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By Electronic Submission to www.regulations.gov

Acting Administrator Wheeler
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

Docket ID No. EPA–HQ–OAR–2017–0355

Re: COMMENTS ON PROPOSED RULE: EMISSION GUIDELINES FOR GREENHOUSE GAS EMISSIONS FROM EXISTING ELECTRIC UTILITY GENERATING UNITS; REVISIONS TO EMISSION GUIDELINE IMPLEMENTING REGULATIONS; REVISIONS TO NEW SOURCE REVIEW PROGRAM, 83 FED. REG. 44,746 (AUG. 31, 2018)

Dear Acting Administrator Wheeler:

The Emmett Environmental Law & Policy Clinic at Harvard Law School (the "Clinic") respectfully submits these comments on behalf of itself and the undersigned parties regarding 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, 83 Fed. Reg. 44,746 (Aug. 31, 2018) (hereinafter, the "Proposed Regulation," the "Policy" or "ACE").[1] The signatories to these comments have backgrounds in economics, public health, and environmental law and policy; they include lead authors on reports by the Intergovernmental Panel on Climate Change and former senior level advisors in the White House National Science and Technology Council, the White House Office of Science and Technology Policy, and the State Department.

For the reasons discussed herein, we urge the Environmental Protection Agency ("EPA") to withdraw the Proposed Regulation.

[1] The signatories to these comments are: Philip B. Duffy, Ph.D., Woods Hole Research Center; Kelly Sims Gallagher, Ph.D., Tufts University; Stefan Koester, Tufts University; William Moomaw, Ph.D., Tufts University, Shinsuke Tanaka, Ph.D., Tufts University; and Madhavi Venkatesan, Ph.D., Northeastern University and Sustainable Practices, Ltd.

The Proposal raises a plethora of issues, too many to address in a single comment. We will focus our comments on fundamental flaws in the Regulatory Impact Analysis for the Proposed Regulation (the "RIA").[2] The RIA repeatedly takes steps that artificially and unreasonably skew the cost-benefit analysis to favor the Proposed Regulation. The impacts of the errors in the RIA go beyond this Proposed Regulation; they suggest a precedent for future regulatory proposals that would similarly be presented without reliable or transparent analyses. EPA has failed to offer a rational basis for the RIA's departure from precedent and rejection of long-standing cost-benefit best practices and climate science. In brief, these comments address the following deficiencies in the RIA:

- The RIA is inconsistent with decades of government practice that considers a wide range of costs and benefits of proposed regulations. By cherry-picking the costs and benefits considered, including auxiliary risks and co-benefits, the RIA creates artificial and arbitrary boundaries on the scope of its analysis. For example:
    - The RIA limits the costs considered by failing to account for increases in emissions from upstream activities and from anticipated rebound effects; such emissions increase the negative health effects of the Proposed Regulation.
    - The RIA understates the foregone benefits of the Proposed Regulation as compared to the Clean Power Plan, *i.e.* understates the cost, by failing to fully quantify and monetize the impacts of non-carbon dioxide emissions that negatively impact public health.
    - The RIA insufficiently accounts for the distributional impacts of the foregone public health benefits and other negative impacts of the Proposed Regulation on populations such as young children and environmental justice communities.

- The RIA utilizes a Social Cost of Carbon ("SCC") that significantly skews the calculation of costs and benefits in favor of the Proposed Regulation and that is inconsistent with government and private sector practice. Errors contributing to the RIA's low value for SCC include the following:
    - The RIA's use of a domestic rather than a global SCC in an inappropriate departure from precedent.
    - The RIA fails to account for the costs of climate change-related physical impacts occurring within the United States and adjusts the global SCC to a domestic value in a manner inconsistent with the literature cited by EPA itself.
    - The RIA does not adequately address costs from the potential long-term and irreversible impacts of climate change.
    - The RIA's use of discount rates contravenes federal guidance and best practice for accounting for intergenerational, irreversible impacts and variability in long-term growth.

[2] These comments do not address other shortcomings, such as EPA's impermissibly narrow interpretation of Best System of Emission Reductions, that bias the formulation of the Proposed Regulation.

Aspects of the RIA such as these are an inexplicable departure with no demonstrated need or basis from long-standing cost-benefit practices.[3] Because of these flaws, the RIA does not provide an accurate or complete assessment of the Proposal's impacts on human health or the environment and significantly skews the calculation of costs and benefits in favor of the Proposed Regulation.

I. The Regulatory Impact Analysis' Limited Consideration of Countervailing Risks and Co-Benefits Creates Artificial and Arbitrary Boundaries on the Scope of the Analysis that Skews the Outcome and is Inconsistent with Decades of Government Precedent

Consideration of the full range of costs and benefits, including countervailing risks and co-benefits, is required by and/or consistent with federal guidelines, standard economic cost-benefit methodologies, and prior agency action. Besides being inconsistent with precedent, limiting consideration of countervailing risks and co-benefits creates artificial boundaries on analyses that skew outcomes. If an agency selects which costs and benefits to consider, whether by defining them as "direct" or otherwise, it opens the door to "cherry-picking" exercises that are arbitrary. Akin to the Supreme Court's prohibition on "interpretive gerrymandering" of statutes, agencies cannot consider only the costs and benefits that best support their positions.[4] With respect to cost-benefit analyses, courts have similarly concluded that, when conducing such an analysis, agencies "cannot put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards."[5]

Not only should agencies avoid selecting which costs and benefits to consider, they must also, statutory provisions permitting, give equal weight to the consideration of costs and benefits – whether direct or indirect. There are "no legal, political, or intellectual . . . impediments to treating ancillary benefits and countervailing risks equally in cost-benefit analysis,"[6] and failing to adequately consider either auxiliary costs or co-benefits could lead to incorrect assessments of net costs that result in inefficient and biased regulations. Agencies cannot avoid the obligation of attempting to "quantify and monetize" both direct costs and benefits and auxiliary risks and co-

[3] See, e.g., FCC v. Fox Television Stations, Inc., 556 U.S. 502, 515–16 (2009) (explaining that an agency "must show that there are good reasons for [a] new policy" and that, when a "new policy rests upon factual findings that contradict those which underlay its prior policy," an agency must "provide a more detailed justification than what would suffice for a new policy created on a blank slate.") (citing Smiley v. Citibank (South Dakota), 517 U.S. 735, 742 (1996)). See also, Motor Vehicles Mfrs. Ass'n v. State Farm Mutual Auto Ins. Co., 463 U.S. 29 (1983) [hereinafter "State Farm"].

[4] Michigan v. EPA, 135 S.Ct. 2699, 2708 (2015) ("Chevron allows agencies to choose among competing reasonable interpretations of a statute; it does not license interpretive gerrymanders under which an agency keeps parts of statutory context it likes while throwing away parts it does not.")

[5] Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1198 (9th Cir. 2008).

[6] Christopher C. DeMuth & Douglas H. Ginsburg, *Rationalism in Regulation,* 108 Mich. L. Rev. 877, 888 (2010); see also Samuel J. Rascoff & Richard L. Revesz, *The Biases of Risk Tradeoff Analysis: Towards Parity in Environmental and Health-and-Safety Regulation,* 69 U. CHI. L. REV. 1763, 1791–1793 (2002) ("Since regulatory interventions bring about a range of ancillary effects, positive as well as negative, we regard the systematic inattention to ancillary benefits as a serious methodological bias. Risk tradeoffs and ancillary benefits are simply mirror images of each other. There is no justification for privileging the former and ignoring the latter.")

benefits by refusing to assign a value to an issue; courts have held that placing no value on a factor rather than a value of zero is a distinction without a difference.[7]

In most rulemakings, it is relatively straightforward to categorize auxiliary risks, also referred to as countervailing costs or indirect costs, and co-benefits, also referred to as ancillary benefits. The procedural posture in this instance complicates the analysis. The Proposal seeks to both repeal and replace a previous rule, the Clean Power Plan. Thus, the ACE RIA uses two baselines for its analysis – (i) the "No CPP" baseline that resembles the status quo where the CPP is not in effect; and (ii) the "CPP" baseline that represents the mass-based implementation of its requirements. When describing the effects of ACE compared to the "No CPP" baseline, the RIA typically refers to reductions of local air pollution as an "ancillary health co-benefit," however, relative to the CPP baseline, reductions of pollution that are not achieved are "forgone benefits." Similarly, implementation costs are variously referred to as "compliance costs" or "avoided costs," again, depending on the baseline used. This comment treats the health and welfare effects of non-CO_2 pollutants as "ancillary benefits" or a "co-benefits" that become "foregone benefits" when the Proposed Regulation is compared to the CPP baseline. Thus, what the RIA calls a "forgone benefit" is a "cost" of the Proposed Regulation.

