPA, Technical Support Document, GHG Abatement Measures, (June 2014); 80 Fed. Reg. at 64,728, 64,756.

Here, EPA mischaracterizes its prior record by claiming that co-firing was rejected due to cost and feasibility reasons,[142] but fails to acknowledge that this was *as compared to generation-shifting*. Now, that EPA has – unlawfully and unreasonably – taken generation shifting off the table, it must perform its own "complex balancing"[143] of the section 111 factors to determine the *best* system. Instead, EPA makes a series of conclusory statements with no underlying support.[144]

EPA claims that co-firing with gas can negatively impact a unit's efficiency,[145] but fails to cite any studies or undertake its own analysis to quantify the impact on efficiency or how that interacts with costs or emission reductions. EPA then asserts that it would not be environmentally beneficial to reroute natural gas to co-firing plants because it would be more efficiently used at an NGCC plant.[146] However, EPA makes no showing that natural gas supplies are limited such that supplies would not be available for both co-firing plants and NGCC plants. Even if some gas supply was re-routed for use at affected sources, it is highly likely that the environmental benefit of co-firing at a coal plant would exceed the marginal efficiency losses associated with using the gas at a co-firing plant as opposed to a NGCC. Finally, EPA, in conclusory fashion, claims that "[m]any existing coal-fired plants…do not have access to natural gas transportation infrastructure and gaining access would be either infeasible…or unreasonably costly."[147] Astonishingly, EPA cites *nothing* for this, or any other of these propositions. EPA does not undertake any analysis to determine how many plants have access to gas pipelines or the costs associated with gaining access. This "type of vaporous record will not do—the Administrative Procedure Act requires reasoned decisionmaking grounded in actual evidence."[148]

EPA also tangentially discusses the possibility that basing the best system on co-firing or converting to natural gas might improperly "redefine" the source.[149] As Commenters discuss in depth in Joint Environmental Comments on BSER Issues, this principle does not apply in the context of section 111 and, even if it did, would not necessarily preclude co-firing or converting to natural gas. EPA's argument that affected sources do not have access to gas or that co-firing may redefine the sources is further belied by the facts – 45% of plants with affected units generated more than 1,000 MWh from natural gas in 2017. And EPA has not analyzed whether access is available at reasonable cost for those remaining plants.

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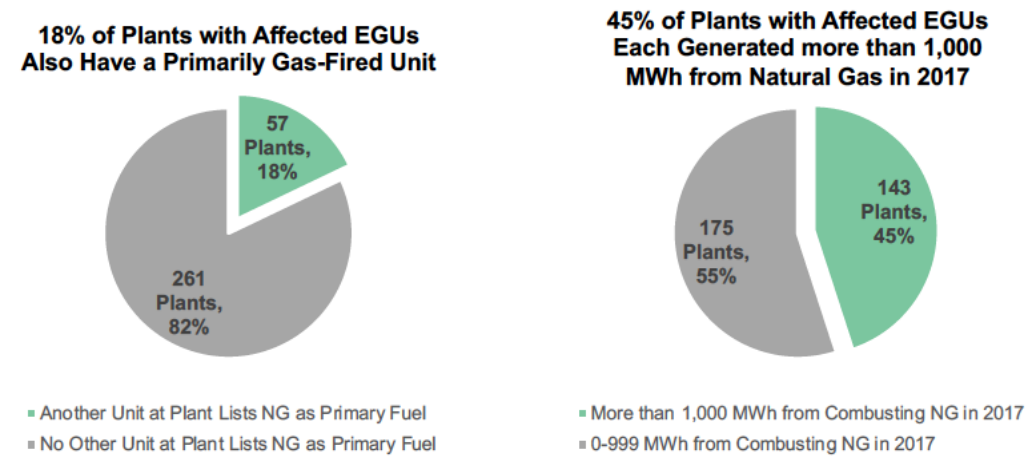
[142] 83 Fed. Reg. at 44,762.
[143] *Am. Elec. Power Co.,* 564 U.S. at 427.
[144] *Keyspan-Ravenswood v. FERC*, 474 F.3d 804, 812 (D.C. Cir. 2007); *see also Chem. Mfrs. Ass'n v. EPA*, 28 F.3d 1259, 1265 (D.C. Cir. 1994) (conclusory statements imply that the agency is committed to a path regardless of the facts).
[145] 83 Fed. Reg. at 44,762.
[146] *Id.*
[147] *Id.* at 44,752-53.
[148] *Flyers Rights Educ. Fund v. FAA*, 864 F.3d 738, 741 (D.C. Cir. 2017).
[149] 83 Fed. Reg. at 44,752-53.



