

COMMENT ON USE OF SOCIAL COST OF GREENHOUSE GASES IN EPA'S STANDARDS OF PERFORMANCE FOR NEW, RECONSTRUCTED, AND MODIFIED SOURCES AND EMISSIONS GUIDELINES

87 FED. REG. 74702

*Institute for Energy Research**

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INTRODUCTION

The Environmental Protection Agency is proposing regulations “which are intended to significantly reduce emissions of greenhouse gases (GHGs) and other harmful air pollutants from the Crude Oil and Natural Gas source[s]”¹ as well as soliciting comments on new estimates of the impacts of greenhouse gas emissions. EPA should withdraw this proposed rule. EPA needs to follow the federal government’s guidelines for regulatory analysis, it needs to fix the flaws in its regulatory analysis, and its needs to be transparent with the American people about the impact of these regulations on climate change, instead of withholding information.

A. EPA CONTINUES TO IGNORE CIRCULAR A-4 AND THE REQUIREMENT OF A 7 PERCENT DISCOUNT RATE

In 2003, the White House Office of Management and Budget published Circular A-4 providing guidance to federal agencies on developing regulatory

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¹ Environmental Protection Agency, *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 87 Fed. Reg. 74702, Dec. 6, 2022.

analyses required by Executive Order 12866. Instead of following Circular A-4, as regulatory agencies have done for twenty years, EPA now wishes to arbitrarily disregard the principles and regulatory analysis established in that document. This is inappropriate as well as arbitrary and capricious.

To justify not including a 7 percent discount rate, EPA states:

OMB Circular A-4 (2003) recognizes that special considerations arise when applying discount rates if intergenerational effects are important. In the IWG’s 2015 Response to Comments, OMB—as a co-chair of the IWG—made clear that “Circular A-4 is a living document,” that “the use of 7 percent is not considered appropriate for intergenerational discounting,” and that “[t]here is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself.² [emphasis added]

EPA’s description here is intentionally misleading and wrong. Circular A-4 has a section on intergenerational discounting. It specifically contemplates the ethical issues with intergenerational discounting. For example, Circular A-4 states:

Some believe, however, that it is ethically impermissible to discount the utility of future generations. That is, government should treat all generations equally. Even under this approach, it would still be correct to discount future costs and consumption benefits generally (perhaps at a lower rate than for intragenerational analysis), due to the expectation that future generations will be wealthier and thus will value a marginal dollar of benefits or costs by less than those alive today. Therefore, it is appropriate to discount future benefits and costs relative to current benefits and costs, even if the welfare of future generations is not being discounted. Estimates of the appropriate discount rate appropriate in this case, from the 1990s, ranged from 1 to 3 percent per annum.³

After explaining this, as well as the difficulty of determining discount rates for longer time horizons, Circular A-4 states, “If your rule will have

² Environmental Protection Agency, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, Sept. 2022, p. 7, https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf

³ OMB, Circular A-4, at 35-36.

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.”⁴ [emphasis added]

In other words, under Circular A-4, EPA may include lower discount rates in its analysis and EPA may include a sensitivity analysis, however, this should be “in addition to calculating net benefits using discount rates of 3 and 7 percent.”

EPA’s continued mischaracterization of the requirements of Circular A-4 is very concerning. Circular A-4 specifically contemplates and allows other discount rates in addition to 3 and 7 percent. It is unclear why EPA would continually choose to willfully ignore and mischaracterize the requirements of Circular A-4 other than to obfuscate the impacts of proposed regulation to the American people and the courts. This is especially true because there is value in providing additional information. As Nobel prize winner William Nordhaus explained:

There are many perspectives through which to view the future costs and benefits of policies to slow global warming. These perspectives differ in terms of normative assumptions, national interests, estimated behavioral structures, scientific data and modeling, risk aversion, and the prospects of future learning. No sensible policymaker would base the globe’s future on a single model, a single set of computer runs, or a single national or ethical perspective. Sensible decision making requires a robust set of alternative scenarios and sensitivity analyses to determine whether some rabbit has in the dead of night jumped into the hat and is responsible for unusual results.⁵

To have a robust set of alternative scenarios, EPA has to include a scenario with a 7 percent discount rate.

⁴ OMB, Circular A-4, at 36.

