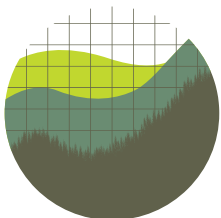




Toward Rationality in Oil and Gas Leasing

Building the Toolkit for Programmatic Reforms



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Executive Summary

For decades, the federal government has inadequately considered the environmental harms of oil and gas extraction in its management of public lands and waters. As a result, fossil-fuel developers have been handed vast swaths of land at bargain prices, causing dangerous levels of greenhouse gas pollution that exacerbates climate change while depriving the public of more beneficial uses of the land.

That is all likely to change soon. A week into his term, President Biden called for a comprehensive review of the oil and gas program.¹ That review is now underway and is likely to result in substantial programmatic reforms such as curtailing fossil-fuel leasing, prioritizing conservation and renewable-energy generation, increasing environmental controls, and adjusting lease terms to ensure fair value to taxpayers. The substantial climate and other environmental benefits of these reforms should justify any associated economic impacts.

But those benefits will remain largely obscured if Interior continues to use the methodologies it has relied upon in the past. That is because under previous administrations spanning decades, both the Bureau of Land Management (“BLM”) and the Bureau of Ocean Energy Management (“BOEM”) have prepared analyses that did not fully capture the environmental impacts of fossil-fuel extraction. More rigorous evaluation of these impacts could help Interior defend its breaks from prior policy and, in doing so, provide critical analytical support for long-overdue reforms. Additionally, stronger analytical support will help safeguard this administration’s reforms against any efforts by a future presidential administration to roll them back.

This report offers suggestions on how Interior can build an analytical toolkit to support ambitious reforms in federal land-management policies based on sound scientific and economic methodologies. Interior should not substantially delay overdue reforms in anticipation of revised analytical tools. Some of the tools suggested in this report can be applied immediately, while Interior could develop others in the meantime and then apply those methodologies to any reforms that it undertakes after those methodologies are available.

In particular, this report makes the following recommendations regarding how Interior can use science and economics to support programmatic reform:

Capturing the Benefits of Programmatic Reform

Substitution and Leakage: *To realistically capture the environmental and economic effects of programmatic reforms on the energy system as a whole, Interior should retool its energy market model to correct critical flaws and incorporate reasonable assumptions about the long-term energy mix.* An energy market model attempts to capture the aggregate impacts of adding or removing an energy source on the market as a whole. In recent analyses, both BLM and BOEM have relied on a model with critical shortcomings that led these agencies to conclude—inaccurately—that oil and gas extraction on public lands has few, if any, net downstream greenhouse gas impacts because that extraction is merely displacing extraction that would occur on other lands. Correcting these shortcomings—either by fixing Interior’s existing model or, even better, by tailoring an available model from the Energy Information Administration—would enable Interior to more realistically assess how programmatic reforms would affect the global energy mix. This would enable a clear-eyed assessment of the net environmental and economic impacts of those reforms while avoiding legal risk that may accompany assumptions of either zero or full substitution.

Climate Benefits: *To capture the climate benefits from programmatic reforms in the most useful and salient manner, Interior should evaluate those benefits using the Social Cost of Greenhouse Gases.* The Social Cost of Greenhouse Gases (sometimes called the Social Cost of Carbon when referring to the economic costs of carbon dioxide) is a widely-endorsed scientific tool that presents the incremental climate benefits of reducing greenhouse gas emissions (or the climate costs of increasing emissions) in dollar values. Yet Interior has mostly rejected this tool in the past, instead opting for less rigorous methodologies that trivialize emissions. Applying the Social Cost of Greenhouse Gases would clearly demonstrate the enormous climate benefits of programmatic reforms and facilitate an apples-to-apples comparison to monetized economic effects.

Option Value and the Benefits of Delay: *To capture the benefits of slowing down commitments of additional resources to fossil-fuel extraction, Interior should improve its consideration of option value (i.e., the information value of delay).* The option value of delaying leasing can be substantial due to the numerous uncertainties involved and the near-irreversibility of leasing federal lands to fossil-fuel developers. Yet BLM's prior analyses have disregarded option value altogether, while BOEM has failed to model environmental uncertainties or give them sufficient consideration. Adequate consideration of option value could provide strong analytical support for curtailing leasing, particularly in environmentally sensitive regions.

Assessing and Mitigating the Costs of Programmatic Reform

While capturing the environmental benefits of any reforms is critical, it is also important for Interior to closely analyze the potential economic costs of programmatic reform. In doing so, the agency should seek to transparently disclose the total economic effects of its reforms on both localized communities and the marketplace as a whole. In particular:

Market-Wide Economic Effects: *To holistically capture the economic impacts of reform on the marketplace and economy more broadly, Interior should use its revised substitution model.* In previous analyses, Interior has looked narrowly at the economic impacts from fossil-fuel extraction, considering only direct revenue and employment effects without considering broader effects on the market as a whole. This approach overstates employment and revenue effects by ignoring energy substitution (i.e., the fact that some federal extraction merely displaces extraction elsewhere), while simultaneously disregarding broader economic effects on energy prices and supply. For a more comprehensive perspective, Interior should use modeling tools to capture system-wide economic effects. This will ensure analytical consistency and reasonable balancing of environmental and economic impacts while enabling Interior to assess a broad array of market-wide impacts including effects on energy prices and supply.

Localized Economic Harms: *To assess and mitigate potentially harmful distributional impacts on local communities that have traditionally relied on extraction, Interior should use its forecasts of localized royalty and payroll impacts as a guidepost.* Although reductions in local revenues and employment are not economy-wide costs because they are partially offset by substitute energy production (both fossil-fuel and renewables)—and may even exaggerate localized economic effects because energy extraction could cause some offsetting localized harms by hurting tourism and recreation—they nonetheless do represent hardships on local communities. Interior can use localized forecasts of economic impacts to help assess these effects. This will help Interior identify burdened communities and attempt to mitigate those impacts through the siting of beneficial projects such as renewable-energy generation and environmental clean-up.

Incorporating Analytical Developments into Reform Design

Robust economic and environmental analysis is not only useful for analyzing the impacts of reforms. Economic principles also can influence the nature of the reforms themselves, particularly for policy areas that are monetary in nature such as royalty rates. This report closes by identifying several areas where Interior can incorporate the analytical tools discussed above when designing reforms.

Using Royalty Rates to Internalize Climate Damages: Interior should impose a “carbon adder” into the royalty rate, effectively causing producers to pay for the total climate harm that their extraction imposes on society. Doing so will cause developers to reduce extraction by causing producers to bear the costs of climate change, and would likely increase royalty revenues for federal, state, and local governments. The tools described above can enable Interior to calculate the carbon adder to internalize climate damages, and offer the agency various methodological options for doing so.

Using Cost-Benefit Analysis to Support Leasing Curtailment: Interior should consider deploying cost-benefit analysis to determine the scope of widescale programmatic reforms such as curtailing leasing. BOEM already uses a cost-benefit analysis framework in its five-year planning process, although recent analyses have minimized environmental impacts and failed to integrate climate costs. Correcting these flaws, and incorporating cost-benefit analysis into BLM reviews, should provide support for ambitious programmatic reforms and curtailing the scope of the leasing program.

Using Carbon Offsets to Minimize Greenhouse Gas Impacts: Interior should require that producers offset carbon emissions as a condition of extraction. Although reforms such as curtailing leasing and revising royalty rates will limit extraction on lands that have not yet been leased, they do little to mitigate the effect on climate change from the vast amount of land that has already been leased but where production has not yet begun. To mitigate the climate impacts from extraction on these lands, Interior should require offsetting greenhouse gas emissions as a condition of drilling. While Interior could require offsets for direct emissions only, substitution tools could enable Interior to require offsets for indirect emissions as well.

I. Upcoming Reforms to the Federal Oil and Gas Program

As Interior Secretary Deb Haaland explained at the agency’s March 25 public forum on the federal oil and gas program, the government in recent years has “offered vast swaths of our public lands and waters for drilling, prioritizing fossil fuel development above all other uses”—causing substantial “impacts to people, water, wildlife, and climate” that the agency “ignored.”² Given this imbalance, there have been widespread calls for programmatic reform, which are likely to produce ambitious changes in the coming years.

This section begins by describing prior issues with Interior’s oil and gas leasing program. It then summarizes various programmatic reforms on the table.

A. The Problematic State of Leasing on Federal Lands

The federal government owns more than a quarter of all land in the United States, concentrated primarily in Western states and Alaska, along with waters in the Outer Continental Shelf.³ BLM and BOEM are responsible for managing millions of acres of these public lands and waters, and determining when to allow leasing for coal, oil, and gas development. As of fiscal year 2020, BLM oversees 37,496 leases on 26.6 million acres of federal lands,⁴ while BOEM manages 2,287 leases on 12.1 million acres of offshore federal lands.⁵

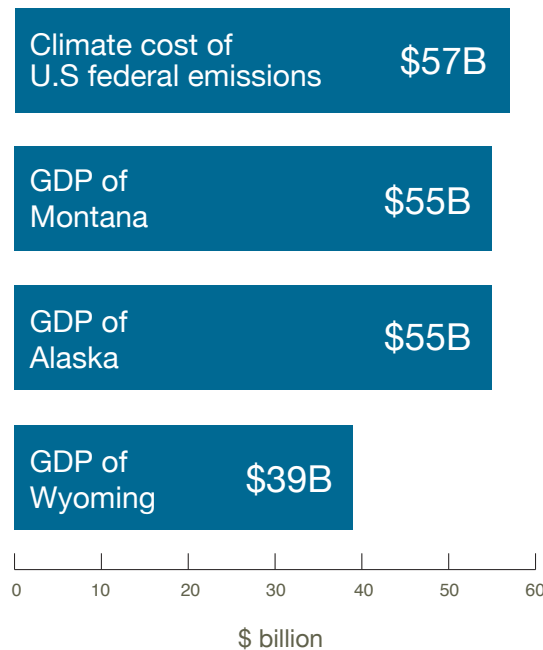
The current problems with Interior’s land management can be broken down into at least three overarching areas: inattention to the risks of climate change; inadequate consideration of local and regional harms to health and the environment from leasing; and failure to adequately set fiscal terms for leasing and extraction. These failures produce economic “externalities,”⁶ which are market failures that result when a producer does not account for the actual costs of their activities, instead offloading them onto society.⁷ Interior should better account for these externalities in its programmatic reforms.

1. *Failure to Sufficiently Account for Impacts on Climate Change*

Under the Paris Climate accords, the U.S. has committed to slashing its greenhouse gas emissions in half by 2030, with the aim of achieving net zero emissions by 2050.⁸ Meeting these goals will not be possible if the country is still primarily reliant on oil and gas for its energy needs.⁹ Federal oil and gas leasing policies, both onshore and offshore, must play a vital part in these mitigation efforts. In total, fossil fuels from public lands make up approximately one quarter of all U.S. carbon dioxide emissions;¹⁰ because the harm from those emissions is borne by the public rather than by the producers themselves, it represents a negative externality that should be taken into account when assessing the net costs and benefits of leasing. According to a recent estimate, in fact, U.S. public lands would rank fifth in the world for greenhouse gas emissions if they were their own country.¹¹

It is thus evident that the Department of Interior will need to account for climate change risks in its permitting process, given the agency’s mandate to avoid permanent degradation of natural resources and the cumulative impact of leasing decisions.¹² Yet to date, Interior has not sufficiently accounted for the climate risks from the federal government’s leasing program.

According to data from an Interior report, extraction and combustion emissions from U.S. federal lands in 2014 caused over \$57 billion in climate damage (in present-day dollars), which is greater than the total GDP of several high-production states.



Emission data is taken from Matthew D. Merrill et al., U.S. Geological Survey, Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14 at 8 (2018), <https://pubs.usgs.gov/sir/2018/5131/sir20185131.pdf>. Those emissions figures were monetized using the Interagency Working Group’s most recent damage valuations for the year 2014, adjusted for inflation to present-day value. GDP data is from the Bureau of Economic Analysis, <https://www.bea.gov/sites/default/files/2021-06/qgdpstate0621.pdf>. All dollar values are in billions.