As EPA documents in the 2015 Clean Power Plan record, "[s]ome owners/operators are already converting some affected EGUs from coal to natural gas, and it is apparent that the measure can be attractive…"[150] This trend is continuing, as seen in the Table BB below summarizing recent conversions to natural gas or investments in co-firing capabilities at coal-fired generating units. Companies are co-firing with natural gas "to better position the plant for low gas price environments…,"[151] as well as to satisfy state and federal pollution standards,[152] and to "react quickly and prudently to changing market conditions."[153]

EPA updated its record on emission reduction "opportunities available within a plant including…switching from coal to gas" last year.[154] The Agency explained that co-firing "is becoming a more common way to reduce CO_2 emissions" from coal-fired power plants,[155] reporting that "5.6 GW…switched to run solely on natural gas between December 2014 and April 2016."[156] The Agency also described the ongoing expansion of the natural gas pipeline infrastructure to increase overall delivered capacity.[157] EPA concluded that "utilities are currently taking advantage of the lower cost and the associated environmental benefits of natural gas."[158]

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[150] 80 Fed. Reg. at 64,728.
[151] SEC filing, Talen Energy Corp., Annual Report (Form 10-K) (Feb. 26, 2016) (describing Brunner Island conversion), *available at*: https://www.sec.gov/Archives/edgar/data/1622536/000162253616000111/tln-20151231x10k.htm.
[152] *See, e.g.*, NRG Energy, Inc., Annual Report (Form 10-K) (Feb. 29, 2016) (describing Joliet gas conversion), *available at*: https://www.sec.gov/Archives/edgar/data/1013871/000101387116000022/a201510-k.htm.
[153] Indianapolis Power & Light Co, "2016 Integrated Resource Plan: Public Version," (Nov. 1, 2016) https://www.iplpower.com/About_IPL/Regulatory/Filings/IRP_2016/IPL_2016_IRP_Volume_1_110116-compressed/.
[154] EPA, *Basis for Denial of Petitions to Reconsider and Petitions to Stay the CAA section 111(d) Emission Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units*, at App. 3, *Non-BSER CPP Flexibilities*, at 3-10 (Jan. 2017).
[155] *Id.* at 2.
[156] *Id.* at 3 (citing EIA, "EIA electricity generator data show power industry response to EPA mercury limits," (July 7, 2016) https://www.eia.gov/todayinenergy/detail.php?id=26972).
[157] *Id.*
[158] *Id.*

Companies have expressed that "conversion is 'the most economic and environmentally responsible thing to do."[159] As a representative from Dominion recently stated, with respect to a plant conversion from coal to gas: "The economics has changed to where we have low-cost natural gas and solar is dropping in price and becoming more efficient, as is wind, …Because of these factors, we looked at all of our generation facilities for efficiency and economics."[160]

Table BB: Examples of Recent Coal Plants Converting to Gas or Co-firing with Gas

Unit Name	State	ID	Owner	Capacity (Summer MW)	Co-firing or Conversion?	2011 Coal Usage (as % of total MWh)*	2017 Coal Usage (as % of total MWh)*
Brunner Island	PA	03140	Talen Energy	1,411	Co-firing	100%	18%
Joliet 29	IL	00384	NRG	1,036	Conversion	100%	0%
E.C. Gaston (Units 1-4)	AL	00026	Southern	1,020	Conversion	100%	3%
Big Bend	FL	00645	TECO Energy	770	Proposed Conversion, Pending Regulatory Approval	100%	83%
Jack Watson	MS	02049	Southern	716	Conversion	95%	0%
Harding Street (Units 5-7)	IN	00990	AES	628	Conversion	100%	0%
Big Cajun 2 (Unit 2)	LA	06055	NRG	575	Conversion	100%	0%
Shawville	PA	03131	NRG	565	Conversion	100%	0%
Greene County (AL)	AL	00010	Southern	497	Conversion	100%	0%
Clinch River (Units 1-2)	VA	03775	AEP	460	Conversion	100%	0%
Danskammer (Units 3-4)	NY	02480	Tiger Infrastructure/ Agate Power	358	Conversion	100%	0%
Joliet 9	IL	00874	NRG	314	Conversion	100%	0%
New Castle	PA	03138	NRG	305	Conversion	100%	0%
James M Barry (Units 1-2)	AL	00003	Southern	275	Conversion	100%	0%

