



March 9, 2018

To: Bureau of Ocean Energy Management, U.S. Department of the Interior

Subject: Comments on Using the Social Cost of Greenhouse Gases in the 2019-2024 OCS Oil and Gas Leasing Program and Programmatic Environmental Impact Statement

Submitted by: Environmental Defense Fund, Montana Environmental Information Center, Institute for Policy Integrity at New York University School of Law, Sierra Club, Union of Concerned Scientists, WildEarth Guardians¹

Monetizing the environmental costs of greenhouse gas emissions provides useful information and context to the public and decisionmakers, as required by the National Environmental Policy Act² and by the Outer Continental Shelf Lands Act.³ These comments explain that, when the Bureau of Ocean Energy Management monetizes the environmental costs of emissions, the estimates of the social cost of greenhouse gases published in 2016 by the Interagency Working Group remain the best available values for federal agencies to use in analyses.

As a crucial caveat, the social cost of greenhouse gas metrics provide useful information and context only to the extent they are applied to accurate quantifications of the tons of greenhouse gases produced under the various action alternatives. To the extent that calculations of downstream tons of emissions, upstream tons of emissions, or tons of emissions from energy market substitutes (including the possibility of reduced demand) are incomplete or biased, the ultimate monetization of the climate impacts using the social cost of greenhouse gas metrics will similarly be arbitrarily incomplete or biased.

¹ Our individual organizations may separately submit other comments regarding other aspects of the DEIS.

² NEPA requires “hard look” consideration of beneficial and adverse effects of each alternative option for major federal government actions. The U.S. Supreme Court has called the disclosure of impacts the “key requirement of NEPA,” and held that agencies must “consider and disclose the actual environmental effects” of a proposed project in a way that “brings those effects to bear on [the agency’s] decisions.” *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 96 (1983).

Courts have repeatedly concluded that an EIS must disclose relevant climate effects. As the Ninth Circuit has held: “[T]he fact that climate change is largely a global phenomenon that includes actions that are outside of [the agency’s] control . . . does not release the agency from the duty of assessing the effects of its actions on global warming within the context of other actions that also affect global warming.” *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008); see also *Border Power Plant Working Grp. v. U.S. Dep’t of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (failure to disclose project’s indirect carbon dioxide emissions violates NEPA).

Courts review NEPA documents “under an arbitrary and capricious standard,” which requires “a reasonably thorough discussion of the significant aspects of the probable environmental consequences,” to “foster both informed decisionmaking and informed public participation.” *Ctr. for Biological Diversity*, 538 F.3d at 1194 (citations omitted). See also *Montana Env’tl. Info. Ctr. v. Office of Surface Mining*, cv 15-106-M-DWM, at 12-13 (D.Mt., Aug. 14, 2017). In particular, “the impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impact analysis that NEPA requires,” and it is arbitrary to fail to “provide the necessary contextual information about the cumulative and incremental environmental impacts.” *Ctr. for Biological Diversity*, 538 F.3d at 1217; see also *Montana Env’tl. Info. Ctr.*, cv 15-106-M-DWM at 45.

³ 43 U.S.C. § 1344(a)(3) (requiring the leasing program to balance the potential for environmental damage against the potential for oil and gas discovery and other adverse coastal impacts); *id.* § 1344(c)-(f) (requiring public notice and comment on the leasing program).

These comments are focused only on the appropriate selection of social cost of greenhouse gas values, and should not be read to endorse any of BOEM's previous calculations of the tons of greenhouse gases in the draft proposed program, or the proposed methodology for making those calculations, or any initial conclusions BOEM has reached regarding the emissions outcomes or desirability of any of the action alternatives, including the no action alternative. Our organizations may separately submit other comments regarding other aspects of the draft proposed program or the environmental impact statement scoping, including comments on how offshore drilling will affect global carbon emissions.