⁵ William D. Nordhaus, *A Review of the Stern Review on the Economics of Climate Change*, 45 J. of Econ. Lit. 686, at 701, Sept. 2007.

B. Low Intergenerational Discount Rates are Inappropriate

1. Discount rates, investment, and regulation

EPA's analysis of the social costs of greenhouse gas in both *Appendix B: Sensitivity Analysis of Monetized Climate Benefits*⁶ and the *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances Sensitivity Analysis* is flawed in part because EPA relies on discount rates that are too low such as 1.5, 2.0, and 2.5 percent⁷ (and as the last section noted, refused to include the standard 7 percent).

Regulations or taxes guided by the SC-GHG (social cost of greenhouse gases) would impose costs in the present for benefits in the future. People in the future receive net benefits from costly actions taken by people today. Because there are unlimited possible investment activities and limited resources available to pay for them, efficiency mandates that investment undertaken should provide a future benefit that is at least as large as the highest valued reasonable alternative investment. This is the basic concept of opportunity cost. Resources used to make a poor investment today, preclude using those resources to make a better investment. Making a worse investment costs us the benefit not received from the better investment.

Different investments have different patterns of costs and benefits across time. Given these differing patterns, it is not a simple matter to compare a given investment to others. To overcome these difficulties, a tool called discounting is used.

Discounting is simply compounding in reverse. The discounted value of the future cost/benefit, or present value, is the amount that would need to be invested today to generate the future value.

For instance, using 7 percent as the rate of return on an alternative investment, the discounted present value (or just present value) of \$100 benefit received 150 years from now is only \$.004, today. If 7 percent is the rate of return that could reasonably be expected from an alternative

⁶ Environmental Protection Agency, *Regulatory Impact Analysis of the Supplemental Proposal for the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, Nov. 2022.

⁷ Environmental Protection Agency, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, Sept. 2022, p. 191, https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf

investment, then we should spend no more than \$.004 today for each \$100 received 150 years from now.

Some have argued that this market-based rate of return is too high to use as the discount rate because it undervalues benefits to those living in the future. They have suggested it would be more equitable to discount at 2 percent (or even lower).

One hundred dollars discounted for 150 years at 2 percent gives a present value of \$5.13. This means we should invest up to \$5.13 today to create a \$100 benefit in 150 years, but that would be a bad deal for the future.

Discounting and the discount rate (the rate of return number used in discounting) are not tools for weighing the relative value of people's welfare in different time periods, instead, they are tools for ranking different investments. For example, if grandparents were creating a trust fund for their grandchildren and they could invest the money at either 2 percent or 7 percent, choosing the worse investment (2 percent) is not more equitable, nor would it be a sign that the grandparents loved their grandchildren more than if they invested at 7 percent.

Table 1 below helps illustrate this situation.

The present value of \$100 received in 150 years would only be \$.004 today when the discount rate is 7 percent. Using the "more equitable" discount rate of 2 percent per year would give a present value of \$5.13. Eschewing the 7-percent rate for the two-percent rate argues for spending up to \$5.13 on greenhouse-gas mitigation for a \$100 climate benefit 150 years later. However, investing that \$5.13 at seven percent would provide a benefit of \$131,081 150 years later, clearly a much better deal for the future.

Table 1. Comparing-Climate Mitigation and Stock-Market Investment		
Interest Rate	Value Today (Present Value)	Value in 150 years (Future Value)
2%	\$5.13	\$100
7%	\$0.00	\$100
7%	\$5.13	\$131,081

2. The Ramsey Equation?

Both the *Sensitivity Analysis* and the new *Report on the Social Costs of Greenhouse Gases* use the Ramsey equation to determine the discount rate(s). This is a logically flawed approach. The Ramsey equation describes the productivity of capital (and, hence, the appropriate opportunity cost of capital to use as a discount rate) in an optimal equilibrium. This rate of return is a function of the rate of pure time preference, the income elasticity of utility, and the real growth rate of the economy. Neither the rate of pure time preference nor the income elasticity of utility is directly observable. Even if they were, aggregating and homogenizing these very personal values presents serious conceptual and practical hurdles.