For instance, Interior has inconsistently incorporated tools like the Social Cost of Greenhouse Gases to evaluate the impact of leases on the global environment. Nor has the agency meaningfully accounted for climate impacts in its land-use decisions, such as by curtailing fossil-fuel leasing due to climate concerns or consistently imposing greenhouse gas mitigation requirements. Under the Trump administration, Interior’s strategic five-year plan did not even mention climate change once.¹³ Scientists at BOEM reported pressure to avoid discussing the climate impacts of offshore leasing,¹⁴ while BLM field officers were discouraged from considering the climate impacts of leasing decisions.¹⁵ And more public lands were leased for fossil fuel extraction from 2017-2020 than under any prior U.S. administration in history, which will make it challenging for the U.S. to lower its greenhouse gas emissions to avoid the worst impacts from a warming planet.¹⁶

2. *Failure to Sufficiently Account for Local and Regional Environmental Harms*

The leasing process as currently structured does not sufficiently account for numerous environmental and public health externalities (in addition to climate change) that can affect communities near drilling operations. For example, oil and gas extraction releases pollutants that reduce local air quality, worsening ozone levels that contribute to asthma attacks, cardiovascular disease and premature death.¹⁷ Yet Interior has frequently failed to sufficiently consider these effects.

Fossil fuel development can also contaminate drinking water,¹⁸ destroy habitats of threatened or endangered species,¹⁹ and jeopardize historic archeological sites.²⁰ For example, during the Trump administration, BLM leased areas that required drilling through drinking water aquifers despite agency studies warning of contamination risk.²¹ Extraction can also wreak havoc on the land, reducing biodiversity and populations of species already on the brink. In recent years, courts have blocked federal leases that could destroy vital habitat for the sage grouse,²² criticizing BLM for failing to solicit appropriate public input and ignoring their mandate to consider environmental protection.²³ Beyond these ecologi-



Recently-approved extraction in the Beaufort Sea, off the coast of Alaska, is expected to encroach on public lands that provide essential habitat for polar bears.

cal harms, oil and gas development in areas close to Native American tribal lands can adversely affect sacred sites. Chaco Canyon, an area that encompasses the ancestral homeland of Secretary Haaland, has faced continuous threats from fossil fuel extraction with more than 90% of lands in the region already subject to leases.²⁴ And oil and gas extraction is increasingly being used for petrochemical production, driving up demand for plastics that are contaminating the oceans and whose production produces air pollution.²⁵

In the offshore context, continued drilling risks catastrophic spills like the 2010 Deepwater Horizon disaster in addition to the more frequent smaller releases that happen on a regular basis.²⁶ These spills threaten ecosystems, tourism, and the fishing industry in communities along vast swaths of the U.S. coastline, prompting grassroots opposition to offshore leasing in hundreds of municipalities along the Atlantic and Gulf coasts.²⁷ Further development could lead to the emission of billions of tons of greenhouse gases on top of these direct harms from drilling.²⁸ But despite these risks, past administrations have repeatedly attempted to tap into offshore oil and gas reserves, while explicitly overlooking catastrophic oil-spill risks.²⁹

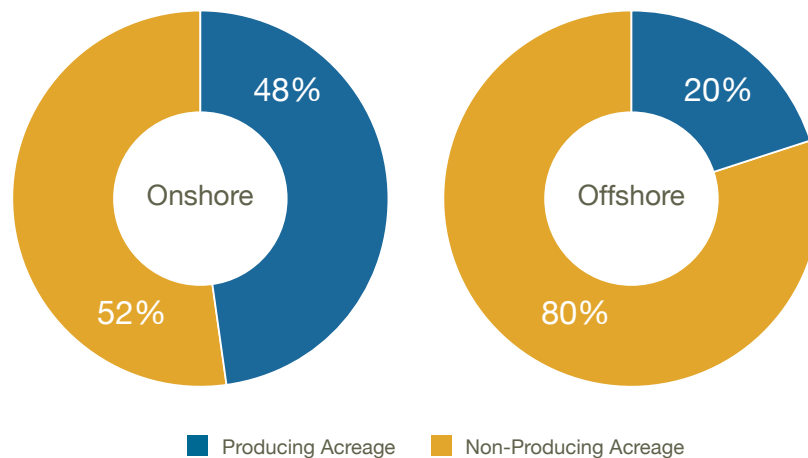
3. *Failure to Obtain Fair Market Value for Leasing and Extraction*

When Interior issues a lease to an oil and gas developer, it is required by statute to obtain “fair market value” for selling the right to mine these natural resources.³⁰ Yet since 1987, when Congress last amended the law governing the leasing process, nearly a third of public lands leased for oil and gas development have been leased for a total of \$2.00 per acre or less.³¹ These low prices shortchange taxpayers and allow companies to buy cheap leases in order to “resell the parcels at profit or to pad their balance sheets with unexplored subsurface reserves.”³² The Trump administration accelerated many of these practices despite an often poor market for fossil fuels.³³

The bidding process itself has contributed to the federal government’s poor rate of return on public land leases. In the past, BLM has allowed companies to informally nominate any public lands for leasing through “expressions of interest” and has rejected few of these suggested parcels.³⁴ This is despite the fact that BLM has discretion to reject such nominations³⁵ as well as to conduct a more formal process that allows bidding only on lands BLM identifies as suitable for leasing.³⁶ In the last decade, the informal bidding process resulted in huge swaths of land available for leasing with only about a quarter receiving any bids at all.³⁷ As a result, millions of acres were leased noncompetitively for no fee.³⁸

Fossil fuel companies have also been able to stockpile thousands of leases, which allows them to maintain control of the land and prevents Interior from setting aside parcels for other uses.³⁹ There are currently over 26 million acres of federal onshore land under lease as of fiscal year 2020, but only about 12.7 million acres are in production.⁴⁰ This pattern has held for years, with the federal government continuing to lease substantial amounts of land despite the fact that roughly half of the onshore land that has already been leased is not actually under development.⁴¹ This deprives the public of the use of the land for other purposes, while giving developers the option to sit on the land and drill when economic conditions are more favorable.⁴² For offshore lands, the percentage of non-producing leases is even higher.⁴³ Furthermore, many leases never go into production. In the last decade, leases for more than 20 million onshore acres were relinquished or expired without any oil and gas activity.⁴⁴ Another 10% of federal leases are currently held in suspension, totaling 3.25 million acres with no royalties or rental fees.⁴⁵

Most Federal Leases Are Not Producing



Onshore figures are from BLM, Oil and Gas Statistics, Table 1-10, <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>. Offshore figures are from BOEM, Combined Leasing Report As of April 1, 2021, <https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/oil-gas/Lease%20stats%204-1-21.pdf>.

Even once oil and gas development begins, lease holders are subject to a minimal royalty rate that does not give taxpayers a fair return. The federal government’s current royalty rate for onshore oil and gas leases is set at 12.5%, which has not been updated in decades and is lower than the rate imposed by many western states.⁴⁶ Similarly, the royalty rate for offshore oil and gas leases in shallow waters is set at 12.5%, though the rate for deep-water leases is slightly higher at 18.75%.⁴⁷ Noting the discrepancy between federal and state royalty rates for leasing, the Congressional Research Service has recognized, “higher royalty rates would translate into relatively significant amounts of money that would go back to the states.”⁴⁸ Interior has also used its discretion at times to lower royalties even further, without accounting for the public

interest. For instance, BLM dropped the rate even lower for hundreds of leases in response to the Covid-19 pandemic without verifying that relief was needed to keep wells operational.⁴⁹ Additionally, royalty rates fail to account for externalities of fossil fuel development, whether from local environmental impacts, health threats, or climate change.⁵⁰

B. Potential Reforms on the Horizon

This section summarizes some of the key reforms that Interior may implement to the federal oil and gas program. With President Biden targeting reforms to the program, agency leaders are now taking initial steps to implement key changes.

In Executive Order 14,008, *Tackling the Climate Crisis at Home and Abroad*, President Biden called on Interior to undertake a “comprehensive review of Federal oil and gas permitting and leasing practices.”⁵¹ As part of that review, the President asked Interior to “consider whether to adjust royalties” or “take other appropriate action [] to account for corresponding climate costs” from fossil-fuel extraction on public lands and waters.⁵² This Executive Order also requested that Interior “increase renewable energy production” on public lands and waters, “with the goal of doubling offshore wind by 2030.”⁵³

With Secretary Haaland at the helm, and the agency’s leadership teams beginning to take shape, Interior is now moving ahead on these priorities. Pursuant to the President’s order, the agency paused all upcoming oil and gas lease sales pending its programmatic review⁵⁴—although that pause has now been enjoined by a federal district court.⁵⁵ Interior has also delayed implementation and taken steps to reverse some Trump administration regulations and policies, such as a rule from the Office of Natural Resources Revenue that would effectively reduce natural resource royalty rates by revising valuation methodologies.⁵⁶ And in recent months, BOEM has jumpstarted the process to approve offshore wind energy projects in the Atlantic Ocean⁵⁷ and relaxed permitting standards for offshore wind.⁵⁸

Meanwhile, Interior leadership has taken initial steps toward broader programmatic reforms. In late March, agency leaders convened a public forum on the federal oil and gas program in which they solicited feedback from a range of key stakeholders. Interior plans to issue a report in the summer with initial findings.⁵⁹ Agency leadership has signaled a desire to pursue wide-ranging reforms on multiple fronts, including land management, environmental mitigation, and lease terms.

On the land-management front, Interior has signaled an interest in curtailing new fossil-fuel leasing for public lands and waters, and prioritizing beneficial uses such as conservation and renewable-energy generation.⁶⁰ BLM can do so by revising Resource Management Plans to curtail leasing and development, and BOEM can develop a new five-year plan that prioritizes conservation and minimizes leasing. Both agencies should also consider additional mechanisms such as tightening standards for lease suspensions⁶¹ and furthering efforts to improve timely permitting of renewable energy development.⁶²

Interior can also require additional environmental mitigation for fossil fuel extraction that does occur. On the regulatory front, President Biden has asked Interior to revisit numerous Trump-era regulations that rescinded key environmental protections on federal onshore and offshore extraction,⁶³ including protections aimed at reducing methane leaking and flaring,⁶⁴ limiting groundwater contamination from hydraulic fracturing,⁶⁵ and taking precautions against the risk of catastrophic oil spills from offshore drilling.⁶⁶ Interior could also impose greenhouse gas offset requirements at the permitting or leasing stage as a form of compensatory mitigation⁶⁷—as the agency suggested when it evaluated reforms to the coal leasing program under the Obama administration.⁶⁸

In addition to these initiatives, Interior should look to implement various reforms to lease terms. Pursuant to President Biden's directive, Interior should revisit and increase royalty fees on both onshore and offshore extraction.⁶⁹ The agency should consider a "carbon adder," which imposes the estimated damage cost from greenhouse gas emissions onto producers as part of the royalty (or as a form of compensatory mitigation⁷⁰). Additional lease terms such as minimum bids, rental fees, and bonding requirements should also be revised to increase government revenue and incentivize producers to take proper precaution and reduce speculation.⁷¹

Bottom Line: Robust and transparent assessment of the impacts of key reforms can not only help Interior shape its policy choices, but also provide crucial analytical support that will help those reforms survive judicial review and rollback attempts by future presidential administrations.

II. The Importance of Robust Analysis

This section provides an overview of the major laws that govern federal public lands and examines how robust analysis can ensure that Interior adequately justifies any reforms that it pursues.

Congress passed three primary statutes granting BLM and BOEM authority to manage onshore and offshore oil and gas leasing. There are two primary onshore leasing statutes: the Mineral Leasing Act of 1920 (“MLA”),⁷² and the Federal Land Policy and Management Act of 1976 (“FLPMA”).⁷³ Offshore leases are subject to the Outer Continental Shelf Lands Act (“OCSLA”), passed in 1953.⁷⁴ These statutes all grant Interior broad authority to manage public lands and waters for the public interest, requiring rational balancing of competing uses.