These comments focus on the following reasons why the 2016 estimates of the social cost of greenhouse gases published by the Interagency Working Group remain the best available values for BOEM to use in decisions about managing the outer continental shelf resources:

- Though the Interagency Working Group has been disbanded, its 2016 estimates used the best available data and methodologies. The Interagency Working Group's methodology and estimates have been endorsed by the National Academies of Sciences, by the Government Accountability Office, and by federal courts. BOEM reaffirmed as recently as August 2017 that the 2016 estimates are a "useful measure" to "inform agency decisions."
- The Interagency Working Group's estimates are appropriate not only for rulemakings but for resource management decisions and any other agency action with significant marginal climate effects.
- The Interagency Working Group's focuses on a 3% discount rate and on a global value are consistent with best practices for economic analysis, as embodied in the Office of Management and Budget's *Circular A-4*.
- If anything, the Interagency Working Group's 2016 estimates are significant underestimates—due to uncertainties, catastrophic risks, option value and risk aversion—and so should be treated as a conservative lower bound estimate of the true impact of greenhouse gas emissions on society.

The Interagency Working Group Estimates Remain the Best Available Values for Federal Agencies to Use in Analyses

Since the Interagency Working Group (IWG) first issued the federal social cost of carbon protocol in 2010, its methodology relied on the three most cited, most peer-reviewed integrated assessment models. These three models—called DICE (the Dynamic Integrated Model of Climate and the Economy⁴), FUND (the Climate Framework for Uncertainty, Negotiation, and Distribution⁵), and PAGE (Policy Analysis of the Greenhouse Effect⁶)—draw on the best available scientific and economic data to link physical impacts to the economic damages of each marginal ton of greenhouse gas emissions. Each model translates emissions into changes in atmospheric greenhouse gas concentrations, atmospheric concentrations into temperature changes, and temperature changes into economic damages, which can then be adjusted according to a discount rate. The IWG then combined these three models with inputs derived from peer-reviewed literature on climate sensitivity, socio-economic and emissions trajectories,

⁴ William D. Nordhaus, *Estimates of the social cost of carbon: concepts and results from the DICE-2013R model and alternative approaches*, 1 JOURNAL OF THE ASSOCIATION OF ENVIRONMENTAL AND RESOURCE ECONOMISTS 1 (2014).

⁵ David Anthoff & Richard S.J. Tol, THE CLIMATE FRAMEWORK FOR UNCERTAINTY, NEGOTIATION AND DISTRIBUTION (FUND), TECHNICAL DESCRIPTION, VERSION 3.6 (2012), available at <http://www.fund-model.org/versions>.

⁶ Chris Hope, *The Marginal Impact of CO₂ from PAGE2002: An Integrated Assessment Model Incorporating the IPCC's Five Reasons for Concern*, 6 INTEGRATED ASSESSMENT J. 19 (2006).

and discount rates. The results of the three models were given equal weight in the IWG's estimates, after being run through statistical techniques like Monte Carlo analysis to account for uncertainty. The 2016 estimates represent the IWG's most recently updated runs of the methodology.

In a 2017 report, the National Academies of Sciences recommended future improvements to this methodology but supported the continued near-term use of the IWG's existing social cost of greenhouse gas estimates based on the DICE, FUND, and PAGE models.⁷ In short, DICE, FUND, and PAGE continue to represent the state-of-the-art models. The Government Accountability Office found in 2014 that the IWG's estimates derived from these models are consensus-based, rely on peer-reviewed academic literature, disclose relevant limitations, and are designed to incorporate new information via public comments and updated research.⁸ In fact, the IWG's estimates used in federal regulatory proposals and EISs have been subject to nearly 100 distinct public comment periods.⁹ The economics literature confirms that estimates based on these three integrated assessment models remain the best available estimates (even though the IWG estimates are likely conservative underestimates of true climate costs).¹⁰ In 2016, the U.S. Court of Appeals for the Seventh Circuit held that it was reasonable for a federal agency to rely on the IWG's estimates.¹¹

In March 2017, Executive Order 13,783 officially disbanded the IWG and withdrew its technical support documents that underpinned their range of estimates.¹² Nevertheless, Executive Order 13,783 assumes that federal agencies will continue to "monetiz[e] the value of changes in greenhouse gas emissions" and instructs agencies to ensure such estimates are "consistent with the guidance contained in OMB Circular A-4."¹³ Consequently, while BOEM and other federal agencies no longer benefit from ongoing technical support from the Interagency Working Group on use of the social cost of greenhouse gases, by no means does the new Executive Order imply that agencies should not monetize important effects in their regulatory analyses or environmental impact statements. In fact, Circular A-4 instructs agencies to monetize costs and benefits whenever feasible.¹⁴ The Executive Order does not prohibit agencies from relying on the same choice of models as the IWG, the same inputs and assumptions as the IWG, the same statistical methodologies as the IWG, or the same ultimate values as derived by the IWG. To the contrary, because the Executive Order requires consistency with Circular A-4, as agencies follow the Circular's standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG's work continues to represent the best available estimates.¹⁵ The Executive Order does not preclude agencies from using the same range

