



Texas Public Policy Foundation

June 21, 2021

VIA REGULATIONS.GOV

Dominic J. Mancini
Deputy Administrator
Office of Information and Regulatory Affairs
Office of Management and Budget
1600 Pennsylvania Ave., NW
Washington, DC 20500

RE: Notice of Availability and Request for Comment on “Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990” OMB-2021-0006-0001

Dear Deputy Administrator Mancini:

The Texas Public Policy Foundation (TPPF) submits its comments on the Interagency Working Group on the Social Cost of Greenhouse Gases’ Technical Support Document on the Social Cost of Carbon, Methane and Nitrous Oxide (“Social Cost of Greenhouse Gases”) Interim Estimates under Executive Order 13,990 (TSD). The notice of availability and request for comment notes that the President has tasked the Interagency Working Group with a number of actions between now and 2022, including making recommendations about the process for reviewing the Social Cost of Greenhouse Gases estimates and the methodologies for calculating the estimates. In the meantime, your office and the Interagency Working Group requested comments on specific areas related to the TSD.¹ These comments respond to that request.

TPPF is a 501(c)(3) non-profit, non-partisan research institute dedicated to promoting and defending liberty, personal responsibility, and free enterprise. TPPF’s Life: Powered initiative seeks to raise America’s energy IQ through its research.

Evaluating the social cost of greenhouse gases and government actions that relate to them can and should be an important part of policy making. That is especially the case in relation to an area as important and impactful as climate regulation and policy. Developing estimates for the social cost of greenhouse gases should be based upon sound science, engineering, and economics and reflective of a robust and public process. In these comments we address the following issues that we believe are crucial for your office to address:

¹ 86 Fed. Reg. 24,669, 24670 (May 7, 2021)

- **Compliance with the Administrative Procedure Act:** The Interim and any future Social Cost of Greenhouse Gases estimates should follow the Administrative Procedure Act’s notice-and-comment rule making procedures. The Act clearly applies here, but the interim estimates and the process previously used to develop the Social Cost of Carbon estimates, on which they rely, fall short of what is required. We explain some of these shortcomings, and why OMB and the Interagency Working Group must fix these flaws before jeopardizing government decisions that include or rely on the interim or later versions of the estimates.
- **Domestic Benefits:** The interim estimates fail to evaluate and ultimately mask the social costs and benefits of domestic actions related to greenhouse gases on the United States because they only discuss global costs. Although evaluation of global externalities may be appropriate, it is not appropriate to avoid discussion of domestic costs and benefits, as well as the “leakage” of social costs beyond U.S. borders, for the purposes of evaluating domestic action. Failing to address this deficiency will render rules that rely on the estimates arbitrary and capricious and otherwise contrary to law.
- **Flawed assumptions:** The interim estimates and the previous versions of the Social Cost of Carbon are based on a number of flawed assumptions, methods, and inputs. We address several of these and point out that they must be fixed and subjected to public review and comment before decision makers rely on them.

I. The Interim Social Cost of Greenhouse Gases Estimates Must Follow the APA’s Notice-And-Comment Rulemaking Procedures.

The Social Cost of Greenhouse Gases interim estimates and the TSD present the Interagency Working Group’s estimation of “the monetary value of the net harm to society associated with adding a small amount of that greenhouse gases to the atmosphere in a given year.”² Those estimates are required by a January 20, 2021 executive order for use by federal agencies when conducting benefit-cost analyses “of regulatory and other actions” that affect domestic greenhouse gases emissions. Indeed, agencies already have begun to employ the interim estimates in rule makings.³

Benefit-cost analyses are a critical part of the rule making process. They help policy makers assess the efficacy of new and existing federal regulations. They help legislators perform oversight. And, perhaps most importantly, they help the public and the regulated community better understand the economic consequences and potential benefits of federal actions. Especially when related to a topic as important and impactful U.S. climate policy, transparency is crucial. Estimates of the social cost of greenhouse gases and regulatory government decision making will play an

² TSD at 8.

³ See, e.g., *Revised Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS*, 86 Fed. Reg. 23,054, 23,061 (April 30, 2021).

important role in policy making and debate. Due care should be taken to ensure they are based upon the most sound reasoning, and comply with laws and norms related to good government.

The interim estimates, however, like the prior Social Cost of Carbon estimates upon which they were built, were developed outside of the ordinary rule making process and failed to comply with procedural requirements and norms. The interim estimates for example, were issued without an opportunity for comment at all. They were issued with extraordinary speed for an estimate of this magnitude and outside of the public process.⁴ Carrying those failures into many separate rule makings and policy decisions that rely on the interim estimates or future versions that build on the interim estimates will jeopardize those rules and policies and undermine the rule making process. OMB and the Interagency Working Group should undertake a full and transparent notice-and-comment rule making for the interim and any final estimates before other agencies rely on them.

The interim estimates and any later updates to those estimates are “rules” subject to the Administrative Procedure Act (APA). The APA defines a “rule” as “an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy,” including “the approval or prescription of . . . valuations, costs, or accounting.”⁵ The Social Cost of Greenhouse Gases estimate and the TSD create a statement of general and particular applicability that prescribes social costs used to evaluate the cost effectiveness of regulatory and other actions by federal agencies; *i.e.*, it prescribes values, costs, or accounting. Like the preceding estimates, the interim and subsequent Social Cost of Greenhouse Gases estimates will be incorporated by federal agencies into their analyses of the costs and benefits of agency decision making related to greenhouse gas emissions and used to create substantive obligations for the regulated entities who are subject to those decisions.

Rules, like these,⁶ must follow procedures established by the APA for “rule making,” defined as the process of “formulating, amending, or repealing a rule.”⁷ Under these procedures,

⁴ Indeed, the Interagency Working Group’s work and membership have not even been made part of a public record. The haste at which these estimates were and are being developed suggests to some that they are more driven by a predetermined effort to “revamp and wield the social cost of carbon to drive ambition” as opposed to an effort to use facts, science, and reasonable degrees of economic judgment to evaluate the costs and benefits of ambition. *See* Brenda Mallory, Joe Goffman, Jennefer Macedonia, et al., Climate 21 Project Transition Memo: Environmental Protection Agency *available at* https://climate21.org/documents/C21_EPA.pdf (recommending the Biden Administration use the social cost of carbon).

⁵ 5 U.S.C. § 551(4).

⁶ Of course, not all rules require notice-and-comment. The APA’s notice-and-comment requirement, for example, “does not apply” to “interpretive rules, general statements of policy, or rules of agency organization, procedure, or practice.” 5 U.S.C. § 554(b). But this is not an interpretive rule, policy statement, or other rule exempt from notice-and-comment. The Social Cost of Greenhouse Gases estimates control how other agencies will perform regulatory impact and cost benefit analyses by providing cost figures those agencies can plug into their analyses without developing those figures from scratch. That is, they set values and standards and are the kind of binding rule that requires notice-and-comment.

⁷ *Id.* § 551(5).

an agency must provide advance public notice that includes a “reference to the legal authority under which the rule is proposed,” and “the terms or substance of the proposed rule.”⁸ It must provide a meaningful opportunity to participate in the rule making through written or oral comments, and it must consider and offer reasoned responses to those comments.⁹ Once that process is complete, the rule and the adequacy of the agency’s consideration of comments are subject to judicial review.¹⁰

Following the notice-and-comment procedure is particularly important in a rule like this that will influence numerous benefit-cost analyses and government decisions regarding “significant,” “major,” and “economically-significant” rulemakings. “[W]hen an agency decides to rely on a cost-benefit analysis as part of its rulemaking, serious flaws undermining that analysis can render a rule unreasonable.”¹¹ The courts will not tolerate a failure to explain an important step in an agency’s analysis, perhaps especially when the analysis involves use of models to predict future outcomes far into the future.¹² “When an agency uses a computer model, it must explain the assumptions and methodology used in preparing the model.”¹³ And that includes *why* the agency decided to use certain methods or data points.¹⁴ As the D.C. Circuit has explained:

Reasoned decision-making can use an economic model to provide useful information about economic realities. However, the agency must sufficiently explain the assumptions and methodology used in preparing the model; it must provide a complete analytic defense of its model (and) respond to each objection with a reasoned presentation. The technical complexity of the analysis does not relieve the agency of the burden to consider all relevant factors and to identify the stepping stones to its final decision. There must be a rational connection between the factual inputs, modeling assumptions, modeling results and conclusions drawn from these results.¹⁵

⁸ *Id.* § 553(b).

