To: Alaska State Office, Bureau of Land Management

Subject: Comments on Failure to Monetize Greenhouse Gas Emissions and Properly Account for Energy Substitution in the Willow Master Development Plan Draft Environmental Impact Statement

Submitted by: Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Montana Environmental Information Center, Sierra Club, Union of Concerned Scientists, WildEarth Guardians, The Wilderness Society[1]

The following comments focus on the failure of the Bureau of Land Management ("BLM") to monetize climate damages and properly analyze energy substitution in the Willow Master Development Plan Draft Environmental Impact Statement ("DEIS").[2] BLM forecasts that the project will produce more than 260 million metric tons of cumulative greenhouse gas emissions[3]—an enormous amount that will contribute to numerous adverse climate impacts including sea-level rise, greater incidence of coastal storms and extreme weather events, and human health impacts and mortality from heat-related illnesses. While the National Environmental Policy Act ("NEPA") requires BLM to disclose and assess the significance of the development plan's contributions to such actual environmental impacts, BLM only provides volumetric emissions totals and thus fails to disclose any of the actual, real-world climate damages (such as sea-level rise, property damage, human health impacts, and so forth) that those substantial emissions will produce.

BLM acts under the misapprehension that it is not possible to quantify the plan's incremental climate impacts, stating that while "all projects may contribute cumulatively to the significant impact of global climate change," it is "not currently possible to determine the impact of a single project."[4] But this statement is untrue, as BLM overlooks the social cost of greenhouse gases metric that was designed by a federal Interagency Working Group ("IWG") and allows BLM to contextualize the significance of the plan's climate impacts as NEPA requires. BLM should use that metric to monetize the damages that will result from this master development plan. And if the agency does not provide additional information to contextualize the plan's emissions, it will violate its obligations under NEPA.

In addition to its failure to analyze and disclose to the public the significance of the actual climate damages associated with the master development plan, BLM downplays the effect of these emissions by claiming that more than 95 percent of downstream emissions from new federal mineral production described in the plan would, absent the project, be offset by increased emissions in other locations.[5]

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[1] Our organizations may separately and independently submit other comments on other issues raised by CEQ's Draft Guidance. Due to time constraints, the Environmental Defense Fund takes no position on Section II of these comments.

[2] U.S. Department of the Interior, Bureau of Land Management, Willow Master Development Plan Draft Environmental Impact Statement, Aug. 2019 [hereinafter "DEIS"].

[3] *Id*. at table 3.2.2.

[4] *Id*. at 25.

[5] *Id*. at App. E.2B, p. 3.

Yet this conclusion relies on several faulty assumptions that overstate this substitution effect. Most significantly, BLM assumes that global oil and gas demand will remain constant over the next 70 years, despite the fact that such a scenario would produce catastrophic climate damages and, for this reason, nations around the world are adopting policies to avert such a scenario. BLM also fails to recognize this substitution effect when describing the plan's projected economic impacts, arbitrarily and impermissibly placing a thumb on the scale by discounting only the plan's environmental harms.

These comments make the following points:

1. NEPA requires a "reasonably thorough discussion" and "necessary contextual information" on real-world climate impacts and their significance, which the social cost of greenhouse gases provides;
2. NEPA requires agencies to assess the impacts of emissions, including an assessment of their significance, yet BLM admittedly fails to assess the magnitude of climate impacts from the DEIS. The social cost of greenhouse gases metric is designed to measure marginal additional damages and is therefore an appropriate and available tool to assess the significance of the emissions from a plan like this one. Monetizing climate damages will directly contextualize the significance of emissions from the DEIS;
3. BLM monetized a number of other effects of the draft master development plan, including tax revenue and royalties, and must give climate effects the same consideration. When an agency monetizes a proposed action's potential benefits—as BLM does here—the potential climate costs must be treated with proportional rigor. Additionally, the fact that not every effect can be monetized does not mean that monetization is not a useful analytical tool;
4. BLM significantly understates the plan's projected net emissions by applying an energy substitution analysis that irrationally inflates energy substitution effects, while artificially exaggerating the plan's projected benefits relative to its environmental costs by inconsistently failing to project this substitution analysis to the economic benefits.

We explain each of these points in turn below.

I. BLM Impermissibly Fails to Disclose the Plan's Actual Climate Impacts Despite the Presence of a Simple and Readily-Available Tool for Doing So: The IWG's Social Cost of Greenhouse Gases

A. BLM Must Monetize the Social Cost of Greenhouse Gases in the DEIS

NEPA, the statute under which environmental impact statements are required, directs agencies to fully and accurately analyze the environmental, public health, and social welfare differences between proposed alternatives, and to contextualize that information for decision-makers and the public. NEPA requires a more searching analysis than merely disclosing the amount of pollution. Rather, BLM must examine the "ecological[,]… economic, [and] social" impacts of those emissions, including an assessment of their "significance."[6] By failing to use available tools, such as the social cost of carbon, to analyze the significance of the greenhouse gas emissions resulting from the master development plan, BLM has violated NEPA.

Monetizing Climate Damages Fulfills the Obligations and Goals of NEPA

When a project has climate consequences that must be assessed under NEPA, monetizing the climate damages fulfills an agency's legal obligations under NEPA in ways that simple quantification of tons

[6] 40 C.F.R. §§ 1508.8(b), 1502.16(a)–(b).

of greenhouse gas emissions cannot. NEPA requires "hard look" consideration of beneficial and adverse effects of each alternative option for major federal government actions. The U.S. Supreme Court has called the disclosure of impacts the "key requirement of NEPA," and held that agencies must "consider and disclose the *actual environmental effects*" of a proposed project in a way that "brings those effects to bear on [the agency's] decisions."[7] Courts have repeatedly concluded that an environmental impact statement must disclose relevant climate effects.[8] NEPA requires "a reasonably thorough discussion of the significant aspects of the probable environmental consequences," to "foster[] both informed decision-making and informed public participation."[9] In particular, "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires," and it is arbitrary to fail to "provide the necessary contextual information about the cumulative and incremental environmental impacts."[10]

Furthermore, the analyses included in environmental assessments and impact statements "cannot be misleading."[11] An agency must provide sufficient informational context to ensure that decisionmakers and the public will not misunderstand or overlook the magnitude of a proposed action's climate risks compared to the no action alternative. As this section explains, by only quantifying the volume of greenhouse gas emissions, agencies fail to assess and disclose the actual climate consequences of an action and misleadingly present information in ways that will cause decisionmakers and the public to overlook important climate consequences. Using the social cost of greenhouse gas metrics to monetize climate damages fulfills NEPA's legal obligations in ways that quantification alone cannot.

BLM Must Assess Actual Incremental Climate Impacts, Not Just the Volume of Emissions

The tons of greenhouse gases emitted by a project are not the "actual environmental effects" under NEPA. Rather, the actual effects and relevant factors that must be analyzed and disclosed to the public are the incremental climate impacts caused by those emissions, including:[12]

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[7] *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 96 (1983) (emphasis added); *see also* 40 C.F.R. § 1508.8(b) (requiring assessment of the "ecological," "economic," "social," and "health" "*effects*") (emphasis added).

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

[9] *Ctr. for Biological Diversity*, 538 F.3d at 1194 (citations omitted).

[10] *Id.* at 1217.

[11] *High Country Conservation Advocates v. U.S. Forest Service*, 52 F. Supp. 3d 1174, 1182 (D. Colo. 2014); *accord Johnston v. Davis*, 698 F.2d 1088, 1094–95 (10th Cir. 1983) (disapproving of "misleading" statements resulting in "an unreasonable comparison of alternatives"); *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446 (4th Cir. 1996) ("For an EIS to serve these functions" of taking a hard look and allowing the public to play a role in decisionmaking, "it is essential that the EIS not be based on misleading economic assumptions"); *see also Sierra Club v. Sigler*, 695 F.2d 957, 979 (5th Cir. 1983) (holding that an agency's "skewed cost-benefit analysis" was "deficient under NEPA"); *see generally Bus. Roundtable v. SEC*, 647 F.3d 1144, 1148–49 (D.C. Cir. 2011) (criticizing an agency for "inconsistently and opportunistically fram[ing] the costs and benefits of the rule" and for "fail[ing] adequately to quantify the certain costs or toe explain why those costs could not be quantified").

[12] These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. *Compare* Interagency Working Group on the Social Cost of Carbon, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis* at 6–8, 29–33 (2010), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf [hereinafter 2010 TSD]; *with* Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf.

- property lost or damaged by sea-level rise, coastal storms, flooding, and other extreme weather events, as well as the costs of protecting vulnerable property and resettling following property losses;
- changes in energy demand, from temperature-related changes to the demand for cooling and heating;
- lost productivity and other impacts to agriculture, forestry, and fisheries, due to alterations in temperature, precipitation, CO_2 fertilization, and other climate effects;
- human health impacts, including cardiovascular and respiratory mortality from heat-related illnesses, changing disease vectors like malaria and dengue fever, increased diarrhea, and changes in associated pollution;
- changes in fresh water availability;
- ecosystem service impacts;
- impacts to outdoor recreation and other non-market amenities; and
- catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.[13]

Even in combination with a general, qualitative discussion of climate change, by calculating only the tons of greenhouse gases emitted, an agency fails to meaningfully assess the actual incremental impacts to property, human health, productivity, and so forth.[14] An agency therefore falls short of its legal obligations and statutory objectives by disclosing only volume estimates. To take an analogous example, courts have held that just quantifying the acres of timber to be harvested or the miles of road to be constructed does not constitute a "description of *actual* environmental effects," even when paired with a qualitative "list of environmental concerns such as air quality, water quality, and endangered species," when the agency fails to assess "the degree that each factor will be impacted."[15]

By monetizing climate damages using the social cost of greenhouse gas metrics, BLM can satisfy NEPA's legal obligations and statutory goals to assess the incremental and actual effects bearing on the public interest. The social cost of greenhouse gases methodology calculates how the emission of an additional unit of greenhouse gases affects atmospheric greenhouse concentrations, how that

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For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of West Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, *see* EPA, *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment* (2017); U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment* (2017); EPA, *Climate Change in the United States: Benefits of Global Action* (2015); Union of Concerned Scientists, *Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate* (2018).

[13] For additional discussion of the climate impacts caused by greenhouse gas emissions, see Intergovernmental Panel on Climate Change, *Global Warming of 1.5 ℃: Summary for Policymakers* 9–12 (Valérie Masson-Delmotte et al. eds., 2018), *available at* https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf.