⁷ Specifically, NAS concluded that a near-term update was not necessary or appropriate and the current estimates should continue to be used while future improvements are developed over time. Nat'l Acad. Sci., Eng. & Medicine, *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update 1* (2016) [hereinafter "NAS, First Report"].

⁸ Gov't Accountability Office, *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (2014).

⁹ Howard & Schwartz, *supra* note 17 at Appendix A.

¹⁰ E.g., Richard G. Newell et al., *Carbon Market Lessons and Global Policy Outlook*, 343 SCIENCE 1316 (2014); Bonnie L. Keeler et al., *The Social Costs of Nitrogen*, 2 SCIENCE ADVANCES e1600219 (2016); Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (co-authored with Nobel Laureate Kenneth Arrow, among others).

¹¹ *Zero Zone*, 832 F.3d at 678-79 (7th Cir. 2016) (finding that the agency "acted reasonably" in using global estimates of the social cost of carbon, and that the estimates chosen were not arbitrary or capricious).

¹² Exec. Order. No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).

¹³ *Id.* § 5(c).

¹⁴ OMB, Circular A-4 at 27 (2003) ("You should monetize quantitative estimates whenever possible.").

¹⁵ Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 SCIENCE 6352 (2017) (explaining that, even after Trump's Executive Order, the social cost of greenhouse gas estimate of around \$50 per ton of carbon dioxide is still the best estimate).

of estimates as developed by the IWG, so long as the agency explains that the data and methodology that produced those estimates are consistent with Circular A-4 and, more broadly, with standards for rational decisionmaking.

Similarly, the Executive Order's withdrawal of the Council on Environmental Quality guidance on greenhouse gases does not—and legally cannot—remove agencies' statutory requirement to fully disclose the environmental impacts of greenhouse gas emissions. As the Council explained in its withdrawal of that guidance, the "guidance was not a regulation," and "[t]he withdrawal of the guidance does not change any law, regulation, or other legally binding requirement."¹⁶ In other words, when the guidance originally recommended the appropriate use of the social cost of greenhouse gases in environmental impact statements,¹⁷ it was simply explaining that the social cost of greenhouse gases is consistent with longstanding NEPA regulations and case law, all of which are still in effect today.

Notably, some agencies under the Trump administration have continued to use the IWG estimates even following the Executive Order. Most relevantly, in an August 2017 draft environmental impact statement, BOEM called the social cost of carbon "a useful measure" and used the IWG's 2016 estimates to analyze the consequences of offshore oil and gas drilling.¹⁸ Similarly, in July 2017, the Department of Energy used the IWG's 2016 estimates for carbon and methane emissions to analyze energy efficiency regulation, describing the social cost of methane as having "undergone multiple stages of peer review."¹⁹

The Social Cost of Greenhouse Gas Metrics Are Appropriate for Resource Management Decisions

Though the IWG first developed its estimates for use in regulatory impact analyses, the social cost of greenhouse gas methodology is well suited to measure the marginal climate effects of resource management decisions. The IWG's protocols were developed to assess the cost of actions with "marginal" impacts on cumulative global emissions, and the metrics estimate the dollar figure of damages for one extra unit of greenhouse gas emissions. This marginal cost is calculated using integrated assessment models. These models translate emissions into changes in atmospheric greenhouse concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. A range of plausible socio-economic and emissions trajectories

¹⁶ 82 Fed. Reg. 16,576, 16,576 (Apr. 5, 2017).