The provisions in FLPMA are intended to work in tandem with those in the MLA. FLPMA provides BLM with an overarching framework for managing federal lands “on the basis of multiple use and sustained yield unless otherwise specified by law.”⁷⁵ These multiple uses include “recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values,” though the statute specifies that potential uses are not limited to these activities.⁷⁶ Under FLPMA, BLM must manage public land uses “in the combination that will best meet the present and future needs of the American people,”⁷⁷ when determining which lands should be available for leasing or devoted to another use.⁷⁸ Once land is made available for leasing, the MLA authorizes BLM “to promote the orderly development of the oil and gas deposits” by granting leases on designated land parcels.⁷⁹

OCSLA governs the development of fossil fuel resources in the Outer Continental Shelf.⁸⁰ The statute requires BOEM to balance the production of oil and gas with “protection of the human, marine, and coastal environments.”⁸¹ Like FLPMA, OCSLA provides for a multistage planning process that determines which lands will be subject to potential leasing.⁸² BOEM is required to consider the environmental risks of oil and gas development in offshore areas opened for oil and gas extraction.⁸³ Once an area is authorized for leasing, BOEM must ensure that drilling will not “be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archeological significance.”⁸⁴

Rational assessment and balancing of positive and adverse impacts can ensure that BLM and BOEM comply with these statutory mandates to consider the environmental impacts of land use plans and oil and gas development. For example, under FLPMA, BLM is required to “weigh long-term benefits to the public against short-term benefits” when formulating regional management plans.⁸⁵ Similarly, before any land can be subject to withdrawal from development, OCSLA stipulates that BOEM must weigh the “economic, social, and environmental values of the renewable and nonrenewable resources contained in the outer Continental Shelf, and the potential impact of oil and gas exploration on other resource values of the outer Continental Shelf and the marine, coastal, and human environments.”⁸⁶ This law further requires “proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone.”⁸⁷

Many of BLM and BOEM's actions, such as land use plans and leasing decisions, are also subject to the National Environmental Policy Act ("NEPA"). BLM and BOEM must comply with NEPA's requirements at all stages of land use management, whether issuing regional plans on multi-year timescales,⁸⁸ deciding to lease certain areas,⁸⁹ or granting site-specific drill permits.⁹⁰ NEPA stipulates that federal agencies should undertake an assessment of the environmental impacts of major federal actions to ensure that "environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."⁹¹ Like the land-use planning statutes discussed above, NEPA also requires Interior to carefully assess and weigh project impacts. While NEPA does not require a formal cost-benefit analysis,⁹² in assessing whether an agency fulfilled its obligation to prepare a "detailed statement" on the "environmental amenities" of its chosen policy as well as the "economic and technical considerations," courts have recognized that the statute effectively requires agencies to balance positive and adverse impacts.⁹³

Prior BLM and BOEM planning and leasing activities have faced repeated challenges for not rationally weighing the pros and cons as NEPA requires.⁹⁴ Interior's limited treatment of greenhouse gas emissions has drawn particular scrutiny in recent years. In one case, for example, the U.S. District Court for the District of Colorado enjoined drilling exploration when BLM failed to adequately assess the impact of greenhouse gas emissions from the activities.⁹⁵ In another, the U.S. Court of Appeals for the Ninth Circuit enjoined a BOEM offshore drilling and production facility along the coast of Alaska after the agency severely undercounted resulting greenhouse gas emissions.⁹⁶ And in yet another, the U.S. District Court for the District of Columbia held that BLM violated NEPA by failing to quantify either drilling-related or downstream greenhouse gas emissions and not taking a hard look at their environmental impact.⁹⁷

Other rulings against Interior subagencies have emphasized the importance of applying consistent methods in analyzing the beneficial versus adverse effects of agency action.⁹⁸ These cases and others underscore the importance of applying a consistent approach that rationally weighs the societal gains from drilling against the environmental harms using quantified metrics.

Cost-benefit analysis is one way Interior can ensure that it rationally weighs the impacts of its programs and determinations, akin to the analyses that agencies traditionally perform for major rulemakings under Executive Order 12,866. Although executive precedent requires cost-benefit analysis only in the rulemaking context, the tool can also be very useful under NEPA, in land management plans, and in other decisionmaking proceedings. In fact, BOEM has conducted cost-benefit assessments of recent five-year planning processes to better assess the impact of leasing activities.⁹⁹ While those cost-benefit assessments certainly should be improved to more accurately and completely account for key environmental impacts, BOEM's use of the tool demonstrates the value and applicability of cost-benefit analysis to a variety of Interior policy decisions.

Beyond complying with the statutory mandates of NEPA, FLPMA, MLA and OCSLA, strong assessments of regulatory impacts can both justify breaks from prior policy and insulate planning and land-use decisions from later reversal by a future administration.¹⁰⁰ In promulgating federal policies, agencies are expected to consider important evidence and make reasoned decisions.¹⁰¹ When an agency changes its position on an issue, it must "at least 'display awareness that it is changing position' and 'show that there are good reasons for the new policy.'"¹⁰² A more robust factual record supporting an original decision can make it more difficult for an agency to reverse those policies in the future, for as the Supreme Court has made clear, "when an agency seeks to disregard facts underlying a prior rule, it

Beyond complying with the statutory mandates of NEPA, FLPMA, MLA and OCSLA, strong assessments of regulatory impacts can both justify breaks from prior policy and insulate planning and land-use decisions from later reversal by a future administration.

must provide a more detailed justification than it would for a new policy.”¹⁰³ For this same reason, robust analysis can be crucial for an agency seeking to justify a break from prior policy, such as Interior’s upcoming reforms.

One of the major reasons the Trump administration had so much difficulty implementing its deregulatory agenda was its frequent failure to provide reasoned explanations for deviating from the strong cost-benefit analyses that justified the prior administrative determinations.¹⁰⁴ For instance, when the Trump administration tried to reverse an Obama-era rule limiting methane leakage and flaring from oil and gas drilling, a federal court found Interior had acted arbitrarily by changing the cost-benefit numbers to consider only domestic (and not global) impacts from climate change.¹⁰⁵ By investing the resources to develop high-quality assessments of the benefits and costs of planning and leasing decisions, Interior can significantly reduce the risk that a future administration will be able to disregard policies that have substantial benefits for the environment and public health.

BLM and BOEM should thus consider incorporating cost-benefit analysis that fully accounts for the health and environmental benefits of their land-use decisions to ensure that any future attempts to undo these policies will have to contend with a detailed factual justification for these policies. But even without a full cost-benefit analysis, robust assessment and balancing of positive and adverse impacts can strongly support Interior’s planned reforms and make them resistant to future alterations that irrationally ignore their important benefits.

III. Assessing the Environmental and Economic Effects of Reform

This section offers a variety of suggestions on how Interior can better assess and convey the beneficial and potentially adverse impacts of programmatic reforms. As discussed above, robust and balanced analysis can provide critical support to any reforms that Interior pursues.

The section begins by offering suggestions to Interior on assessing the system-wide impacts of any reforms, including leakage and substitution. Analysis of the market impacts of any reform is important for assessing the aggregate environmental and economic impacts of those reforms on a market- and economy-wide level. Yet previous Interior analyses have used a flawed analytical model that inappropriately minimized environmental impacts, while often failing to apply that same model to assess economic impacts. This section provides guidance to Interior on how to improve upon its model to support planned reforms.

There are various additional tools that Interior should consider to inform its analysis of the benefits of programmatic reform. For one, after Interior estimates the net greenhouse gas emission reductions from any reforms, it should assess the societal impacts of those benefits using the Social Cost of Greenhouse Gases, which captures the benefits of incremental reductions in climate pollution in dollar-value terms. Moreover, Interior can make better use of option value—that is, the informational value of delay—to inform its analysis of curtailing leasing, particularly in environmentally sensitive areas.

With an improved substitution model, Interior should also be able to estimate the aggregate economic impacts that it has largely avoided in the past. For instance, the agency can assess the impacts of policy changes on oil and gas prices, along with total supply, output, and government revenue. While the localized analyses that Interior has traditionally conducted do not take account of aggregate economic impacts, they can inform Interior’s assessment of the distributional impacts of programmatic changes and efforts to direct resources to affected communities.

A. Interior Should Revise Its Substitution Model to Better Capture Market-Wide Environmental and Economic Impacts

Bottom Line: An energy substitution model can assess how Interior’s decisions affect total resource extraction, enabling the agency to project the greenhouse gas emissions reduced from upcoming reforms.

An energy substitution model looks at how an increase or decrease in a particular energy supply affects market prices and demand, thereby informing a robust and complete analysis of net environmental and economic impacts. Yet in recent years, both BOEM and BLM have relied on a model developed by BOEM known as MarketSim, which applies implausible inputs and produces unreliable results. Time and again, MarketSim has minimized or altogether eliminated the climate impacts of major fossil-fuel extraction projects.

Continued reliance on MarketSim is also legally questionable after the Ninth Circuit recently vacated BOEM’s approval of an offshore oil plan due to the model’s failures.¹⁰⁶ Accordingly, Interior should consider applying another model—the National Energy Modeling System (“NEMS”), developed by the U.S. Energy Information Administration—that more reliably captures market impacts, or else retooling MarketSim to correct for its myriad shortcomings. A robust and well-crafted model such as NEMS, if properly calibrated and used, would allow Interior to reasonably estimate the aggregate environmental and economic impacts of reforms.

1. *What Is an Energy Substitution Model?*

As noted above, an energy substitution model attempts to capture the aggregate impacts of adding or removing an energy source on the market as a whole. Though simple in theory, energy substitution modeling can become complicated in practice because of the need to account for cross-region and cross-source substitution impacts and the challenges of forecasting long-term demand of various energy sources.

Substitution refers to the situation in which a reduction in energy supply from a particular market segment produces an increase in energy supply from another market segment. For instance, fossil-fuel developers who are restricted from extracting on public lands because of changes in federal land-management policies will likely seek to extract energy from state or private lands instead. Due to the international and interconnected nature of the energy market, the economic effects of substitution can spill into other countries or other energy sources. For instance, a reduction in fossil-fuel extraction on public lands is likely to cause an increase in renewable-energy generation to meet consumer demand.

Estimates of substitution have major implications for the projected environmental costs of an extraction project (or benefits of curtailing extraction). If Interior assumes that substitution is perfect or near-perfect—meaning that an oil and gas extraction project on federal lands is simply displacing oil and gas extraction that would occur elsewhere and produce identical quantities of oil and gas at identical prices—then it will conclude that extraction projects have few, if any, climate costs relative to the no-action baseline—and, conversely, that reducing extraction will have minimal benefits. As detailed below, many previous analyses from both BLM and BOEM have assumed perfect or near-perfect substitution, causing Interior to conclude that major leasing and extraction projects have minimal, zero, or even positive climate impacts.

But in fact Interior’s decisions have significant effects on greenhouse gas emissions, because extraction on federal lands often represents additional extraction that does not fully displace extraction that would have occurred elsewhere.¹⁰⁷ The explanation for this rests on basic supply-and-demand principles. Classical economics posits that the reason that energy producers want to lease and extract from federal lands in the first place is that this is the cheapest option to supply the energy demanded.¹⁰⁸ If such leasing and extraction is made unavailable—or made more expensive through government regulation—then producers must turn to a more expensive option for supplying the energy. As a result, prices rise and thus demand and consumption falls¹⁰⁹ as consumers, faced with higher energy prices, will take additional conservation measures.¹¹⁰

Declining demand for oil and gas may also cause consumers to seek out cheaper sources of energy. For this reason, a decrease in oil and gas extraction on federal lands may lead to increased demand from a different energy source altogether. Particularly over the medium- and long-term, a decrease in oil and gas extraction on federal land is likely to result in an increase in energy conservation or use of cleaner energy sources like renewables, producing a steep decline in greenhouse gas emissions. Recent evidence in fact demonstrates that renewables will substantially cut into the demand for fossil-fuel electricity in the coming decades.¹¹¹ The overall effect may vary with time, as the relative fuel mix of energy substitutes in the market changes.



Decreasing the supply of oil and gas should make renewable energy, including solar and wind, more competitive in the marketplace—hastening the growth of these industries and the jobs that they provide.

Forecasting and balancing out all these various consequences requires a sophisticated model. If calibrated properly, an energy substitution model could forecast how a certain reduction (or increase) in fossil-fuel supply affects the prices, supply, and consumption of different energy sources over time.