[14] *See High Country*, 52 F. Supp. 3d at 1190 ("Beyond quantifying the amount of emissions relative to state and national emissions and giving general discussion to the impacts of global climate change, [the agencies] did not discuss the impacts caused by these emissions."); *Mont. Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1096–99 (D. Mont. 2017) (rejecting the argument that the agency "reasonably considered the impact of greenhouse gas emissions by quantifying the emissions which would be released if the [coal] mine expansion is approved, and comparing that amount to the net emissions of the United States").

[15] *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 995 (9th Cir. 2004) ("A calculation of the total number of acres to be harvested in the watershed is . . . not a sufficient description of the actual environmental effects that can be expected from logging those acres."); *see also Oregon Natural Res. Council v. Bureau of Land Mgmt.*, 470 F.3d 818 (9th Cir. 2006).

change in atmospheric concentrations changes temperature, and how that change in temperature incrementally contributes to the above list of economic damages, including property damages, energy demand effects, lost agricultural productivity, human mortality and morbidity, lost ecosystem services and non-market amenities, and so forth.[16] The social cost of greenhouse gases tool therefore captures the factors that actually affect public welfare and assesses the degree of impact to each factor, in ways that just estimating the volume of emissions cannot.

Climate Damages Depend on Stock and Flow, But Volume Estimates Only Measure Flow

The climate damage generated by each additional ton of greenhouse gas emissions depends on the background concentration of greenhouse gases in the global atmosphere. Once emitted, greenhouse gases can linger in the atmosphere for centuries, building up the concentration of radiative-forcing pollution and affecting the climate in cumulative, non-linear ways.[17] As physical and economic systems become increasingly stressed by climate change, each marginal additional ton of emissions has a greater, non-linear impact. The climate damages generated by a given amount of greenhouse pollution is therefore a function not just of the pollution's total volume but also the year of emission, and with every passing year an additional ton of emissions inflicts greater damage.[18]

As a result, focusing just on the volume or rate of emissions, as BLM does here,[19] is insufficient to reveal the incremental effect on the climate. The change in the rate of emissions (flow) must be assessed given the background concentration of emissions (stock). A percent comparison to national emissions is perhaps even more misleading. A project that adds 23 million additional tons per year of carbon dioxide would have contributed to 0.43% of total U.S. carbon dioxide emissions in the year 2012.[20] In the year 2014, that same project with the same carbon pollution would have contributed to just 0.41% of total U.S. carbon dioxide emissions—a seemingly smaller relative effect, since the total amount of U.S. emissions increased from 2012 to 2014.[21] However, because of rising background concentrations of global greenhouse gas stock, and because of growing stresses in physical and economic systems, the marginal climate damages per ton of carbon dioxide (as measured by the social cost of carbon) increased from $33 in 2012 to $35 in 2014 (in 2007$).[22] Consequently, those 23 million additional tons would have caused marginal climate damages costing $759 million in the year 2012, but by 2014 that same 23 million tons would have caused $805 million in climate damages. To summarize: the percentage comparison to national emissions misleadingly implies that a project adding 23 million more tons of carbon dioxide would have a relatively less significant effect in 2014 than in 2012, whereas monetizing climate damages would accurately reveal that the emissions in 2014 were much more damaging than the emissions in 2012—almost $50 million more.

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[16] 2010 TSD, *supra* note 12, at 5.

[17] Carbon dioxide also has cumulative effects on ocean acidification, in addition to cumulative radiative-forcing effects.

[18] *See* 2010 TSD, *supra* note 12, at 33 (explaining that the social cost of greenhouse gas estimates grow over time).

[19] *See, e.g.*, DEIS at Table 3.2.4.

[20] Total U.S. carbon dioxide emissions in 2012 were 5,366.7 million metric tons (for all greenhouse gases, emissions were 6,529 MMT CO2 eq). *See* EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016* at ES-6, tbl. ES-2 (2018).

[21] Total U.S. carbon dioxide emissions in 2014 were 5,568.8 million metric tons (and for all greenhouse gases, 6,763 MMT CO2 eq.). *Id.*

[22] Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis* 25 tbl. A1 (2016) (calculating the central estimate at a 3% discount rate), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf [hereinafter 2016 TSD].

Capturing how marginal climate damages change as the background concentration changes is especially important because NEPA requires assessing both present and future impacts.[23] Different project alternatives can have different greenhouse gas consequences over time. Most simply, different alternatives could have different start dates or other consequential changes in timing. Calculating volumes or percentages, especially on an average annual basis, is insufficient to accurately compare the climate damages of project alternatives with varying greenhouse gas emissions over time. Here, for instance, BLM reports only the total greenhouse gas emissions from each of the three action alternatives, misleadingly implying a proportional relationship between these volumetric estimates and the climate impacts of each alternative.[24] Yet BLM fails to recognize that, because Alternative D calls for oil production to occur two years later than Alternatives B and C, its emissions will have a greater incremental climate impact than those alternatives.[25] By reporting only volumetric greenhouse gas projections, therefore, BLM paints an incomplete and misleading portrait of the relative climate impacts of the master development plan's various alternatives.

This problem would be easily solved by applying the social cost of greenhouse gases metric, which seamlessly accounts for timing differences between different alternatives. By factoring in projections of the increasing global stock of greenhouse gases as well as increasing stresses to physical and economic systems, the social cost of greenhouse gas metrics enable accurate and transparent comparisons of projects with varying greenhouse gas emissions over time.

Monetization Provides the Required Informational Context that Volume Estimates Alone Lack

NEPA requires sufficient informational context. Yet the limited context that BLM provides for the plan's projected greenhouse gas emissions—namely, comparing such totals to largely irrelevant volumes of greenhouse gas emissions including the U.S. greenhouse gas inventory[26]—provides a confusing and inadequate picture that attempts to minimize the impacts of the plan's substantial emissions. Indeed, in a country of over 300 million people and over 6.5 billion tons of annual greenhouse gas emissions, it is far too easy to make highly significant effects appear relatively trivial.[27] For example, presenting all weather-related deaths as less than 0.1% of total U.S. deaths makes the risk of death by weather event sound trivial, but in fact that figure represents over 2,000 premature deaths per year[28]—hardly an insignificant figure.[29] As the U.S. Court of Appeals for the

[23] NEPA requires agencies to weigh the "relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity," as well as "any irreversible and irretrievable commitments of resources." 42 U.S.C. § 4332(2)(C).

[24] *See* DEIS at Table 3.2.2.

[25] DEIS at App. E.2A, p. 6 ("For Alternatives B and C, oil production would begin in 2024 and end in 2050. For Alternative D, oil production would begin in 2026 and end in 2052."). Over time, as background atmospheric concentrations increase and physical and economic systems become increasingly stressed, a single ton of greenhouse gases emitted in a future year contributes more climate damage than a ton emitted sooner. The increase in the social cost of greenhouse gases occurs independently from, and partly offsets, the need the discount future monetized effects back to a present-day value in the context of a full cost-benefit analysis. Bottom line is, the timing of emissions matters, and agencies cannot assume that the same quantities of emissions would have the same climate impacts if released on different timelines.

[26] *Id*. at 27.

[27] California CEQA guidance, Final Adopted Text for Revisions to the CEQA Guidelines § 15064.4, *available at* http://resources.ca.gov/ceqa/docs/2018_CEQA_FINAL_TEXT_122818.pdf. ("A project's incremental contribution may be cumulatively considerable even if it appears relatively small compared to statewide, national or global emissions.").

[28] *Compare* Nat'l Ctr. for Health Stat., Ctrs. for Disease Control & Prevention, *Death Attributed to Heat, Cold, and Other Weather Events in the United States, 2006-2010* at 1 (2014) (reporting about 2000 weather-related deaths per year) *with* Nat'l Ctr. for Health Stat., *Deaths and Mortality*, https://www.cdc.gov/nchs/fastats/deaths.htm (reporting about 2.7 million U.S. deaths per year total).

[29] The public willingness to pay to avoid mortality is typically estimated at around $9.6 million (in 2016$). *See, e.g.*, 83 Fed. Reg. 12,086, 12,098 (Mar. 19, 2018) (U.S. Coast Guard rule using the Department of Transportation's value of statistical life in a

Fifth Circuit recently observed, even a seemingly "very small portion" of a "gargantuan source of [harmful] pollution" may nevertheless "constitute[] a gargantuan source of [harmful] pollution on its own terms."[30] In other words, percentages can be misleading and can be manipulated by the choice of the denominator; what matters is the numerator's actual contribution to total harm.

For example, the presentation of the master development plan's average annual emissions as just 0.135% of the U.S. greenhouse gas inventory makes a substantial and incredibly costly amount of emissions seem inconsequential. As described by Professor Cass Sunstein—drawing from the work of recent Nobel laureate economist Richard Thaler—a well-documented mental heuristic called "probability neglect" causes people to irrationally reduce such small probability risks entirely down to zero.[31] People have significant "difficulty understanding a host of numerical concepts, especially risks and probabilities."[32] By presenting large quantities of emissions—more than 260 million metric tons—as a tiny percentage representing less than 0.2% percent or a much larger total, the DEIS is likely to cause stakeholders to misunderstand the true significance of these emissions and treat them as meaningless. By comparison, through monetization it becomes clear that, for example, annual gross emissions from the project could cause about $500 million per year in climate damages.[33]

Economic theory also explains why monetization is a much better tool than mere volume estimates to provide the necessary contextual information on climate damages. Abstract volume estimates fail to give people the required informational context due to another well-documented mental heuristic called "scope neglect." Scope neglect, as explained by Nobel laureate Daniel Kahneman, among others, causes people to ignore the size of a problem when estimating the value of addressing the problem. For example, in one often-cited study, subjects were unable to meaningfully distinguish between the value of saving 2,000 migratory birds from drowning in uncovered oil ponds, as compared to saving 20,000 birds.[34] As the Environmental Protection Agency's website explains, "abstract measurements" of so many tons of greenhouse gases can be rather inscrutable for the public, unless "translat[ed] . . . into concrete terms you can understand."[35]

By failing to contextualize greenhouse gas emissions in the DEIS, BLM potentially misleads the reader into believing that there would be no climate effects from the master development plan, or that the effects would be extremely limited. As a result of scope neglect, for instance, many decisionmakers and members of the public may be unable to meaningfully contextualize the impact of more than 8 million metric tons of carbon dioxide equivalent into the atmosphere each year. While

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recent analysis of safety regulations). Losing 2,000 lives prematurely to weather-related events is equivalent to a loss of public welfare worth over $19 billion per year.

[30] *Southwestern Elec. Power Co. v. EPA*, 920 F.3d 999, 1032 (5th Cir. 2019).

[31] Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 Yale L. J. 61, 63, 72 (2002).

[32] Valerie Reyna & Charles Brainerd, *Numeracy, Ratio Bias, and Denominator Neglect in Judgments of Risk and Probability*, 18 Learning & Individual Differences 89 (2007).