¹⁷ See CEQ, *Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 16 (Dec. 2014), available at https://obamawhitehouse.archives.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf ("When an agency determines it appropriate to monetize costs and benefits, then, although developed specifically for regulatory impact analyses, the Federal social cost of carbon, which multiple Federal agencies have developed and used to assess the costs and benefits of alternatives in rulemakings, offers a harmonized, interagency metric that can provide decisionmakers and the public with some context for meaningful NEPA review. When using the Federal social cost of carbon, the agency should disclose the fact that these estimates vary over time, are associated with different discount rates and risks, and are intended to be updated as scientific and economic understanding improves."); see also CEQ, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 33 n.86 (Aug. 2016), available at https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf.

¹⁸ Draft Env'tl. Impact Statement: Liberty Development Project at 3-129, 4-51, 4-246 (Aug. 2017). The DEIS does not explicitly state the source of the social cost of carbon estimates used. However, the DEIS refers to a paper by Wolfovsky and Anderson, which specifically uses the 2016 estimates from the IWG. In addition, comparing the table on page 4-51 (quantification of tons of greenhouse gases) with the table of page 4-247 (monetization of total damages) implies use of a central social cost of carbon estimate of about \$39 per ton.

¹⁹ Energy Conservation Program: Energy Conservation Standards for Walk-In Cooler and Freezer Refrigeration Systems, 82 Fed. Reg. 31,808, 31,811, 31,857 (July 10, 2017).

are used to account for the scope of potential scenarios and circumstances that may actually result in the coming years and decades. The marginal cost is attained by first running the models using a baseline emissions trajectory, and then running the same models again with one additional unit of emissions. The difference in damages between the two runs is the marginal cost of one additional unit. The approach assumes that the marginal damages from increased emissions will remain constant for small emissions increases relative to gross global emissions. In other words, the monetization tools are in fact perfectly suited to measuring the marginal effects of individual projects, resource management plans, or other discrete agency actions. No part of the methodology is unique to the regulatory context.

IWG's Focus on a 300-Year Horizon and 3% Discount Rate Is Consistent with Best Economic Practices.

Because of the long lifespan of greenhouse gases and the long-term or irreversible consequences of climate change, the effects of today's emissions changes will stretch out over the next several centuries. IWG's focus on a 300-year time horizon and a 3% discount rate as the central estimate follows best economic practices, consistent with *Circular A-4*. By comparison, applying a 7% discount rate to intergenerational climate effects would be entirely inconsistent with best economic practices.

In 2015, the Office of Management and Budget explained that "Circular A-4 is a living document. . . . [T]he use of 7 percent is not considered appropriate for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself." ²⁰ While Circular A-4 tells agencies generally to use a 7% discount rate in addition to lower rates for typical rules, ²¹ the guidance does not intend for default assumptions to produce analyses inconsistent with best economic practices. Rather, Circular A-4 requires agencies to use "sound and defensible values" ²² and to justify "assumptions [about] the discount rate." ²³

Under Circular A-4, a 3% discount rate based on the consumption rate of interest is the correct framework for analysis of climate effects, while a 7% discount rate based on the private return to capital is inappropriate since climate change concerns the public well-being broadly, not the sole preferences of private market participants. ²⁴ The National Academies of Sciences recently confirmed that a consumption rate of interest is the appropriate basis for a discount rate for climate effects, ²⁵ and there is also strong consensus through the economic literature that a capital discount rate like 7% is

²⁰ OMB 2015 Response to Comments, *supra*, at 36.

²¹ Circular A-4 at 36 ("For regulatory analysis, you should provide estimates of net benefits using both 3 percent and 7 percent....If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.").

²² *Id.* at 27.

²³ *Id.* at 3.

²⁴ Revesz et al. Science.

²⁵ NAS Second Report, *supra*, at 28; see also Kenneth Arrow et al., Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?, 272 SCIENCE 221 (1996) (explaining that a consumption-based discount rate is appropriate for climate change).

inappropriate for climate change.²⁶ Moreover, uncertainty over the long time horizon of climate effects should drive analysts to select a lower discount rate.²⁷

IWG's Focus on a Global Value Is Consistent with Best Economic Practices.