2. *The Advantages of a Robust Energy Substitution Model: Showing the True Greenhouse Gas Impacts of Overdue Reforms*

There are strong legal reasons for agencies like Interior to develop and apply a robust energy substitution model. Beyond the practical usefulness of the model for projecting total greenhouse gas emissions, numerous courts have held that NEPA requires federal agencies to assess both the direct and indirect greenhouse gases emissions of fossil fuel extraction.¹¹² Energy substitution models can estimate a project’s total greenhouse gas emissions, including downstream emissions. Downstream emissions refer to the emissions associated with energy combustion and end-use,¹¹³ and can greatly exceed the emissions associated with production and distribution (known as “upstream emissions,” or “direct emissions”).¹¹⁴

For instance, in a 2017 case, the U.S. Court of Appeals for the D.C. Circuit held that the Federal Energy Regulatory Commission (“FERC”) must assess the downstream emissions resulting from the approval of a natural-gas pipeline, as this is a natural and foreseeable indirect effect that must be analyzed under NEPA.¹¹⁵ Likewise, in a 2011 case, the Ninth Circuit held that the Surface Transportation Board must consider the indirect emissions from coal production from the construction of a coal railroad.¹¹⁶ Multiple cases against the Office of Surface Mining (an Interior subagency which regulates coal extraction) have similarly held that the agency must consider indirect greenhouse gas emissions under NEPA.¹¹⁷

But assessing downstream greenhouse gas emissions is challenging due to substitution effects. While some agencies have assumed away downstream emissions altogether by assuming “perfect substitution” from alternative energy sources, courts on numerous occasions have rejected this inference as irrational for the reasons discussed above.¹¹⁸ In 2017, the U.S. Court of Appeals for the Tenth Circuit rejected a BLM analysis that assumed perfect substitution, finding the assumption “contrary to basic supply and demand principles.”¹¹⁹ Some agencies (including BLM in some recent analyses) have also essentially assumed zero substitution by reporting downstream greenhouse gas emissions without accounting for substitution effects.¹²⁰ While assuming a “worst-case [emissions] scenario”¹²¹ through a zero-substitution assumption may be legally prudent in the case of actions that increase extraction (and thus increase greenhouse gas emissions), it could face additional scrutiny if used to justify actions that reduce extraction (and thus reduce greenhouse gas emissions), as it could inflate the benefits of such actions particularly if presented without proper context.

Use of an energy substitution model to project net emissions, if performed properly, provides the most accurate and legally sound picture of the climate benefits of curtailing federal leasing and extraction. Several court cases recognize the availability of energy substitution models and explain that agencies should make use of such models rather than relying on simplistic assumptions like perfect substitution.¹²² In one notable case, the Tenth Circuit pointed to “available computer modeling” tools as a basis for rejecting BLM’s assumption of perfect substitution. In another, the U.S. Court of Appeals for the Eighth Circuit sharply criticized the Surface Transportation Board for “illogical[ly]” concluding that approving new railroad lines to Powder River Basin coal mines would not affect coal demand and consumption, and for ignoring “widely used” models capable of forecasting such effects.¹²³ And a federal district court rejected the State Department’s analysis of indirect emissions from the Keystone Pipeline after the agency disregarded recent market developments that would affect its substitution analysis.¹²⁴

An energy substitution model is also key for assessing the impacts of policies that indirectly curtail fossil-fuel extraction, such as higher royalties. A well-designed model could assess how the increased royalty rate’s effect on production costs would translate into reduced extraction and fossil-fuel emissions. Without such a model, projecting the impacts of royalty and other financial reforms is very difficult. For instance, under the Trump administration, an Interior regulation that effectively lowered the royalty rate cited increased production as a goal of the rule, yet assumed no production changes in its regulatory impact analysis.¹²⁵

A robust energy substitution model would also enable Interior to more carefully and holistically assess the economic effects of any reform. As discussed above, an energy substitution model enables an agency to estimate impacts on total energy supply, consumption, and prices, along with the regional mix between different energy sources. For a determination that reduces energy extraction and may cause some adverse economic impacts, such an analysis could be important to consider and contextualize the project’s economic impacts. Particularly to the extent that an agency conducts a formal cost-benefit analysis of its policies, including for rulemakings pursuant to Executive Order 12,866,¹²⁶ such outputs are critical for analyzing total regulatory cost.¹²⁷

3. Key Problems with Interior’s Existing Model Minimize (or Sometimes Entirely Negate) Greenhouse Gas Effects

Interior uses a model known as MarketSim to assess energy substitution and downstream greenhouse gas emissions.¹²⁸ Most significantly, BOEM (which developed the model) used MarketSim to project net lifecycle emissions from its 2017-2022 five-year plan.¹²⁹ And although BLM frequently disregarded downstream emissions¹³⁰ until that practice was judicially rebuked just a few years ago,¹³¹ it has assessed downstream emissions in recent years and applied MarketSim as part of that assessment for some resource management¹³² and fossil-fuel development plans.¹³³

Analyses relying on MarketSim have tended to show unrealistically high levels of substitution, resulting in very low estimates of net downstream emissions from fossil fuel extraction.

But analyses relying on MarketSim have tended to show unrealistically high levels of substitution, resulting in very low estimates of net downstream emissions from fossil fuel extraction. In general, Interior analyses applying MarketSim have found extremely high substitution (approximately 95%) from fossil fuel projects.¹³⁴ As a result, these analyses have found that fossil fuel extraction on federal lands has few environmental costs. In fact, BOEM’s analysis of its 2017-2022 leasing plan concluded that offshore leasing during those years, on net, would *decrease* global greenhouse gas emissions because it only modestly increased total extraction while displacing production in areas that would have yielded greater emissions to transport the energy to its end destination.¹³⁵

But such substitution estimates are very likely exaggerated. While research finds some substitution from extraction on federal lands, there is little justification for rates of 95%. Instead, analyses tends to converge on substitution and leakage rates of around 50%. One recent study, for instance, used existing elasticity estimates in the literature to estimate total leakage rates for federal oil and gas of 53–74%.¹³⁶ Another recent estimate, also based on existing demand elasticities and assuming a business-as-usual reference case, found that substitution of federal oil production was only 39%—meaning that more half of the decline in federal extraction would not be offset by increased extraction on other lands.¹³⁷ Another study identified leakage rates for the oil market of 55%.¹³⁸ Given MarketSim’s extraordinarily high substitution and leakage rates, if it continues to use the model in its current form, Interior will incorrectly conclude that restricting fossil-fuel extraction on public lands will have a fairly minor effect.

Several critical errors in MarketSim produce this vast underestimate of greenhouse gas impacts. First, as the Ninth Circuit recently held, the model irrationally omits impacts on foreign oil demand from domestic oil production.¹³⁹ In that case, *Center for Biological Diversity v. BOEM*, the Ninth Circuit considered BOEM’s approval of the Liberty Project, a major extraction project in the Beaufort Sea off of Northern Alaska. In the project’s environmental impact statement, BOEM concluded that the proposal would produce over 64 million metric tons of carbon dioxide equivalents while substitute energy production under the no-action alternative would result in nearly 90 million metric tons. In other words, BOEM concluded that this extraction project would result in a *reduction* of total greenhouse gas emissions by over 25 million metric tons.¹⁴⁰ As the Court explained, BOEM reached this conclusion after MarketSim found that “the oil substituted for the oil not produced at Liberty will come from places with comparatively weaker environmental protection standards associated with exploration and development of the imported product and increased emissions from transportation.”¹⁴¹

But as the Ninth Circuit held, BOEM was only able to reach this “counterintuitive result by omitting a key variable in its analysis: foreign oil consumption.”¹⁴² Specifically, the Court explained, MarketSim “fail[s] to include emissions estimates resulting from foreign oil consumption” and thereby irrationally “assumes that foreign oil consumption will remain static” when domestic production increases.¹⁴³ As the Court explained, this ignores the global nature of the energy market and violates “basic economics principles” about supply and demand. In reality, because increased domestic production causes global energy prices to decline, it increases foreign demand and thus causes “foreign consumers [to] buy and consume more oil.”¹⁴⁴

Because increased “[e]missions resulting from the foreign consumption of oil are surely a ‘reasonably foreseeable’ indirect effect of drilling at Liberty,” the Court held that BOEM’s failure to consider this critical substitution effect was “insufficient to satisfy NEPA’s requirements.”¹⁴⁵ The Court pointed to “credible scientific evidence” demonstrating that “domestic consumption impacts foreign oil consumption, and increases in foreign oil consumption can be translated into estimates of greenhouse gas emissions,” including one study “conclud[ing] that developing the [project] would cause an increase in global oil consumption ten times greater than the increase in domestic consumption forecasted by BOEM.”¹⁴⁶ In short, the Court found that MarketSim’s disregard for impacts on foreign oil consumption caused a gross underestimate of net downstream greenhouse gas emissions.

While the Ninth Circuit focused on MarketSim’s disregard for foreign market impacts, the model suffers other flaws that also cause it to further underestimate greenhouse gas impacts. Perhaps most notably, the model unreasonably assumes near constant domestic demand for oil and gas for up to 70 years into the future, with limited growth in demand for renewable energy.¹⁴⁷ But the main predicate behind this assumption—that there will be no “future changes in laws and policies” that affect energy demand—is simply unreasonable given the realities of climate change.¹⁴⁸ As international commitments and growing state-level legislation demonstrate, domestic demand for fossil-fuel energy is highly likely to decrease over the long-term and be replaced by cleaner energy sources.

Interior has even acknowledged this effect in the past, yet refuses to incorporate it into MarketSim. For instance, Interior has previously stated that “[a]s countries, including the U.S., address climate change with individual policy targets, this assumption [of very high substitution] could no longer hold,” and that “as new energy sources become more economically feasible, they could displace existing sources.”¹⁴⁹ For this reason, BLM has called its assumed energy trajectory a “worst-case scenario outcome” that incorporates a “maximum emissions” baseline.¹⁵⁰ Interior should not assume an outlier (if not completely implausible) scenario that, in effect, minimizes the net emissions from increasing—and the net emissions benefits from reducing—federal leasing and extraction.

Additionally, MarketSim suffers from various more technical, but also significant, errors that likely contribute to its minimization of substitution rates. For instance, the model does not currently incorporate a broad range of expert opinions in developing its parameters, as several parameters rely on the opinion of a single expert.¹⁵¹ While use of expert elicitation is acceptable when estimates are unavailable in the literature, expert elicitations should not rely on a single expert.¹⁵² Additionally, many of MarketSim’s elasticities are out of date, not grounded in the literature, or based on inconsistent sources. For instance, 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.¹⁵³ At this point, even the model’s most recent estimates are seven years old,¹⁵⁴ whereas newer estimates are available in the literature.¹⁵⁵

4. *Using NEMS, or Fixing MarketSim, to Reliably Assess Substitution and Reveal Climate Impacts*

Particularly given the recent Ninth Circuit decision in *Center for Biological Diversity*, any future determinations making use of MarketSim in its current form are legally precarious. Additionally, because the model exaggerates substitution effects, does not sufficiently account for the long-term trajectory of renewables, and includes outdated elasticities and other modeling limitations, it produces unreliable results and is bound to underestimate the effects of any reform. While Interior could revise MarketSim to correct its flaws, it may be easier and more legally sound for the agency to replace MarketSim with another model, known the National Energy Modeling System (“NEMS”), which was developed by the U.S. Energy Information Administration and is widely applied by government and independent forecasters. Or, alternatively, Interior could make use of another available energy market model.

NEMS is an “energy-economy modeling system” that “projects the production, imports, conversion, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, cost and performance characteristics of energy technologies, and demographics.”¹⁵⁶ The model can be used “to project the impact that energy, economic, environmental, and security factors can have on the U.S. energy system as a result of alternative energy policies and different assumptions about energy markets,” providing “a consistent framework . . . to examine the impact of new energy programs and policies.”¹⁵⁷

NEMS’s projections extend through 2050¹⁵⁸ and encompass both the net economic and environmental impacts of proposed policies, assessing impacts across energy sources and geographic regions. As the Energy Information Administration explains, NEMS “accounts for all combustion-related carbon dioxide (CO₂) emissions, as well as emissions of sulfur dioxide (SO₂), nitrogen oxides (NO_x), and mercury from the electricity generation sector,” and “also accounts for CO₂ resulting from non-combustion uses of fossil fuel inputs.”¹⁵⁹ In addition to its regular use by the Energy Information Administration for developing regular forecasts of the energy market, NEMS has also been applied by the U.S. Congress,¹⁶⁰ other federal agencies such as the Surface Transportation Board, and various academic and non-governmental organizations.¹⁶¹ In fact, MarketSim is calibrated to the supply and demand projections from NEMS, indicating Interior’s endorsement of the model.¹⁶²

Although it is not possible to know what results NEMS will generate without actually running the model, it is likely that the model, if calibrated carefully, will avoid the key problems with MarketSim. With regard to foreign oil demand, for instance, NEMS features an International Energy Module that “generates a worldwide liquids supply-demand balance with regional detail” based on changes in domestic policy, enabling a worldwide estimate of “end-use consumption for each service and fuel type.”¹⁶³ Unlike the current version of MarketSim, in other words, NEMS is designed to measure global impacts on energy demand and consumption, avoiding the key problem that the Ninth Circuit recognized in striking down BOEM’s assessment of the Liberty Project.¹⁶⁴

NEMS can also be calibrated to avoid MarketSim’s problem of assuming constant market demand over the coming decades, although this requires careful consideration. The NEMS reference case “generally assumes that current laws and regulations that affect the energy sector, including laws that have end dates, remain unchanged throughout the projection period”¹⁶⁵ and has been criticized for understating the long-term growth of renewable energy.¹⁶⁶ Thus, relying merely on the NEMS reference case will replicate MarketSim’s error of assuming near-constant fossil-fuel demand over the long-term.