⁹ *Id.* § 553(c); and see, e.g., *Conn. Light & Power Co. v. Nuc. Reg. Comm’n*, 673 F.2d 525, 528 (D.C. Cir. 1982) (“One particularly important component of the reasoning process is the opportunity for interested parties to participate in a meaningful way in the discussion and formulation of rules.”).

¹⁰ See 5 U.S.C. § 702 & 706(2)(A).

¹¹ *National Ass’n of Home Builders v. EPA*, 682 F.3d 1032, 1040 (D.C. Cir. 2012).

¹² Here, the Interagency Working Group’s analysis involves averaging some outputs of multiple third-party models to predict long term future outcomes.

¹³ *U.S. Air Tour Ass’n v. FAA*, 298 F.3d 997, 1008 (D.C. Cir. 2002).

¹⁴ See, e.g., *Owner-Operator Independent Drivers Ass’n, Inc. v. Fed. Motor Carrier Safety Admin.*, 494 F.3d 188, 204 (D.C. Cir. 2007) (“[T]he issue is not whether a curve should have been used, but why the agency chose to draw the curve.”); *City of Holyoke Gas & Elec. Dep’t v. F.E.R.C.*, 954 F.2d 740, 743 (D.C. Cir. 1992) (holding FERC failed to provide sufficient explanation of data and assumption used in comparison rate, depriving stakeholders and court opportunity to understand calculation and underlying assumptions).

¹⁵ *Sierra Club v. Costle*, 657 F.2d 298, 333 (D.C. Cir. 1981) (cleaned up).

Although these types of decisions are often subject to some degree of deference, “an agency must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts and the choice made.”¹⁶

But the notice and the Interagency Working Group’s process fail to provide sufficient information to the public and to provide an adequate opportunity to comment or explain why different inputs or assumptions would be appropriate. While the notice solicits comments on some specific topics that relate to updating the Social Cost of Greenhouse Gases estimates by January 22,¹⁷ it falls far short of the public engagement contemplated and mandated by the APA. For example, there are no materials available in the docket other than the TSD itself, which largely is a summary document. None of the integrated assessment models, the inputs that were used to run them, the source of the inputs and reasonable alternatives, or the ranges of model results they generated for each set of assumption are presented to the public for comment. There is no analysis of how sensitive the models are to each of the model’s assumptions. There is no discussion of the different assumptions used for the same parameters in the different models. There is no discussion of inconsistent inputs and assumptions used across the models (for example, some, but not all of the models evaluate improvements in agricultural productivity from CO₂ fertilization). Of the models There is insufficient indication of how the Interagency Working Group or OMB has addressed comments on prior versions of the estimates or the models. There is not even a listing of who participated in the Interagency Working Group process, their qualifications, and how they made their decisions. There is simply no opportunity to comment meaningfully on the underlying assumptions, calculations, or processes that went into developing the interim estimates.

The TSD’s assertion that that there have been previous “opportunities for public input on the estimates and underlying methodologies” is not accurate.¹⁸ Stakeholders raised a number of concerns regarding the integrated assessment models used to form a basis for the Social Cost of Carbon and now the Social Cost of Greenhouse Gases, how they were developed, the inputs and assumptions they used, and the results they provided.¹⁹ But the Interagency Working Group previously refused to address many of those comments, contending they were “outside the scope of the comment exercise.”²⁰ Instead, it deferred the selection of assumptions and judgments regarding the models’ damage function to the model developers’ review of “currently available literature on the effects of climate change on society.”²¹ But the literature relied on and the conclusions that modelers draw from it are precisely the type of science and policy judgments that the public comment process should address.

¹⁶ *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2125 (2016) (cleaned up).

¹⁷ 86 Fed. Reg. at 24,670.

¹⁸ TSD at 10.

¹⁹ *See Comments of the Aluminum Association, et. al.* submitted June 21, 2021.

²⁰ IWG, Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (July 2015).

²¹ *Id.* at 8.

To the extent that the Interagency Working Group ever addressed prior comments about data inputs and sources, it did so in a 2010 document, now more than a decade out of date.²² In the interim, calculations and information have changed without public process. For example, just one economist involved in the development of one of the integrated assessment models unilaterally caused profound increases to cost estimates using the models. The economist increased his estimate for global output in the DICE model by 50% and his estimate of global damages by 25%.²³ As he put it, “[because damages are generally proportional to output, increasing output increases the SCC in a proportional fashion.” The IWG has never engaged in an open and transparent public process to assess the reasonableness of these or any other assumptions in the integrated assessment models. Meanwhile, peer-reviewed studies have concluded that many of the assumptions used in some of the integrated assessment models are outdated, subject to manipulation, or contain errors.²⁴ The bottom line is that such important judgment calls as the data inputs and assumptions used to run models with as profound impacts as the Social Cost of Greenhouse Gases will have on government decision making must be subject to a robust and fulsome comment process. This is especially so in the context of the evolving nature of scientific knowledge and projections regarding climate impacts. The Interagency Working Group should make all data, models, and assumptions available to the public for comment.

Furthermore, neither the Interagency Working Group nor subsequent agencies that rely on the estimates can avoid a new rulemaking procedure to cover the revisions and amendments to the estimates. The APA’s notice-and-comment procedures apply equally to new rules and amendments to prior rules.²⁵ As the Supreme Court once put it, “[t]he [APA] makes no distinction . . . between initial agency action and subsequent agency action undoing or revising that action.”²⁶ And where an agency applies a similar methodology as a prior rule to calculate a relevant consideration, it must submit that methodology to new comments if it applies updates, modifications, and new multipliers to the methodology.²⁷ Simply put, the revisions to the Social Cost of Greenhouse Gases estimate should be put out for comment and that should include an opportunity to comment on the underlying models and all of the inputs. Unless a re-proposal is issued, with a complete docket, allowing stakeholders to comment and propose revisions, the Interagency Working Group will repeat past non-compliance and deprive the public of their rights to participate in the rule making process under the Administrative Procedure Act.

²² *Id.*

²³ William D. Nordhaus, Revisiting the Social Cost of Carbon, Proceedings of the National Academy of Sciences (Jan. 31, 2017) available at <https://www.pnas.org/content/114/7/1518#T3>.

²⁴ *E.g.*, Kevin D. Dyaratna, Ross McKittrick & Patrick J. Michaels, Climate Sensitivity, Agricultural Productivity, and the Social Cost of Carbon in FUND, *Envtl. 22 Econ. & Policy Studies* 433-48 (2020) available at <https://www.springer.com/journal/10018>; Kevin Dyaratna, Ross McKittrick & David Kreutzer, Empirically Constrained Climate Sensitivity, and the Social Cost of Carbon, *8 Climate Change Econo.* 02 (2017) available at <https://www.worldscientific.com/doi/abs/10.1142/S2010007817500063>.

²⁵ 5 U.S.C. § 551(5).

²⁶ *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

²⁷ *Owner-Operator Independent Drivers Association, Inc.*, 494 F.3d at 201; *see also Perez v. Mortg. Bankers Ass’n*, 135 S. Ct. 1199, 1203 (2015) (“An agency must consider and respond to significant comments received during the period for public comment.”)