[33] DEIS at Table E.2.4 reports annual average gross greenhouse gas emissions under Alternative B as 8.714 million CO_2e using the IPPC's AR5 100-year GWP. (Average annual emissions under Alternatives C and D are similar). The 2016 Interagency Working Group's central estimate of the social cost of carbon for year 2025 emissions is $46 in 2007$; adjusted for inflation using the CPI Inflation Calculator, that equals approximately $57 in 2019$. 8.714 million * $57 = $499.092 million. In a proper cost-benefit analysis, that calculation of costs from year 2025 emissions would be discounted back to present value as of year 2019.

[34] Daniel Kahneman et al., *Economic Preferences or Attitude Expressions? An Analysis of Dollar Responses to Public Issues*, 19 J. RISK & UNCERTAINTY 203, 212–13 (1999).

[35] EPA, *Greenhouse Gas Equivalencies Calculator*, *available at* https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator (last updated Dec. 2018) ("Did you ever wonder what reducing carbon dioxide (CO_2) emissions by 1 million metric tons means in everyday terms? The greenhouse gas equivalencies calculator can help you understand just that, translating abstract measurements into concrete terms you can understand[.]").

decisionmakers and the public can certainly tell this is a non-zero number, without any context it may be difficult to weigh the climate risks to which this volumetric estimate equates. In contrast, the plan's climate risks would be readily discernible through application of the social cost of greenhouse gas metrics. While the impact of releasing over 8 million metric tons of carbon dioxide equivalent annually into the atmosphere may seem indiscernible, that impact is clearly conveyed by explaining that such a figure represents approximately $500 million per year in annual climate damages.[36]

In general, non-monetized effects are often irrationally treated as worthless.[37] On several occasions, courts have struck down administrative decisions for failing to give weight to non-monetized effects.[38] Most relevantly, in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, the U.S. Court of Appeals for the Ninth Circuit found it arbitrary and capricious to give zero value "to the most significant benefit of more stringent [fuel-economy] standards: reduction in carbon emissions."[39] Monetizing climate damages provides the informational context required by NEPA, whereas a simple tally of emissions volume and a qualitative, generic description of climate change are misleading and fail to give the public and decisionmakers the required information about the magnitude of discrete climate effects.[40] Thus, while BLM treats "emissions . . . as a proxy for climate change impacts" throughout the DEIS,[41] the social cost of greenhouse gases metrics in fact convey the plan's actual climate effects and contextualize the significance in ways that quantification alone cannot, and thus should be utilized to satisfy the agency's obligations under NEPA.

Climate Effects Must Be Monetized If Other Costs and Benefits Are Monetized

Though NEPA does not always require a full and formal cost-benefit analysis,[42] agencies' approaches to assessing costs and benefits must be balanced and reasonable. Courts have warned agencies, for example, that an agency cannot selectively monetize benefits in support of its decision while refusing to monetize the costs of its action.[43]

In *High Country Conservation Advocates v. Forest Service*, for instance, the U.S. District Court of Colorado found that it was "arbitrary and capricious to quantify the *benefits* of the lease modifications and then explain that a similar analysis of the *costs* was impossible when such an

[36] *See* supra note 33 for our calculation of this value.

[37] Richard Revesz, *Quantifying Regulatory Benefits*, 102 Cal. L. Rev. 1424, 1434–35, 1442 (2014).

[38] *See id.* at 1428, 1434.

[39] 538 F.3d at 1199.

[40] *See* 42 U.S.C. § 4332(2)(B) (requiring agencies to "identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations").

[41] DEIS at App. E.2A, p.4

[42] 40 C.F.R. § 1502.23 ("[T]he weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis."); *but see e.g.*, *Sierra Club v. Sigler*, 695 F.2d 957, 978–79 (5th Cir. 1983) (holding that NEPA "mandates at least a broad, informal cost-benefit analysis," and so agencies must "fully and accurately" and "objectively" assess environmental, economic, and technical costs); *Chelsea Neighborhood Ass'ns v. U.S. Postal Serv.*, 516 F.2d 378, 387 (2d Cir. 1975) ("NEPA, in effect, requires a broadly defined cost-benefit analysis of major federal activities."); *Calvert Cliffs' Coordinating Comm. v. U.S. Atomic Energy Comm'n*, 449 F.2d 1109, 1113 (D.C. Cir. 1971) ("NEPA mandates a rather finely tuned and 'systematic' balancing analysis" of "environmental costs" against "economic and technical benefits"); *Nat'l Wildlife Fed. v. Marsh*, 568 F. Supp. 985, 1000 (D.D.C. 1983) ("The cost-benefit analysis of NEPA is concerned primarily with environmental costs. . . . A court may examine the cost-benefit analysis only as it bears upon the function of insuring that the agency has examined the environmental consequences of a proposed project.").

[43] *High Country Conservation Advocates*, 52 F. Supp. 3d at 1191; *accord MEIC v. Office of Surface Mining*, 274 F. Supp. 3d at 1094–99 (holding it was arbitrary for the agency to quantify benefits in an EIS while failing to use the social cost of carbon to quantify costs, as well as arbitrary to imply there would be no effects from greenhouse gas emissions).

analysis was in fact possible."[44] The court explained that, to support a decision on coal mining activity, the agencies had "weighed several specific economic benefits—coal recovered, payroll, associated purchases of supplies and services, and royalties"—but arbitrarily failed to monetize climate costs using the readily available social cost of carbon protocol.[45] Similarly, in *Montana Environmental Information Center v. Office of Surface Mining* (*MEIC v. OSM*), the U.S. District Court of Montana followed the lead set by *High Country* and likewise held an environmental assessment to be arbitrary and capricious because it quantified the benefits of action (such as employment payroll, tax revenue, and royalties) while failing to use the social cost of carbon to quantify the costs.[46]

High Country and *MEIC v. OSM* were simply the latest applications of a broader line of case law in which courts find it arbitrary and capricious to apply inconsistent protocols for analyzing some effects compared to others, especially when the inconsistency obscures some of the most significant effects.[47] For example, in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, the U.S. Court of Appeals for the Ninth Circuit ruled that, because the agency had monetized other uncertain costs and benefits of its vehicle fuel efficiency standard—like traffic congestion and noise costs—its "decision not to monetize the benefit of carbon emissions reduction was arbitrary and capricious."[48] Specifically, it was arbitrary to "assign[] no value to *the most significant benefit* of more stringent [vehicle fuel efficiency] standards: reduction in carbon emissions."[49] When an agency bases a decision on cost-benefit analysis, it is arbitrary to "put a

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[44] 52 F. Supp. 3d at 1191.

[45] *Id.*

[46] 274 F. Supp. 3d at 1094–99 (also holding that it was arbitrary to imply that there would be zero effects from greenhouse gas emissions).

[47] Other cases from different courts that have declined to rule against failures to use the social cost of carbon in NEPA analyses are all distinguishable by the scale of the action or by whether other effects were quantified and monetized in the analysis. *See League of Wilderness Defenders v. Connaughton*, No. 3:12-cv-02271-HZ (D. Ore., Dec. 9, 2014*); EarthReports v. FERC*, 828 F.3d 949 (D.C. Cir. 2016); *WildEarth Guardians v. Jewell*, 1:16-CV-00605-RJ, at 23-24, (D.N.M. Feb. 16, 2017).

In *WildEarth Guardians v. Zinke*, while the U.S. District Court for the District of Columbia stopped short of requiring BLM to use the social cost of carbon, it issued its holding on very narrow grounds. Specifically, the court declined to side with plaintiffs that "it was arbitrary and capricious for BLM to discuss the economic benefits of oil and gas drilling without quantifying their economic costs" by using the social cost of carbon protocol. 368 F. Supp.3d 41, 78 (D.D.C. Mar. 19, 2019). However, the court did *not* hold that BLM acted consistently in choosing to monetize benefits without monetizing costs; rather, it held that BLM's treatment of economic benefits was so "sparse[]" and "cursory" that the precedent established in *High Country Conservation Advocates v. Forest Service* could be differentiated. *Id.* But several important distinguishing arguments apply. First, the inconsistent treatment of costs and benefits is not the only reason why agencies should use the social cost of greenhouse gases to assess climate damages in NEPA reviews. The court never considered whether using the social cost of greenhouse gases was necessary or appropriate to fulfill the obligations and goals of NEPA: to assess a project's actual real-world impacts, to weigh the intensity and significance of a project's contributions to such impacts, and to give meaningful context to the information presented. Second, the court's consideration was incomplete on the issue of inconsistent treatment of costs and benefits. It is not clear why the paltry size of the lease's economic benefits should excuse BLM from inconsistently treating costs and failing to apply a readily available and easy-to-use tool to monetize the lease's hugely significant climate costs. *High Country*'s ruling turned not on the size of the monetized benefits but on the inconsistent treatment of costs and benefits. Furthermore, the court overlooked other portions of the original EAs and the tiered EISs that monetized and relied on larger economic benefits to much greater extent. The D.C. District Court also deferred to BLM's so-called "reasoned explanations," *id.*, yet failed to recognize that in *High Country*, the District of Colorado also considered and dismissed the post-hoc attempt to argue that the social cost of carbon protocol was too imprecise or controversial to use because of the range of estimates. 52 F. Supp. 3d 1174, 1192 (D. Colo. 2014). Finally, the court in *WildEarth v. Zinke* never discussed other important case law, such as *MEIC v. OSM*. Ultimately, the court instructed BLM on remand to "reassess" whether the social cost of greenhouse gas protocol would "contribute to informed decisionmaking" and ensure more accurate analysis as required by NEPA, 368 F. Supp.3d at 79 n.31. The court believed that "the protocol may one day soon be a necessary component of NEPA analyses," *id.*—and, indeed, that day has already arrived.

[48] 538 F.3d 1172, 1203 (9th Cir. 2008).

[49] *Id.* at 1199.

thumb on the scale by undervaluing the benefits and overvaluing the costs."[50] Similarly, the U.S. Court of Appeals for the District of Columbia Circuit has chastised agencies for "inconsistently and opportunistically fram[ing] the costs and benefits of the rule [and] fail[ing] adequately to quantify the certain costs or to explain why those costs could not be quantified";[51] and the U.S. Court of Appeals for the Tenth Circuit has remanded an environmental impact statement because "unrealistic" assumptions "misleading[ly]" skewed comparison of the project's positive and negative effects.[52]

The DEIS monetizes economic benefits similar to those highlighted in *High Country* and *MEIC*, including government revenues such as taxes and royalties.[53] BLM does not sufficiently justify this inconsistent approach to monetizing some effects but not others, but tries to skirt the precedent set in the cases discussed above by labeling taxes and royalties as "economic impacts" rather than costs or benefits.[54] First, as explained in *MEIC v. OSM*, this is a semantical "distinction without a difference."[55] Indeed, NEPA regulations group all impacts—including economic, social, ecological, and public health—under the same category of "effects," and NEPA requires the agency to discuss all of these effects in as much detail as possible.[56] Whether an effect is a cost, benefit, or transfer, if monetization is the best way to assess that effect's significance and contextualize its precise impacts, then monetization is also the best way to comply with NEPA's obligations. Second, BLM has effectively calculated the market value of oil and gas production through its estimate of the plan's royalties.[57] In a competitive market, like for coal, oil, and natural gas, the market price is typically thought to reflect aggregate willingness to pay based on social utility. Therefore, in calculating and reporting royalties, BLM has effectively presented a monetized estimate of the plan's projected social benefits.