But this hurdle can be overcome. In addition to its reference case, NEMS features 24 additional cases reflecting a range of assumptions about economic growth, oil prices, resource availability, policy development, and technological progress.¹⁶⁷ While Interior could present the results from various cases to show a range of plausible outcomes under different

assumptions,¹⁶⁸ it may instead wish to solicit opinion from a range of experts on the most likely trajectory, and weight the results of different NEMS cases accordingly.¹⁶⁹ In fact, the National Academies of Sciences has suggested that agencies conduct “expert elicitation of future emission projections” given the uncertainty of long-term energy policies,¹⁷⁰ suggesting that Interior too may wish to conduct expert elicitation to assess the likelihood of different baseline scenarios for its substitution analysis. Because NEMS features a wide range of cases that assume different future trajectories, it enables Interior to consider a range of more likely trajectories and avoid MarketSim’s problem of assuming the unlikely scenario that fossil-fuel demand will remain constant for decades into the future.

Beyond its analytical rigor and ability to assess a wide range of policies under different assumptions, there are also legal and practical advantages to applying NEMS. For one, whereas MarketSim has been criticized by the Ninth Circuit, the Eighth Circuit approved of the Surface Transportation Board’s use of NEMS to assess the market and environmental impacts from construction of a coal railroad.¹⁷¹ Whereas the Eighth Circuit had previously remanded the Board’s determination to approve the railroad after the agency failed to assess “‘the reasonably foreseeable increase in coal consumption’ expected from the project due to the availability of cheaper and easier distribution of . . . coal,”¹⁷² the Court now approved of the Board’s use of NEMS on remand to assess those market impacts, recognizing that the NEMS model enabled the Board to reasonably assess “the potential impacts on air quality that may result from the implementation of the project.”¹⁷³ Although this decision does not insulate future uses of NEMS from legal challenges, it provides helpful legal precedent.

Furthermore, because NEMS is developed by the Energy Information Administration—an agency within the Department of Energy whose mission is to produce independent analysis and forecasts¹⁷⁴—it may be seen by courts as more reliable than any forecast developed by Interior. Accordingly, if Interior begins applying NEMS to assess energy substitution, potential attempts by future administrations to reconsider those substitution analyses by applying a different methodology may be viewed skeptically by courts. And because NEMS is publicly available and has already been used by several other federal agencies and departments, use of the model by Interior would provide some degree of consistency with other agencies that engage in substitution analysis.

While using NEMS appears to be the best option, it is not without challenges. For one, as the agency already has with MarketSim, Interior may need to adjust the NEMS baseline in certain scenarios to reflect the current state of the agency’s leasing and planning decisions.¹⁷⁵ Perhaps more significantly, while NEMS’s current structure would easily allow Interior to model a contraction (or expansion) of capacity—such as the impacts of revising resource management plans to curtail fossil-fuel leasing—the tool cannot currently model changes to leasing policies (such as royalty rates) because it does not differentiate between federal and private lands. Ideally, Interior could work with the EIA to tailor NEMS to meet the agency’s needs. If this is not feasible, Interior could potentially expand NEMS on its own, and in the meantime use the model only for determinations that directly affect capacity. Alternatively, Interior could make use of another energy-market model, such as the Environmental Protection Agency’s Integrated Planning Model or Resources for the Future’s model, E4ST (among other available models).

Because NEMS is developed by the Energy Information Administration—an agency within the Department of Energy whose mission is to produce independent analysis and forecasts—it may be seen by courts as more reliable than any forecast developed by Interior.

If Interior cannot make NEMS fit its needs—or deems NEMS and other available models unsuitable to its purposes for other reasons—it could alternatively work to correct MarketSim to fix its various flaws. To correct the issue that the Ninth Circuit identified, Interior should revise the model to directly analyze impacts on foreign emissions. As the Ninth Circuit explained, there is ample scientific evidence that could inform this analysis.¹⁷⁶ In fact, BOEM has previously acknowledged that MarketSim actually can “estimate a foreign reduction in consumption . . . for oil,” but ultimately disregards those impacts due to uncertainty.¹⁷⁷ For example, according to BOEM’s runs of MarketSim in the context of its offshore oil and gas leasing program, in the mid-price scenario, taking 8 billion barrels of U.S. oil production off the global market would result in a reduction in foreign oil consumption of approximately 4 billion barrels of oil.¹⁷⁸ This finding suggests that curtailing domestic offshore oil production will reduce total foreign consumption by approximately 50% of the curtailed amount—a finding corroborated by external analyses applying similar assumptions¹⁷⁹ and broadly consistent with independent estimates of energy substitution.¹⁸⁰

If Interior chooses to revise MarketSim, it should also attempt to correct its other flaws. For instance, a revised model should also account for the likelihood that fossil-fuel demand will decline over the long term from efforts to reduce greenhouse gas emissions. Although MarketSim is currently calibrated to the NEMS reference case,¹⁸¹ as discussed above that case does not forecast long-term policy trends and thus does not represent a likely baseline. If Interior continues to use MarketSim, therefore, it may wish to elicit estimates from a range of experts on the most likely NEMS case and probabilistically weight those scenarios accordingly.¹⁸² If Interior revises MarketSim, it could also fix additional problems with the model. For instance, the agency could solve the model’s problem of relying on a single expert for many parameters by developing a range of possible estimates for key parameters by surveying multiple experts.¹⁸³ Interior may also wish to revise the model’s elasticities to ensure currency and consistency, given that many of MarketSim’s elasticities are inconsistent and outdated.¹⁸⁴

Of course, like with all of the suggestions in this report, Interior could choose to implement methodological reforms piecemeal as they become available, without substantially delaying overdue reforms. For instance, Interior could begin to use NEMS in the relatively near-term future for leasing and planning determinations, whereas longer-term modeling modifications may be necessary to assess the impacts of reforming leasing policies. If Interior continues to use MarketSim—either on a temporary or permanent basis—it could also revise that model in stages, beginning with modelling foreign demand (which the model already has the capacity to estimate) before proceeding to more fundamental reforms like model elasticities and parameters. In that case, Interior should acknowledge the limitations of the model, consider sensitivity analysis if possible, and recognize qualitatively that the model likely represents an underestimate of substitution. To the extent practicable, Interior could revisit and revise certain reforms as its methodologies develop. For instance, if Interior reforms royalty rates to account for net downstream greenhouse gas emissions—an option discussed further below—it could start by relying on current leakage estimates and then adjust rates in the future when more accurate leakage estimates become available.

In short, Interior should strongly consider replacing MarketSim with NEMS, which offers a variety of technical, practical, and legal advantages and can, if carefully calibrated, provide a more robust and accurate analysis of substitution effects. If Interior continues to rely on MarketSim for substitution analysis, it should make holistic modeling updates to correct the model’s myriad flaws.

5. *Applying an Energy Substitution Model Consistently to Both Environmental and Economic Impacts*

In addition to the technical and modeling limitations of MarketSim, Interior (particularly BLM) has sometimes made critical errors by applying the model inconsistently. While concluding that most emissions of greenhouse gases would occur regardless of federal policies due to substitute oil and gas production, the agency has simultaneously attributed all of the positive economic impacts from federal extraction to its policies without analyzing the possibility of substitution effects that would diminish net economic benefits.

To provide just one example, consider BLM's final analysis of the Willow Master Development Plan from December 2020. Due to the problems with MarketSim discussed above, BLM concluded that roughly 97% of the fossil fuel extracted under that project was replacing other sources of fossil-fuel extraction that would occur under the no-action alternative.¹⁸⁵ Thus, according to the agency, just a small percentage of the project's gross greenhouse gas emissions represented surplus emissions that would not have occurred under the no-action alternative.¹⁸⁶ Yet when assessing economic impacts, BLM simply provided gross dollar-figure projections of revenue and royalties without attempting to assess how much these represented additional revenues beyond what would occur under the no-action alternative.¹⁸⁷

Of course, if the vast majority of the Willow Project's extraction were in fact substituting for other energy extraction projects on federal, state, and private lands, then the economy would still reap many of the supposed economic effects from the plan such as tax revenues, employment income, and royalties. While the distribution of these benefits would be different under the leasing and no-leasing alternatives, as a federal agency, Interior should take a broad perspective and consider net effects in addition to regional distributional impacts. By disregarding substitution effects in assessing economic impacts, Interior thus provides a lopsided account of the environmental and economic effects—an inconsistency that can render an analysis arbitrary and capricious.¹⁸⁸ Proper use of a robust substitution model can correct this imbalance.

B. Interior Should Apply the Social Cost of Greenhouse Gases to Assess the Impacts of Greenhouse Gas Emission Reductions

Bottom Line: The Social Cost of Greenhouse Gases captures the real-world benefits of reducing planet-warming emissions, enabling Interior to quantify the extent to which its upcoming actions will mitigate climate change effects.

Once Interior reliably estimates the greenhouse gas emissions reductions from any reform, the agency should then contextualize and assess the significance of those emissions using the Social Cost of Greenhouse Gases. The Social Cost of Greenhouse Gases is a tool developed by a federal interagency working group to assess the climate-change impacts of agency action. Assessing the actual impacts of their actions on climate change “facilitates sound decision-making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues.”¹⁸⁹ While Interior has mostly neglected the tool in recent years outside the rulemaking context, it has signaled a new openness to using the tool more broadly under the Biden administration.

This section provides a brief overview of the Social Cost of Greenhouse Gases, including its past use by Interior agencies. It then offers a legal case for how the methodology can support analyses underlying key reforms. The section closes by rebutting arguments that Interior offered under the Trump administration for why it should not apply the Social Cost of Greenhouse Gases in NEPA reviews, providing a roadmap that the agency can now use to justify a reversal.

1. *The Social Cost of Greenhouse Gases: A Tool to Assess the Economic and Welfare Benefits of Emission Reductions*

The Social Cost of Greenhouse Gases measures, in dollar value terms, the climate consequences of a marginal ton of greenhouse gas emissions or emissions reductions.¹⁹⁰ The most widely used valuation of the Social Cost of Greenhouse Gases was developed by the Interagency Working Group on the Social Cost of Greenhouse Gases (“Working Group”)—a coordinated effort among twelve federal agencies and White House offices—through a transparent and rigorous process. It has been widely used by federal agencies, including sometimes Interior, to evaluate the significance of an action’s or rule’s greenhouse gas emissions.

Beginning in 2009, the Working Group 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 “assumptions that are grounded in the existing scientific and economic literature.”¹⁹¹ The Working Group’s methods combined three frequently used models built to predict the economic costs of the physical impacts of each additional ton of carbon dioxide.¹⁹² The models together incorporate a number of damage categories, such as impacts on agriculture and forestry, coastal communities from sea-level rise, extreme weather events, vulnerable market sectors, human health, outdoor recreation and other non-market amenities, human settlements and ecosystems, and catastrophic events.¹⁹³ Those underlying models were the subject of extensive expertise and peer review: One of the models, DICE, was developed by Nobel-prize winner William Nordhaus.