Not only are the estimates a “rule” under the Administrative Procedures Act, they are a “significant regulatory action” under Executive Order 12866 and a “major” rule under the Congressional Review Act. Such rules cannot be made effective for 60 days following final publication of the rule. OMB and the Interagency Working Group have violated these requirements by using the interim estimates as part of multiple rulemakings prior to any public opportunity to participate in their development. In fact, given the novel issues and uncertainty associated with the application of these estimates, the abbreviated comment period and denial of numerous comment deadline extension requests (from a significant number of states, industries, non-profits and even sitting U.S. senators) is unreasonable. By failing to develop these estimates through a formal rulemaking process, OMB and the Interagency Working Group also have inappropriately circumvented the Congressional Review Act and Congress’ authority to review and, if necessary, overturn these estimates. The CRA defines a major rule as one that has resulted in or is likely to result in (1) an annual effect on the economy of \$100 million or more; (2) a major increase in costs or prices for consumers, individual industries, federal, state, or local government agencies, or geographic regions; or (3) significant adverse effects on competition, employment, investment, productivity, or innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic and export markets.²⁸ Given the novel policy issues at hand and economically significant impacts of these estimates, OMB and the Interagency Working Group should have initiated this rulemaking procedure with an advanced notice of proposed rulemaking, followed by a major rule proposal, allowing multiple rounds of public input. It should be noted that for complex agency rulemakings it has been a longstanding practice for federal agencies to accept public comment for 180 days or more.

In addition, given the scope and implications of the Social Cost of Greenhouse Gases estimates across the government and all regulatory sectors, the Interagency Working Group and OMB should explain how issuance and use of the estimates will comply with the Regulatory Flexibility Act.²⁹ The Regulatory Flexibility Act requires agencies to determine and consider the impact of their rules on small entities. The interim estimates make a number of choices that will impact smaller entities. For example, failure to consider domestic costs and benefits has a disproportionate impact on small businesses. Among other reasons, it discourages investment in the United States and encourages investment (and emissions leakage) outside of the U.S.

The deficiencies in the comment process also cannot be resolved by deferring comments to later rule makings that incorporate the Social Cost of Greenhouse Gases into benefit-cost analyses. History shows that agencies relying on the Social Cost of Carbon estimates rely on the work of the Interagency Working Group and are in no place to address comments about the integrated assessment models or their inputs, outputs, or conclusions.³⁰ In other words, “showing

²⁸ 5 U.S.C. § 804(2).

²⁹ 5 U.S.C. § 601, et seq.

³⁰ *E.g.*, 79 Fed. Reg. 17,726, 17,777-79 (Mar. 28, 2014); Final Affordability Determination – Energy Efficiency Standards, 80 Fed. Reg. 25,901, 25,905-06 (May 6, 2015) (summarizing technical critiques of SCC and responding that “the SCC is an important and established element of a regulatory impact analysis”); Energy Conservation Standards for General Service Fluorescent Lamps and Incandescent

the work” as part of the process of developing the estimates and putting that work out for comment is the one meaningful opportunity for stakeholders to comment on the estimates.³¹

In summary, failure to take and address comments on the underlying inputs, assumptions, and conclusions underlying the models and the Social Cost of Greenhouse Gases itself presents two major complications. First, no interim or final Social Cost of Greenhouse Gases estimate can be procedurally sound until all its bases are subject to public comment and fully vetted. Second, any rulemakings that rely on the interim Social Cost of Greenhouse Gases estimates or a later iteration that is not fully subject to notice-and-comment rulemaking will themselves be procedurally flawed because they will subject important government decisions to prescribed valuations that were not properly subject to notice-and-comment proceedings. We strongly encourage your office to subject the interim Social Cost of Greenhouse Gases estimates and any subsequent updates to the estimates to the full, transparent notice-and-comment process.

II. The Estimates Must Separately Account for Domestic Costs and “Leakage” of Social Costs.

The TSD correctly notes that the Interagency Working Group’s use of international benefits and costs is unusual.³² Indeed, OMB guidance on performing benefit-cost analysis specifies that the “analysis should focus on benefits and costs that accrue to citizens and residents of the United States.”³³ Where agencies choose “to evaluate a regulation that is likely to have effects beyond the border of the United States, these effects should be reported separately.”³⁴

Reflector Lamps, 80 Fed. Reg. 4,042, 4,100-01 (Jan. 26, 2015) (summarizing technical comments critiquing the SCC but declining to address them).

³¹ *Zero Zone, Inc. v. Department of Energy*, 832 F.3d 654 (7th Cir. 2016) may support those comments about the underlying merits of the estimate can be raised in subsequent rulemakings. Petitioners challenged the Department of Energy’s use of the Social Cost of Carbon and failure to address comments about it. Specifically, commenters addressed concerns about who worked on the IWG, why the inputs were not peer reviewed, and the development of the damage functions. *Id.* at 678. DOE acknowledged the limitations of the Social Cost of Carbon, referenced letters from supporter of the Social Cost of Carbon values, and stated that despite the commenters’ general concerns the Social Cost of Carbon calculation could be used. *Id.* at 678. Although the Department’s response to comments was held sufficient, the Social Cost of Greenhouse Gases calculation has and will change, and the public is entitled to a more fulsome comment process. As previously stated, the APA’s rule making procedures apply not only to new rules, but updates and amendments to rules as well. 5 U.S.C. § 551(5); see *Fox Television Stations, Inc.*, 556 U.S. at 515 (the APA “make[s] no distinction . . . between initial agency action and subsequent agency action undoing or revising that action.”). And “[t]he opportunity under the APA to comment on proposed rules is meaningless unless the agency responds to significant points raised by the public.” *St. James Hospital v. Heckler*, 760 F.2d 1460, 1470 (7th Cir. 1985).

³² TSD at 14-15.

³³ Office of Management & Budget, Circular A-4 (Sept. 17, 2003) available at <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf>.

³⁴ *Id.*

A. *U.S. laws and regulations are presumed to apply only domestically and involve domestic considerations.*

The OMB guidance does so, in part, because statutes (and regulations enacted under them) apply domestically unless Congress specifies otherwise.

The Supreme Court repeatedly has said that the courts must interpret U.S. laws under a presumption against extraterritorial application.³⁵ That is, the courts presume that laws and regulations apply only domestically. Congress must explicitly call for their application outside of the United States. And when Congress does specify that a law applies outside the U.S., only those specific provisions (*e.g.*, specific statutory sections) mentioning international application may be considered to operate outside the United States.³⁶ And this applies equally to the evaluation of economic impacts from regulation.³⁷ Agencies may not rely on factors “Congress has not intended [them] to consider” or “entirely fail to consider an important aspect of the problem.”³⁸ And courts may set aside agency action for failure to adduce empirical data that can be readily obtained.³⁹

Basing the interim Social Costs of Greenhouse Gases on global average costs without separately evaluating domestic costs puts the estimates in legal jeopardy for most domestic application and puts any rule makings that rely on the estimates in legal jeopardy. The notice and TSD do not identify any statutory authority authorizing the Interagency Working Group’s work or under which the Social Cost of Greenhouse Gases estimates apply. That is perhaps because the estimates are intended to apply across the federal government to decisions that involve greenhouse gas emissions. That involves a number of different statutes addressing an array of domestic issues, from air emissions under the Clean Air Act to land management decisions under the various federal land management statutes. But it does not explain how OMB or the Interagency Working Group have authority to direct federal decision makers to assess highly *uncertain* long-term foreign costs and benefits when promulgating rules and policies relative to *certain* near-term costs and benefits from those domestic actions.

³⁵ *E.g.*, *Morrison v. Nat'l Australia Bank Ltd.*, 561 U.S. 247, 255 (2010) (“When a statute gives no clear indication of an extraterritorial application, it has none.”).

³⁶ *Id.* at 262-63 (“we have repeatedly held that even statutes that contain broad language in their definitions of ‘commerce’ that expressly refer to ‘foreign commerce’ do not apply abroad.”).

³⁷ For example, in *Corrosion Proof Fittings v. EPA*, 947 F.2d 1201, 1209 (5th Cir. 1991), the Fifth Circuit held that Canadian petitioners lacked standing to pursue arguments that EPA failed to consider the impacts of a regulation promulgated under the Toxic Substances Control Act (TSCA) on other countries. “EPA was not required to consider the effects on people or entities outside the United States,” for “TSCA provides a laundry list of factors to consider when promulgating a rule under section 6.” Those factors included “the effect of the rule on the *national* economy,” but not others. *Id.* 1209. Although *Corrosion Proof Fittings* does not foreclose consideration of international costs, its holding is consistent with the view that statutes focus on domestic considerations.