IWG's focus on a global value for the social cost of greenhouse gases follows best economic practices, consistent with *Circular A-4*. While Circular A-4 calls generally for a focus on effects to U.S. citizens and residents,²⁸ the guidance also calls for "different emphases in the analysis, depending on the nature and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions."²⁹

Perhaps more than any other issue, the nature of the issue of climate change requires precisely such a "different emphasis" from the default domestic-only assumption. To avoid a global "tragedy of the commons" that could irreparably damage all countries, including the United States, every nation should ideally set policy according to the global social cost of greenhouse gases.³⁰ If all countries set their greenhouse emission levels based on only domestic costs and benefits, ignoring the large global externalities, the aggregate result would be substantially sub-optimal climate protections and significantly increased risks of severe harms to all nations, including the United States. Thus, basic economic principles demonstrate that the United States stands to benefit greatly if all countries apply global social cost of greenhouse gas values in their regulatory decisions and project reviews. Indeed, the United States stands to gain hundreds of billions or even trillions of dollars in direct benefits from efficient foreign action on climate change.³¹

In order to ensure that other nations continue to use global social cost of greenhouse gas values, it is important that the United States itself continue to do so.³² The United States is engaged in a repeated strategic dynamic with several significant players—including the United Kingdom, Germany, Sweden, and others—that have already adopted a global framework for valuing the social cost of greenhouse gases.³³ For example, Canada and Mexico have explicitly borrowed the U.S. estimates of a global social

²⁶ In addition to the CEA and NAS reports, see, for example, this article by the former chair of the NAS panel on the social cost of greenhouse gases: Richard Newell (2017, October 10). Unpacking the Administration's Revised Social Cost of Carbon. Available at <http://www.rff.org/blog/2017/unpacking-administration-s-revised-social-cost-carbon>. See also Comments from Robert Pindyck, to BLM, on the Social Cost of Methane in the Proposed Suspension of the Waste Prevention Rule (submitted Nov. 5, 2017).

²⁷ Circular A-4 notes, while "[p]rivate market rates provide a reliable reference for determining how society values time within a generation, but for extremely long time periods no comparable private rates exist." Circular A-4 at 36. Circular A-4 cites the work of renowned economist Martin Weitzman and concludes that the "certainty-equivalent discount factor corresponds to the minimum discount rate having any substantial positive probability." *Id.* The NAS makes the same point about discount rates and uncertainty. NAS Second Report, *supra*, at 27.

²⁸ Circular A-4 at 15. Note that A-4 slightly conflates "accrue to citizens" with "borders of the United States": U.S. citizens have financial and other interests tied to effects beyond the borders of the United States, as discussed further below.

²⁹ Circular A-4 at 3. Importantly, despite this language, the U.S. Court of Appeals for the Seventh Circuit had no trouble concluding that a global focus for the social cost of greenhouse gases was reasonable. *Zero Zone v. Dept. of Energy*, 832 F.3d 654, 679 (7th Cir. 2016).

³⁰ See Garrett Hardin, *The Tragedy of the Commons*, 162 Science 1243 (1968) ("[E]ach pursuing [only its] own best interest . . . in a commons brings ruin to all.").

³¹ Policy Integrity, *Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action* (2015), <http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf>

³² See Robert Axelrod, *The Evolution of Cooperation* 10-11 (1984) (on repeated prisoner's dilemma games).

³³ See Howard & Schwartz, *supra* note **Error! Bookmark not defined.**, at Appendix B.

cost of carbon to set their own fuel efficiency standards.³⁴ For the United States to now depart from this collaborative dynamic by reverting to a domestic-only estimate would undermine the country's long-term interests and could jeopardize emissions reductions underway in other countries, which are already benefiting the United States.

Moreover, to follow Circular A-4's instruction to analyze all significant effects that "accrue[s] to U.S. citizens," agencies must look beyond "U.S. borders" to a much broader range of climate effects. Circular A-4 instructs to estimate *all* important "opportunity costs," meaning "what individuals are willing to forgo to enjoy a particular benefit."³⁵ U.S. individuals are willing to forgo money to enjoy benefits or avoid costs from climate effects that occur beyond U.S. borders, and all such significant effects—including from international spillovers to trade, health, and security; from reciprocal foreign actions; and from extraterritorial interests—must be captured.³⁶

Finally, OMB,³⁷ the National Academies of Sciences,³⁸ and the economic literature³⁹ all agree that existing methodologies for calculating a "domestic-only" value of the social cost of greenhouse gases are deeply flawed and result in severe and misleading underestimates.