As detailed further below, the IWG's approach presents a readily available tool to monetize the effects of greenhouse gas emissions based on peer-reviewed inputs and widely accepted assumptions. Agencies are every bit as capable of monetizing climate damages as they are of monetizing socioeconomic impacts. BLM therefore violates NEPA by monetizing social and economic effects in the DEIS while refusing to monetize climate impacts.

B. The Social Cost of Greenhouse Gas Metric Is Appropriate for This Plan

Seemingly anticipating the objections presented above, BLM argues that it cannot monetize the master development plan's effects on greenhouse gas emissions because "[i]t is not currently possible to determine the impact of a single project on global climate change."[58] This statement, however, is simply incorrect: the social cost of greenhouse gas protocol is exactly such a tool to monetize the incremental climate impacts of specific projects or plans, and to contextualize the magnitude of those impacts. NEPA requires BLM to use the best available science to support its NEPA analysis, and the

[50] *Id.* at 1198.
[51] *Bus. Roundtable v. SCC*, 647 F.3d 1144, 1148–49 (D.C. Cir. 2011).
[52] *Johnston v. Davis*, 698 F.2d 1088, 1094–95 (10th Cir. 1983)
[53] *See, e.g.*, DEIS at Table 3.15.3.
[54] *Id.* at App. E.2A, p. 6 ("Some people may perceive increased economic activity as a 'positive' impact that they desire to have occur whereas another person may view increased economic activity as negative or undesirable due to potential increase in local population, competition for jobs, and concerns that changes in population will change the quality of the local community.").
[55] 274 F. Supp. 3d. at 1096 n.9.
[56] 40 C.F.R. §1508.8.
[57] *See* DEIS at App. E.15, p. 6–7, explaining that royalties are calculated by applying 16.67 percent to "the wellhead value." The wellhead value is a market-based valuation of the resource.
[58] DEIS at 25.

social cost metrics remain the best estimates yet produced by the federal government for monetizing the impacts of greenhouse gas emissions and are "generally accepted in the scientific community."[59]

Monetization Is Appropriate and Useful in Any Decision with Significant Climate Impacts, Not Just Regulations

BLM argues that use of the IWG's social cost metrics is inappropriate for this plan because it "is not a rulemaking for which the [social cost of carbon] protocol was originally developed."[60] But this argument misses the point: BLM fails to explain why those metrics should not be used in environmental impact statements when they provide the best method to convey the climate impacts of a plan that would contribute substantially to greenhouse gas emissions.

Indeed, there is nothing in the development of the social cost metrics that would limit applications to other contexts. The social cost of greenhouse gases measures the marginal cost of any additional unit of greenhouse gases emitted into the atmosphere. The government action that precipitated that unit of emissions—a regulation, the granting of a permit, a project approval, or a master development plan—is irrelevant to the marginal climate damages caused by its emissions. Whether emitted by a leaking pipeline or the extraction process, because of a regulation or a resource management decision, or in Alaska or Maine, the marginal climate damages per unit of emissions remain the same. Indeed, the social cost of greenhouse gases has been used by many federal and state agencies in environmental impact reviews[61] and resource management decisions.[62]

The Social Cost of Greenhouse Gas Metrics Provide a Tool to Assess the Significance of Individual Physical Impacts

The social cost of greenhouse gas methodology is well suited to measure the marginal climate damages of individual projects. These protocols were developed to assess the cost of actions with marginal impacts on cumulative global emissions, and the metrics estimate the dollar figure of damages for one extra unit of greenhouse gas emissions. This marginal cost is calculated using integrated assessment models. These models translate emissions into changes in atmospheric greenhouse concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. A range of plausible socioeconomic and emissions trajectories are used to account for the scope of potential scenarios and circumstances that may actually result in the coming years and decades. The marginal cost is attained by first running the models using a baseline emissions trajectory, and then running the same models again with one additional unit of emissions. The difference in damages between the two runs is the marginal cost of one additional unit. The approach assumes that the marginal damages from increased emissions will remain constant for small emissions increases relative to gross global emissions. In other words, the

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[59] *See* 40 C.F.R. § 1502.22(b)(4).

[60] DEIS at App. E.2A, p. 6.

[61] For example, in August 2017, the Bureau of Ocean Energy Management called the social cost of carbon "a useful measure to assess the benefits of CO2 reductions and inform agency decisions," and applied the metric in an environmental impact statement to monetize the emissions difference of about 5 million metric tons per year between the proposed oil and gas development project and the no-action baseline, *Draft Environmental Impact Statement—Liberty Development Project in the Beaufort Sea, Alaska* at 3-129, 4-50 (2017). More generally, agencies have used IWG's social cost of greenhouse gas estimates not only in scores of rulemakings but also in NEPA analyses for resource management decisions. *See* Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 Columbia J. Envtl. L. 203, 270–84 (2017) (listing all uses by federal agencies through July 2016).

[62] States have used the social cost of greenhouse gases in decisions about electricity planning. *See* Iliana Paul et al., *The Social Cost of Greenhouse Gases and State Policy: A Frequently Asked Questions Guide* (Policy Integrity Report, 2017), http://policyintegrity.org/files/publications/SCC_State_Guidance.pdf.

monetization tools are in fact perfectly suited to measuring the marginal effects of individual projects or other discrete agency actions.

Some of the incremental impacts on the environment that the social cost of greenhouse gas protocol captures—and which the DEIS fails to meaningfully analyze—include property lost or damaged; impacts to agriculture, forestry, and fisheries; impacts to human health; changes in fresh water availability; ecosystem service impacts; impacts to outdoor recreation and other non-market amenities; and some catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.[63] A key advantage of using the social cost of greenhouse gas tool is that each physical impact—such as sea-level rise and increasing temperatures—need not be assessed in isolation. Instead, the social cost of greenhouse gases tool conveniently groups together a multitude of climate impacts and, consistent with NEPA regulations,[64] enables agencies to assess whether all those impacts are cumulatively significant and to then compare those impacts with other impacts or alternatives using a common metric.

The Tons of Greenhouse Gas Emissions at Stake Here Are Clearly Significant

BLM quantifies upstream and downstream greenhouse gas emissions from the plan, amounting to more than 8 million metric tons per year.[65] But BLM refuses to take the straightforward next step of applying the social cost of greenhouse gas values to those quantified tons, claiming that it cannot determine the effects of the master development plan on climate change and minimizing the significance of the plan's emissions by presenting them as only a small percentage of the global concentration of greenhouse gas emissions.[66]

The threshold for monetization, to the extent that it exists at all, is well below the volumetric emissions estimates that BLM projects here. While the projected emissions in this plan total more than 8 million metric tons annually, numerous courts have held that far lower annual emissions totals warrant monetization. For instance, the court in *High Country* found that it was arbitrary for the Forest Service not to monetize the "1.23 million tons of carbon dioxide equivalent emissions [from methane] the West Elk mine emits annually."[67] Likewise, in *Center for Biological Diversity*, the Ninth Circuit found that it was arbitrary for the Department of Transportation not to monetize the 35 million metric ton difference in lifetime emissions from increasing the fuel efficiency of motor

[63] These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. *Compare* 2010 TSD, *supra* note 12; *with* Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of West Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, *see* EPA, *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment* (2017); U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment* (2017); EPA, *Climate Change in the United States: Benefits of Global Action* (2015); Union of Concerned Scientists, *Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate* (2018).

[64] 40 C.F.R. § 1508.27(b)(7) (explaining that actions can be significant if related to individually insignificant but cumulatively significant impacts).

[65] *See* DEIS at Table E.2.2 (annual emissions under Alternative B); Table E.2.3 (Alternative C); Table E.2.3 (Alternative D). Citation and use of BLM's estimates of emissions in these comments does not necessarily concede the accuracy or completeness of those estimates.

[66] *Id*. at 27.

[67] 52 F. Supp. 3d at 1191 (quoting an e-mail comment on the draft statement for the quantification of tons).

vehicles[68]: given the estimated lifetime of vehicles sold in the years 2008-2011 (sometimes estimated at about 15 years on average), this could represent as little 2 million metric tons per year. And in a recent environmental impact statement from the Bureau of Ocean Energy Management ("BOEM"), the agency explained that the social cost of carbon was "a useful measure" for a NEPA analysis of an action anticipated to have a difference in greenhouse gas emissions compared to the no-action baseline of about 25 million metric tons over a 5-year period,[69] or about 5 million metric tons per year.

While there may not be a bright-line test for significance, the emissions BLM estimates for this plan are significant and warrant monetization. This is especially true since, once emissions have been quantified, the additional step of monetization through application of the IWG's cost estimates entails a simple arithmetic calculation.[70] It is difficult to understand how NEPA's mandate that an agency take a "hard look" at the environmental impacts of its actions can be satisfied if BLM fails to take the simple step of analyzing the impacts of the greenhouse gas emissions that it quantifies.

Monetizing Climate Damages Is Appropriate and Useful Regardless of Whether Every Effect Can Be Monetized in a Full Cost-Benefit Analysis

BLM further argues that use the social cost of greenhouse gases would be inappropriate because "[w]ithout a complete monetary cost-benefit analysis, which would include the social benefits of the proposed action to society as a whole and other potential positive benefits, including only an SCC cost analysis would be unbalanced, potentially inaccurate, and not useful to the decisionmaker."[71] This is mistaken for several reasons. First, as noted above, BLM has effectively monetized the full benefits of the plan as an input into its calculation of government royalties.[72] BLM's repeated attempts to hide behind its failure to monetize the plan's benefits therefore fails.

But even accepting BLM's premise that it has not monetized the social benefits of the proposed plan, monetizing the plan's negative climate impacts would still provide useful information for decisonmakers and the public, and not skew the analysis. In particular, whether or not other effects are monetized, using the social cost of greenhouse gases will facilitate comparison between alternative options along the dimension of climate change. As discussed above, different alternatives could have varying greenhouse gas consequences over time, and monetization provides an appropriate means of comparing plan alternatives along the dimension of climate change.