The Working Group’s estimates of the Social Cost of Carbon (i.e. carbon dioxide) were first issued in 2010 and have been updated several times to reflect the latest scientific and economic data.¹⁹⁴ 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 those greenhouse gases.¹⁹⁵ These additional metrics used the same economic models, the same treatment of uncertainty, and the same methodological assumptions that Working Group applied to the Social Cost of Carbon, and also underwent rigorous peer-review.¹⁹⁶ Collectively, these three metrics are known as the “Social Cost of Greenhouse Gases.”

The Working Group’s social-cost estimates have been widely endorsed by independent experts. For instance, the National Academies of Sciences has issued reports supporting the use of the Working Group’s estimates by federal agencies, while recommending future improvements.¹⁹⁷ Leading economists who specialize in climate economics have explained that the Working Group’s estimates are the best numbers available.¹⁹⁸ The Government Accountability Office published a report touting the Working Group’s estimates as representing the best available science and economics on monetizing climate damages.¹⁹⁹ And the U.S. Court of Appeals for the Seventh Circuit has upheld agency reliance on these estimates.²⁰⁰

Despite the scientific, economic, and legal support for using the Social Cost of Greenhouse Gases, Interior’s use of the metric outside the rulemaking context has been limited. Until 2017, NEPA analyses from Interior agencies sometimes, though inconsistently, incorporated the Social Cost of Greenhouse Gases to evaluate the significance of the greenhouse gas emissions associated with a project approval or lease sale. In a 2016 assessment of a lease sale, for instance, BOEM explained that the Social Cost of Greenhouse Gases methodology “is a useful measure” that enables the agency “to incorporate the social benefits of reducing carbon dioxide emissions into its decision-making.”²⁰¹ BLM also applied the Social Cost of Greenhouse Gases to assess the climate impacts of several lease sales.²⁰² But use was far from uniform. In its five-year leasing plan for 2017-2022, BOEM calculated climate damages using the Social Cost of Greenhouse Gases yet presented those values in a separate report rather than incorporating them into its net-benefits analysis.²⁰³ For some other planning and leasing decisions, Interior overlooked the tool entirely.²⁰⁴

In March 2017, President Trump issued an executive order that disbanded the Working Group and withdrew its technical support documents as no longer representing government policy.²⁰⁵ In the ensuing years, Interior and other federal agencies abandoned the use of the Social Cost of Greenhouse Gases for project-level assessments under NEPA, citing the executive order, numerous technical objections to the social-cost metrics such as their alleged uncertainty, and the supposedly limited need for monetization or balancing in NEPA reviews.²⁰⁶ Instead, Interior typically minimized climate impacts by comparing a project’s emissions to far larger totals, such as total global or domestic greenhouse gas emissions, and noting that the project’s emissions appear small by comparison.²⁰⁷ While Interior and other federal agencies continued to monetize greenhouse gas emissions in regulatory cost-benefit analysis, during the Trump administration they substantially lowered the Working Group’s valuations in attempt to reflect only domestic impacts—once again minimizing climate impacts resulting from the agency’s decisions.²⁰⁸

From day one, the Biden administration has reversed the Trump administration’s actions on the Social Cost of Greenhouse Gases and signaled an openness to use the metric broadly in agency decisionmaking, including project- or program-level NEPA assessments and other decisionmaking contexts. In one of his first executive orders, President Biden reestablished the Working Group and called for it to provide estimates “monetizing the value of changes in greenhouse gas emissions resulting from regulations and other relevant agency actions.”²⁰⁹ As called for in that Order, the Working Group has since reconvened and released interim estimates of the social-cost metrics that readopt its prior valuations from 2016 (adjusted for inflation), as conservative interim estimates.²¹⁰ In doing so, the Working Group reaffirmed its previous numbers as reflecting the best available science, though it acknowledged that these valuations “likely underestimate societal damages from [greenhouse gas] emissions” and began a process to update these valuations by January 2022.²¹¹

Under the current valuations, the central value of the social cost of carbon (using a 3% discount rate) is \$51 for emissions in the year 2020, which social-cost values incrementally rising over time as the baseline concentration of atmospheric greenhouse gases increases.²¹² The central value of the social cost of methane emissions is \$1,500 for emissions in the year 2020,²¹³ while the social cost of nitrous oxide emissions is \$18,000 for emissions in the year 2020.²¹⁴

Social Cost Values (in 2020\$ per metric ton of CO₂, using central 3% discount rate)

	Carbon Dioxide	Methane	Nitrous Oxide
2020	\$51	\$1,500	\$18,000
2025	\$56	\$1,700	\$21,000
2030	\$62	\$2,000	\$23,000
2035	\$67	\$2,200	\$25,000
2040	\$73	\$3,100	\$28,000
2045	\$79	\$3,500	\$30,000
2050	\$85	\$3,800	\$33,000

While President Biden called on the Working Group to provide additional guidance by September 2021 on scope of agency use of the Social Cost of Greenhouse Gases,²¹⁵ the Working Group recently stated that agencies should apply the social cost metrics to other relevant agency actions beyond regulations.²¹⁶

Interior has begun to follow suit. In a Secretarial Order published in April, Secretary Haaland recognized that the Social Cost of Greenhouse Gases provides a “useful measure to assess the climate impacts of [greenhouse gas] emission changes for Federal proposed actions, in addition to rulemakings,” emphasizing the tool as “essential . . . to quantify the costs and benefits associated with a proposed action’s [greenhouse gas] emissions and relevant to the choice among different alternatives being considered.”²¹⁷ While the Secretarial Order stopped short of requiring Interior agencies to use the Social Cost of Greenhouse Gases in all relevant NEPA assessments, it strongly endorsed the tool’s use.

2. *The Legal and Practical Advantages of Applying the Social Cost of Greenhouse Gases Compared to Alternative Assessment Approaches*

Use of the Social Cost of Greenhouse Gases in all relevant analyses has numerous legal and practical advantages. First, the tool enables Interior to saliently and meaningfully convey the significance of greenhouse gas impacts in a manner that the agency’s previous methodologies do not. Second, the tool facilitates an apples-to-apples comparison with other monetized impacts including economic effects. Third, the tool allows Interior to fulfill NEPA’s legal requirements to assess actual climate impacts. And fourth, application of the Social Cost of Greenhouse Gases is crucial for policies such as a carbon adder that seek to internalize climate damages onto fossil-fuel producers.

Comparing a project’s emissions to national or global totals—as Interior has frequently done in the past—inappropriately trivializes often substantial climate impacts by presenting them as small fractions of much larger totals.

Due to a phenomenon known as salience bias, the public and agency decisionmakers tend to focus more on information that is prominent or emotionally striking such as large monetary estimates while disregarding less prominent information like generic descriptions of climate impacts or miniscule percentages of national or global totals.²¹⁸ Interior’s prior preferred method of comparing a project’s emissions to national or global totals is particularly problematic on this front, as it inappropriately trivializes often substantial climate impacts by presenting them as small fractions of much larger totals.²¹⁹ As one court recently explained, “[t]he global nature of climate change and greenhouse-gas emissions means that any single . . . project likely will make up a negligible percent of state and nation-wide greenhouse gas emissions.”²²⁰

The Social Cost of Greenhouse Gases solves this problem by presenting climate damages in a manner that policymakers and the public can readily understand. A recent NEPA assessment from Interior’s Office of Surface Mining (“OSM”) illustrates this contrast. In that assessment, OSM deemed a proposal’s carbon dioxide emissions “minor” because they equated to 0.44% of the annual global total.²²¹ Yet application of the Social Cost of Greenhouse Gases would have revealed that the projected emissions from that proposal would cause roughly \$8.8 billion in annual climate harm, which is hardly a “small” figure.²²² As this example illustrates, use of the Social Cost of Greenhouse Gases would vastly improve upon Interior’s ability to contextualize the significance of greenhouse gas impacts.

The Social Cost of Greenhouse Gases is also particularly valuable for agency decisionmaking because it facilitates an even-handed comparison to a project’s economic impacts, which are also presented as dollar values. While NEPA does not require a full and formal cost-benefit analysis, the law nonetheless “mandates a rather finely tuned and systematic balancing analysis” of “environmental costs” against “economic and technical benefits.”²²³ By presenting climate change impacts in dollars—the same unit of measurement as projected benefits such as revenues and payroll impacts—the Social Cost of Greenhouse Gases facilitates this balancing. With upcoming programmatic reforms, for instance, Interior could compare monetized climate benefits against potential economic harms. Such a comparison becomes difficult and arbitrary if climate impacts are not presented in dollar figures, potentially affording a future administration broad latitude to reverse key reforms.

Not only is the need to apply the Social Cost of Greenhouse Gases essentially undisputed in the context of regulatory cost-benefit analysis,²²⁴ but courts have also frequently embraced the use of the Social Cost of Greenhouse Gases for project-level determinations under NEPA for the various reasons discussed above. As the Ninth Circuit has held, merely providing the tonnage of greenhouse gases emitted by a project and presenting that tonnage as a percentage of national totals “does not evaluate the incremental impact that these emissions will have on climate change or on the environment more generally” as NEPA requires.²²⁵ Rather, the “actual environmental effects” for NEPA purposes²²⁶ are the incremental climate impacts caused by those emissions. Because the Social Cost of Greenhouse Gases methodology measures how the emission of an additional unit of greenhouse gases incrementally contributes to a wide range of climate impacts,²²⁷ the tool fulfills the aims of NEPA.

Numerous other courts have rejected NEPA analyses that merely quantified emissions and compared them to larger totals such as total national or domestic emissions.²²⁸ Interior agencies have been the defendants in several of these decisions, including two decisions from the U.S. District Court for the District of Montana against the Office of Surface Mining²²⁹ along with a recent decision from the Northern District of California against BLM.²³⁰ While some court decisions have reached the opposite conclusion,²³¹ failure to assess climate impacts using the Social Cost of Greenhouse Gases at least invites legal risk. Notably, the Ninth Circuit decision discussed above came in the context of a regulation that decreased total greenhouse gas emissions—demonstrating that application of the Social Cost of Greenhouse Gases is equally valuable for assessing climate benefits as assessing climate costs.²³²

While important for all NEPA assessments and useful for any decision with significant climate implications, application of the Social Cost of Greenhouse Gases is especially critical for any policies that directly internalize climate externalities such as a carbon adder. As detailed later in this report, imposing a carbon adder would require Interior to calculate the costs of greenhouse gases emissions, which necessitates monetizing emissions using available tools. The Social Cost of Greenhouse Gases enables such a policy.

3. *Reconsidering Interior’s Bases for Rejecting the Social Cost Valuations for Project- or Program-Level Determinations*

While there are many good reasons to apply the Social Cost of Greenhouse Gases in project- or program-level NEPA reviews,²³³ Interior analyses in recent years have offered various reasons for rejecting the methodology. In future analysis that apply the Social Cost of Greenhouse Gases, Interior should provide explanations justifying the change in position.²³⁴ This section offers suggestions for how Interior could disclaim several common rationales that it has offered in the recent past for rejecting the Social Cost of Greenhouse Gases. For further analysis rebutting these and other agency rationales for declining to apply the social-cost valuations, please refer to a 2019 report from the Institute for Policy Integrity titled *Pipeline Approvals and Greenhouse Gas Emissions*²³⁵ and a 2021 Policy Integrity report titled *Playing with Fire: Responding to Criticism of the Social Cost of Greenhouse Gases*.²³⁶

The Relevance of the Social Cost of Greenhouse Gases Is Not Limited to Rulemakings: In the past, Interior has claimed that the Social Cost of Greenhouse Gases is “intended to be used as part of an economic cost-benefit analysis for proposed rules,” and thus is not appropriate for a NEPA analysis.²³⁷ But this statement was dubious at the time, and is even less defensible now in light of recent developments. Although the Working Group’s estimates were originally published to help guide regulatory analyses, climate damages are the same whether the emissions result from a regulation or a project. Recognizing its value, many federal and state agencies have used the Social Cost of Greenhouse Gases in environmental impact reviews²³⁸ and resource management decisions.²³⁹

In any event, regardless of the veracity of Interior’s claim at the time, it is now clear that the Social Cost of Greenhouse Gases applies beyond rulemaking and is also relevant for project-level analysis. As the Working Group recently explained, agencies should apply the social-cost metrics to any relevant agency actions—not just regulations.²⁴⁰ This advice echoed similar language in Executive Order 13,990, in which President Biden recognized that the Social Cost of Greenhouse Gases could be useful for a wide range of agency processes including “decision-making, budgeting, and procurement.”²⁴¹ In that Executive Order, President Biden called on the Working Group to provide additional guidance by September 2021 on the use of the social-cost metrics.²⁴²

Monetizing Climate Damages Is Appropriate and Useful Regardless of Whether Every Effect Can Be Monetized in a Full Cost-Benefit Analysis: Interior has further claimed in the past that application of the Social Cost of Greenhouse Gases is inappropriate and potentially misleading unless it is incorporated into a full cost-benefit analysis, including an analysis of economic benefits or costs “as defined in economic theory.”²⁴³ This too was incorrect. The fact that Interior does not monetize all effects does not mean that it should neglect monetizing other effects for which methodologies are readily available.²⁴⁴ Indeed, NEPA regulations provide that an agency can consider quantified costs and benefits alongside “unquantified . . . impacts, values, and amenities.”²⁴⁵ And Interior has historically included monetized values of economic impacts such as royalties and revenues, without similar qualms. When monetized values can help Interior contextualize and assess the significance of impacts—as the Social Cost of Greenhouse Gases can for climate impacts—monetization is a valuable tool whether or not the agency is conducting a broader cost-benefit analysis.