³⁸ *Motor Vehicle Mfrs. Ass’n v. State Farm*, 463 U.S. 29, 43 (1983).

³⁹ *Id.* at 46-56.

The aggregation of global costs without any attempt to assess U.S. costs separately will render most decisions that rely on the interim Social Cost of Greenhouse Gases or later iterations unlawful. Absent explicit direction from Congress to apply a statutory provision outside the United States, the courts must presume that the directive under which federal actors make decisions and for which they evaluate costs and benefits are focused on domestic costs and domestic benefits.⁴⁰ Failing to isolate and evaluate these domestic costs and benefits will render decisions relying on the estimates unlawful.

B. It is unreasonable and therefore arbitrary and capricious not to present and evaluate domestic costs and associated “leakage” for domestic regulatory actions.

Failure to isolate and evaluate domestic costs also is unreasonable, and therefore arbitrary and capricious. It may be reasonable to think about the potential global effect of greenhouse gases on the climate and even to evaluate potential global costs as a relevant consideration for policy makers. Greenhouse gases present global externalities. That does not make it reasonable, however, to treat all costs the same across all nations. Indeed, the costs presented in the integrated assessment models are aggregates of national or regional cost projections, with each individual nation or region representing a fraction of the global costs presented in the models. Even where appropriate to consider the aggregate costs, U.S. policy makers must consider the costs-and-benefits to the U.S. when evaluating regulatory actions that impact the U.S.

Looking only at global costs fails to adequately consider the difference between potential costs to the U.S. and other nations. The international costs projected in the models are based on conditions that would be experienced differently in different locations. For example, negative impacts in North America would be different than those in South America or Northeastern Europe, because of the current climate of those locations. As one economist put it, “[h]otter countries have more negative impacts. Richer countries have more positive impacts.”⁴¹ Further, some nations, like the U.S., are better equipped to absorb costs or harms than others, due to factors such as physical and economic resilience. Poorer countries simply have a more limited ability to adapt, and it costs more for them to do so.⁴²

For example, one study (written by one of the creators of one of the integrated assessment models relied on by the Interagency Working Group) concluded that the national social cost of carbon for the United States was far lower than other nations who are together responsible for the majority of carbon emissions.⁴³ In one scenario, the United States costs were \$0.13/tC compared

⁴⁰ To be sure, there are some statutory provisions in the environmental space that contemplate international action, such as limiting negative impacts on certain nations. *E.g.*, 42 U.S.C. § 7415. It might well be the case that evaluating international costs in comparison to U.S. Costs may be appropriate under those specific provisions. But not for every environmental regulation or land use program in the U.S.

⁴¹ Richard S. J. Tol, *A Social Cost of Carbon for (Almost) Every Country*, 83 *Energy Econ.* 555, 557 (July 16, 2019), available at <https://www.sciencedirect.com/science/article/pii/S014098831930218X>.

⁴² *Id.* at 557-58.

⁴³ *Id.*

to \$28.76/tC globally.⁴⁴ Regardless of whether the costs in this model accurately predict the global or nation social costs of carbon, it shows that there is a wide discrepancy between global and national costs. Indeed, as another economist put it “the global measure is 4 to 14 times greater than the estimated domestic measure, which is significant.”⁴⁵ In fact, during the Obama Administration, the Interagency Working Group estimated that 77 to 93 percent of the benefits from avoiding or reducing greenhouse gas emissions accrue outside of the United States.⁴⁶ Failing to distinguish domestic from global benefits masks important considerations, such as the relative costs to the U.S., from policy makers and the public.

Indeed, the courts do not tolerate attempts to avoid evaluating appropriate factors like domestic costs based on convenience or even uncertainty. For example, in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, the Ninth Circuit held that the National Highway Traffic Safety Administration acted arbitrarily and capriciously when it failed to monetize the benefits of greenhouse gas reductions in its evaluation of the benefits of fuel economy standards.⁴⁷ Commenters had submitted a range of values that the agency viewed as too uncertain or wide-ranging to adopt. But the court found that the uncertainty and difficulty in selecting the appropriate range or value failed to justify the agency’s refusal to monetize the benefits. Here, the domestic costs, which are necessarily a subset of the global costs presented in the model, are easily isolated and implicitly relied on by the agency (they are, after all, part of the average cost estimates relied on to form the global costs and are readily accessible to the Interagency Working Group from the models). As such, the Interagency Working Group and agencies relying on its analysis can and should present the domestic social costs in any analysis relying on the Social Cost of Greenhouse Gases estimates.

Moreover, by averaging global costs from models, which themselves present an aggregate of social costs across all nations, the interim estimates unreasonably treat all greenhouse gas emissions as equal. That is, the estimates treat a ton of greenhouse gases emitted in the U.S. the same as a ton of greenhouse gases emitted in, for example, Venezuela. But the marginal costs and benefits of those emissions are not the same. The United States tends to have lower emissions and higher production per unit of energy than developing nations.⁴⁸ It also tends to have lower energy

⁴⁴ *Id.* at 559, 561.

⁴⁵ Testimony of Ted Gayer, PHD, Jt. Hearing before the Subcommittee on Envt. & Subcommittee on Oversight, U.S. House of Representatives, 114 Cong., 1st Session (Feb. 28, 2017) *available at* <https://www.govinfo.gov/content/pkg/CHRG-115hhrg24670/html/CHRG-115hhrg24670.htm>.

⁴⁶ Interagency Working Group on the Social Cost of Carbon, United States Government, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (Feb. 2010) at 11 *available at* https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf.

⁴⁷ 538 F.3d 1172, 1198 (9th Cir. 2008).

⁴⁸ *See* International Energy Agency, *CO₂ Emissions from Fuel Combustion 2020 Highlights*, *available at* <https://www.iea.org/data-and-statistics/data-product/co2-emissions-from-fuel-combustion-highlights>; International Energy Agency, *Picture of CO₂ Emissions From Fuel Combustion 2018 Highlights* *available at* <https://webstore.iea.org/co2-emissions-from-fuel-combustion-2018-highlights>. The International Energy Agency recognizes that U.S. greenhouse gas emissions were 0.26kg CO₂ per U.S.

consumption per unit of GDP. As such, the marginal costs of U.S. greenhouse gases are lower when compared to other nations because each activity that generates greenhouse gases in the U.S. presents more economic and physical benefits than those nations. Averaging global costs unreasonably treats all of these activities the same, ignoring the fact that on a unit-by-unit basis U.S. greenhouse gases are more efficient and produce less costs than emissions in most other nations.

It also is unreasonable to look at global costs without isolating national costs because doing so will tend toward supporting policies that displace U.S. emissions reductions while increasing emissions abroad. Due to technological innovations, market demand for less carbon-intensive energy, U.S. federal and state emissions policies and voluntary efforts by industry, U.S. emissions have declined 13 percent from 2005-2019, while global emissions have increased 25 percent.⁴⁹ Meanwhile, the U.S. Energy Information Agency projects an additional 50% in global energy consumption by 2050 and a similar increase in greenhouse gas emissions, most significantly from countries like China and India, while U.S. emissions decline.⁵⁰ The International Energy Agency similarly projects continuous increases in global greenhouse gas emissions, particularly in Asia, Africa, the Middle East, and Central and South America, while U.S. emissions decline. Failing to account for differences in costs (and benefits) across nations inflates the costs of U.S. activity, and when combined with existing laws, regulations, and programs already promoting domestic emissions reductions, will further shift production and use of energy to regions that use energy less efficiently and/or with greater impacts. This is particularly true for any global commodity, or service in the international market, such as fuel. Quite simply, looking only at global costs will lead to “carbon leakage” that is contrary to the Administration’s policy goals and the United States’ interest.

The interim estimates from the Interagency Working Group completely ignore and fail to correct for known carbon leakage.⁵¹ The impact of various greenhouse gas policies on domestic

dollar of GDP in 2016. This compares to a global average of 0.41 kg CO₂ (41% higher than the U.S.). Non-OECD emissions average 0.71 kg CO₂ per U.S. dollar of GDP (173% higher than the U.S.), and China’s emissions average of 0.95 kg CO₂ per U.S. dollar of GDP (328% higher than the U.S.). Since 2016, U.S. emissions have decreased while global emissions have increased, meaning the percentage differences outline above may be higher today.