Monetizing the plan's climate effects could also provide a framework for making decisions when some effects but not others are monetized, through what is not as "break-even analysis." As described in the Office of Management and Budget's *Circular A-4*,[73] which provides guidance to agencies on conducting economic analysis including methods for weighing monetized and qualitative costs and benefits, agencies should carry out a "'break-even' analysis" when it is "not . . . possible to

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[68] 538 F.3d at 1187.

[69] BOEM, *Liberty Development and Production Plan Draft EIS* at 3-129, 4-50 (2017) (89,940,000 minus 64,570,000 is about 25 million).

[70] Agencies simply need to multiply their estimate of tons in each year by the IWG's 2016 values for the corresponding year of emissions (adjusted for inflation to current dollars). If the emissions change occurs in the future, agencies would then discount the products back to present value.

[71] DEIS at App. E.2A, p. 6.

[72] *See supra* note 57 and accompanying text.

[73] OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT OMB CIRCULAR A-4, REGULATORY ANALYSIS (2003). Though *Circular A-4* focuses on agencies' regulatory analyses under Executive Order 12,866, the document nevertheless more generally has distilled best practices on economic analysis and is a useful guide to all agencies undertaking an assessment of costs and benefits.

express in monetary units all of the important benefits and costs."[74] Under such an analysis, the agency considers "[h]ow small could the value of the non-quantified benefits be (or how large would the value of the non-quantified costs need to be) before the rule would yield zero net benefits."[75] Such an analysis could be useful here: Even if BLM is unable to fully monetize all costs and benefits, it could consider whether the alleged benefits of this proposal are worth the roughly $500 million in annual climate costs.

Moreover, even without using something as formal as a break-even analysis, it is clear that monetizing climate damages provides useful information whether or not every effect can be monetized in a full cost-benefit analysis. NEPA regulations acknowledge that when monetization of costs and benefits is "relevant to the choice among environmentally different alternatives," "that analysis" can be presented alongside "any analyses of unquantified environmental impacts, values, and amenities."[76] In other words, contrary to BLM's argument against the use of the social cost of greenhouse gas metrics, the inability to monetize some impacts should not preclude the monetization of impacts—like climate damages—that can be readily monetized.

C. BLM Should Use the Interagency Working Group's 2016 Estimates of the Social Cost of Carbon, the Social Cost of Nitrous Oxide, and the Social Cost of Methane

In 2016, the IWG published updated central estimates for the social cost of greenhouse gases: $50 per ton of carbon dioxide, $1440 per ton of methane, and $18,000 per ton of nitrous oxide (in 2017 dollars for year 2020 emissions).[77] Agencies must continue to use estimates of a similar or higher[78] value in their analyses and decisionmaking. A recent Executive Order disbanding the IWG—which BLM credits in part for its decision not to monetize climate impacts[79]—does not change the fact that the IWG estimates still reflect the best available data and methodologies.

IWG's Methodology Is Rigorous, Transparent, and Based on the Best Available Data

Beginning in 2009, the IWG assembled experts from a dozen federal agencies and White House offices to "estimate the monetized damages associated with an incremental increase in carbon emissions in a given year" based on "a defensible set of input assumptions that are grounded in the existing scientific and economic literature."[80] IWG's methods combined three frequently used models built to predict the economic costs of the physical impacts of each additional ton of carbon.[81] The models together incorporate such damage categories as: agricultural and forestry impacts, coastal impacts due to sea level rise, impacts from extreme weather events, impacts to vulnerable market sectors, human health impacts including malaria and pollution, outdoor recreation impacts and other non-market amenities, impacts to human settlements and ecosystems, and some catastrophic

[74] *Id*. at 2.

[75] *Id*.

[76] 40 C.F.R. § 1502.23.

[77] U.S. Interagency Working Group on the Social Cost of Greenhouse Gases, "Technical support document: Technical update of the social cost of carbon for regulatory impact analysis under executive order 12866 & Addendum: Application of the methodology to estimate the social cost of methane and the social cost of nitrous oxide" (2016), available at https://obamawhitehouse.archives.gov/omb/oira/social-cost-of-carbon.

[78] *See, e.g.*, Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (explaining that current estimates omit key damage categories and, therefore, are very likely underestimates).

[79] DEIS at App. E.2A, p. 6.

[80] 2010 TSD, *supra* note 12.

[81] *Id.* at 5. These models are DICE (the Dynamic Integrated Model of Climate and the Economy), FUND (the Climate Framework for Uncertainty, Negotiation, and Distribution), and PAGE (Policy Analysis of the Greenhouse Effect).

impacts.[82] IWG ran these models using a baseline scenario including inputs and assumptions drawn from the peer-reviewed literature, and then ran the models again with an additional unit of carbon emissions to determine the increased economic damages.[83] IWG's social cost of carbon estimates were first issued in 2010 and have been updated several times to reflect the latest and best scientific and economic data.[84]

Following the development of estimates for carbon dioxide, the same basic methodology was used in 2016 to develop the social cost of methane and social cost of nitrous oxide—estimates that capture the distinct heating potential of methane and nitrous oxide emissions.[85] These additional metrics used the same economic models, the same treatment of uncertainty, and the same methodological assumptions that IWG applied to the social cost of carbon, and these new estimates underwent rigorous peer-review.[86]

IWG's methodology has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office concluded that IWG had followed a "consensus-based" approach, relied on peer-reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research.[87] In 2016 and 2017, the National Academies of Sciences, Engineering, and Medicine issued two reports that, while recommending future improvements to the methodology, supported the continued use of the existing IWG estimates.[88] And in 2016, the U.S. Court of Appeals for the Seventh Circuit held that the Department of Energy's reliance on IWG's social cost of carbon was reasonable.[89] It is, therefore, unsurprising that leading economists and climate policy experts have endorsed the IWG's values as the best available estimates.[90]

Furthermore, uncertainty over the values or range of values included in the IWG's social costs of greenhouse gases metric is not a reason to abandon the social cost of greenhouse gas methodologies;[91] quite the contrary, uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail tipping points, catastrophic risks, and unknown unknowns about the damages of climate change. Because the key uncertainties of climate change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions.

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[82] *Id.* at 6–8.

[83] *Id.* at 24–25.

[84] IWG, *Technical Update of the Social Cost of Carbon* at 5–29 (2016). *Available at* https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/ scc_tsd_final_clean_8_26_16.pdf.

[85] *See* 2016 IWG Addendum at 2.

[86] *Id.* at 3.

[87] Gov't Accountability Office, *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* 12–19 (2014). Available at http://www.gao.gov/assets/670/665016.pdf.

[88] Nat'l Acad. Sci., Engineering & Med., *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* 3 (2017), https://www.nap.edu/read/24651/chapter/1; Nat'l Acad. Sci., Engineering & Med., *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update* 1–2 (2016); https://www.nap.edu/read/21898/chapter/1.

[89] *Zero Zone, Inc. v. U.S. Dep't of Energy,* 832 F.3d 654, 678 (7th Cir. 2016).

[90] See, e.g., Richard Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 Science 655 (2017); Michael Greenstone et al., *Developing a Social Cost of Carbon for U.S. Regulatory Analysis: A Methodology and Interpretation*, 7 Rev. Envtl. Econ. & Pol'y 23, 42 (2013); Revesz, *Global Warming: Improve Economic Models of Climate Change*, *supra* note 78.

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

Not only was justifying omitted climate damages due to uncertainty rejected by the Ninth Circuit in *Center for Biological Diversity*—"while . . . there is a range of values, the value of carbon emissions reduction is certainly not zero"[92]—but the range of values recommended by the IWG[93] and endorsed by the National Academies of Sciences[94] is rather manageable. In 2016, the IWG recommended values at discount rates from 2.5% to 5%, calculated as between $12 and $62 for year 2020 emissions.[95] Numerous federal agencies have had no difficulty either applying this range in their environmental impact statements or else focusing on the central estimate at a 3% discount rate.[96] Most recently, in August 2017, BOEM applied the IWG's range of estimates calculated at three discount rates (2.5%, 3%, and 5%) to its environmental impact statement for an offshore oil development plan,[97] and called this range of estimates "a useful measure to assess the benefits of CO_2 reductions and inform agency decisions."[98]

A Recent Executive Order Does Not Change the Requirements to Monetize Climate Damages

In March 2017, President Trump disbanded the IWG and withdrew its technical support documents.[99] Nevertheless, Executive Order 13,783 assumes that federal agencies will continue to "monetiz[e] the value of changes in greenhouse gas emissions" and instructs agencies to ensure such estimates are "consistent with the guidance contained in OMB Circular A-4."[100] Consequently, while federal agencies no longer benefit from ongoing technical support from the IWG on using the social cost of greenhouse gases, by no means does the new Executive Order imply that agencies should not monetize important effects in their environmental impact statements. The Executive Order does not prohibit agencies from relying on the same choice of models as the IWG, the same inputs and assumptions as the IWG, the same statistical methodologies as the IWG, or the same ultimate values as derived by the IWG. To the contrary, because the Executive Order requires consistency with Circular A-4, as agencies follow the Circular's standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG's work continues to represent the best available estimates.[101] The Executive Order does not preclude agencies from using the same range of estimates as developed by the IWG, so long

[92] 538 F.3d at 1200.

[93] *See* Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Update* (2016) (hereinafter 2016 TSD).

[94] *See* National Academies of Sciences, *Assessment of Approaches to Updating the Social Cost of Carbon* (2016) (hereinafter First NAS Report) (endorsing continued near-term use of the IWG numbers; in 2017, the NAS recommended moving to a declining discount rate, *see* National Academies of Sciences, *Valuing Climate Damages* (2017) (hereinafter Second NAS Report).

[95] 2016 TSD. The values given here are in 2007$. The IWG also recommended a 95th percentile value of $123.

[96] BLM, *Envtl. Assessment—Waste Prevention, Prod. Subject to Royalties, and Res. Conservation* at 52 (2016); BLM, *Final Envtl. Assessment: Little Willow Creek Protective Oil and Gas Lease*, DOI-BLM-ID-B010-2014-0036-EA, at 82 (2015); Office of Surface Mining, *Final Envtl. Impact Statement—Four Corners Power Plant and Navajo Mine Energy Project* at 4.2-26 to 4.2-27 (2015) (explaining the social cost of greenhouse gases "provide[s] further context and enhance[s] the discussion of climate change impacts in the NEPA analysis."); U.S. Army Corps of Engineers, *Draft Envtl. Impact Statement for the Missouri River Recovery Mgmt. Project* at 3-335 (2016); U.S. Forest Serv., *Rulemaking for Colorado Roadless Areas: Supplemental Final Envtl. Impact Statement* at 120–23 (Nov. 2016) (using both the social cost of carbon and social cost of methane relating to coal leases); NHTSA EIS, *Available at* http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FINAL_EIS.pdf at 9-77.