The ACE RIA fails to quantify and monetize both auxiliary risks and foregone co-benefits, consideration of which would increase the cost of the Proposed Regulation. The significance of these exclusions is highlighted by the fact that the Proposed Regulation already has negative net benefits, *i.e.* higher costs, relative to the CPP baseline.[8] In some instances, the ACE RIA fails to assign values to co-benefits, or foregone benefits, that have been monetized in prior rulemakings, without providing a reasoned analysis for the departure from precedent. A few examples of the ACE RIA's failure to appropriately address countervailing risks and co-benefits are addressed herein.

1. **Decades of Government Practice Considers a Wide Range of Costs and Benefits of Proposed Regulations**

Some form of Regulatory Impact Analysis ("RIA") has been a component of federal environmental rulemaking since the Nixon Administration. For instance, in a 1971 memorandum to the heads of federal departments and agencies, the Office of Management and Budget ("OMB") directed agencies proposing regulations with significant impacts to describe "alternatives to the proposed actions that have been considered" and "a comparison of the expected benefits or accomplishments and the costs (Federal and non-Federal) associated with the alternatives considered."[9] Subsequent administrations reiterated this directive and provided

[7] Ctr. for Biological Diversity, *supra* note 5, at 1200 ("NHTSA insisted at argument that it placed no value on carbon emissions reduction rather than zero value. We fail to see the difference.")

[8] 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, ES-17, Table ES-13 (Aug. 2018) [hereinafter the "ACE RIA"].

[9] October 5, 1971 OMB Memorandum regarding "Agency regulations, standards, and guidelines pertaining to environmental quality, consumer protection, and occupational and public health and safety."

further detail on the types of impacts agencies were to consider. For example, President Carter directed agencies to consider "the direct and indirect effects" of significant regulations in Executive Order 12044, and President Reagan specified in Executive Order 12291 that agencies conducting cost-benefit analyses of significant rules should consider the net costs and benefits to society.[10]

President Reagan's call for holistic cost-benefit analyses has been repeated by all subsequent administrations, and in 1993, President Clinton issued Executive Order 12866, setting the foundation for the current framework for RIAs, which emphasizes the need for a broad consideration of costs and benefits that goes beyond direct costs and benefits.

Describing the government's "regulatory philosophy," Executive Order 12866 provides that:

> In deciding whether and how to regulate, agencies should *assess all costs and benefits* of available regulatory alternatives . . . . Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further … agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach. [Section 1 (emphasis added)]

In 2003, the Bush administration issued guidance, via OMB for agency implementation of E.O. 12866 and performance of RIAs. The OMB guidance (hereinafter "OMB Circular A-4") directs agencies to: (i) identify "the expected undesirable side-effects and ancillary benefits of the proposed regulatory action and the alternatives [and] add [them] to the direct benefits and costs as appropriate"; and (ii) make an effort to "quantify and monetize ancillary benefits and countervailing risks" using "[t]he same standards… that apply to direct benefits and costs."[11]

President Trump endorsed OMB Circular A-4 in Executive Order 13783, observing that the guidance "has been widely accepted for more than a decade as embodying the best practices for conducting regulatory cost-benefit analysis."

As explained by the Office of Information and Regulatory Affairs ("OIRA"), the value of conducting RIAs goes beyond the development of a specific regulation; "[r]egulatory analysis

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[10] EPA has implemented these directives across decades by including a broad range of costs and benefits in its economic analyses. Earlier examples include EPA's attention in 1978 to lower prices and reduced health risks as "indirect, longer-term benefits" from pesticide regulations (EPA, Economic Impact Analysis: Proposed Guidelines for Registering Pesticides in the United States, 43 Fed. Reg. 39,644, 39,654 (Sept. 6, 1978)) and EPA's discussion in 1987 of the indirect benefit of reducing particulate matter from the regulation of toxic emissions (EPA, Assessment of Municipal Waste Combustor Emissions under the Clean Air Act, 52 Fed. Reg. 25,399 (July 7, 1987)).

[11] OFFICE OF MANAGEMENT AND BUDGET, Circular A-4, "Regulatory Analysis" (2003) (hereinafter, "OMB Circular A-4") at 2, 25 (providing further that, "if monetization is not feasible, quantification should be attempted through use of informative physical units… Sound quantitative estimates of benefits and costs, where feasible, are preferable to qualitative descriptions of benefits and costs because they help decision makers understand the magnitudes of the effects of alternative actions.")

also has an important democratic function; it promotes accountability and transparency and is a central part of open government."[12] OMB further reminds agencies that, in conducting RIAs, it is "important to keep in mind the larger objective of analytical consistency in estimating benefits and costs across regulations and agencies. . . . Failure to maintain such consistency may prevent achievement of the most risk reduction for a given level of resource expenditure." [OMB Circular A-4, pgs. 9–10]

The ACE RIA departs from precedent, OMB guidance, and widely adopted scientific and economic principles. EPA's departure from this precedent conflicts with President Trump's own endorsement of OMB Circular A-4 without any legitimate or rational basis for doing so. Moreover, the changes in the RIA's development are flawed in multiple ways, including as described below.

2. The RIA overstates the climate benefits of the Proposed Regulation by overlooking countervailing risks, including, but not limited to, upstream emissions and an anticipated rebound effect [C-9]

Under the Proposed Regulation, emissions of carbon dioxide (CO_2) are projected to increase 3% by 2030 compared to the Clean Power Plan [ACE RIA, ES-8, Table ES-5]. However, the ACE RIA underestimates this increase in CO_2 emissions, and thus understates the projected costs of the ACE rule. This error stems from at least two decisions. First, the RIA departs from prior practice by declining to evaluate the upstream emissions expected to result from the Proposed Regulation. Second, the RIA ignores credible data that suggests a "rebound effect" from ACE[13] on account of increased efficiency and lifespans at coal-fired electric generating units ("EGUs"). Because of these accounting decisions, the ACE RIA overestimates the climate benefits of ACE relative to the "No CPP" baseline and understates the climate costs of ACE relative to the "CPP" baseline.

With respect to upstream emissions, the ACE RIA recognizes that generation from coal-fired EGUs will increase under the Proposed Regulation as compared to both the CPP and No CPP baselines [pg. 3-23, Table 3-17]. The projected increase in market share reflects more than just increased operational efficiencies, it also implies additional production, which in turn, means that additional coal will need to be mined and transported to EGUs. While the CPP RIA assessed the potential auxiliary risks posed by upstream emissions from additional use of natural gas at EGUs,[14] the ACE RIA does not attempt to quantify such emissions nor explain why such emissions are excluded from the analysis. The significance of this omission is underscored by two salient facts. First, upstream emissions in the fossil fuel sector can account for up to "25% of

[12] OFFICE OF INFORMATION AND REGULATORY AFFAIRS, *Regulatory Impact Analysis: A Primer*, at 2 [hereinafter "OIRA Primer"] https://reginfo.gov/public/jsp/Utilities/circular-a-4_regulatory-impact-analysis-a-primer.pdf

[13] See, e.g., Kathryne Cleary & Karen L. Palmer, *A Giant Rebound? How the Coupling of ACE and Federal Energy Policies to Protect Coal Could Drive Up CO2 Emissions*, RESOURCES FOR THE FUTURE (Sept. 18, 2018), http://www.rff.org/blog/2018/giant-rebound-how-coupling-ace-and-federal-energy-policies-protect-coal-could-drive-co2.