⁴⁹ U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019 at ES-5 available at <https://www.epa.gov/sites/production/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf>; International Energy Agency, Global CO₂ Emissions in 2019 available at <https://www.iea.org/articles/global-co2-emissions-in-2019>; Le Quere et al, Global Carbon Project Nature Climate Change (2020) available at https://www.globalcarbonproject.org/global/images/general/TemporaryReductionInCO2EmissionsDuringCOVID-19_Fig3_global_emissions_to_Dec2020.full.png.

⁵⁰ U.S. Energy Information Administration, International Energy Outlook 2020 (IEO2020) available at <https://www.eia.gov/outlooks/ieo/pdf/ieo2020.pdf>; U.S. Energy Information Administration, International Energy Outlook 2017 at 131, available at [https://www.eia.gov/outlooks/archive/ieo17/pdf/0484\(2017\).pdf](https://www.eia.gov/outlooks/archive/ieo17/pdf/0484(2017).pdf)

⁵¹ See Larry Parker & John Blodgett, Congressional Research Service, “Carbon Leakage” and Trade: Issues and Approaches (Dec. 19, 2008) available at <https://fas.org/sgp/crs/misc/R40100.pdf>. As just one

economic outcomes and the effectiveness of environmental regulations and other actions are precisely the point of benefit-cost analyses and must be accounted for. Failure to account for leakage can lead not only to poorer economic outcomes (i.e., less profits and loss of output) but negative environmental consequences (i.e., leakage – displacement of domestic emissions with emissions from less-constrained nations). The estimates similarly fail to account for the social costs of domestic job losses associated with the displacement of domestic production that may occur because of failure to address other leakage and economic competitiveness concerns.

With this in mind, prior to any application of the estimates to domestic policy, agencies must first assess whether the covered sector is subject to the thousands of federal, state, local and utility sector policies that discourage greenhouse gas emissions and/or reward the avoidance or reduction of greenhouse gas emissions; and, if so, the agency must subtract those existing costs from the federal estimated costs, and apply the balance, if any, to the cost-benefit analysis. Failure to take these reasonable steps ensures that federal agencies are double counting any potential costs of greenhouse gas emissions and ignoring both the downward trend in U.S. emissions and the increasing trend in global emissions. That is, as currently applied, federal agency application of the greenhouse gas cost estimates is encouraging global emission increases.

In short, the interim estimates and any proposal to finalize or revise them should separate domestic and global costs and account for leakage of social costs. At a minimum, U.S. policy makers should be presented the information they need to assess the costs of domestic regulatory activity on the United States.

III. There Are a Number of Flawed Assumptions, Methods, and Inputs Used in the Interagency Working Group’s Models and the Estimates.

Agencies have an obligation to “explain the assumptions and methodology used in preparing a model.”⁵² And they must “provide a complete analytic defense” of those assumptions and methods.⁵³ At a minimum, they must explain why the models, assumptions, conclusions and ultimate predictions are reasonable, because the courts defer to “reasonable agency predictions about the future impact of the agency’s own regulatory policies,”⁵⁴ and will “vacate [rules] if the

example, it is well documented that glass container manufacturing has shifted from highly regulated U.S. markets to less regulated Mexico and China markets, whereby the glass containers previously produced in the U.S. are now produced in Mexico, China and elsewhere, then shipped into the U.S. See Observatory of Economic Complexity, *Glass Bottles*, available at <https://oec.world/en/profile/hs92/glass-bottles>; Reuters Staff, *Mexico’s Vitro in \$950 Mln Bottle-Making Deal with Constellation* (Aug. 14, 2014) available at <https://www.reuters.com/article/vitro-constellation-br/mexicos-vitro-in-950-mln-bottle-making-deal-with-constellation-idUSL2N0QK27120140814>. This shift in production likely has increased greenhouse gas emissions from manufacturing and transportation.

⁵² *Owner-Operator Independent Drivers Association, Inc.*, 494 F.3d at 205.

⁵³ *Id.* (quoting *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 535 (D.C. Cir. 1983)).

⁵⁴ *Ass’n for Community Affiliated Plans, et al. v. United States Dept. of Treasury*, 966 F.3d 782, 798 (D.C. Cir. 2020) (cleaned up).

agency's conclusions drawn from [a] model are unreasonable.⁵⁵ With this in mind, the Interagency Working Group should address the issues discussed below.

- A. *The range of discount rates applied by the Interagency Working Group are unreasonable, inconsistent with long-standing agency and economic best practices and should be changed.*

Regulatory requirements often generate costs and benefits that stretch out into the future. When decision makers evaluate the value of future costs and benefits, whether to estimate a return on investment, calculate the amount of damages one will experience in the future, or compare the future benefits of government action to the costs of doing so today, they employ a “discount rate.” Discount rates generate a “net present” value (*i.e.*, value in today's dollars) of the estimates or calculations of future benefits and costs. When performed as part of a regulatory benefit-cost analysis, discount rates help allow comparison of future costs and benefits with short-term costs and benefits.

There is a substantial range of discount rates reflecting the significant variables in facts and circumstances of their application. For example, courts evaluating future damages to a plaintiff have applied rates as high as 19%.⁵⁶ The Government Accounting Standards Board says that the expected future return on assets should be around 7.5%. State public utility commissions that oversee state-sanctioned monopoly electric and gas utilities routinely authorize a cost of capital of approximately 7 percent and a guaranteed return on equity of approximately 10 percent.⁵⁷ Indeed, the Federal Energy Regulatory Commission (FERC) recently established a base return on equity assumption of 10.02% for electric transmission projects.⁵⁸ And of course, private investors assume a range of risk levels when looking at costs and benefits. In short, selecting a discount rate necessarily requires making judgment calls based on specific facts and circumstances. In the case of government action, that judgment call becomes a policy decision with impacts on the entire

⁵⁵ *West Virginia v. EPA*, 362 F.3d 861, 868 (D.C. Cir. 2004) (“We will vacate if the agency's conclusions draw from this model are unreasonable”).

⁵⁶ *See, e.g., Burger King Corp. v. Barnes*, 1 F. Supp.2d 1367 (S.D. Florida, 1998) (9% discount rate approved in an action by a franchiser for breach of contract by a franchisee); *Olson v. Nieman's, Inc.*, 579 N.W.2d 299 (Iowa, 1998) (discount rate of 19.4% was approved for future hypothetical patent royalties based on an expert's testimony to a 14.4% rate of return for publicly held corporations plus 5% for market risk.); *Knox v. Taylor*, 992 S.W.2d 40 (Tex. App. 1999) (7% risk-free discount rate to calculate lost profits damages for 1994 through 2002 was not erroneous as a matter of law.)

⁵⁷ For example, Florida Power & Light's authorized return on equity is 10.55% with a range of 9.6% to 11.6% and an equity ratio of about 59%. *See, e.g., Moody's Investor Service, Florida Power & Light Company: Update to Credit Analysis* (Aug. 3, 2018) available at http://www.investor.nexteraenergy.com/~media/Files/N/NEE-IR/fixed-income-investors/download-library/fpl%20credit%20opinion_080318.pdf.

⁵⁸ *Ass'n of Businesses Advocating Tariff Equity, et al. v. Midcontinent Independent System Operator, Inc., et al.*, No. EL14-12-004, 171 FERC ¶ 61,154 (May 21, 2020), available at <https://cms.ferc.gov/sites/default/files/2020-06/E-1-052120.pdf>.

economy that must be well-reasoned, vetted through the public comment process, and not be subject to whim or results oriented manipulation.