However, a greater flaw is that we already have an observable return to capital, and it is greater than the Ramsey-derived rates in EPA's analyses. The implicit argument in EPA's analyses is that the observed return to capital is higher than optimal and optimal decisions for allocating capital across time (in particular, investing in climate improvement) should use the Ramsey-derived optimal rate. Unless this Ramsey optimality holds across all investments, it is not optimal to use this calculated rate for discounting. The Ramsey-derived rate in EPA's analyses is significantly lower than the observed rate of return to capital. We can do better for those in the future than the low Ramsey-optimal rate.

The inflation-adjusted (before-tax) rate of return to capital is at least 7 percent. This is true looking at the entire New York Stock Exchange for the past two centuries and is similar to the return to the Standard and Poor's 500 for nearly the past century.

By using the Ramsey-derived rates, the authors of EPA's analyses dream up an economy organized according to their own preferences. In their imaginary world, investment and saving levels are so much higher than what we know to be true, that the Ramsey equation (with the authors' choices for pure time preference and income elasticity of utility) fits. Whether EPA's analyses' version of optimality is actually optimal is debatable, but we need not bother with that debate since EPA's analyses' optimality does not hold in the real world.

3. Equity

Basing their appeal on concerns for equity, the EPA argues for a lower

than the efficient rate of return when discounting future benefits of greenhouse-gas mitigation. As noted above, getting a worse return on climate investment does not provide a greater benefit for future generations, but odder still is the notion that equity requires reducing the welfare of the poor in order to increase the welfare of the rich.

EPA projects impacts of current greenhouse-gas emissions for nearly 300 years. That is, it estimates the damage done in the year 2300 from today's emissions. It is a terrible policy to make investments that return \$100 instead of \$131,081, but it is virtually brain-dead to argue the bad return is justified on equity grounds. Those alive centuries from now are almost certain to be much wealthier, healthier, and possessed of technology to better overcome any adversity—including climate change.

One hundred and fifty years ago, the average American earned about one-fifteenth as much as the average American today. Similar growth is expected over the next 150 years. Taking from the poor to give to those twenty or more times as rich is no justification for inefficient investment.

C. Calculating Costs or Benefits on Science Fiction Time Horizons are Inappropriate

In the *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, EPA discusses some extrapolations from the year 2100 through 2300.

These inputs were extrapolated from 2100 to 2300 as follows: (1) population growth rate declines linearly, reaching zero in the year 2200; (2) GDP/ per capita growth rate declines linearly, reaching zero in the year 2300; (3) the decline in the fossil and industrial carbon intensity (CO₂/GDP) growth rate over 2090-2100 is maintained from 2100 through 2300; (4) net land use CO₂ emissions decline linearly, reaching zero in the year 2200; and (5) non-CO₂ radiative forcing remains constant after 2100.⁸

One obvious area of extrapolation that EPA is not including is the role of

⁸ Environmental Protection Agency, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, Sept. 2022, p. 18. https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf

dilithium crystals and matter/anti-matter energy systems. As we know from the *Star Trek: The Next Generation Technical Manual*, the U.S.S. Enterprise uses a “fifth-phase dilithium controlled matter/antimatter reactor primary power. Sustainable field output to exceed 1,650 cochranes.”⁹ That sounds like a lot of power.

Starfleet will commission the Enterprise in 2245,¹⁰ meaning that dilithium crystals and matter/anti-matter energy systems are well understood more than 50 years before the end of the time period EPA is using for the calculation of the social costs of greenhouse gases.

Some observers may reject the inclusion of dilithium crystals and matter/anti-matter energy systems in EPA’s extrapolation with the claim that Star Trek is a fictional television show and movie franchise. While true, is there any reason to believe EPA’s projections of the world’s (and universe’s) energy system in the 2200s rather than Star Trek’s projections? EPA does not justify believing its projections rather than Star Trek’s.