[14] EPA, REGULATORY IMPACT ANALYSIS FOR THE CLEAN POWER PLAN FINAL RULE, 3-20–3-21 (Oct. 2015) [hereinafter, the "CPP RIA"].

the direct emissions from the power plant."[15] Second, mining for coal releases methane, a more potent form of greenhouse gas than CO_2. According to the Energy Information Administration, "methane emissions from coal mining and abandoned coal mines accounted for about 10% of total U.S. methane emissions" in 2015.[16] (In add to an increase in methane emissions,

The decision to exclude the countervailing risk of upstream emissions is an unexplained departure from accepted practice and undermines the accuracy of estimated climate effects. Given the potency of methane, and that emissions of it prompt a faster and more intense climatic response, even a small increase in atmospheric methane can overwhelm the climate benefits of CO_2 reductions in the short-term. (Beyond emissions, an increase in production from coal-fired EGs will also result in additional coal ash waste, which – as recent storm events have highlighted – can cause significant harm to communities and ecosystems.)

In addition to upstream emissions, the ACE RIA supposes greater climate benefits from ACE, and thus under-calculates costs, by dismissing claims of a rebound effect. Considered broadly, rebound effects could range from (i) increases in utilization at electric generation units ("EGUs") following heat rate improvements ("HRI") that reduce operating costs to (ii) delayed retirement decisions that result in more years of operation. With respect to the latter, the ACE RIA notes that states have flexibility in implementing the Proposed Regulation and may choose "to avoid implementing HRI and retirement of affected sources," however, the RIA acknowledges that it does not capture these scenarios in its analysis [pg. 1-19]. This omission is exacerbated to the extent that changes to the New Source Review ("NSR") standards allow coal EGUs to remain online longer or to increase generation in the short-term.

Even when demand for electricity is held constant, a review of the Proposed Regulation by Resources for the Future still found a rebound effect under ACE. In that study, the identified rebound effect was minimal but likely to be greater with revisions to the NSR standards.[17] Studies that evaluate emission reductions under ACE up to 2050 find that, relative to *both* the "CPP" and "no CPP" baselines, emissions from coal-fired EGUs under *all three* illustrative policies in ACE are higher in 2050.[18] The RIA does not explain why its analysis ended earlier than 2050.

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[15] Daniel Weisser, *A Guide to Life-Cycle Greenhouse gas (GHG) Emissions from Electric Supply Technologies*, pgs. 10–11 (explaining reasons for this estimate and describing sources of upstream emissions: mining activity and fuel transportation) http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.184.9443&rep=rep1&type=pdf

[16] U.S. ENERGY AND INFO. ADMIN., *Coal and the Environment*, March 23, 2018 https://www.eia.gov/energyexplained/index.php?page=coal_environment (last accessed 10/31/18).

[17] See Keyes et al., *Carbon Standards Re-Examined*, RESOURCES FOR THE FUTURE, Working Paper No. 18-20, pgs. 12–13 (Aug. 2018) (explaining how the current NSR standard would diminish the rebound effect of HRI, but that revising NSR removes this check on increased utilization of coal).

[18] Cleary & Palmer, *A Giant Rebound?*, *supra* note 13; see also Kathryne Cleary & Karen L. Palmer, *Changing the Game for Coal: How Federal Energy Policies Could Impact Coal Plant Retirement*, RESOURCES FOR THE FUTURE (Aug. 30, 2018), http://www.rff.org/blog/2018/changing-game-coal-how-federal-energy-policies-could-impact-coal-plant-retirement.

The RIA's failure to consider auxiliary risks presented by upstream emissions and rebound effects not only dampens its cost estimates, but also results in under-addressing additional costs, or foregone benefits, to public health (*e.g.*, the impact of increased emissions from coal production and utilization on respiratory issues). Deficiencies in the ACE RIA's calculation of costs/foregone benefits is addressed further below.

3. The RIA understates the Proposed Regulation's impact on public health from non-CO_2 emissions by failing to fully quantify and monetize the impacts of previously monetized pollutants

Cost-benefit analyses that quantify and monetize all costs and benefits, direct and ancillary, both promote informed and accountable decision-making and create analytical consistency for agencies engaged in rulemakings. The ACE RIA flies in the face of these principles, asserting that "data, time, and resource limitations" prevented the quantification of "foregone ancillary co-benefits," *i.e.*, costs of the Proposed Regulation relative to the CPP [pg. 4-45]. However, the CPP RIA provided a feasible roadmap for quantifying the very co-benefits that the ACE RIA leaves unaddressed, including the co-benefits/foregone co-benefits associated with emissions of mercury, sulfur dioxide ("SO_2") and oxides of nitrogen (NO_X) from coal-fired EGUs [CPP RIA pg. 4-20].

Agencies have frequently analyzed and integrated these types of co-benefits, thus lending greater weight to the modeling and accounting methods used.[19] A departure from these established norms and practices, as occurs in the ACE RIA, must be supported by a reasoned analysis. Such an explanation is particularly important where, as here, the deviations from prior practice weigh in favor of reducing the costs of a proposed regulation, whether by ignoring auxiliary risks or not quantifying foregone benefits.

a. The RIA fails to monetize the impacts of mercury emissions despite a means to do so that has support in practice and science

The ACE RIA acknowledges that there are benefits of reducing exposure to mercury but does not attempt to quantify or monetize the foregone co-benefits arising from increased mercury emissions under the Proposed Regulation [pg. 4-45]. In prior regulatory proceedings EPA has accounted for at least some of the impacts of mercury emissions. For example, in the MATS rule, EPA addressed, at least partially, the impact of mercury emissions by monetizing the health end point of cognitive function and quantifying that effect based on consumption patterns of freshwater fish in select communities.[20] While likely only accounting for a fraction of mercury's

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[19] Jason Perkins, "The Case for Co-Benefits: Regulatory Impact Analyses, *Michigan v. EPA*, and the Environmental Protection Agency's Mercury and Air Toxics Standards," at 8–15, (Stanford Law ed., 2016) (providing general, historical overview of administrative CBA practice, giving examples where co-benefits were explicitly considered), https://law.stanford.edu/publications/the-case-for-co-benefits-regulatory-impact-analyses-michigan-v-epa-and-the-environmental-protection-agencys-mercury-and-air-toxics-standards/

[20] For more on EPA's analysis, see Charles Griffiths, Al McGartland, and Maggie Miller, *A Comparison of the Monetized Impact of IQ Decrements from Mercury Emissions*, 115(6) ENVTL. HEALTH PERSPECTIVES 841 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1892144/. This monetization aligns with EPA practice for quantifying positive effects from reduced exposure to pollutants, such as airborne lead. See U.S. ENVTL. PROT.

health effects,[21] this analysis utilized the narrow view of causation promoted by the ACE RIA [pgs. 4-51, 4-52], limiting the scope of effects to a specific causal pathway connecting mercury emissions to human health. In this instance, increases in mercury emissions are a foregone co-benefit, as opposed to a direct benefit under the MATS rule, however, the OMB guidance is clear in requiring the same type of analysis for direct benefits and co-benefits.[22]