In any event, as detailed later in this report, Interior can improve future analyses by assessing the society-wide economic costs of programmatic reforms, including reduced energy supply and decline in total surplus. An improved energy market model would better enable Interior to reliably assess these impacts. If Interior estimates total economic costs in future assessments, then the factual predicate for this objection to the Social Cost of Greenhouse Gases will cease to apply. However, as detailed above, this argument against the Social Cost of Greenhouse Gases is groundless regardless of whether Interior bolsters its analysis of economic impacts.

The Uncertainty in the Social-Cost Valuations Is Manageable: Interior has also argued in the past that the Social Cost of Greenhouse Gases is unreliable because it “and does not include all damages or benefits from carbon emissions” and “is generated in a range.”²⁴⁶ Yet these rationales provide poor reasons to avoid the tool altogether.

First, the mere fact that there is some uncertainty in the Social Cost of Greenhouse Gases valuations does not require Interior to disregard the methodology entirely. To the contrary, courts have recognized that uncertainty alone is not a basis to disregard needed analysis, as “[r]egulators by nature work under conditions of serious uncertainty.”²⁴⁷ While “[a]gencies are often called upon to confront difficult administrative problems armed with imperfect data,” and “the proper response to that problem is for the [agency] to do the best it can with the data it has.”²⁴⁸ Indeed, “it is entirely proper[] and necessary” for an agency to make “educated predictions” under NEPA.²⁴⁹ For instance, BLM and BOEM typically project economic impacts such as royalties and revenues even though these estimates, too, are subject to wide uncertainty and rely on projections of such variable factors as energy prices and the state of interconnected global energy markets.²⁵⁰ Applying the Social Cost of Greenhouse Gases to assess climate impacts involves similar projection.

Interior’s critique also overstates the uncertainty in the Social Cost of Greenhouse Gases. While the Working Group has provided a range of social-cost valuations, it systemically evaluated uncertainty and provided estimates that represent central damage values.²⁵¹ Because of the simplicity provided by a single central value, agencies often prioritize the central estimate when assessing climate impacts.²⁵² Aside from the central value, the Working Group also provided a manageable range of social-cost values depending on the discount rate.²⁵³ The fact that agencies routinely apply Social Cost of Greenhouse Gases for regulations belies the argument that the metric is too uncertain to aid administrative decisionmaking.

Additionally, where this is some uncertainty in the social-cost values, this uncertainty tends to point toward higher damage estimates, and the Working Group's current estimates are widely considered to be conservative underestimates that omit many key categories of climate damages.²⁵⁴ For instance, the Working Group has explained that several of the underlying economic models omit certain major damage categories such as catastrophic damages and certain cross-regional spillover effects.²⁵⁵ While the Working Group's valuations also omit some positive impacts of greenhouse gas emissions, evidence indicates that those impacts pale in comparison to the omitted damages, making the Working Group's valuations almost certainly underestimates.²⁵⁶ Because the Working Group's social-cost valuations rigorously account for uncertainty—and remaining uncertainty strongly suggests that those valuations are underestimates—the presence of some uncertainty in the Social Cost of Greenhouse Gases should not stop Interior from using the tool.

It Is Appropriate for Agencies to Consider Global Externalities: In its most recent five-year leasing plan, BOEM claimed that fully incorporating the Social Cost of Greenhouse Gases into its economic analysis was inappropriate because the tool measures climate impacts on a “global scale” and is not restricted to domestic impacts.²⁵⁷ But considering only domestic climate impacts does not reflect international spillovers to the United States,²⁵⁸ U.S. benefits from foreign reciprocal actions,²⁵⁹ or the extraterritorial interests of U.S. citizens, including financial interests,²⁶⁰ global commons,²⁶¹ and altruism.²⁶²

For these myriad reasons, judicial precedent supports agency consideration of global climate impacts. In upholding reliance on the Working Group's damage estimates, the Seventh Circuit deferred to the government's judgment that because greenhouse gases “affect[] the climate of the entire world . . . those global effects are an appropriate consideration.”²⁶³ Likewise, the U.S. District Court for the Northern District of California recently rejected a BLM analysis that relied on the Trump administration's domestic-only Social Cost of Methane valuation, concluding that “the appropriate context for a nationwide rulemaking that contributes to a global problem is the world as a whole.”²⁶⁴ The National Academies of Sciences has also concluded that social-cost valuations should include global damage estimates and not be limited to the national scale.²⁶⁵ And other independent experts have concluded the same.²⁶⁶

President Biden's recent executive order reestablishing the Working Group explained that it “is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account.”²⁶⁷ Moreover, President Biden recognized in the Executive Order that accounting for global damages “supports the international leadership of the United States on climate issues,” as it properly recognizes climate change as a global externality that affects all nations.²⁶⁸ Given that the president possesses unique “power to act in foreign affairs,”²⁶⁹ it is particularly appropriate for agencies to follow the president's directive and act to protect foreign nations from the harms of domestic pollution.

C. Interior Should Account for the Benefits of Option Value, Especially for Curtailing Leasing of Low-Potential or Environmentally Sensitive Lands

Bottom Line: Option value captures the benefits of delaying an irreversible commitment of resources, enabling Interior to more fully assess the public's value in curtailing leasing and minimizing speculation.

Another key potential benefit of programmatic reform comes in the form of option value. Option value is the informational value gained by waiting to make an irreversible decision. While there is substantial option value in curtailing leasing, restricting fossil-fuel extraction, and preserving federal lands for other beneficial uses, Interior has paid little attention to this benefit in the past. More robust consideration of option value, whether quantitative or qualitative, would provide additional support for curtailing leasing of federal lands and waters, or otherwise restricting extraction in environmentally sensitive regions.

1. *Option Value and the Benefits of Delaying Resource Extraction*

Option value is the informational value gained by waiting to make an irreversible decision. Option value arises in situations that are characterized by two features: irreversibility and uncertainty. Irreversibility is present when the action cannot be undone, or when reversing the action is highly improbable due to legal or procedural hurdles. Uncertainty is present when the expected value to be derived from a given action may change, when the costs and benefits associated with the action are subject to doubt, or when the costs and benefits of alternative policies may be uncertain. Under these conditions, the passage of time will often reduce uncertainty about the expected value of the irreversible action.²⁷⁰

Firmly established in the economic literature²⁷¹—including in the context of natural resources policy²⁷²—option value can play an important role in Interior's leasing and extraction decisions, which are characterized by both irreversibility and uncertainty. In terms of irreversibility, not only is fossil-fuel leasing difficult to reverse from a legal standpoint, but also the extraction and use of nonrenewable resources, including oil and natural gas, cannot be undone; destruction of habitat for an endangered or threatened species may have irreparable consequences; and heat-trapping greenhouse gases released during fossil fuel extraction and consumption persist in the atmosphere for thousands of years.²⁷³ There is also a high degree of uncertainty associated with designating and leasing public lands and waters for extraction. Relevant uncertainties include resource prices and the costs of drilling; energy efficiency, energy conservation, and fuel-economy standards that affect fossil fuel demand; environmental conditions and risks from drilling including habitat effects, local pollution, and oil-spill risk; current and expected effects of climate change on the ecosystem; developments in drilling technologies including safety and pollution-capture; and competing uses of public lands.²⁷⁴ Because resource extraction on public lands is characterized by high irreversibility and uncertainty, the option value to delaying leasing is large.

Owing to the substantial irreversibility and uncertainty involved, the U.S. Court of Appeals for the District of Columbia Circuit, in two separate opinions, has recognized the significance of timing and option value in land-management decisions. First, in *California v. Watt*, the Court remanded an offshore leasing determination because Interior failed to “properly consider[] the economic effect of delaying lease sales,” keying in on the fact that the agency “ignored the price rises in crude oil that make delay a factor.”²⁷⁵ Then, in *Center for Sustainable Economy v. Jewell*, the Court explained that because “[m]ore is learned with the passage of time”—including about drilling costs, safety and environmental risks, and

the economics of the oil and gas industry, among others—the informational value of delay is a relevant factor to consider in leasing decisions.²⁷⁶ While the D.C. Circuit found BOEM’s qualitative consideration of option value in the challenged leasing plan to be sufficient, it suggested that an agency may act irrationally in failing to consider the informational value of delay.²⁷⁷ While these cases both involve BOEM’s management of offshore lands, their rationales equally apply to BLM’s management of onshore lands.

Yet Interior has not always considered option value in the past, and when it has considered option value that consideration has typically been secondary. To its credit, BOEM provided an extensive qualitative discussion of option value in its most recent five-year plan.²⁷⁸ However, while BOEM did consider option value with respect to environmental, social, and technological uncertainty, it did not appear to meaningfully include those option values as part of its determination of whether to schedule the lease sales.²⁷⁹ Meanwhile, BLM has failed to account for option value in any manner, either at the planning or the leasing stages.

2. *How Option Value Can Support Reforms that Curtail Leasing and Limit Speculation*

There are numerous advantages to a robust assessment of option value in any leasing or resource-management decision. For one, as discussed above, the D.C. Circuit has explicitly recognized the importance of option value in resource planning determinations.²⁸⁰ Based on this precedent, meaningful consideration of option value is likely required in any planning or leasing determination.²⁸¹

Robust consideration of option value also has strong practical advantages for both BLM and BOEM, and can help support determinations that curtail leasing or strengthen lease terms such as minimum bids and rental fees that currently encourage speculative leasing. In recent years, in particular, Interior has regularly offered lease sales for lands that developers scoop up at negligible prices and sit on without any development, depriving the public of the land for minimal compensation. As of the end of fiscal year 2020, more than half of the over 26.5 million acres of federal onshore land locked up in oil and gas leases—nearly 14 million acres—was lying idle without production.²⁸² And nearly 80% of leased offshore acreage is currently non-producing.²⁸³ By leasing these non-producing onshore and offshore lands, Interior has effectively given away its option value to private developers, allowing them to decide whether and when to engage in extraction based on their own private value rather than the public interest. Since social option value differs from private option value, the socially optimal timing for leasing and extraction will differ from the privately optimal timing. In essence, Interior is giving away the public’s option to determine the best use of the land, allowing developers to sit on the land and time extraction based on private option value rather than the public interest.

Interior is giving away the public’s option to determine the best use of the land, allowing developers to sit on the land and time extraction based on private option value rather than the public interest.

Regardless of whether Interior accounts for option value in its resource-management decisions, oil and gas companies will, and they will time extraction and resource decisions in a manner that is privately optimal. Option value in fact largely explains the routine practice of companies purchasing tracts and waiting years or decades to develop them, when conditions are optimal from their perspective.²⁸⁴ First, companies often have a “perverse incentive . . . to sit on undeveloped federal land,” since by having subsurface reserves as assets on a balance sheet, a company can “immediately improve its overall financial health, boost its attractiveness to shareholders and investors, and even increase its ability to borrow on favorable terms.”²⁸⁵ Second, although there is frequently “little evidence that much oil or gas is easily accessible,” buyers may be “hoping that the land will increase in value nonetheless, because of higher energy prices, new technologies that could make exploration and drilling more economical or the emergence of markets for other resources hidden beneath

the surface.”²⁸⁶ In other words, prospectors are considering their private option value, and taking advantage of the fact that government is not also accounting for public option value.