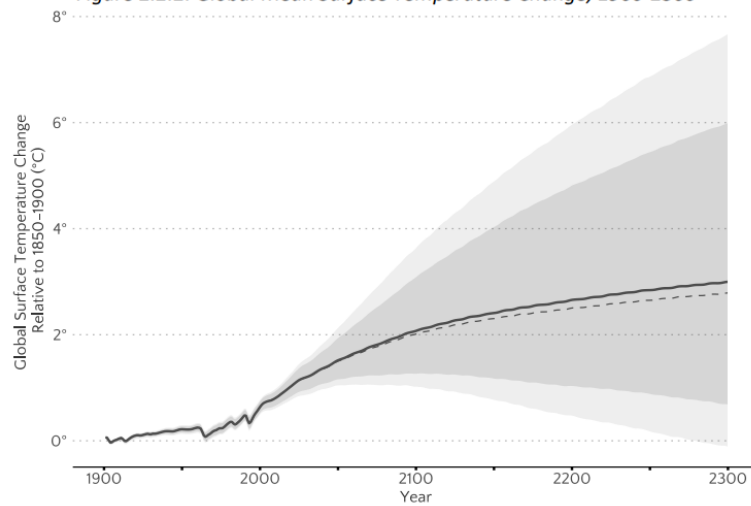
D. What is the Temperature and Sea Level Impact of EPA’s Proposed Rule?

In the external review draft, EPA provides the following chart showing the global mean surface change from 1900-2300.¹¹

⁹ Rick Sternbach & Michael Okuda, *Star Trek: The Next Generation Technical Manual*, 1991, p. 1.

¹⁰ Wikipedia, *USS Enterprise (NCC-1701)*, [https://en.wikipedia.org/wiki/USS_Enterprise_\(NCC-1701\)](https://en.wikipedia.org/wiki/USS_Enterprise_(NCC-1701)), accessed Feb. 11, 2023.

¹¹ Environmental Protection Agency, *Regulatory Impact Analysis of the Supplemental Proposal for the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, p. 31, Nov. 2022.

Figure 2.2.2: Global Mean Surface Temperature Change, 1900-2300

The range of global mean surface temperature change relative to pre-industrial (1850-1900) as calculated by FaIR 1.6.2 corresponding to the CO₂ concentrations from Figure 2.2.1 and the accompanying figures for CH₄ and N₂O in the Appendix. Uncertainty comes from emissions uncertainty from the RFF-SP projections and physical climate uncertainty from FaIR. Mean (solid) and median (dashed) lines are shown along with the 5th to 95th (dark shade) and 1st to 99th (light shade) percentile ranges.

As EPA notes in the next sentence after this chart, “Because the SC-GHG is calculated based on the impact of a marginal pulse of emissions, it is particularly relevant to investigate how the climate model responds to small changes in emissions.”¹² EPA continues, “The response of the climate to a pulse of GHG emissions (i.e., CO₂, CH₄, or N₂O) is calculated by using a reference scenario (baseline) and subtracting the temperatures of that reference scenario from a second scenario (perturbed) that is identical in all dimensions except for the marginal increase in emissions for the one year and one gas being examined (i.e., all characteristics of the model run, emissions levels of other gases, etc., are held constant for the duration of the perturbed model run).”¹³

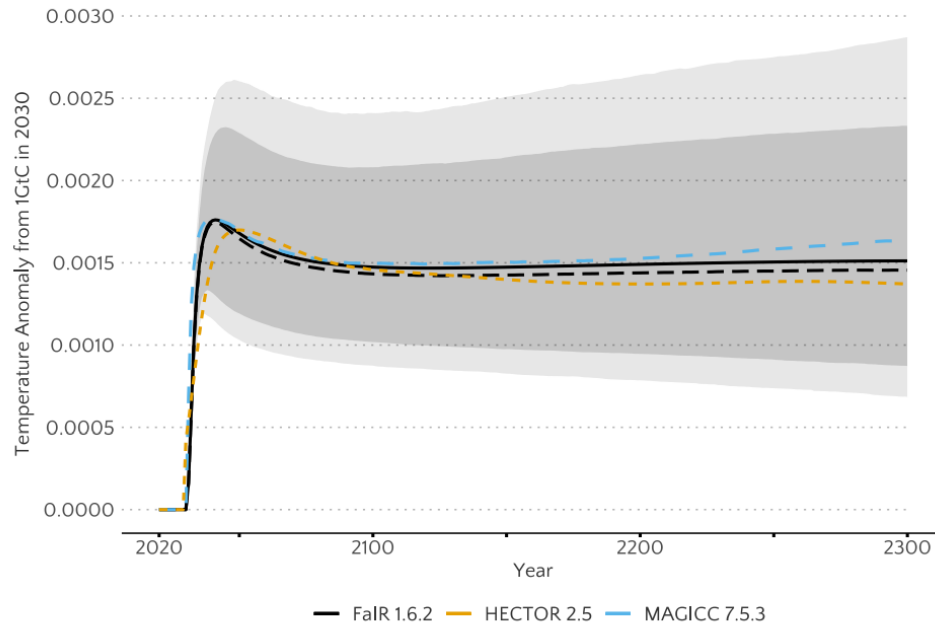
To graphically show how climate models respond to a perturbation, EPA includes the following figure:¹⁴

¹² *Id.* at 32.