The failure to address the negative impacts from mercury emissions is particularly significant given that mercury disproportionately hurts children and that coal-fueled EGUs are often located in environmental justice communities, where populations frequently have worse baseline health conditions and are therefore more impacted by emissions.[23] As noted in the ACE RIA, "[a]ny potential costs or benefits of this proposed action are not expected to be experienced uniformly across the population, and may not accrue to the same individuals or communities." [pg. 5-4] However, the ACE RIA dedicates only a single paragraph to the distributional aspects of the Proposed Regulation's Health Benefits. After noting that a distributional, or environmental justice, analysis would characterize the change in air pollution and exposure and risk among population subgroups, the RIA states that, "[w]hile the Agency did not perform a quantitative distributional analysis for this proposed policy, the Agency anticipates doing so in the Regulatory Impact Analysis for the final promulgated policy." [pg. 5-8].[24] Quantifying the distributional impact of a foregone benefit only *after* a regulation is finalized defeats the purpose of the notice and comment process required by the Administrative Procedure Act and provides an incomplete, and potentially misleading, basis and overview of the Proposed Regulation.

b. The RIA fails to monetize the impacts of and SO_2 and NOx emissions despite a means to do so that has support in practice and science

Under the Proposed Regulation, emissions of SO_2 and NOx are projected to increase between 5%-6% and 4%-5% respectively by 2030 relative to the CPP [ACE RIA at 3-15]. As with mercury, the ACE RIA acknowledges that there are benefits of reducing exposure to SO_2 and

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AGENCY, *Proposed Lead NAAQS Regulatory Impact Analysis*, 5, 9–10 (Jun. 2008) https://www3.epa.gov/ttnecas1/docs/ria/naaqs-lead_ria_proposal_2008-06.pdf.

[21] See FINAL BRIEF OF ELSIE M. SUNDERLAND, JOEL D. BLUM, CELIA Y. CHEN, CHARLES T. DRISCOLL, JR., DAVID C. EVERS, PHILIPPE GRANDJEAN, DANIEL A. JAFFE, ROBERT P. MASON, AND NOELLE ECKLEY SELIN AS AMICI CURIAE IN SUPPORT OF RESPONDENTS, Case No. 16-1127 (D.C. Cir. Apr. 25, 2016) at 8-10 (describing EPA's analysis and alleging additional harms were overlooked).

[22] OMB, Circular A-4, *supra* note 11.

[23] The failure to adequately address mercury emissions is exacerbated by the fact that EPA asserts in the ACE RIA that "the projected EGU emissions reflect the emissions reductions in the Final Mercury Air Toxics Rule announced on December 21, 2011" [pg. 8-4] while simultaneously seeking to repeal or roll-back that very same rule. See, e.g., Timothy Cama, *Trump Moves to Target EPA Mercury Regulation*, THE HILL, Oct. 1, 2018 https://thehill.com/policy/energy-environment/409230-trump-moves-to-target-epa-mercury-regulation

[24] Beyond the need to quantify the distributional impacts of mercury emissions, EPA should conduct the analysis required by Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (1997), which applies to economically significant rules that concern an environmental health or safety risk that EPA has reason to believe may disproportionately affect children. Pursuant to this analysis, EPA must explain why the Proposed Regulation is better than "reasonable alternatives."

NOx but does not attempt to quantify or monetize the foregone co-benefits arising from increased emissions under the Proposed Regulation [pg. 4-45]. In contrast, the CPP RIA monetized the effects of SO_2 and NOx by adopting a "benefit per ton" approach [pgs 4-15, 4-20-4-36], which is also utilized in papers prepared by nongovernment actors.[25]

The ACE RIA, on the other hand, did not attempt to directly quantify impacts of SO_2 and NOx at all, but instead relied upon modelled particulate matter 2.5 ("PM2.5") concentrations as a proxy for the monetized effects of SO_2 and NOx emissions.[26] Rather than using the modeling to impute direct values to these pollutants, the ACE RIA only qualitatively discusses the independent, and in some cases compounding, health effects of SO_2 and NOx [Chapters 4 and 8]. This is in contrast to the CPP RIA, which asserted that the "benefit per ton" approach monetized the benefits of reducing one ton of PM2.5 *as well as* PM2.5 precursors such as SO_2 and NOx [pgs. 4-20]. Thus, the ACE RIA functionally limits the effects of SO_2 and NOx by treating those pollutants as having no causal relationship to a monetizable health end point [pgs. 4-51-4-52].

The use of PM2.5 as a proxy for impacts from SO_2 and NOx is contrary to the understanding among scientists that PM2.5 alone does not capture the effects of air pollution mixtures. For example, a paper in 2016 reported that:

> Recent research that investigates the health impacts of particular sources suggests that specific sources, especially combustion sources, produce pollutant mixtures that may be more harmful than others. Such differences in toxicity would not be apparent in analyses of total PM2.5 mass.[27]

Relying on PM2.5 as a proxy is even more concerning where, as here, the effects of PM2.5 on morbidity are arguably understated.[28] Moreover, focusing causation narrowly on health end points neglects the additional welfare effects of reducing emissions. For example, a recent study about the effects of air pollution on cognition, particularly on the aging brain, implied that "the indirect effect on social welfare could be much larger than previously thought. A narrow focus on the negative effect on health may underestimate the total cost of air pollution."[29]

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[25] See, e.g., Dallas Burtraw and Michael Toman, *The Benefits of Reduced Air Pollutants in the U.S. from Greenhouse Gas Mitigation Policies*, RESOURCES FOR THE FUTURE, Discussion Paper No 98-01-REV at *18, table 5 (1997).

[26] ACE RIA, *supra* note 8, at 4-12–4-16, Chapter 8.

[27] J. Jason West et al., *What we Breathe Impacts our Health: Improving Understanding of the Link between Air Pollution and Health*, 50(10) ENVT. SCI. TECH. 4895, 4899 (2016) https://pubs.acs.org/doi/10.1021/acs.est.5b03827

[28] Compare INDUS. ECON., INC., HEALTH AND WELFARE BENEFITS ANALYSES TO SUPPORT THE SECOND SECTION 812 BENEFIT-COST ANALYSIS OF THE CLEAN AIR ACT 2-40 (Feb. 2011) (finding morbidity effects account for 4% of the PM2.5 benefits and mortality accounts for 96%) with ACE RIA, *supra* note 8, at 4-23 (finding mortality accounts for 98% of benefits for PM2.5).

[29] Xin Zhang, Xi Chen, and Xiaobo Zhang, *The Impact of Exposure to Air Pollution on Cognitive Performance*, 115(37) PROCEEDINGS OF THE NAT'L ACAD. OF SCI. 9193, 9197 (Robert M. Hauser ed., 2018), http://www.pnas.org/content/early/2018/08/21/1809474115

The RIA's view of causation recalls arguments made by tobacco companies, namely, that strong correlation failed to constitute "scientific proof" because experiments could not isolate tobacco smoke as the "cause" of lung cancer due to ethical and practical constraints on data collection. Exposure to air pollutants, like smoking, does not occur in a vacuum, but we know that pollutant mixtures have "synergistic or nonlinear impacts."[30] Requiring a direct and singular causation between emission of a pollutant and a negative health impact would be contrary to EPA's history of relying on epidemiological studies to ascertain health effects; inherently, those studies draw measurements from a population that was exposed to a pollutant, but they obviously cannot control for prior exposure or overlapping variables in all instances.

Even though the ACE RIA interprets causation to refute mortality end points for NOx and SO_2 emissions, it found a causal relationship to three short-term morbidity endpoints, based on the Integrated Science Assessments for NOx and SO_2 [pgs. 4-51–4-52]. But, the RIA does not quantify these impacts even though their effects—*e.g.*, missed days from work, hospital or emergency room visits due to asthma—have been both quantified and monetized by EPA in data which is available for use in the ACE RIA.[31]

Finally, as with mercury emissions, SO_2 and NOx emissions from coal-fired EGUs have a disproportionate impact on low-income and environmental justice communities.[32] Thus, the RIA should have addressed these disproportionate effects and conducted an analysis pursuant to Executive Order 13045.