[97] BOEM, *Liberty Development Project: Draft Environmental Impact Statement*, at 4-247 (2017).

[98] *Id.* at 3-129.

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

[100] *Id.* § 5(c).

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

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

Similarly, the Executive Order's withdrawal of the Council on Environmental Quality's guidance on greenhouse gases,[102] does not—and legally cannot—remove agencies' statutory requirement to fully disclose the environmental impacts of greenhouse gas emissions. As the Council on Environmental Quality explained in its withdrawal, the "guidance was not a regulation," and "[t]he withdrawal of the guidance does not change any law, regulation, or other legally binding requirement."[103] In other words, when the guidance originally recommended the appropriate use of the social cost of greenhouse gases in environmental impact statements,[104] it was simply explaining that the social cost of greenhouse gases is consistent with longstanding NEPA regulations and case law, all of which are still in effect today.

Notably, some agencies under the Trump administration have continued to use the IWG estimates even following the Executive Order. For example, in August 2017, the BOEM called the social cost of carbon "a useful measure" and applied it to analyze the consequences of offshore oil and gas drilling.[105] And in July 2017, the Department of Energy used the IWG's estimates for carbon and methane emissions to analyze energy efficiency regulation, describing the social cost of methane as having "undergone multiple stages of peer review."[106]

Two agencies have developed new "interim" values of the social cost of greenhouse gases following the Executive Order. Relying on faulty economic theory, these "interim" estimates drop the social cost of carbon from $50 per ton in year 2020 down to as little as $1 per ton, and drop the social cost of methane from $1420 per ton in year 2020 down to $58. These "interim" estimates are inconsistent with accepted science and economics; the IWG's 2016 estimates remain the best available estimates. The IWG's methodology and estimates have been repeatedly endorsed by reviewers as transparent, consensus-based, and firmly grounded in the academic literature. By contrast, the "interim" estimates ignore the interconnected, global nature of our climate-vulnerable economy, and obscure the devastating effects that climate change will have on younger and future generations. BLM should not use the "interim" social cost of greenhouse gas estimates because of its methodological flaws.

Uncertainty Supports Higher Social Cost of Greenhouse Gas Estimates, and Is Not a Reason to Abandon the Metric

Generally, uncertainty is *not* a reason to abandon the social cost of greenhouse gas methodologies;[107] quite the contrary, uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail tipping points, catastrophic risks, and unknown unknowns about the damages of climate change. Because the key uncertainties of climate

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[102] Exec. Order 13,783 § 3(c)

[103] 82 Fed. Reg. 16,576, 16,576 (Apr. 5, 2017).

[104] *See* CEQ, *Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 16 (Dec. 2014), *available at* https://obamawhitehouse.archives.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf ("[A]lthough developed specifically for regulatory impact analyses, the Federal social cost of carbon, which multiple Federal agencies have developed and used to assess the costs and benefits of alternatives in rulemakings, offers a harmonized, interagency metric that can provide decisionmakers and the public with some context for meaningful NEPA review.").

[105] *Draft Environmental Impact Statement—Liberty Development Project in the Beaufort Sea, Alaska* at 3-129.

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

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

change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions.

There are numerous well-established, rigorous analytical tools available to help agencies characterize and quantitatively assess uncertainty, such as Monte Carlo simulations, and the IWG's social cost of greenhouse gas protocol incorporates those tools. To further deal with uncertainty, the IWG recommended to agencies a range of four estimates: three central or mean-average estimates at a 2.5%, 3%, and 5% discount rate respectively, and a 95th percentile value at the 3% discount rate. While the IWG's technical support documents disclosed fuller probabilities distributions, these four estimates were chosen by agencies to be the focus for decisionmaking. In particular, application of the 95th percentile value was not part of an effort to show the probability distribution around the 3% discount rate; rather, the 95th percentile value serves as a methodological shortcut to approximate the uncertainties around low-probability but high-damage, catastrophic, or irreversible outcomes that are currently omitted or undercounted in the economic models.

The shape of the distribution of climate risks and damages includes a long tail of lower-probability, high-damage, irreversible outcomes due to "tipping points" in planetary systems, inter-sectoral interactions, and other deep uncertainties. Climate damages are not normally distributed around a central estimate, but rather feature a significant right skew toward catastrophic outcomes. In fact, a 2015 survey of economic experts concludes that catastrophic outcomes are increasingly likely to occur.[108] Because the three integrated assessment models that the IWG's methodology relied on are unable to systematically account for these potential catastrophic outcomes, a 95th percentile value was selected instead to account for such uncertainty. There are no similarly systematic biases pointing in the other direction which might warrant giving weight to a low-percentile estimate.

Additionally, the 95th percentile value addresses the strong possibility of widespread risk aversion with respect to climate change. The integrated assessment models do not reflect that individuals likely have a higher willingness to pay to reduce low-probability, high-impact damages than they do to reduce the likelihood of higher-probability but lower impact damages with the same expected cost. Beyond individual members of society, governments also have reasons to exercise some degree of risk aversion to irreversible outcomes like climate change.

The National Academies of Sciences, Engineering, and Medicine did recommend that the IWG document its full treatment of uncertainty in an appendix and disclose low-probability as well as high-probability estimates of the social cost of greenhouse gases.[109] However, that does not mean it would be appropriate for individual agencies to rely on low-percentile estimates to justify decisions. While disclosing low-percentile estimates in a sensitivity analysis may promote transparency, relying on such an estimate for decisionmaking—in the face of contrary guidance from the best available science and economics on uncertainty and risk—would not be a "credible, objective, realistic, and scientifically balanced" approach to uncertainty, as required by Circular A-4.[110]

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[108] Peter Howard and Derek Sylvan, *Expert Consensus on the Economics of Climate Change* 2 (2015), available at https://policyintegrity.org/files/publications/ExpertConsensusReport.pdf. ("Experts believe that there is greater than a 20% likelihood that this same climate scenario would lead to a 'catastrophic' economic impact (defined as a global GDP loss of 25% or more).").

[109] Nat'l Acad. Of Sci., *Assessment of Approaches to Updating the Social Cost of Carbon* 49 (2016) ("[T]he IWG could identify a high percentile (e.g., 90th, 95th) and corresponding low percentile (e.g., 10th, 5th) of the SCC frequency distributions on each graph.").

[110] CIRCULAR A-4 at 39.

In short, the 95th percentile estimate attempts to capture risk aversion and uncertainties around lower-probability, high-damage, irreversible outcomes that are currently omitted or undercounted by the models. There is no need to balance out this estimate with a low-percentile value, because the reverse assumptions are not reasonable:

- There is no reason to believe the public or the government will be systematically risk seeking with respect to climate change.[111]
- The consequences of overestimating the risk of climate damages (i.e., spending more than we need to on mitigation and adaptation) are not nearly as irreversible as the consequences of underestimating the risk of climate damage (i.e., failing to prevent catastrophic outcomes).
- Though some uncertainties might point in the direction of lower social cost of greenhouse gas values, such as those related to the development of breakthrough adaptation technologies, the models already account for such uncertainties around adaptation; on balance, most uncertainties strongly point toward higher, not lower, social cost of greenhouse gas estimates.[112]
- There is no empirical basis for any "long tail" of potential benefits that would counteract the potential for extreme harm associated with climate change.

Moreover, even the best existing estimates of the social cost of greenhouse gases are likely underestimated because the models currently omit many significant categories of damages—such as depressed economic growth, pests, pathogens, erosion, air pollution, fire, dwindling energy supply, health costs, political conflict, and ocean acidification, as well as tipping points, catastrophic risks, and unknown unknowns—and because of other methodological choices.[113]

Consequently, uncertainty suggests an even higher social cost of greenhouse gases and so is not a reason to abandon the metric, which would misleadingly suggest that climate damages are worthless.

II. BLM's Energy Substitution Analysis is Flawed and Inconsistently Applied, Leading to a Likely Underestimation of Net Emissions and an Inflation of Economic Benefits

In addition to its refusal to monetize the social cost of the master development plan's projected greenhouse gas emissions, BLM also seeks to downplay the quantified emissions by asserting that approximately 95 percent of increased downstream greenhouse gas emissions would be substituted by additional emissions elsewhere under a "no action" scenario—suggesting, in other words, that the

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[111] As a 2009 survey revealed, the vast majority of economic experts support the idea that "uncertainty associated with the environmental and economic effects of greenhouse gas emissions increases the value of emission controls, assuming some level of risk-aversion." *See Expert Consensus, supra* note 108, at 3 (citing 2009 survey).

[112] *See* Revesz, *Global Warming: Improve Economic Models of Climate Change*, *supra* note 78. R. Tol, *The Social Cost of Carbon*, 3 Annual Rev. Res. Econ. 419 (2011) ("[U]ndesirable surprises seem more likely than desirable surprises. Although it is relatively easy to imagine a disaster scenario for climate change—for example, involving massive sea level rise or monsoon failure that could even lead to mass migration and violent conflict—it is not at all easy to imagine that climate change will be a huge boost to human welfare.").

[113] *See* Revesz, *Global Warming: Improve Economic Models of Climate Change*, *supra* note 78; Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014); Frances C. Moore & Delavane B. Diaz, *Temperature Impacts on Economic Growth Warrant Stringent Mitigation Policy*, 5 NATURE CLIMATE CHANGE 127 (2015) (demonstrating SCC may be biased downward by more than a factor of six by failing to include the climate's effect on economic growth).

plan is only actually responsible for 5 percent of its generated emissions.[114] But BLM does not release its full analysis, and its estimates are based on a model known as MarketSim that has significant structural flaws.

BLM should not only release its full analysis to provide for meaningful public review, but should also reconsider its reliance on MarketSim in its present form. Given the model's fundamental flaws and unexplained results, reliance on this model without further reassessment or disclosure would violate BLM's obligations under NEPA. BLM also inconsistently fails to apply any substitution analysis to its estimates of projected oil and gas revenues and other economic effects, thereby misleadingly inflating the plan's purported economic benefits relative to its environmental harms.

BLM Should Release Its Full Substitution Analysis, Particularly in Light of MarketSim's Previously Inconsistent and Unexplained Results

According to BLM's substitution analysis, only 3.26% of the oil and gas production called for under this plan represents new demand, meaning that the remainder—96.74%—would be offset by substitute fuels at other locations under a "no action" alternative.[115] However, while BLM reports that it obtained these results using a model developed by BOEM known as MarketSim, it does not release its full analysis or its runs of the simulation tool. BLM should provide such information to allow the public to meaningfully review and analyze the results.