Indeed, discount rates have a massive effect on any cost estimate, with many economists highlighting the fact that one can obtain virtually any value for the Social Cost of Greenhouse Gases that one desires by choosing the “right” discount rate. Because there are many estimates of discount rates and the choice of discount rate in any modeling exercise often reflects normative values rather than values based purely on the “best evidence,” OMB established strict guidance for regulatory cost-benefit analysis. More specifically, OMB Circular A-4 directs agencies evaluating regulations to discount future costs and benefits using a 3% rate and a 7% rate.⁵⁹ Also, OMB Circular A-94, to which Circular A-4 cites, states that “[u]sing the shadow price of capital to value benefits and costs is the analytically preferred means of capturing the effects of government projects on resource allocation in the private sector.”⁶⁰

OMB chose the 3% discount rate in Circular A-4 because it approximates the “consumption discount rate,” or the rate at which society is willing to substitute present for future consumption. It attempts to account for the preferences of everyone in society and focuses on maximizing consumption within a “social welfare function.” The 7% discount rate represents the “social opportunity cost of capital.” It reflects the typical rate of return for private business investments. This is an important consideration because regulatory decisions effect private sector investments. They require use of private funds that otherwise would have been invested elsewhere, and the social opportunity cost of capital reflects the private returns forgone in order to produce public benefits. To put this another way, the 7% rate is appropriate discounting of future benefits because the returns on capital that were lost when private investment was displaced by the public investment would have grown at 7%. It is imperative to compare the future returns to the public investment (the benefits or avoided damages that occur in the future) to the relevant opportunity that was foregone to achieve them (the private sector investment plus the expected returns to that investment over the same time period).

Although Circular A-4 directs agencies to evaluate regulatory actions at both discount rates, the social opportunity cost of capital (7%) reflects historical average returns to private capital across a wide range of economic activities. It is therefore the most appropriate discount rate to use when a regulation requires private-sector entities to make expenditures for compliance. That is because it better reflects the opportunity cost of those expenditures. The consumption discount rate is most appropriate when regulatory compliance expenditures primarily displace consumption, rather than investment. For instance, the consumption discount rate would be the preferred rate when evaluating a government expenditure that uses tax dollars collected from the public, because those expenditures are primarily displacing present consumption by consumers in favor of future

⁵⁹ *Supra* note 31 at 11.

⁶⁰ Office of Management and Budget, *Circular A-94 Guidelines & Discount Rates for Benefit-Cost Analysis of Federal Programs at 9*, available at <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A94/a094.pdf>.

consumption of public goods generated by the government action.⁶¹ In some cases, government expenditures or private sector regulatory compliance costs can have attributes of both capital investment and consumption, such that it is appropriate to evaluate the costs and benefits with a blend of discount rates.

But in this context, the 7% social opportunity cost of capital discount rate is appropriate for Social Cost of Greenhouse Gases estimates. When regulating, the government is not investing public funds and the expenditures for compliance do not equate to foregone current period consumption. Rather, they force private spending that would otherwise be invested for long term gain. For those costs, the Interagency Working Group should direct agencies to apply the 7% social cost of capital discount rate.⁶²

The Interagency Working Group nonetheless has stated that it believes it should focus on the consumption discount rate and set it at 3%. The Group then seems to suggest that it is considering using even *lower* rates based on new studies.

But the Interagency Working Group fails to mention other studies that support using a social consumption discount rate of 3% or above. For example, the National Academies recommended that the Interagency Working Group focus on discount rates using Ramsey discounting. Derived from a standard social welfare function, the relevant discount rate equation includes a pure rate a time preference, the elasticity of the marginal utility of consumption, and the rate of consumption growth. Moore and Vining survey the literature and find that while methods of estimating the various components differ, most estimates place the consumption discount rate value between 3% and 3.7%, with a range of plausible values from 2.75% to 4.83%. They produce a best estimate of 3.5%.⁶³ Although OMB and the Interagency Working Group should not use the consumption discount rate at all (for the reasons noted above), if it nonetheless does, it should consider raising the consumption discount rate above 3%, rather than selecting an even lower rate.

OMB and the Interagency Working Group also should reject the studies suggesting a lower consumption rate is appropriate. The Interagency Working Group cites Drupp et.al. in support of applying discount rates below 3%. That study surveyed experts about what they “felt” should be the discount rate. But when asked about each component of the Ramsey equation they offered

⁶¹ Even when the government borrows money rather than using tax revenues to finance an expenditure, it is likely that the expenditure displaces some private sector investment and therefore the consumption discount rate would not be accurate.

⁶² Again, this would be consistent with OMB Circular A-94, to which Circular A-4 cites, and specifies that “[u]sing the shadow price of capital to value benefits and costs is the analytically preferred means of capturing the effects of government projects on resource allocation in the private sector.” Instead, OMB and the IWG have unreasonably excluded from the range of interim estimates any estimate of the social of GHGs using a 7 percent discount rate.

⁶³ Moore, M.A. and Vining, A.R. “[The Social Rate of Time Preference and the Social Discount Rate.](https://www.mercatus.org/system/files/moore_and_vining_-_mercatus_research_-_a_social_rate_of_time_preference_approach_to_social_discount_rate_-_v1.pdf)” *Mercatus Symposium*, Mercatus Center at George Mason University, Arlington, VA, November 2018, available at https://www.mercatus.org/system/files/moore_and_vining_-_mercatus_research_-_a_social_rate_of_time_preference_approach_to_social_discount_rate_-_v1.pdf.

more objective answers, and when the average across experts for each of the answers are combined, they yield a social discount rate of 3.4%.⁶⁴ Nevertheless, the authors highlight in their abstract, and the Interagency Working Group reiterated, that experts “felt” that a rate closer to 2% was appropriate. This is an example of why the Interagency Working Group should stick to OMB guidance as supported by established evidence for social discount rates using the Ramsey discount rate. Deviating from evidence and practice to apply discount rates based on subjective valuations and feelings is arbitrary and capricious.

Discount rates have a massive effect on any cost estimate, perhaps especially the Social Cost of Greenhouse Gases. Because discount rates have a broad range of plausible values, and the choice of discount rate is ultimately normative, the Interagency Working Group should rely on long-standing practice and guidance in selecting appropriate discount rates.

B. The methodology employed by the Interagency Working Group to produce the Social Cost of Greenhouse Gases estimates does not meet Information Quality Act and Circular A-4 Guidelines, and Fails to Reasonably Estimate Costs.

Any estimate of the Social Cost of-Greenhouse Gases that is intended for use in federal rulemaking must be based on quantitative analysis and modeling that meets the criteria of OMB Circular A-4 and the Information Quality Act.

The Interagency Working Group uses three integrated assessment models called the DICE, PAGE, and FUND models to estimate the social cost of future damages from the emission of greenhouse gases. These models are “integrated” because they combine a climate science model that predicts climate impacts of additional tons of greenhouse gases with an economic damage function that estimates changes in economic variables (like GDP). These future damages are then discounted to a present value to produce a social cost of carbon or other greenhouse gas emissions.

Although these models are fine pedagogical and research tools, they are fundamentally flawed for use in policymaking because the estimates lack theoretical or empirical support. They can be easily modified to produce virtually any social cost per ton of carbon (SCC, or SCC equivalent for other greenhouse gases) that the model user desires because virtually all the model parameters are uncertain and have little to no theoretical or empirical basis. In other words, they rely almost entirely on the arbitrary judgement of the modelers and those judgements cannot be tested by stakeholders.

Both Circular A-4 and the Information Quality Act acknowledge that information used for regulatory decision making is seldom perfect. In most cases, federal agencies need to estimate at least some of the impacts of regulatory actions using indirect methods, like predictive models. However, in most cases regulators have *ex ante* theoretical and empirical justification for those

⁶⁴ Drupp, M., Freeman, M., Groom, B., and Nesje, F. (2018) “[Discounting Disentangled](https://www.aeaweb.org/articles?id=10.1257/pol.20160240).” American Economic Journal: Economic Policy, 10(4): 109-34, available at <https://www.aeaweb.org/articles?id=10.1257/pol.20160240>.

estimates based on the data and methodology used. And in most cases, they are completed in a sufficiently transparent manner that stakeholders can verify the details. In addition, most regulatory actions take effect in the near term and begin producing results a short time after, thus allowing regulators, stakeholders, and courts to verify *ex post* that the results comply with what the models predicted.