[159] Kathleen McGrory & Richard Danielson, *Tampa Electric planning to convert Big Bend power plant where five died in June from coal to natural gas*, TAMPA BAY TIMES (Jan. 13, 2018) http://www.tampabay.com/news/business/energy/Tampa-Electric-planning-to-convert-Big-Bend-power-plant-where-five-died-in-June-from-coal-to-natural-gas_164449729.
[160] Bryan McKenzie, *Bremo Power Station shutdown to affect 45 jobs in Fluvanna*, THE DAILY PROGRESS (Jan. 20, 2018) https://www.dailyprogress.com/news/local/bremo-power-station-shutdown-to-affect-jobs-in-fluvanna/article_1f253bb4-fe34-11e7-b470-5ba25db8f303.html.

Big Sandy (Unit 1)	KY	01353	AEP	250	Conversion	100%	0%
McMeekin	SC	03287	SCANA	250	Conversion	100%	0%
Bremo Bluff	VA	03796	Dominion	227	Conversion	100%	0%
W.S. Lee (Unit 3)	SC	03264	Duke Energy	170	Conversion	100%	0%
Ames Electric Services Power Plant	IA	01122	City of Ames, Iowa	105	Conversion	100%	0%
M.L. Kapp	IA	01048	Alliant Energy	102	Conversion	100%	0%
Lake Road	MO	02098	Kansas City Power & Light	96	Conversion	100%	0%
Urquhart (Unit 3)	SC	03295	SCANA	95	Conversion	100%	0%
Syl Laskin	MN	01891	Minnesota Power	89	Conversion	100%	0%
Streeter Station	IA	01131	Cedar Falls Utilities	34	Co-firing	97%	0%
Total				**10,349**			

EPA must engage in reasoned decisionmaking based on a robust record and cannot ignore the record underlying its previous determinations. EPA fails to substantiate its determination that co-firing with natural gas is not the best system of emission reduction, nor does it overcome the record underlying the Clean Power Plan or engage with the means by which the source category is currently reducing CO_2 emissions. These failures render the Proposal arbitrary and capricious and not in accordance with law.

VII. EPA's rejection of CCS as the best system of emission reduction is entirely unsupported and fails to overcome the record underlying the Clean Power Plan

Carbon capture and sequestration (CCS) is adequately demonstrated, cost reasonable and critical to staving off the worst impacts of catastrophic climate change. *See* CATF & NRDC Comments on Carbon Capture and Sequestration.EPA fails to overcome the extensive record on CCS built under the Clean Power Plan or to build a record of support for its determination that CCS is not the best system of emission reduction. CCS is available at reasonable cost to achieve emission reduction significantly greater than the proposed heat rate improvements.

In three short paragraphs, EPA dispenses with one of the most promising technologies for significantly reducing CO_2 emissions from fossil fuel-fired power plants. The Agency "entirely failed

to consider"[161] or even cite any studies, projects, or reports – especially those cataloguing significant advancements occurring since the close of the Clean Power Plan record – before hastily rejecting CCS as part of the BSER. Again, "[t]h[is] type of vaporous record will not do—the Administrative Procedure Act requires reasoned decisionmaking grounded in actual evidence."[162] This failure to develop any record supporting the decision renders the Proposal arbitrary, capricious and unlawful.[163]

VIII. Trading is inappropriate unless its availability is built into the stringency of the emission guidelines.

As EPA found in the Clean Power Plan, if affected sources would benefit from flexibilities, such as trading and averaging, to demonstrate compliance, those flexibilities must be included in the best system of emission reduction and reflected in the stringency of the emission target.[164] While all measures that are available for compliance need not be included in the best system of emission reduction, those that are generally applicable and better fulfill the section 111(a)(1) factors, must be.[165]

This has been EPA's longstanding position. For example, EPA issued emission guidelines for large municipal waste combustors, under section 111(d), and section 129, which allowed sources to average the emission rates from multiple units at a single source and to trade emission credits with other sources.[166] However, if a source chose to utilize averaging and trading to show compliance, that flexibility was accounted for in setting a more stringent emission guideline.[167]

In 2005, during the Bush Administration, "EPA determined that a cap-and-trade program based on control technology available in the relevant timeframe is the best system for reducing [mercury] emissions from existing coal-fired Utility Units."[168] EPA found that the term "standard of performance" is broad enough to include an emissions cap and allowance trading.[169] The Clean Air