¹³ *Id.*

¹⁴ *Id.* at 33.

Figure 2.2.3: Global Mean Surface Temperature Anomaly from a Pulse of Carbon Dioxide (1GtC) by Model, 2020-2300



The mean global temperature response resulting from a pulse of emissions of CO₂ in 2030 as projected by FaIR1.6.2, Hector 2.5, and MAGICC 7.5.3. This represents the difference between a reference scenario (using SSP2-RCP4.5 for the figure) and the same scenario including the pulse of emissions. The emission pulse size is 1 GtC for carbon dioxide. Mean (solid) and median (dashed) lines are shown along with the 5th to 95th (dark shade) and 1st to 99th (light shade) percentile ranges.

After the section on temperature impacts, EPA describes the sea level projections EPA uses.¹⁵

Information on temperature impacts of regulation and sea level rise are important pieces of information in evaluating regulatory impacts. As EPA’s webpage on climate change states, “Understanding and addressing climate change is critical to EPA’s mission of protecting human health and the environment. EPA tracks and reports greenhouse gas emissions, leverages sound science, and works to reduce emissions to combat climate change.”¹⁶

If understanding and addressing climate change is important for EPA, why does EPA not report the temperature and sea level impacts of the proposed regulation? In the proposed rule, there is no description of the temperature impact of the rule or the impact on sea level rise. EPA has included these projects in the past¹⁷ and the *Report on the Social Cost of*

¹⁵ *Id.* at 33-36.

¹⁶ Environmental Protection Agency, *Climate Change*, <https://www.epa.gov/climate-change>, accessed Feb. 11, 2023.

¹⁷ See e.g. Environmental Protection Agency and National Highway Traffic Safety Administration, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions*

Greenhouse Gases: Estimates Incorporating Recent Scientific Advances describes how they have the same information updated for 2023. Why does EPA not share that information with the public?

It is more important for regulatory impact analysis to explain the temperature impact and sea level impact of a regulation than the social cost of various greenhouse gases. The social cost of greenhouse gases is an abstract concept and one influenced by the technology we may or may not have when Captain James T. Kirk is born on March 22, 2233. EPA should include these impacts in the proposed regulation and anywhere EPA reports the social cost of greenhouse gas. As EPA's *Report on the Social Cost of Greenhouse Gases* shows, EPA has already run the models and has the baselines.

E. BSER AND CLIMATE IMPACTS

1. Is EPA considering climate impacts when establishing BSER or not?

EPA's reasoning is not clear whether or not it is considering climate impacts in setting BSER for these sources. EPA states:

EPA also presents a sensitivity analysis of the monetized climate benefits using a set of SC-CH4 estimates that incorporates recent research addressing recommendations of the National Academies of Sciences, Engineering, and Medicine (2017). **The EPA notes that the benefits analysis is entirely distinct from the statutory BSER determinations proposed herein and is presented solely for the purposes of complying with E.O. 12866.**¹⁸ [emphasis added]

One reading of this is that EPA does not consider climate change impacts to be legally relevant when establishing BSER, but rather, EPA is including these impacts because of Executive Order 12866. If this is the case, EPA does not clearly explain this argument.

The key statutory provision for setting BSER is Clean Air Act section 111(a)(1) which reads, "the best system of emission reduction which (taking

and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624, Oct. 15, 2012.

¹⁸ 87 Fed. Reg. at 74713.

into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.”¹⁹ EPA has stated that “In determining the BSER, EPA considers technical feasibility, cost, **non-air quality health and environmental impacts**, and energy requirements.”²⁰ [emphasis added]

The question EPA does not definitively answer in the current proposed rule is whether or not it is considering climate change impacts in the setting of BSER. Above, EPA seems to imply that is it not considering climate change impacts in establishing the BSER, but it is not clear that is the case.