In the case of the integrated assessment models used by the Interagency Working Group to create the Social Cost of Greenhouse Gases Estimates, neither *ex ante* validation of the models or data nor verification of the predicted results *ex post* is possible. In essence, when it comes to the integrated assessment models, we are forced to accept the accuracy and precision of the estimates as an act of faith. As MIT economist Robert Pindyck put it, “the models are so deeply flawed as to be close to useless as tools for policy analysis. Worse yet, their use suggests a level of knowledge and precision that is simply illusory, and can be highly misleading.”⁶⁵ The following discussion highlights numerous flaws with the use of integrated assessment models for estimating the social cost of greenhouse gases.

- C. *The models fail to account for technological and policy changes that are driving emissions reductions that are changing and will change the future greenhouse gas concentrations that drive the modeled costs; and some of the models fail to consider benefits from increased agricultural productivity.*

The accuracy of any model depends on our ability to make accurate and precise predictions of input variables. Long-run predictions of the main variables of interest, GDP and carbon emissions, form the baseline scenario used to compare scenarios with abatement policies that reduce greenhouse gases, and the differences in the resulting levels of GDP create the damages from emissions predicted in the model. Because the assumed driver of damages is greenhouse gases that remain in the atmosphere for long periods of time, it is the stock level of greenhouse gases in the atmosphere over time that drive the incremental modeled climate impacts which in turn impact GDP.

Although we know GDP will continue growing over time (we can only guess by how much) the same cannot be assumed for greenhouse gases. Clean energy policies around the world already are being implemented, and market forces continue to drive development of new technologies that reduce emissions. For example, between 1990 and 2015, worldwide energy intensity declined by 32%, partly driven by climate policy especially in the latter years, but predominantly driven by technological advancement.⁶⁶ There is no reason to believe this trend will not continue and strengthen, as over the long-time horizon of climate models world population and income per capita will increase substantially laying the groundwork for faster rates of technological change.

⁶⁵ Pindyck, R.S. (2013) “[Climate Change Policy: What Do the Models Tell Us?](https://www.aeaweb.org/articles?id=10.1257/jel.51.3.860)” *Journal of Economic Literature*, 51(3): 860-72, at 2, available at <https://www.aeaweb.org/articles?id=10.1257/jel.51.3.860>.

⁶⁶ U.S. Energy Information Administration, *Today In Energy: Global Energy Intensity Continues to Decline*, available at <https://www.eia.gov/todayinenergy/detail.php?id=27032>.

It is therefore highly likely that as climate impacts begin to accrue, new technology will be developed and widely deployed that reduces emissions, perhaps drastically. Under the right market incentives, it is also likely that new technologies to reduce atmospheric greenhouse gas levels will be developed. But the models irrationally fail to account for these likelihoods, and therefore predict costs based on an unreasonable assumption that emissions rates (as well as temperatures and damages) will continue to increase as if there are no policy or market forces at work.

Moreover, because the time horizons are so long on these models, small systematic errors in the estimates of the trend of GDP and greenhouse gases are likely to be persistent and to compound over time. For GDP growth, one might use an endogenous growth model to incorporate technological change over the long run, but it is unlikely the prediction will be very precise over that time period. The result is that for much of the time period under analysis in the models we do not have sufficient information to develop useful forecasts for the main variables under consideration. The inherent error in the predictions is likely substantially larger than any estimated impact we can model, including from climate damages.

For these and other reasons, the U.S. Energy Information Administration, the lead federal agency for collecting, analyzing, and disseminating data on U.S. and world energy supply and consumption, draws a “distinction between projections (*i.e.*, estimates based on specified assumptions) and forecasts or predictions (*i.e.*, best guesses about the future).”⁶⁷ Its flagship projections, the Annual Energy Outlook and the International Energy Outlook, project domestic and global energy supply, demand, prices, and emissions over only a 25-30 projection period.⁶⁸ In fact, given that Congress tasked the Energy Information Agency with collecting “data and information which is relevant to energy resource reserves, energy production, demand, and technology, and related economic and statistical information,”⁶⁹ and that the Energy Information Administration operates and maintains the National Energy Modeling System,⁷⁰ including thousands of model input assumptions shared with the public,⁷¹ it would be logical for the Interagency Working Group to solicit the Energy Information Administration’s review of the integrated assessment models, their assumptions and uncertainties, if not for the Energy Information Administration to supplant the Interagency Working Group entirely. Unfortunately, again, the public has not been provided with any information about the Interagency Working Group’s process to develop or vet their estimates and whether the subject-matter experts at Energy Information Administration have been given an opportunity to review and critique the integrated assessment models and the OMB/Interagency Working Group’s interpretation of the integrated assessment models.

⁶⁷ Congressional Research Service, *The U.S. Energy Information Administration*, (Sept. 9, 2020), available at <https://crsreports.congress.gov/product/pdf/R/R46524#>

⁶⁸ *Id.*

⁶⁹ 42 U.S.C. § 7135.

⁷⁰ U.S. Energy Information Administration, *The National Energy Modeling System: An Overview 2018* (April 2019), available at [https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581\(2018\).pdf](https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581(2018).pdf).

⁷¹ U.S. Energy Information Administration, *Assumptions to AEO2018* (April 5, 2018), available at <https://www.eia.gov/outlooks/archive/aeo18/assumptions/>.

D. Vast uncertainty about the main variables used in the models render the models easily manipulated, their predictions arbitrary, and their results absurd.

Vast uncertainty about the main variables under investigation compounds these problems. Because the models look so far forward, in some cases more than 300 years, virtually all of the model parameters are unknowable and unverifiable until the distant future. There are no theoretical or empirical tools that allow regulators or stakeholders to determine if the relationships between greenhouse gas emissions and economic variables, like GDP and consumption, are accurate. As Pindyck shows, our lack of knowledge on these crucial workings of the models means that the economic damage functions that turn predicted climate impacts into lost GDP and consumption are arbitrary.⁷² The models leave too much discretion in the hands of the modeler, and the model assumptions are so variable and influential to the outcomes that the modelers can produce nearly any desired result simply by altering the inputs or assumptions.

Because we do not have accurate predictions of GDP or greenhouse gas emissions into the far future, and we do not know the parameter values that describe the relationship between atmospheric carbon and economic variables like GDP, the uncertainty in these models is substantial.

All the variables and parameters used in the models are subject to a wide range of possible values. As discussed above, there is a vast uncertainty regarding future trends of GDP and greenhouse gas emissions, and parameter values within the models for the sensitivity of climate to greenhouse gas emissions and the subsequent impact of climate on GDP and consumption are unknown and potentially unknowable. This wide range of possible model variables and parameters is compounded within the models when uncertain variables and parameters are combined. It means that the range of possible Social Cost of Greenhouse Gases that the model can generate is potentially vast.

But the Interagency Working Group has produced only a point estimate to be used as “the” Social Cost of Greenhouse Gases. The only acknowledgment of uncertainty is the inclusion of one result from the 95th percentile of simulation runs, and charts showing the distribution of results from Monte Carlo simulations using different parameter values. This is not sufficient to address uncertainty or communicate to the public the substantial uncertainty of the estimates.

To be sure, the Interagency Working Group has employed model runs with Monte Carlo simulations over a range of model parameter values to account for uncertainty. But running the various models with Monte Carlo simulations does not actually improve our understanding of model uncertainty in this case. As noted, the parameter values used in these models have little-to-no theoretical or empirical support; they reflect judgment calls made by the modelers. Using Monte Carlo simulations to address this lack of certainty does not help, because there is also no theoretical

⁷² Pindyck, R.S. (2017) “[The Use and Misuse of Models for Climate Policy](https://www.journals.uchicago.edu/doi/10.1093/reep/rew012),” *Review of Environmental Economics and Policy*, 11(1): 100-114, at 6, available at <https://www.journals.uchicago.edu/doi/10.1093/reep/rew012>.

or empirical support for the probability distributions used to create the simulations.⁷³ In most cases, the parameter values follow the work of Roe and Baker, which simply assumes normal distributions for all relevant parameters.⁷⁴ This choice is arbitrary, however, and has been compounded by modelers who use it for convenience rather than scientific integrity. In the same journal as the Roe and Baker paper, Allen and Frame make a convincing argument that climate sensitivity is unknowable.⁷⁵ Relying on the simulations to characterize uncertainty creates a false sense that the model results are more accurate and grounded in scientific and economic knowledge than is the case. In reality, we cannot judge whether the point estimate or the distribution of any parameter values or outputs is reasonable, and therefore the Interagency Working Group should spend more time explaining the nature of the uncertainty and discussing the broad range of results that can be reasonably produced with these models given their deficiencies.