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[161] *State Farm*, 463 U.S. at 43.
[162] *Flyers Rights Educ. Fund,* 864 F.3d at 741.
[163] 5 U.S.C. § 706(2)(A); 42 U.S.C. § 7607(d)(9).
[164] 80 Fed. Reg. at 64,786, n. 623. ("The EPA has frequently required that sources meet a more stringent nominal limit when they are allowed compliance flexibility, particularly, the opportunity to trade." *Citing e.g.,* EPA, "Improving Air Quality with Economic Incentive Programs," EPA-452/R-01-001, at 82 (2001) (requiring that Economic Incentive Programs show an environmental benefit, such as "reducing emission reductions generated by program participants by at least 10 percent"), *available at https://www.epa.gov/sites/production/files/2015-07/documents/eipfin.pdf*; "Economic Incentive Program Rules: Final Rule," 59 FR 16,690(Apr. 7, 1994) (same); "Certification Programs for Banking and Trading of NO[X] and PM Credits for Heavy-Duty Engines: Final Rule," 55 FR 30,584 (July 26, 1990) (requiring that for programs for banking and trading of NO[X] and PM credits for gasoline, diesel and methanol powered engines, all trading and banking of credits must be subject to a 20 percent discount "as an added assurance that the incentives created by the program will not only have no adverse environmental impact but also provide an environmental benefit.")).
[165] *See* Kate Konschnik & Ari Peskoe, Harvard Law School, *Efficiency Rules: The Case for End Use Energy Efficiency Programs in the Section 111(d) Rule for Existing Power Plant*s, at 5-6 (Mar. 3, 2014), *available at*: http://blogs.harvard.edu/environmentallawprogram/files/2013/03/The-Role-of-Energy-Efficiency-in-the-111d-Rule.pdf (describing the "symmetry principle.").
[166] 60 Fed. Reg., at 65,387 (Dec. 19, 1995).
[167] *Id.*, at 65,400.
[168] 70 Fed. Reg. 28,606, 28,617 (May 18, 2005).
[169] *Id.* at 28,616-17.

Mercury Rule allowed for inter-source and interstate trading of emission allowances, but more importantly, these flexibilities were built into the stringency of the emission guidelines.

Additionally, EPA's regulations phasing out lead in gasoline took the form of an average standard for the "total pool" of gasoline produced by each refiner; EPA's assumption that refiners would participate in a yet-to-be created inter-refinery credit trading system—which was integral to the stringency of the standard—was likewise upheld by the D.C. Circuit.[170]

EPA has provided no rationale that would allow it to abandon its longstanding position or overcome its prior determination and therefore cannot allow affected sources to comply with the Proposal through any trading flexibilities that are not built into best system of emission reduction and the stringency of the standards of performance.

IX. Conclusion

EPA fails entirely to propose a system of emission reduction, let alone the *best* system. The Proposal increases emissions by allowing affected sources to evade New Source Review control requirements when they undertake life extension projects. As such, ACE is diametrically opposed to the core purposes and explicit language of the Clean Air Act and cannot stand.

EPA is bound by the statute and must undertake a complete analysis to determine the best system of emission reduction for these highly-polluting sources, which are contributing mightily to an existential threat bearing down on humanity. Anything less would be illegal. Commenters urge the Agency to withdraw this hopelessly flawed Proposal and meet its obligations under the law by strengthening the Clean Power Plan.

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[170] *See Small Refiner Lead Phase-Down Task Force v. EPA,* 705 F.2d 506, 536 (D.C. Cir. 1983). Note that although sec. 211(g) of the Clean Air Act placed numerical limits on average lead standards for small refiners, that section made no mention of inter-refinery trading for purposes of standard-setting or compliance. *See* Clean Air Act Amendments of 1977, Pub. L. No. 95-95, § 223, 91 Stat. 685, 764 (1977). In addition, EPA's pre-1977 regulations for refiners established "total pool" average lead standards despite the absence of explicit authorization for such standards in the Act. *See* Clean Air Act Amendments of 1970, Pub. L. No. 91-604, § 211, 84 Stat. 1676, 1698 (1970). Those early standards were also upheld by the D.C. Circuit, *see Ethyl Corp. v. EPA,* 541 F.2d 1 (D.C. Cir. 1976), and Congress effectively ratified EPA's approach in 1977 by enacting a special provision for small refiners prescribing maximum levels of stringency for average lead limits.

Appendix A