II. The Social Cost of Carbon Value Utilized in the Regulatory Impact Analysis Significantly Skews the Calculation of Costs and Benefits Associated with the Proposed Regulation and Is Inconsistent with Historic and Current Practices by Both Government and Private Actors

The social cost of carbon dioxide ("SCC" or "SC-CO_2") is a tool for monetizing the cost of carbon dioxide emissions and the benefit of reducing emissions that is widely used to carry out the RIAs required by Executive Order 12866 and OMB Circular A-4. A federal Interagency Working Group ("IWG") developed a SCC value for use by federal agencies after a 2008 court decision required the federal government to account for the economic effects of climate change

[30] West et al., *What we Breath Impacts our Health*, *supra* note 27, at 4899, notes 53–55.

[31] EPA, FINAL REGULATORY IMPACT ANALYSIS FOR THE SO2 NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS), 5-19 (June 2010) (quantifying health end points for morbidity end points identified by the ACE RIA: asthma, hospital and emergency room visits, and acute respiratory symptoms); EPA, FINAL REGULATORY IMPACT ANALYSIS (RIA) FOR THE NO2 NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS), 4-8–4-10 (Jan. 2010) (providing cost of illness for morbidity end points identified in the ACE RIA, including emergency department visits and hospitalizations, respiratory symptoms, airway hyper responsiveness, airway inflammation, and lung function).

[32] See, e.g., Joan A. Casey et al., *Retirements of Coal and Oil Power Plants in California: Association with Reduced Preterm Birth among Populations Nearby*, 187 AM. J. OF EPIDEMIOLOGY 1586 (2018) https://academic.oup.com/aje/article/187/8/1586/4996680; Joan A. Casey et al., *Increase in Fertility following Coal and Oil Plant Retirements in California*, 17 ENVTL. HEALTH, no. 44, May 2, 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5932773/

in regulatory cost benefit analyses.[33] The resulting uniform SCC has been used in roughly 100 federal actions.[34]

Many private actors, including large utility companies and owners of electric generating units, also use metrics akin to the SCC in their decision making. For example, Entergy Corporation, which owns and operates power plants with approximately 30,000 megawatts of electric generating capacity, reported in 2015 that it:

> [U]ses a forecast price on CO_2 as a strategic tool to evaluate 1) the impacts and opportunities a CO_2 price could have on long-lived asset investments, 2) to inform Integrated Resource Plan scenarios designed to determine the optimal mix of future resources, and 3) to help identify least-cost methods for meeting its voluntary CO_2 stabilization goals.[35]

The SCC utilized in the ACE RIA suffers from multiple arbitrary departures from precedent, including but not limited to its approach to global versus domestic costs, treatment of uncertainty and selection of discount rates. These flaws render the SCC significantly lower than previous estimates and inconsistent with historic and current practices by both government and private actors, including EGU owners. The Trump Administration's withdrawal of prior IWG documents as "no longer representative of government policy" does not suffice to refute the scientific basis or findings in such documents.[36] The ACE RIA does not articulate any need or basis for departing from the science and economic analysis underlying the IWG SCC. The approach is merely an effort to skew the calculation of costs and benefits to favor the Proposed Regulation.

1. The RIA's Use of a Domestic rather than Global Social Cost of Carbon Is an Inappropriate Departure from Precedent that Results in Inconsistencies in the RIA

Until now, the federal government has consistently used a global SCC in rulemaking proceedings – a decision that courts have upheld[37] and that is consistent with OMB's directions to agencies. The SCC used in the ACE RIA departs from prior practice and excludes costs and benefits from impacts occurring internationally from its SCC calculation. This change in accounting for the

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[33] Ctr. for Biological Diversity, *supra* note 5, at 1203 (finding "NHTSA's decision not to monetize the benefit of carbon emissions reduction was arbitrary and capricious… in its analysis of the proper CAFE standards.").

[34] Environmental Defense Fund, *The True Cost of Carbon Pollution*, https://www.edf.org/true-cost-carbon-pollution (last visited Oct. 31, 2018).

[35] Joseph Kruger, *Managing Uncertainty in the US Electric Power Sector: Can Shadow Carbon Prices Light the Way?*, 194 RESOURCES FOR THE FUTURE (Spring 2017) http://www.rff.org/research/publications/managing-uncertainty-us-electric-power-sector-can-shadow-carbon-prices-light.

[36] E.O. 13783, 82 Fed. Reg. 16093 (March 28, 2017).

[37] See, e.g., Zero Zone, Inc. v. U.S. Dept. of Energy, 832 F.3d 654, 677, 679 (finding DOE's use of a "global" SCC proper since "national energy conservation has global effects, and, therefore, those global effects are an appropriate consideration when looking at a national policy.")

SCC is not only inconsistent with precedent but also creates internal inconsistencies in the RIA's interpretation and modeling of costs and benefits that accrue domestically.

OMB Circular A-4 instructs agencies to "focus on benefits and costs that accrue to citizens and residents of the United States" [pg. 15]. Significantly, OMB's focus encompasses "costs and benefits" from impacts *regardless of location – including international impacts*. Physical impacts of climate change (*e.g.*, droughts and floods) that occur internationally can result in costs on the United States because of their foreseeable effects on issues such as resource availability (*e.g.*, food supplies) and migration. The National Academies of Science, Engineering, and Medicine (the "National Academies") concur with the OMB's approach of taking international impacts into account in the SCC, explaining that:

> Climate damages to the United States cannot be accurately characterized without accounting for consequences outside U.S. borders. As the IWG noted (Interagency Working Group on the Social Cost of Carbon, 2010), climate change in other regions of the world could affect the United States through such pathways as global migration, economic destabilization, and political destabilization. In addition, the United States could be affected by changes in economic conditions of its trading partners: lower economic growth in other regions could reduce demand for U.S. exports, and lower productivity could increase the prices of U.S. imports.[38]

The ACE RIA's use of a domestic SCC is unreasonable and inconsistent with the RIA's approach to calculating the compliance costs of the Proposed Regulation. For example, according to Chapter 4 of the RIA, "some of the compliance costs accruing to entities outside U.S. borders is captured in the compliance costs presented in this RIA." [pg. 4-7]. EPA explains this result by indicating that the models it used in the RIA model international markets ("electricity and natural gas trade") and capture costs on domestically-operating firms with foreign ownership. This suggests at least two corrections to the RIA calculations: first, the RIA should capture the "domestic" costs of carbon by modeling trade in markets predicted to be hardest hit by climate change (*e.g.*, agriculture); and second, the RIA should account for costs sustained abroad by domestic companies that "accrue" as costs in the United States (*e.g.*, lower yields and higher adaptation costs could result in higher prices for consumers, reduced shareholder value, and lower tax revenue). The RIA's selective input of international impacts is an arbitrary decision; ignoring direct, indirect or foregone costs or benefits of international impacts only makes sense if none exist or are alleged to exist. That is not the case here.

Any failure to explicitly address and quantify costs and benefits to United States residents from climate change impacts outside the United States in the SCC must be accounted for elsewhere in the RIA's calculation of direct costs and benefits and/or countervailing risks and ancillary benefits.

[38] NATIONAL ACADEMIES OF SCIENCE, ENGINEERING AND MEDICINE ("NATIONAL ACADEMIES"), VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE 53 (2017). The report also notes the "emerging literature that also incorporates interactions among regions and impacts." Id at 150.

2. The Domestic Value of SCC Utilized in the RIA is Lower than Estimates Supported by Existing Research or Industry Practices

Even if a domestic calculation of SCC were reasonable (it is not), the value chosen by EPA for use in this RIA is unreasonably low and has the purposeful effect of artificially reducing the ultimate SCC in order to justify the Proposal. The Proposal would not be justified were EPA to use a credible SCC. The value of SCC used in the ACE RIA is flawed because, among other problems, the calculation excludes physical impacts occurring within the United States and relies on a regional model that is heavily criticized by economists and scientists. As a result of these deficiencies in the RIA's method of accounting for domestic costs, the RIA produced a SCC estimate that falls outside the range of even the lowest estimates of private actors.