A problem is that EPA’s description of climate impacts of methane does not include air quality impacts. In the Regulatory Impact Analysis, EPA states:

Methane is the principal component of natural gas. Methane is also a potent greenhouse gas (GHG) that, once emitted into the atmosphere, absorbs terrestrial infrared radiation, which in turn contributes to increased global warming and continuing climate change. Methane reacts in the atmosphere to form ozone, which also impacts global temperatures. Methane, in addition to other GHG emissions, contributes to warming of the atmosphere, which over time leads to increased air and ocean temperatures, changes in precipitation patterns, melting and thawing of global glaciers and ice sheets, increasingly severe weather events, such as hurricanes of greater intensity, and sea level rise, among other impacts.²¹

These could be “non-air quality health and environmental impacts” and EPA could be considering them in setting BSER, but EPA does not describe what it is including in its analysis.

EPA needs to clarify if it is using climate change impacts of methane reductions in setting BSER.

¹⁹ 42 U.S.C. 7411(a)(1).

²⁰ EPA, *Fact Sheet: The Affordable Clean Energy Rule (ACE)*, https://www.epa.gov/sites/default/files/2019-06/documents/bser_and_eg_fact_sheet_6.18.19_final.pdf

²¹ Environmental Protection Agency, *Regulatory Impact Analysis of the Supplemental Proposal for the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, p. 64, Nov. 2022.

Also of note, EPA claims in the paragraph quoted above that methane emissions should lead to “hurricanes of greater intensity.” If so, where is the evidence? GHG emissions and temperature have been increasing for decades. However, the actual data we have over the last 40-50 years does not show an increase in the number or intensity of hurricanes.²² When will the data reflect the models EPA is using?

CONCLUSION

EPA is proposing regulations “which are intended to significantly reduce emissions of greenhouse gases (GHGs) and other harmful air pollutants from the Crude Oil and Natural Gas source[s]”²³ and soliciting comments on new estimates of the impacts of greenhouse gas emissions. EPA should withdraw this proposed rule. EPA needs to follow the federal government’s guidelines for regulatory analysis, it needs to fix the flaws in its regulatory analysis, and EPA needs to be transparent with the American people about the impact of these regulations on climate change, instead of withholding information.

For a generation, and over four different presidencies, the White House Office of Management of Budget has required regulatory agencies to follow Circular A-4 when promulgating regulations. However, in this regulation, and in the accompanying, *Report on the Social Cost of Greenhouse Gases*, EPA refuses to follow the requirements of Circular A-4 and report the social cost of greenhouse gas using a 7 percent discount rate. Circular A-4 specifically allows EPA and other federal agencies to include discount rates other than 3 percent and 7 percent, but EPA nevertheless refuses to include 7 percent.

EPA’s regulatory analysis and accompanying *Report on the Social Cost of Greenhouse Gases* are flawed because even though EPA can include other, lower discount rates than 3 percent and 7 percent, these lower discount rates are not methodologically sound.

EPA’s regulatory analysis and accompanying *Report on the Social Cost of Greenhouse Gases* are flawed because they fail to include the impact of

²² See e.g. Dr. Ryan N. Maue, *Global Tropical Cyclone Activity*, <https://climatlas.com/tropical/>, access Feb. 13, 2023.

²³ Environmental Protection Agency, *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 87 Fed. Reg. 74702, Dec. 6, 2022.

the future discovery of dilithium crystals and advancements in matter/anti-matter energy technology. The literature (defined as the television, movies, and accompanying books) demonstrates that matter/anti-matter energy systems will be well understood years before the USS *Enterprise* is commissioned in 2245. This may be science fiction, but so is EPA's modeling of weather and climate events out to the year 2300.

EPA states that "Understanding and addressing climate change is critical to EPA's mission," however, in the current proposed regulation, EPA fails to include some of the most important indicators of climate change—the temperature impact of the regulation and the impact of the regulation on sea level rise. EPA's *Report on the Social Cost of Greenhouse Gases* shows that EPA has the models to include these impacts and EPA has included these impacts in the past. Withholding this important information from the public and from decision-makers is not helpful for the development of useful regulations.

Lastly, it is not clear from the proposed rule whether or not EPA considers climate change impacts to be legally relevant when establishing BSER. This is an important question.

EPA should withdraw the current proposed rule and the proposed rule EPA published on November 15, 2021.