Full disclosure of all MarketSim runs is particularly critical because the tool has produced inconsistent results in the past. For instance, when BLM ran MarketSim for its recent draft resource management plan for Eastern Colorado, it found that the majority of increased oil and gas production would be replaced by onshore production elsewhere[116]—a nearly inverse result from its MarketSim results earlier in the year for the now-finalized oil and gas leasing in the Arctic National Wildlife Refuge Coastal Plain, which found most substitution coming from increased foreign imports.[117] In this case, BLM conspicuously fails to provide any breakdown of where the different substitutes would come from—such as from increased foreign imports or additional onshore production—making it impossible to determine whether its present results are consistent with any of BLM's previous substitution analyses.

To facilitate meaningful public review, therefore, BLM should make all data models and runs of its substitution analysis available, and reopen public comment to provide adequate opportunity for all stakeholders to assess this data. If it refuses to do so, it should at least provide a summary of where the substitution would come from (onshore production, foreign imports, etc.) as it has for previous substitution analyses.

[114] *See* DEIS at App. E.2B, p. 5. Specifically, BLM reports that 225.147 million metric tons of greenhouse gas equivalence out of the 237.626 million metric tons in downstream emissions in Alternative B would be produced throughout substitute emissions elsewhere under a no action alternative. *Id*. This equates to 94.75%.

[115] *Id*. at App. E.2B, p. 3.

[116] *See, e.g.*, U.S. Department of the Interior, Bureau of Land Management, Draft Eastern Colorado Resource Management Plan & Environmental Impact Statement B-74 (June 2019) [hereinafter Eastern Colorado DEIS].

[117] BLM did not publicly release the full results of its substitution analysis for the Coastal Plain project, but provided the Institute for Policy Integrity with a summary of its results. *See* Institute for Policy Integrity, *Comments on Arctic Coastal Plain Draft EIS* (Mar. 13, 2019), *available at* https://policyintegrity.org/documents/Arctic_Coastal_Plain_DEIS_Comments_2019.3.13-final.pdf

Fundamental Problems with BLM's Substitution Analysis Cause Likely Underestimates of Net Downstream Emissions from the Proposed Plan and Counsel in Favor of Developing a New Model Before Finalizing the Environmental Impact Statement

In addition to the above-mentioned concerns about BLM's lack of transparency and its inconsistent prior findings, there are also broader and more fundamental issues with MarketSim that skew its results, likely causing it to underestimate the substitution effects of decreased demand and thereby also underestimate a project's climate impacts. These errors, enumerated below, should be rectified in any final analysis, and any revision of MarketSim and new analysis of the environmental effects of the master development plan should be republished in draft form for public comment.

1) Agencies' applications of MarketSim omit effects on foreign consumption and so grossly underestimate net downstream emissions

BLM has followed BOEM's lead in applying MarketSim to assess energy substitution,[118] and so has copied a significant error from BOEM. Specifically, BOEM's applications of MarketSim have not accounted for changes in foreign oil and gas demand, [119] which drastically skews MarketSim's results since there is strong evidence that foreign demand is decreasing.[120]

Indeed, while MarketSim "estimates a foreign reduction in consumption . . . for oil," the simulations that BOEM and now BLM have run to estimate energy substitution in the no-action scenario seemingly do not account for any changes in foreign demand.[121] Specifically, MarketSim finds that reducing U.S. oil production decreased foreign oil consumption by approximately 50% in a mid-price scenario[122]—a result that is consistent with economic literature.[123] This 50% offset from reduced demand is significantly more than the 3.26% drop in U.S. demand that BLM reports, and so omitting the effects of global consumption may translate into a massive underestimate of the plan's net downstream emissions effects.

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[118] DEIS at App. E.2B, p. 1 (referencing BOEM's Market Simulation Model and Greenhouse Gas Lifecycle Model).

[119] Bureau of Ocean Energy Management, OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon 23 (2016), available at https://www.boem.gov/ocs-oil-and-natural-gas/ [hereinafter Potential Lifecycle]. (explaining that "the reduction in foreign consumption of oil and gas in a no action analysis is not taken into account").

[120] Indeed, given that 197 countries have signed on to the Paris Agreement and are continuing to develop their commitments to reduce emissions, decreases in foreign demand could accelerate in the future, and a reduction in U.S. supply of oil and gas may be even more easily substituted with conservation and efficiency efforts.

[121] BOEM, Potential Lifecycle, *supra* note 119, at 23.

[122] *Id.* (reporting that taking 8 billion barrels of U.S. oil production off the global market would result in "a reduction in foreign oil consumption of approximately 1, 4, and 6 billion barrels of oil for the low-, mid-, and high-price scenarios, respectively, over the duration of the 2017–2022 program."); *see also* P. Erickson, Final Obama administration analysis shows expanding oil supply increases CO2, Stockholm Environment Institute (Jan. 30, 2017) & P. Erickson, U.S. Again Overlooks Top CO2 Impact of Expanding Oil Supply . . . But That Might Change, Stockholm Environment Institute (Apr. 30, 2016) (calculating that forgoing 8.3 billion barrels of U.S. offshore production will decrease global consumption by 4 billion barrels and decrease global emissions by 1.7 billion metric tons); G. Metcalf, *The Impact of Removing Tax Preferences for U.S. Oil and Gas Production* (Council on Foreign Relations, Aug. 2016) (finding a global response of about 0.5 decrease per 1 unit of forgone U.S. production when matching the assumptions used in MarketSim, while also noting that hidden assumptions in MarketSim may lead global production to fall by even more than that, especially depending on the assumption on how OPEC will respond).

[123] *See* P. Erickson & M. Lazarus, *Would Constraining U.S. Fossil Fuel Production Affect Global CO2 Emissions? A Case Study of US Leasing Policy*, Climatic Change 1-14 (2018) (finding that a one unit decrease in U.S. oil production decreases annual global production by 0.61 units); *id.* ("In particular, several studies find this ratio to be about 0.5, an outcome that would occur whenever supply and demand elasticities are equal in magnitude, since in that case, a supply shock would be accommodated by equal and opposite changes to production and consumption (Fæhn et al. 2017; Metcalf 2016; Wolvovsky and Anderson 2016).").

BLM offers no explanation for how it has approached, or ignored, changes in foreign demand. In the past, BOEM has claimed that "[e]xcluding the foreign oil and gas markets is reasonable" because "BOEM does not have information related to which countries would consume less oil" and so cannot make predictions about the changes in net emissions from changes in foreign consumption.[124] In other words, according to BOEM, we should entirely ignore foreign reductions in demand for oil and gas that we know are occurring because it would be too difficult to translate those reductions into changes in net greenhouse gas emissions.

This logic is unsound. The Department of the Interior hardly explains why it could not make a reasonable assumption about average emissions from total foreign consumption of oil, stating only that "oil is consumed in a variety of products, which have a wide range of emissions factors."[125] But there are numerous ways to rationally account for this uncertainty. In fact, the Department of Energy's National Energy Technology Laboratory recently published a methodology to study the impacts of U.S. energy exports on greenhouse gas generation around the world, comparing the greenhouse gas implications of electric power generation on different continents.[126] And the emissions factors for oil that BLM has used elsewhere show a rather manageable range of between a low of 5.72 kilograms of carbon dioxide per gallon to a high end of 14.64 kilograms per gallon.[127] BLM could easily apply either the U.S. Energy Information Administration's ("EIA") tables of U.S. exports by petroleum product,[128] or could simply give a lower-bound estimate of the net emissions effect.[129] Either option would be much more accurate and reasonable than a complete omission. (Meanwhile, "emissions factors for natural gas do not vary," and so there should be no bar whatsoever in calculating emissions reductions from a global drop in the consumption of gas.[130]) While there may "a range of values" regarding the net greenhouse gas impacts of declining foreign oil consumption, the proper value "is certainly not zero," which is what BLM has improperly assumed by excluding foreign oil and gas markets entirely.[131]

In short, the available information is more than sufficient to make reasonable estimates regarding the impacts of reductions in foreign demand on greenhouse gas emissions. By falsely concluding that this task is impossible and excluding such reductions altogether, BLM may be massively underestimating the net downstream emissions of the proposed master development plan.

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[124] BOEM, Potential Lifecycle, *supra* note 119, at 23.

[125] *Id.* at 22.

[126] National Energy Technology Laboratory, *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States: 2019 Update*, available at https://www.energy.gov/sites/prod/files/2019/09/f66/2019%20NETL%20LCA-GHG%20Report.pdf.

[127] *See* BLM, Greater Mooses Tooth 2 SEIS, Appendix H, table 4-2.

[128] *See* https://www.eia.gov/dnav/pet/pet_move_exp_dc_NUS-Z00_mbbl_a.htm

[129] BLM might also need to make some other reasonable assumptions about foreign substitutes for oil and gas consumption if those effects are not already modeled in the MarketSim. *See* Erickson & Lazarus (2018), *supra* note 123, making a reasonable assumption that the alternative energy mix is about 85% as carbon intensive as oil-based fuels, and calculating the effect on global emissions of a change in U.S. oil supply.

[130] Potential Lifecycle, *supra* note 119, at 22.

[131] *Ctr. for Biological Diversity*, 538 F.3d at 1200.

2) MarketSim implausibly assumes near constant domestic demand for oil and gas over the next seven decades

Because MarketSim ignores reductions in foreign demand altogether, it uses domestic oil and gas consumption projections as a proxy for worldwide consumption.[132] But MarketSim unreasonably assumes near constant demand for domestic oil and gas for up to 70 years into the future.[133] Accordingly, the model assumes a constant global demand for oil and gas throughout most of the century's remainder—an assumption that is totally incompatible with international efforts to mitigate the impacts of climate change and would lead to unsustainable amounts of warming.

The main assumption that the government makes in forecasting constant demand over 70 years—that there will be no "future changes in laws and policies"—is simply unreasonable given the realities of climate change.[134] Indeed, the Interior Department has acknowledged that "[a]s countries, including the U.S., address climate change with individual policy targets, this assumption could no longer hold," and that "as new energy sources become more economically feasible, they could displace existing sources and/or alter the composition of energy supply."[135] And sure enough, numerous states in recent years have adopted low- and zero-emission vehicle standards along with net-zero carbon emissions targets—laws that would require oil and gas consumption within those states to decline precipitously.[136]

BLM's projection of constant demand over the next 70 years is based on the EIA reference case.[137] But the EIA's reference case estimates are intended to reflect trends and are not necessarily firm predictions about the future; indeed, the EIA recently projected "decreasing domestic demand" for petroleum products through 2034.[138] As such, these trends should not be used in isolation as point estimates; instead, agencies should conduct sensitivity analysis over reasonable assumptions and scenarios. For instance, BLM could provide oil and gas demand projections assuming that nations (including the United States) meet their commitments under the Paris Agreement.