The SCC does not accurately capture domestic costs because it categorically excludes impacts anticipated to occur within the United States, such as ocean acidification and species loss [ACE RIA pg. ES-21]. The omission of impact categories that will lead to costs in the United States is significant especially given the existence of data to model these impacts and monetize their costs. (Just one example is the impact of climate change on scallop fisheries.[39]) Even absent modeling capability, omission of these impacts requires transparent recognition and treatment of uncertainties created by the failure to include impacts that inherently raise the costs of carbon. For example, the CPP RIA relied on models that excluded similar impact categories. However, EPA directly acknowledged this gap and addressed it by including a "95th percentile estimate" of the SCC with a 3% discount rate [CPP RIA pg. 4-4]. Yet, the ACE RIA does nothing to treat uncertainty resulting from exclusions of impacts, despite long "right tails" in its SCC distribution [pg. 7-4]. Thus, the RIA should either include the full scope of domestic impacts in its models, or it should utilize methodological supplements (*e.g.*, the 95% figure) to adequately account for uncertainty introduced into models that exclude domestic impacts of climate change. The narrow scope of climate change costs falling into the RIA's definition of a "domestic" estimate requires more attention, particularly given the economic importance of climate-vulnerable species and the potential for climate impacts on those species to magnify costs via recognized feedback loops.[40]

Beyond excluded impacts, the RIA's process of adjusting the global SCC to a domestic value is inconsistent with the studies EPA cites. The RIA utilized three models in its analysis, however, one model (DICE) only gives a global SCC figure as an output. In order to adjust this number to yield a domestic SCC estimate, the RIA utilized a 10% figure based on the results from a regional model (RICE) [pg. 7-2]. However, the Nordhaus article cited in the RIA to support this

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[39] Cooley et al., *An Integrated Assessment Model for Helping the United States Sea Scallop (Placopecten magellanicus) Fishery Plan Ahead for Ocean Acidification and Warming*, 10 PLOS ONE 1 (2015) ("[O]ne of the most economically important single-species commercial fisheries in the United States… scallops will be increasingly influenced by global environmental changes such as ocean warming and ocean acidification.")

[40] See, e.g., id.; Forest Isbell et al., *Biodiversity Increases the Resistance of Ecosystem Productivity to Climate Extremes*, 526 NATURE 574, 574 (2015), https://www.nature.com/articles/nature15374 ("We show that biodiversity increased ecosystem resistance for a broad range of climate events, including wet or dry, moderate or extreme, and brief or prolonged events. Across all studies and climate events, the productivity of low-diversity communities with one or two species changed by approximately 50% during climate events, whereas that of high-diversity communities with 16–32 species was more resistant, changing by only approximately 25%.").

adjustment both (i) argues against reliance on regional disaggregation models, such as RICE,[41] and (ii) estimates that, when adjusting the global SCC using the DICE model (which is the model EPA used in the RIA), the United States' SCC is 15% of the global figure.[42] The 10% fixed estimate the RIA applied to the DICE model deflates the final domestic estimate for SCC; no clear explanation is provided for this departure from the literature cited by EPA itself.

Accounting flaws such as this illustrate why the RIA's SCC is lower than the value used in prior federal actions and the values used by other government entities and private sector actors. Examples of these discrepancies are noted below.

Organization	**SCC/CO_2 Value[43]**	
ACE RIA	$1-$6	(2015 Estimate in 2015$/ton)
CPP RIA	$11-$100	(2015 Estimate in 2010$/ton)
Public Utility Boards in MN and CO	$43	(2022 Estimate in 2017$/ton)
New York Public Service Commission	$40.74	(2020 Estimate in Nominal$/ton)
Privately-Owned Companies	$8-$800	(2016 Value in Nominal$/ton)

In these examples, even the ACE RIA's highest estimate for the present value of the SCC falls below the lowest value assigned to carbon emissions by industry actors. While some discrepancies arise due to different methodologies and uses of the SCC, there is no reasonable explanation for the degree of divergence that appears between these estimates. This is especially troubling given that 90% of nearly 400 expert responses to a survey agreed with the CPP's valuation of the SCC.[44]

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[41] William Nordhaus, *Revisiting the Social Cost of Carbon*, 114 PROCEEDINGS OF THE NAT'L ACAD. OF SCI. 1518, 1522 (2017) (describing inherent uncertainty and variability of regional models).

[42] Compare id. at 1521 (table 2) with ACE RIA, *supra* note 8, at 7-2 ("EPA approximates U.S. damages in step 4 [of DICE] as 10% of the global values based on the results of Nordhaus (2017).") Unlike other models, DICE does not "disaggregate" climate impacts, meaning that it does not identify *where* a climate impacts will occur. Therefore, the estimate it produces must be modulated in order to get a value representing the climate impacts in a given country. For more on DICE, see generally, William D. Nordhaus, "The 'DICE' Model: Background and Structure of a Dynamic Integrated Climate-Economy Model of the Economics of Global Warming," COWLES FOUNDATION RESEARCH PAPERS 1009 (1992) https://ideas.repec.org/p/cwl/cwldpp/1009.html.

[43] See Peter Fairly, *States are Using Social Cost of Carbon in Energy Decisions, Despite Trump's Opposition,* INSIDE CLIMATE NEWS, Aug. 14, 2017, (providing estimates for Colorado and Minnesota Public Utility Boards) https://insideclimatenews.org/news/11082017/states-climate-change-policy-calculate-social-cost-carbon; Joseph Kruger, *Managing Uncertainty*, *supra* note 35 (providing industry estimates); N.Y. INDEP. SYS. OPERATOR, CARBON PRICING DRAFT RECOMMENDATIONS 4 (Aug. 2, 2018) https://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg_ipptf/meeting_materials/2018-08-06/Carbon%20Pricing%20Draft%20Recommendations%2020180802.pdf; ACE RIA, *supra* note 8, at 4-4, Table 4-1; CPP RIA, *supra* note 14, at 4-8, Table 4-2.

[44] See Peter Howard and Derek Sylvan, *Expert Consensus on the Economics of Climate Change*, INSTITUTE FOR POLICY INTEGRITY 21 (Dec. 2015) ("[R]esponses in the 90th percentile vary from 3% to 5%. This strongly suggests that experts believe that the 5% discount rate…is on the high end of what economists recommend. A 7% discount rate…is clearly inappropriate.")

3. The RIA does not adequately address costs from the potential long-term and irreversible impacts of climate change

According to OMB Circular A-4, a formal probabilistic analysis of relevant uncertainties is "*appropriate* for complex rules where there are large, multiple uncertainties whose analysis raises technical challenges, or where the effects cascade; it is *required* for rules that exceed the $1 billion annual threshold." [pg. 41, emphasis added]. The OMB Circular A-4 highlights the use of formal probabilistic analysis with respect to regulating air pollution, noting its appropriateness as follows:

> [T]here is uncertainty about the effects of the rule on future emissions, uncertainty about how the change in emissions will affect air quality, uncertainty about how changes in air quality will affect health, and finally uncertainty about the economic and social value of the change in health outcomes. [pg. 41]

Such analysis is doubly necessary here. First, ACE is a significant rule (defined by its expected economic cost). Further, climate science identifies increased risks of reaching different climate tipping points that could result in much higher costs,[45] and economists agree that compliance now is cheaper than future compliance. [46] In explaining the mandate for a formal quantitative analysis of the relevant uncertainties about benefits and costs, OMB directs agencies to:

> [T]ry to provide some estimate of the probability distribution of regulatory benefits and costs. In summarizing the probability distributions, you should provide some estimates of the central tendency (e.g., mean and median) along with any other information you think will be useful such as ranges, variances, specified low-end and *high-end percentile estimates*, and other characteristics of the distribution. [pg. 40, emphasis added]

As the Supreme Court has iterated, while uncertainty is inherent in the regulatory process, it "does not imply that it is sufficient for an agency to merely recite the terms 'substantial uncertainty' as a justification for its actions. The agency *must explain the evidence* which is available, *and must offer a 'rational connection'* between the facts found and the choice made."[47]

The RIA diverges from prior practice and best practices by failing to transparently present high-end percentile estimates of the SCC derived from its models. For example, in the RIA for the CPP, EPA addressed uncertainty in climate change by presenting the 95% cost estimate for SCC

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[45] For example, disintegration of the West Antarctic and Greenland ice sheets would drastically accelerate sea level rise and magnify warming. See Jørn Thiede et al. *Millions of Years of Greenland Ice Sheet History Recorded in Ocean Sediments*, 80 POLARFORSCHUNG 141 (2011); Jonathan L. Bamber et al., *Reassessment of the Potential Sea-Level Rise from a Collapse of the West Antarctic Ice Sheet*, 324 SCIENCE 901 (2009).