If Anything, the 2016 IWG Values are Underestimates and Should Be Treated as a Lower Bound for True Climate Costs.

The IWG's estimates do not fully capture key factors like catastrophic damages, tipping points, option value, and risk aversion. However, uncertainty around the estimates is *not* a reason to abandon the social cost of greenhouse gas methodologies;⁴⁰ quite the contrary, uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail upside risks and unknown unknowns about the damages of climate change. Because the key uncertainties of climate change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions. Consequently, the social cost of greenhouse gases should be seen as a conservative lower-bound estimate of the greenhouse gas impacts. Even while this metric represents the best and most rigorous effort that the U.S. government has engaged in thus far to realistically

³⁴ See Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24, 147 Can. Gazette pt. II, 450, 544 (Can.), available at <http://canadagazette.gc.ca/rp-pr/p2/2013/2013-03-13/html/sor-dors24-eng.html> ("The values used by Environment Canada are based on the extensive work of the U.S. Interagency Working Group on the Social Cost of Carbon."); Jason Furman & Brian Deese, *The Economic Benefits of a 50 Percent Target for Clean Energy Generation by 2025*, White House Blog, June 29, 2016 (summarizing the North American Leader's Summit announcement that U.S., Canada, and Mexico would "align" their SCC estimates).

³⁵ Circular A-4 at 18.

³⁶ This section draws heavily from Howard & Schwartz (2017), *supra* note **Error! Bookmark not defined.**, and includes passages taken directly from that article (which was written by co-authors of these comments).

³⁷ In November 2013, OMB requested public comments on the social cost of carbon. In 2015, OMB along with the rest of the Interagency Working Group issued a formal response to those comments. Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 36 (July 2015) [hereinafter, OMB 2015 Response to Comments]. ("good methodologies for estimating domestic damages do not currently exist.")

³⁸ National Academies of Sciences, Engineering, and Medicine, *Valuing climate damages: Updating estimation of the social cost of carbon dioxide* at 53 (2017) [hereinafter NAS Second Report].

³⁹ William Nordhaus, the developer of the DICE model, cautioned earlier this year that "regional damage estimates are both incomplete and poorly understood," and "there is little agreement on the distribution of the SCC by region." William Nordhaus, *Revisiting the Social Cost of Carbon*, 114 PNAS 1518, 1522 (2017).

⁴⁰ *Center for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1200 (9th Cir. 2008) ("[W]hile the record shows that there is a range of values, the value of carbon emissions reductions is certainly not zero.").

quantify the impacts of these emissions, it is very likely to underrepresent the true extent of those impacts. Indeed, we strongly encourage further efforts to make the social cost of greenhouse gases more robust.

Sincerely,

Susanne Brooks, Director of U.S. Climate Policy and Analysis, Environmental Defense Fund
Tomás Carbonell, Senior Attorney and Director of Regulatory Policy, Environmental Defense Fund
Rachel Cleetus, Ph.D., Lead Economist and Climate Policy Manager, Union of Concerned Scientists
Denise Grab, Western Regional Director, Institute for Policy Integrity, NYU School of Law*
Anne Hedges, Deputy Director, Montana Environmental Information Center
Jayni Hein, Policy Director, Institute for Policy Integrity, NYU School of Law*
Peter H. Howard, Ph.D., Economic Director, Institute for Policy Integrity, NYU School of Law*
Shannon Hughes, Climate Guardian, WildEarth Guardians
Martha Roberts, Senior Attorney, Environmental Defense Fund
Iliana Paul, Policy Associate, Institute for Policy Integrity, NYU School of Law*
Athan Manuel, Director, Lands Protection Program, Sierra Club
Richard L. Revesz, Director, Institute for Policy Integrity, NYU School of Law*
Jason A. Schwartz, Legal Director, Institute for Policy Integrity, NYU School of Law*
Jeffrey Shrader, Economics Fellow, Institute for Policy Integrity, NYU School of Law*
Peter Zalzal, Director of Special Projects and Senior Attorney, Environmental Defense Fund

For any questions regarding these comments, please contact jason.schwartz@nyu.edu.

* No part of this document purports to present New York University School of Law's views, if any.