Instead of conducting sensitivity analysis over reasonable assumptions, BLM assumes the "worst-case scenario outcome" that demand for oil and gas will continue unabated for most of the century.[139] Basing a model on what BLM admits is an extreme premise is not consistent with the agency's obligation under NEPA to make assumptions that are reasonable and based on the best available information.[140] Particularly concerning is BLM's assumption that uncertainty about climate change should be used as a reason to trivialize net emissions, thereby using uncertainty as cover to promote

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[132] *See, e.g.*, BLM, Coastal Plain Oil and Gas Leasing Program, Final Environmental Impact Statement S-619 (Sept. 2019) [hereinafter Coastal Plain EIS] ("The model estimates the impacts on global oil markets and in doing so calculates changes in U.S. demand for oil, natural gas, coal, and electricity from others sources, as well as the global change in oil demand.").

[133] Potential Lifecycle, *supra* note 119, at 20.

[134] BOEM, Potential Lifecycle, *supra* note 119, at 20.

[135] *Id*.

[136] *See, e.g.*, Brad Plummer, *Blue States Roll Out Aggressive Climate Strategies. Red States Keep to the Sidelines.*, NEW YORK TIMES (June 21, 2019) ("Over the past year. . . California, Colorado, Maine, Nevada, New Mexico, New York and Washington have all passed bills aimed at getting 100 percent of their state's electricity from carbon-free sources like wind, solar or nuclear power by midcentury.").

[137] BOEM, Potential Lifecycle, *supra* note 119, at 20.

[138] U.S. Energy Information Administration, Annual Energy Outlook 2019 66, available at https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf; *see also id.* at 68 (declining demand for gasoline).

[139] Coastal Plain EIS, *supra* note 131, at S-40; *accord* Eastern Colorado DEIS, *supra* note 116, at B-65 (explaining that it is "unlikely" that "emission trajectories follow a historical growth curve . . . over the course of the remainder of the century").

[140] *See, e.g.*, *Balt. Gas & Elec. Co.*, 462 U.S. at 103 (1983) (stating that agency's assumptions in NEPA review must reflect "reasoned decisionmaking" and "consider[] the relevant factors").

policies—like this plan—that will exacerbate climate change. As discussed above, uncertainty about the rate and impacts of climate change should counsel for more restraint, not less.[141]

So long as BLM continues to assume near constant long-term energy demand through its use of MarketSim, it will significantly inflate the substitution effect of proposed energy projects and thereby underestimate their net greenhouse gas emissions.

3) MarketSim over-relies on a single expert's opinion

For several parameters, MarketSim relies on the opinion from a single expert: Dr. Stephen Brown.[142] While use of expert elicitation is acceptable when estimates are unavailable in the literature, it is not clear that the agencies have fully explored all the most current literature to check the accuracy of their parameters, and, furthermore, expert elicitations should not rely on a single author. Indeed, a recent study concluded that less than one-third of elicited experts produced statistically accurate assessments, thereby "highlighting the need for validation" from a multitude of experts.[143] Accordingly, after a thorough review of the literature, BOEM and BLM should identify multiple experts to survey to develop a range of possible estimates, which can be further characterized by central values and variance.[144] This would allow BLM to conduct an informed sensitivity analysis over these parameter values.

Indeed, BOEM and BLM should be conducting more sensitivity analyses over all of their key parameters and assumptions, such as assumptions based on the EIA Energy Outlook's NEMS scenarios. The model should also break down non-U.S. producers in OPEC and non-OPEC nations, and conduct sensitivity analysis on whether OPEC will act competitively or non-competitively in response to changes in U.S. production. Given NEPA's public information requirements, BLM should be conducting more sensitivity analyses and then disclosing all relevant data, models, and runs, so the public can review these analyses.

4) MarketSim does not account for within-region substitution

While it seems natural that much of the potential substitution of fossil fuel production from a given area would come from nearby areas, MarketSim's assumptions largely foreclose such results, since MarketSim holds the supply constant within the project area's region for the same resource when conducting its substitution analysis.[145] This assumption is especially problematic given how broad some of the model's regions are: for instance, onshore oil production from the continental United

[141] *See supra* notes 107–113 and accompanying text. To the extent that we are uncertain about the volume of future greenhouse gas emissions and their impact on the climate, there is an informational value of delay—known as "option value"—because the decision to pursue oil and gas exploration can be made at any time, whereas climate effects are largely irreversible. *See, e.g.*, Michael A. Livermore, *Patience is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. COLO. L. REV. 581 (2013) ("The value associated with the option to delay can be large, especially when there is a high degree of uncertainty about price, extraction costs, and/or the social costs imposed by drilling. The value of the information generated during a period of delay can outweigh the value of immediate extraction.").

[142] *Id.* at 11.

[143] Abigail R Colson & Roger M Cooke, Expert Elicitation: Using the Classical Model to Validate Experts' Judgments, 12 Review of Environmental Economics and Policy 113 (2018).

[144] For example, EPA surveyed twelve experts in an expert elicitation on the mortality impacts of a decrease in PM2.5 in the United States. It utilized its responses to specify a concentration-response function, and explore uncertainty. Henry A. Roman, Katherine D. Walker, Tyra L. Walsh, Lisa Conner, Harvey M. Richmond, Bryan J. Hubbell, & Patrick L. Kinney, *Expert Judgment Assessment of the Mortality Impact of Changes in Ambient Fine Particulate Matter in the US*, 42 ENV'T SCI & TECH 2268 (2008).

[145] *See* Bureau of Ocean Energy Management, *Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2017 Revised Market Simulation Model (MarketSim)* 11, available at https://www.boem.gov/ESPIS/5/5612.pdf.

States constitutes a single region.[146] This leads to the implausible result that energy substitution from a single project cannot come from the same resource in nearby areas and instead must come from more distant regions, when in reality the opposite is likely to be true. Such an assumption is irrational, and must be reassessed as part of a greater reevaluation of the MarketSim model.

5) MarketSim's elasticities are questionable

Many of MarketSim's elasticities are out of date, not grounded in the literature, or based on inconsistent sources. The model assumes equality between onshore and offshore supply elasticities for the lower 48 states, and uses two-decade-old supply elasticities for the lower 48 states.[147] Some elasticities are derived from different versions of NEMS, which may make them inconsistent. All elasticities should be derived from the same version of NEMS and should be consistent with the calibrations run for quantity and prices in each year.

6) MarketSim ignores upstream emissions

MarketSim calculates only downstream emissions and omits any upstream emissions.[148] While the DEIS calculates some upstream emissions from oil and gas production,[149] the substitution analysis does not calculate comparable upstream emissions from substitute energy sources.[150] The analysis is therefore necessarily incomplete, and BLM should rectify this omission—and all of the others issues with MarketSim discussed above —before finalizing the environmental impact statement.

7) MarketSim irrationally ignores expected efficiency gains

While MarketSim assumes that engines used to produce and consume oil and gas will not become more efficient,[151] this assumptions ignores standard best practices for cost-benefit analysis that instruct agencies to make reasonable assumptions about technological growth.[152] It can only be expected that as technology continues to improve and become more efficient, then engines used to produce and consume oil and gas will have lower energy footprints. The government should consider this flaw in MarketSim—along with all the others discussed above—and give the public another opportunity to comment on the environmental impact statement with its revamped substitution analysis.

BLM Arbitrarily Inflates the Plan's Economic Benefits by Failing to Apply Substitution Analysis Beyond the Plan's Environmental Harms

In addition to the above critiques of the methodology for substitution analysis, BLM also inconsistently applies energy substitution to the master development plan's environmental harms without applying the same analysis to the plan's economic benefits. BLM must apply substitution analysis consistently to all of the plan's impacts, and cannot place its thumb on the scale by discounting only the plan's environmental harms.

BLM cannot have it both ways: On one hand, it discounts the plan's environmental impacts by claiming that most of them would occur regardless as a result of substitute oil and gas production in

[146] *Id*. at 20.
[147] *Id*.
[148] DEIS at App. E.2A, p. 6 ("For this Project, only the downstream portion of the model was used as the upstream component is derived in combination with an offshore-specific separate model.").
[149] *See id*. at App. E.2A, p. 5.
[150] *Id*.
[151] BOEM, Potential Lifecycle, *supra* note 119, at 20.
[152] *See* OMB, *Circular A-4* at 5 ("[T]echnological advances often affect economies of scale.").

other areas, while on the other it attributes a wealth of economic benefits to the plan without any mention of this substitution effect. Of course, if BLM is indeed accurate that most of the plan's oil and gas production would be offset through increased production elsewhere under a "no action" alternative,[153] this would also mean that many of the supposed economic benefits of the plan would also occur under the "no action" scenario due to this increased production. For instance, given that, according to BLM's calculations, more than 96% of oil and gas production would be replaced by additional production under a "no action" scenario, then that production would also produce tax revenues, employment income, and (because much fossil fuel development occurs on lands own by the federal or state governments) royalties—meaning that the U.S. economy would still reap many of the plan's supposed economic impacts. Yet BLM never acknowledges this reality, providing total government revenues from the master development plan[154] and projected employment numbers[155] without any recognition that most of these economic benefits would, under the logic of BLM's own substitution analysis, be offset through increased production elsewhere under the "no action" scenario. Under BLM's logic, in other words, this plan is responsible for all of its positive economic impacts but few of its environmental harms.

This is a clear violation of NEPA. As stated above, agencies may not "put a thumb on the scale"[156] by "inconsistently and opportunistically fram[ing] the costs and benefits" of a proposed project.[157] Yet this is precisely what BLM is doing by using substitution analysis to offset the plan's environmental costs without also offsetting the plan's economic benefits. BLM must apply substitution consistently between the project's costs and benefits.[158] By failing to do so, it adopts an inconsistent methodological approach to the plan's economic benefits versus climate costs, further skewing their inconsistent treatment throughout the DEIS. For all the reasons further described herein, this incomplete, inconsistent, and misleading framing violates NEPA.

Sincerely,

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[153] We do not concede this point, as detailed above, and believe that BLM's substitution analysis may overstate the plan's substitution effects.
[154] DEIS at Table 3.15.3.
[155] *Id*. at App. E.15.
[156] *Ctr. for Biological Diversity*, 538 F.3d at 1198.
[157] *Bus. Roundtable*, 647 F.3d at 1148–49.
[158] BLM can do this by applying its modified substitution results to offset the plan's economic benefits. Alternatively, if BLM insists on not applying substitution analysis to offset the plan's economic effects, then for the sake of consistency it should also not apply substitution analysis to offset the plan's environmental harms.

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

^ Due to time constraints, the Environmental Defense Fund takes no position on Section II of these comments.