[46] See, e.g., NATIONAL RESEARCH COUNCIL, LIMITING THE MAGNITUDE OF FUTURE CLIMATE CHANGE 87 (2010) ("[A]n insufficient short-term effort significantly increases the costs of compliance in the long term. Delays in beginning to reduce the U.S. contribution to global GHG emissions would risk further loss of opportunities to control GHG concentrations over the long term.");

[47] State Farm, *supra* note 3, at 52 (emphasis added).

with a 3% discount rate[48] [CPP RIA at pgs. 4-5–4-6]. In explaining this decision, EPA noted uncertainty in the climate system, stale climate data, and the need to compensate for impact categories that are excluded by models[49] [CPP RIA at pgs. 4-5–4-6].

In contrast, the RIA for the ACE acknowledges that its SCC estimates "do[] not yield a probability distribution that fully characterizes uncertainty about the SC-CO_2 due to impact categories omitted from the models and sources of uncertainty that have not been fully characterized" [pg. 7-4], but it does not correct the deficiency. The ACE RIA fails to compensate for such uncertainty, despite input from the Science Advisory Board which, in a letter to EPA Administrator Scott Pruitt, recommended specific treatment of uncertainty related to model inputs.[50] For example, where the uncertainty relates to high-cost impacts, it is obvious that including those impacts would produce a higher SCC value. Therefore, when the RIA identifies long "right-tails" in the distribution of SCC estimates [pg. 7-4], it should elaborate on that feature of the distribution both qualitatively and quantitatively, *e.g.*, describing what the features indicate about the mean SCC measure, and how it relates to the omitted impact categories.

The impact of failing to adequately address uncertainty predominantly cuts in one direction – resulting in an artificially low SCC – because the sources of uncertainty relate to impact categories that create additional costs and tipping points that magnify climate damages.[51]

4. RIA's use of a 3% and a 7% discount rate contravenes OMB guidance and best practice when it comes to accounting for future, irreversible impacts

The RIA's use of 3% and 7% discount rates in calculating the SCC is unreasonable. The selected discount rates (i) ignore OMB guidance for impact assessments primarily affecting future generations, (ii) are inconsistent with best practices of academics and other government entities, and (iii) create internal inconsistencies when utilized in EPA's models. These omissions are significant. As described by the National Academies, "small changes in the discount rate can have large impacts on the estimated SC-CO_2."[52] For example, "a [cost] of $1 million occurring in 100 years has a present value of $369,000 if the discount rate is 1%, $52,000 if it is 3%, and $

[48] CPP RIA, *supra* note 14, at 4-5–4-6. This was consistent with the approach adopted by the National Academies, which, in a report on the Social Cost of Carbon, presented 95% scenarios for each discount rate; concluding that a "balanced presentation of uncertainty includes *both low and high values* conditioned on each discount rate." NATIONAL ACADEMIES, VALUING CLIMATE DAMAGES, *supra* note 38, at 30, 35.

[49] CPP RIA, *supra* note 14, at 4-5–4-6.

[50] EPA SCI. ADVISORY BOARD, SAB ADVICE ON THE USE OF ECONOMY-WIDE MODELS IN EVALUATING THE SOCIAL COSTS, BENEFITS, AND ECONOMIC IMPACTS OF AIR REGULATIONS, EPA-SAB-17-012 at 2, 21 (Sept. 29, 2018) https://yosemite.epa.gov/sab/sabproduct.nsf/4B3BAF6C9EA6F503852581AA0057D565/$File/EPA-SAB-17-012.pdf

[51] See ACE RIA, *supra* note 8, at 6-11 (referencing excluded tipping points and impact categories); Cf. State Farm, *supra* note 3, at 51–52 (explaining that rescission can be justified by uncertainty where "supported by the record and reasonably explained," and finding that basis lacking in the record because of the "unquestionabl[e]" benefits of seatbelts.)

[52] See NATIONAL ACADEMIES, VALUING CLIMATE DAMAGES, *supra* note 38, at 157–58.

1,152 if it is 7%."[53] For climate change, this is particularly problematic both because the most significant impacts are anticipated to occur later in the century and because the effects of the persistence of carbon emissions in the atmosphere means that long-term climate change is "largely irreversible on human time scales."[54]

The analytical purpose of discount rates is to capture the assumption that a dollar today is worth more than a dollar tomorrow. A 7% discount rate is recommended by OMB as an "estimate of the average before-tax rate of return to private capital in the U.S. economy," often referred to as the "opportunity cost of capital." When a regulation primarily and directly affects private consumption, as opposed to affecting the allocation of capital, OMB recommends using a 3% discount rate, reflecting "the rate at which 'society' discounts future consumption flows to their present value," and often referred to as the "social rate of time preference" [OMB Circular A-4 pg. 33].

However, OMB and many economists recommend using a discount rate under 3% when evaluating intergenerational impacts, *i.e.*, costs that foreseeably and primarily impact future generations (frequently defined with respect to a thirty-year horizon). This recommendation is based, in part, on (i) ethical concerns to protect future generations by preventing intergenerational cost-shifting and (ii) uncertainty regarding long-term future growth. For instance, OMB Circular 4-A explains that:

> Special ethical considerations arise when comparing benefits and costs across generations. Although most people demonstrate time preference in their own consumption behavior, it may not be appropriate for society to demonstrate a similar preference when deciding between the well-being of current and future generations. Future citizens who are affected by such choices cannot take part in making them, and today's society must act with some consideration of their interest. [pg. 35]

It is appropriate to discount future benefits and costs at a lower rate both to: (i) address beliefs that "it is ethically impermissible to discount the utility of future generations" (a high discount rate suggests those alive today are worth more than future generations); and (ii) because, even if the welfare of future generations is not being discounted, there is an "expectation that future generations will be wealthier and thus will value a marginal dollar of benefits or costs by less than those alive today" [OMB Circular A-4 pgs. 35–36]. Thus, OIRA, supporting OMB's position, advises that:

> If the regulatory action will have important intergenerational benefits or costs, the agency might consider a sensitivity analysis using a lower but positive discount rage, ranging

[53] Charles Kolstad et al., *Social, Economic, and Ethical Concepts and Methods*, in CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE. CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Ch. 3, p. 228 (Marlene Attzs et al. eds., 2014)

[54] IPCC Fifth Assessment, Chapter 12, p. 1033.

from 1 to 3 percent, in addition to calculating net benefits using discount rates of 3 percent and 7 percent.[55]

OMB's recommendation of a lower discount rate for intergenerational impacts aligns with best practice when it comes to modeling impacts over extended periods of time. For example:

- A survey of 197 economists in 2015 found a mean (median) recommended long-term social discount rate of 2.25%, with 92% of respondents comfortable with rates in the range of 1% to 3%.[56]

- Declining discount rates for cost-benefit analyses conducted over long time periods are also used in countries such as the United Kingdom and France.[57] For example, guidance from the U.K. Treasury states that the "social time preference rate," which reflects the rate at which society values the present compared to the future, should decline (from the starting value of 3.5%) over the long term "due to uncertainty about future values of its components" and when calculating intergenerational effects.[58]

A more nuanced range of discount rates is particularly important given the potential for feedbacks between negative climate change impacts and economic growth. With respect to climate change modeling specifically, academics use ranges with lower values below 3% and upper values below 7%. For example, the range in the Nordhaus article cited by the ACE RIA is 2.5% to 5% [pg. 1520, Table 1]; others, in part motivated to account for potentially catastrophic, irreversible climate impacts, have used a range from 1% to 4%.[59] As explained by the National Academies, the IWG used alternative discount rates of 2.5, 3.0, and 5.0 when calculating the SCC "[d]ue to the atypically long time frame and important intergenerational consequences associated with CO_2 emissions"[60] [pg. 19]. Therefore, beyond ethical concerns, a lower discount

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[55] OIRA Primer, *supra* note 12, at 12.