The methodology employed by the Interagency Working Group does not support producing simple point estimates of the Social Cost of Greenhouse Gases. The exposition would be improved by expanding and improving the discussion and treatment of model uncertainty. At a minimum, the Interagency Working Group should discuss: the lack of precision inherent in very long run predictions of variables such as greenhouse gas emissions, changes in population, and GDP; the substantial uncertainty surrounding parameter values that dictate the sensitivity of climate to greenhouse gas emissions and the impact of climate on GDP; prominently display and discuss a range of potential Social Cost of Greenhouse Gases values ranging from the 5th to 95th percentile of model runs; and, the one-sided nature of the distribution of modeled Social Cost of Greenhouse Gases values and how that impacts the average value compared to the median and modal values.

In addition, the models do not account for the impact of technological change, which is a crucial factor in determining optimum investments and timing of investments for abatement. Therefore, the models are likely to overestimate damages, if any, because they systematically fail to account for the effects of innovation and technological change, which can both lower greenhouse gas emissions per unit of output and reduce the cost of mitigation.

Indeed, the variables in the models that regulators are most interested in from a benefit-cost perspective, GDP and greenhouse gas emissions, are strongly affected by technological change. In the case of GDP, technological change leads to positive growth, while in the case of emissions, technological change can lead to decreases in emissions per unit of output, or energy intensity. Technology is notoriously difficult to forecast, however, especially in application to a specific area like greenhouse gas emissions. John Kerry, Special Presidential Envoy for Climate Change, recently stated, ““I’m told by scientists that 50% of the reductions we have to make (to get to near zero emissions) by 2050 or 2045 are going to come from technologies we don’t yet

⁷³ *Supra* note 63.

⁷⁴ Roe, G. H. and Baker, M. B. (2007) “[Why is Climate Sensitivity So Unpredictable?](https://science.sciencemag.org/content/318/5850/629)” *Science*, 318: 629-32, available at <https://science.sciencemag.org/content/318/5850/629>.

⁷⁵ Allen, M. R. and Frame, D. J. (2007) “[Call Off the Quest,](https://science.sciencemag.org/content/318/5850/582/tab-article-info)” *Science*, 318: 582-3, available at <https://science.sciencemag.org/content/318/5850/582/tab-article-info>

have.”⁷⁶ Similarly, President Biden’s Domestic Climate Advisor, Gina McCarthy recently stated, “I can’t exactly define the pathway, nor should we expect to, because I know there are new technologies being developed today that may trump what we already have available to us now, and so you’ll make the shift. Things will develop.” She added, “I do not want to sell our ability to move these technologies forward in a broad and quick way, nor will I ever tell you that innovation won’t happen when we know it will because it always does.”⁷⁷

We do know that technological solutions to greenhouse gas emissions, and perhaps technology to lower atmospheric carbon, become more likely as market incentives become stronger. In other words, if negative climate-related impacts are felt across more sectors of the economy, we will become more likely to see technological solutions that mitigate emissions or reduce atmospheric carbon, as well as enhance adaptation and minimize damages. Between 1990 and 2015, worldwide energy intensity declined by 32%, partly driven by climate policy especially in the latter years, but predominantly driven by technological advancement.⁷⁸ There is no reason to believe this trend will not continue and strengthen, as over the long run time horizon of climate models world population and income per capita will increase substantially laying the groundwork for faster rates of technological change.

Therefore, each integrated assessment model should include a base case in which global emissions intensity declines 1.3% per year, on par with the rate observed from 1990-2015, with alternative scenarios showing even greater improvements in energy efficiency. For example, while lighting consumes 15% of global electricity and contributes to 5% of total GHG emissions, commercially available LED lighting can reduce energy and associated emissions by 85% and provide significant cost savings to consumers.⁷⁹ Given the success of this technology, the baseline scenario in the integrated assessment models should assume an 85% reduction in global energy use for lighting.

Technological change adds additional uncertainty to the models, but that uncertainty is one-sided and leads to the models overestimating future greenhouse gas emissions levels and the resulting economic implications. This implies that model estimates of the social cost of greenhouse gases will tend to always be high because they fail to recognize likely greenhouse gas emissions reductions from the private sector’s development of energy-saving, emissions-reducing (or greenhouse gas stock reducing) technologies.

⁷⁶ <https://www.bbc.com/news/science-environment-57135506>.

⁷⁷ Washington Post, *The Path Forward: Renewable Energy with White House National Climate Advisor Gina McCarthy* (May 19, 2021) <https://www.washingtonpost.com/washington-post-live/2021/05/19/transcript-path-forward-renewable-energy-with-white-house-national-climate-advisor-gina-mccarthy/>

⁷⁸ U.S. Energy Information Agency, Today in Energy, Global Energy Intensity Continues to Decline (July 12, 2016), available at <https://www.eia.gov/todayinenergy/detail.php?id=27032>.

⁷⁹ U.S. Department of Energy, *Rise and Shine: Lighting the World with 10 Billion LED Bulbs*, (December 7, 2015), available at <https://www.energy.gov/articles/rise-and-shine-lighting-world-10-billion-led-bulbs>.

- E. The models make projections over an unreasonably long period of time, rendering them arbitrary.*

Like any economic modeling effort, the integrated assessment models used in the various Social Cost of Greenhouse Gases estimates attempt to create useful tools for analyzing and predicting future outcomes. And like any modeling exercise, they should strive to provide precise and verifiable implications. All models carry uncertainty and are not expected to achieve complete precision. The value of a model ultimately lies in the quality of the model and the assumptions used to generate results. The looser the verifiable factors used in a model, the more likely it is to fail to provide useful information. For this reason, modelers rarely try to predict outcomes in the far distant future, and certainly not with any degree of precision.

Government entities who regularly engage in modeling exercises generally limit the time periods they analyze to help maintain the usefulness of the models. For example, the U.S. Energy Information Agency generally limits its National Energy Modeling System projection periods, which are designed to project “the impact that energy, economic, environmental, and security factors can have on the U.S. energy system as a result of alternative energy policies and different assumptions about energy markets” to 30 years.⁸⁰ The further out a model gets the less valuable it becomes, in part because the uncertainties inherent in any model are compounded.

There may be room for debate over the helpful projection period for any model, but the integrated assessment models perform model runs that produce results far into the distant future, in some cases hundreds of years into the future. There simply is no way to assess the accuracy or precision of such long-term predictions, especially when attempting to convert those predictions into dollar values used to evaluate the costs and benefits of domestic regulatory actions today. Predictions that far into the future are not reasonably foreseeable and should not be used to assess policy making. The Interagency Working Group and OMB should take comment on a reasonable projection period for these models and limit the projection periods accordingly.

* * *

In short, based on the deficiencies outlined above, OMB should require the Interagency Working Group to withdraw the Technical Support Document and not allow any Federal Agency to rely upon the document in any ongoing or future rulemakings or other regulatory activities. Any estimates of the social cost of carbon should be developed in accordance with the procedures set forth in the Administrative Procedure Act’s notice and comment provisions.

Thank you for the opportunity to comment. We look forward to answering any questions you may have about these comments and look forward to engaging with OMB and the Interagency

⁸⁰ U.S. Energy Information Administration, *The National Energy Modeling System: An Overview 2018* (April 2019) available at [https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581\(2018\).pdf](https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581(2018).pdf); see also p. 22 above, discussing other Energy Information Administration modeling time frames.

Dominic J. Mancini

June 21, 2021

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Working Group on future notice-and-comment efforts related to the development of the Social Cost of Greenhouse Gases estimates.

Sincerely,

A handwritten signature in black ink that reads "Robert Henneke". The signature is fluid and cursive, with a long horizontal stroke at the end.

ROBERT HENNEKE

General Counsel, Texas Public Policy Foundation