[56] Moritz Drupp et al., Discounting Disentangled: An Expert Survey on the Determinants of the Long-Term Social Discount Rate, CENTRE FOR CLIMATE CHANGE ECONOMICS AND POLICY WORKING PAPER NO. 195, 1 (May 2015) http://piketty.pse.ens.fr/files/DruppFreeman2015.pdf. Cf., Peter Howard and Derek Sylvan, "Expert Consensus on the Economics of Climate Change," INSTITUTE FOR POLICY INTEGRITY, 20–21 (Dec. 2015) (presenting survey responses which "strongly suggests that experts believe that the 5% discount rate…is on the high end [of recommended figures].") https://policyintegrity.org/files/publications/ExpertConsensusReport.pdf.

[57] NATIONAL ACADEMIES, VALUING CLIMATE DAMAGES, *supra* note 38, at 171.

[58] HM TREASURY, THE GREEN BOOK: CENTRAL GOVERNMENT GUIDANCE ON APPRAISAL AND EVALUATION 103–04 (2018) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[59] See, e.g., Charles Kolstad et al., *Social, Economic, and Ethical Concepts and Methods*, in CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE. CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Ch. 3, p. 232 (Marlene Attzs et al. eds., 2014) (citing Martin, I.R., *Consumption-Based Asset Pricing with Higher Cumulants*, 80 REVIEW OF ECONOMIC STUDIES 745–773 (2013))

[60] NATIONAL ACADEMIES, VALUING CLIMATE DAMAGES, *supra* note 38 at 19.

rate is necessary to capture the totality of climate damages on a long timeframe; higher discount rates purport to account for all climate damages in less than 150 years.[61]

Despite common practice of using a broader range of discount rates to address uncertainty related to future growth, the ACE RIA defends its use of 3% and 7% discount rates [pg. 7-4]. However, even where a fixed discount rate is used with respect to long-term future growth, models do not use a discount rate as high as 7% and many recommend using a rate of 2.5%, fluctuating up to 5% and down to 1%, to address the type of uncertainty the RIA is supposedly addressing.[62] While experts diverge on the exact number to use, "a consensus favors using a declining risk-free discount rate" given the nature of climate impacts and the range of potential intensity and impacts on the economy.[63] For instance, the National Academies estimated a discount rate ranging from 2% to 4% based on different scenarios of economic growth [pg. 175, Figure 6-4].

Use of a different discount rate with respect to calculating SCC, as opposed to other facets of the RIA, is consistent with historical practice (*see, e.g.*, CPP RIA at ES-19) and recommendations from the literature that support using a lower discount rate for long-term and intergenerational impacts. The ACE RIA itself explicitly recognizes the appropriateness of using different discount rates when the context calls for it, for instance selecting a different discount rate in the context of the "capital recovery factor" [pg. 3-3, 3-4]. Thus, there is no reason that the RIA cannot utilize a lower discount rate when assessing the SCC. In the context of accounting for intergenerational effects, long-term impacts, and the correlation between growth and climate change, as well as feedbacks between those systems (which are excluded from the RIA), the selection of a discount rate should be consistent with common practice and precedent and based on science and economics as opposed to policy or value judgments.

The RIA for the ACE only *briefly* addresses a lower discount rate of 2.5% [pgs. 7-5, 7-7] without even including the estimates derived from this scenario in the RIA's graphics and data summaries [*see, e.g.*, ES-5, ES-14, 4-5, 4-42, 6-11]. This omission is significant because it biases a fundamental component of the RIA's cost-benefit analysis in a manner that unjustifiably favors the Proposed Regulation.

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The issues discussed herein are examples of the flaws in the RIA but are by no means an exhaustive list. For instance, given that the Proposed Regulation does not impose a cap on emissions or deadline for realizing a specific outcome, the RIA fails to provide a reasoned basis for ending its analysis in 2037 [pg. 1-9]. As noted above, limiting the timeframe of the analysis omits significant impacts and overstates emission reductions.[64] Another area that needs

[61] Cf. id., at 159, Figure 6-2 (presenting data of damages over time at 3 different discount rates; finding a 5% discount rate captures all discounted damages by 2150 whereas a 3% discount rate accounted for damages through 2300).

[62] See Howard and Sylvan, *Expert Consensus*, *supra* note 44, at 21.

[63] Kolstad et al., *Social, Economic, and Ethical Concepts and Methods*, *supra* note 59, at 211, 225.

[64] *Supra* pgs. 14–15 and accompanying notes; Cleary and Palmer, *A Giant Rebound?*, *supra* notes 13, 18.

additional clarity is the RIA's consideration of costs and benefits associated with impacts from the Proposed Regulation in Hawaii and Alaska. The ACE RIA purports to adopt a domestic perspective in its analysis but does not account for many of the significant impacts of climate change on states outside the forty-eight contiguous states. For example, the SCC estimates used in the RIA do not account for the direct impacts of climate change anticipated to occur in Alaska and Hawaii, despite these states being particularly at risk from climate change impacts [pg. ES-10]. As a result, the ACE RIA underestimates the costs of climate change and the scale of foregone benefits resulting from the Proposed Regulation.[65] This accounting technique is particularly problematic given that certain compliance costs *are* estimated for Hawaii and Alaska while the benefits of mitigating climate change are excluded from the calculation.[66]

The ACE RIA systematically undervalues the costs of the Proposed Regulation, including with respect to public health and the environment. By disregarding precedent and long-standing cost-benefit best practices, climate science, and existing data, the RIA fails to present a transparent or complete analysis of the Proposal. These deliberate choices effectively put a thumb on the scale of the ACE RIA to justify the Proposed Regulation. For the reasons discussed herein, we respectfully urge EPA to withdraw the Proposed Regulation.

Thank you for your attention to these comments.

BY:

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[65] For example, in Hawaii, plant and marine species are threatened by ocean acidification and sea level rise; ecosystems impacted by ocean acidification provide an estimated $360 million annually. See DEFENDERS OF WILDLIFE, *Climate Change and Hawaii*, p. 2 https://defenders.org/sites/default/files/publications/climate_change_and_hawaii.pdf. In Alaska, a number of species, including commercial salmon, are also threatened by climate change. See e.g., J.B. Haufler et al., *Climate Change Assessment for Alaska Region*, U.S. FOREST SERVICE 10–21 (2010) (describing a range of climate change effects in Alaska's ecosystems, including impacts on Salmon spawning and food supplies).

[66] ACE RIA, *supra* note 8, at 3-43 ("[T]his RIA excludes the potential costs and emission changes incurred in non-contiguous states and territories… as well as the benefits from changes in emissions… [but] MR&R [monitoring, reporting, and recordkeeping] costs are estimated for 49 states, including Alaska and Hawaii.")

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