While it is clear why oil and gas companies often choose to purchase leases with little prospect of near-term drilling, it is far less clear why Interior has facilitated these transactions. After all, the nation derives little monetary benefit from nonproducing leases, yet loses the option to use the land for other purposes such as renewable energy development, recreation, and conservation.²⁸⁷ Meanwhile, the costs of speculative leasing can be enormous. If the environmental costs of extracting at the parcel are ultimately worse than anticipated when the land was leased (if, for instance, because the impacts of climate change are worse than anticipated, mitigation technology develops slower than expected, or species habitat degrades in the ensuing years), then Interior’s decision to lease the land at the earlier stage could have devastating impacts. These effects are exacerbated even further since Interior leasing and planning determinations have traditionally failed to fully account for environmental harms.

3. *Best Practices for Consideration of Option Value*

A quantitative assessment of option value would best enable BLM and BOEM to consider this critical benefit of programmatic reform alongside other quantified effects. In the past, however, BOEM has only quantified option value as it relates to market price uncertainty, excluding uncertainty as it relates to both the market costs (e.g., exploration, development, and extraction) and social costs of extraction (e.g., environmental, infrastructure, and catastrophic oil spills).²⁸⁸ In future analyses, both BLM and BOEM should look to established methodologies for quantifying option value in the natural resources context. As the D.C. Circuit explained in *Center for Sustainable Economy*, failing to quantify option value could present a legal challenge if Interior disregards “well established” quantitative methods.²⁸⁹



Consideration of option value can justify curtailing (or eliminating altogether) oil and gas extraction in environmentally sensitive regions, such as federal lands adjacent to Arches National Park that BLM proposed to lease in 2020.

Four methodologies, in particular, are available from the literature. While a full discussion of these methodologies is not provided in this report, Interior can look to a 2015 comment letter from the Institute for Policy Integrity for more detail on each of these methods, including available literature on each.²⁹⁰ Here, we simply describe each method briefly and quickly describe pros and cons of the approach.

First, Interior could apply the “engineering economic” approach by modeling potential future states to estimate the value gained by learning over time.²⁹¹ This method is reasonably objective and would largely dovetail from the use of NEMS to model the impacts of reforms, since as discussed above NEMS allows for assessment of numerous future scenarios depending on such factors as economic growth, oil prices, resource availability, and others.²⁹² Second, Interior could apply the “optimal stopping model” approach, through which the analyst specifies a stochastic or random process—estimated using available data—to model the value of learning and delay.²⁹³ Notably, this is the same approach that BOEM used to quantify uncertainty in its hurdle price analysis for its most recent five-year plan.²⁹⁴ Using the same approach, Interior could extend its existing methodology to model uncertainty in externality and market costs, which the agency has previously failed to do.

Third, Interior could survey various regulators involved in the relevant oil- environmental planning decisions to determine the value that they place on waiting to learn more information—a method known as “contingent valuation.”²⁹⁵ However, because this methodology is a stated preference technique that relies on purely subjective evaluations, it is likely not ideal. Last, Interior could approximate the option value using the resulting net benefits distribution. A recent working paper demonstrates the application of this technique for estimating option value in the Social Cost of Carbon.²⁹⁶ The methodology used in that paper could be adapted to assess the option value on leasing and planning determinations.

Even if a quantitative analysis is not feasible, a strong qualitative analysis of option value can strongly support curtailing fossil-fuel leasing. For instance, regular consideration of option value could support Interior’s decision not to lease parcels that developers are unlikely to develop in the short-term, which would allow these lands to be put toward more beneficial uses such as renewable energy development, recreation, conservation, or simply delaying to make a future decision. Option value could also support Interior’s decisions to curtail leasing in areas with particular environmental sensitivities or unknowns.²⁹⁷ And a decision to raise lease terms to discourage speculative leasing—such as higher minimum bids and rental fees—could be supported by option value.²⁹⁸ Similar to the other methodologies suggested in this report, Interior could consider option value qualitatively for the time being, while beginning the process to quantify option value that it could incorporate into determinations made after such quantification is available.

D. Interior Should Carefully Assess Both Aggregate and Localized Economic Impacts from Programmatic Reforms

While robust consideration of environmental impacts is key, it is also important for Interior to assess the economic effects of any programmatic reforms. Whether under NEPA, in project-level determinations, or pursuant to a rulemaking cost-benefit analysis, consideration of total economic impacts is important both for assessing policy effects and for surviving judicial review under the Administrative Procedure Act’s arbitrary-and-capricious standard. Assessing economic impacts is also important for identifying and addressing disproportionate economic impacts on certain communities.

This section offers advice on how Interior can analyze economic impacts to support programmatic reform. For any reform, Interior should seek to provide a broad and holistic assessment of economic impacts, including impacts on total revenues, energy supply, energy prices, and employment. Such an analysis—which a robust energy substitution model (discussed above) could facilitate—would enable Interior to capture the full, system-wide economic costs of programmatic reform. Doing so has numerous advantages. For one, it would avoid the problem of relying exclusively on localized

analyses, which ignore substitution effects. An economy-wide assessment of economic impacts would also provide a more realistic portrait of aggregate impacts, and help support an assessment that those impacts are outweighed by environmental benefits.

At the same time, Interior should continue to assess localized economic effects in order to inform its analysis of distributional impacts. Interior should consider avenues to offset local economic harms such as through renewable-energy siting. These practices would help safeguard local communities that have historically relied on federal fossil-fuel extraction.

1. *Adopting a Broad Approach to Economic Impacts*

Programmatic reforms to the federal oil and gas program are likely to have a broad mix of positive and negative economic impacts across the national economy. As detailed above, actions that curtail fossil-fuel development on federal land reduce the energy supply.²⁹⁹ While there is likely to be offset energy production (from both fossil fuels and renewable energy), this substitution only partially makes up for the shortfall in federal production. Accordingly, restricting fossil-fuel extraction decreases the total supply of oil and natural gas, which incrementally raises the market price for the consumer and thereby leads to decreased demand and consumption, and increased demand for energy efficiency and conservation.³⁰⁰ This is true both for Interior actions that directly curtail fossil-fuel extraction and for actions that indirectly curtail extraction by increasing the cost (such as raising royalty rates).

Frequently, however, Interior's analyses of the economic impacts of fossil-fuel leasing and extraction have disregarded these substitution and market effects. Recent BLM analyses, in particular, have looked narrowly at the impacts of a planning or leasing decision without regard to broader market impacts. In a recent proposal to expand oil and gas exploration in the Eastern Colorado resource management planning area, for example, BLM assessed aggregate economic output, employment, and labor income from federal extraction within the “economic analysis area,” without regard to broader market or substitution impacts.³⁰¹ As BLM recognized in that analysis, this “regional economic impact analysis” looks only at gross economic effects within the planning area and does not measure net economic impacts.³⁰² It therefore overlooks how a decision to lease or not to lease lands for development in one region of the country could affect energy development or other economic activities in other regions of the country.

Narrow analyses of this sort provide an incomplete portrait of economic effects, overestimating certain impacts while underestimating others. These analyses overestimate economic impacts in that they fail to recognize that many of the reported “impacts” such as revenues, royalties, and jobs are simply displacing similar effects that would have occurred from substitute production in the absence of federal development. In other words, if Interior does not lease a certain plot of land for fossil-fuel extraction, development at another site (of either fossil-fuel or renewable energy) is likely to increase, and that development may also have revenue, royalty, and job impacts that the federal leasing displaces. With employment in particular, economic research indicates that the net impacts of any Interior land-use policy is likely to be fairly small.³⁰³

However, Interior's traditional analyses also underestimate economic impacts in that they fail to capture certain market-wide impacts such as effects on energy supply, demand, consumption, and prices. While these impacts are also likely to be relatively minor in the context of particular land-use decisions—particularly if coupled with Interior determinations that promote renewable energy—the agency's analyses traditionally ignore these effects entirely because they look only at regional impacts.

While Interior's often limited analyses have typically not posed legal challenges in the context of actions that authorize fossil-fuel development, they may do so if used to justify reforms that restrict fossil-fuel extraction and thereby impose

some market-wide economic costs. After all, agencies are expected to “balance a project’s economic benefits against its adverse environmental effects,” and strong estimates of economic impacts are important for this “balancing process.”³⁰⁴ As detailed above, numerous courts have held that authorizing fossil-fuel extraction foreseeably causes a decrease in price and increase in demand for oil and gas and an attendant increase in greenhouse gas emissions, and that failure to assess those resulting downstream emissions violates NEPA.³⁰⁵ Given this precedent, it is plausible—though hardly inevitable—for a court to hold that Interior must assess foreseeable price increases and demand declines when undertaking reforms that curtail federal fossil-fuel extraction.

In addition to reducing litigation risk, a market-wide economic assessment facilitates a more comprehensive review of the true economic impacts of reform. As guidance from the Office of Management and Budget explains, agency analyses should aim to capture impacts on the “total resources available to society,”³⁰⁶ which includes any reductions in overall energy supply or additional production costs due to substitution effects (in other words, if Interior’s reforms cause a market shift from oil and gas to more expensive forms of energy). In contrast, the types of regional economic analyses that Interior frequently provides mostly capture “transfer” impacts because they describe substitution effects such as the reallocation of capital from one production region to another.³⁰⁷ While these transfer impacts are important to assess from a distributional perspective,³⁰⁸ they present a somewhat limited picture because Interior should take a broader perspective that does not prioritize particular regions of the country over others.

By providing a complete assessment of economic “costs” in the formal sense, assessing market-wide economic impacts would best facilitate a comparison to monetized environmental and social benefits from programmatic reforms, such as estimates of climate benefits using the Social Cost of Greenhouse Gases. In the past, BLM has alleged that the Social Cost of Greenhouse Gases would skew the analysis of fossil-fuel extraction projects because the agency did not conduct an equivalent assessment of “economic benefit” in the formal sense.³⁰⁹ While this argument was always legally questionable,³¹⁰ monetizing economic costs from a restriction in federal fossil-fuel development would undercut its factual premise and enable a transparent comparison of monetized costs and benefits of programmatic reforms. In doing so, Interior should also monetize other environmental impacts to the extent feasible (such as oil-spill risk and harms to water quality), while remembering that many critical environmental benefits are unmonetized and being sure to give those impacts due consideration.³¹¹

Lastly, a market-wide analysis of economic impacts would be advantageous because it would enable Interior to holistically assess the impact of different reforms together. While actions that curtail fossil-fuel development could incrementally increase energy prices and reduce energy demand, actions that facilitate renewable-energy development on federal lands and waters will have a largely countervailing impact by increasing energy supply, demand, and employment while decreasing prices. A market-wide economic analysis would enable Interior to holistically assess the aggregate impacts of these different actions, providing context to Interior’s programmatic reforms that siloed assessments could not.

Estimating market- and economy-wide impacts is challenging, and requires a sophisticated model. Accurately assessing economy-wide employment impacts, in particular, can be challenging because, as noted above, employment is fluid and workers reallocate between sectors—such as from fossil-fuel development to renewable energy development, recreation, and tourism—in response to government intervention, requiring a sophisticated general equilibrium model to reliably capture aggregate employment impacts. As outlined above, a robust energy-market model such as NEMS would provide the inputs needed for Interior to conduct such an analysis, as it provides aggregate estimates of supply, demand, and price impacts of different energy sources over time. Interior should ensure that any aggregate, economy-wide employment estimates are based on a robust general equilibrium model that recognizes market frictions.

2. *Assessing and Mitigating Employment Effects on Local Communities*

Interior's reforms will likely affect job opportunities in communities where federal oil and gas drilling supports the local economy, particularly over the long-term. On the one hand, reducing oil and gas leasing may lead to more employment opportunities in industries like tourism or fishing by reducing the environmental impact of leasing.³¹² On the other hand, limiting oil and gas leasing is likely to decrease job opportunities in the extraction industries. Currently, BLM estimates that about 318,000 Americans are employed in oil and gas extraction on federal lands.³¹³ Although this represents a small part of the overall U.S. economy,³¹⁴ these employment totals nonetheless represent the livelihoods of individuals and communities. Political rhetoric over these issues has also become increasingly heated in debates over projects like the Keystone Pipeline,³¹⁵ underscoring the need for Interior to provide an evidence-based assessment of how land-management reforms might affect employment patterns.

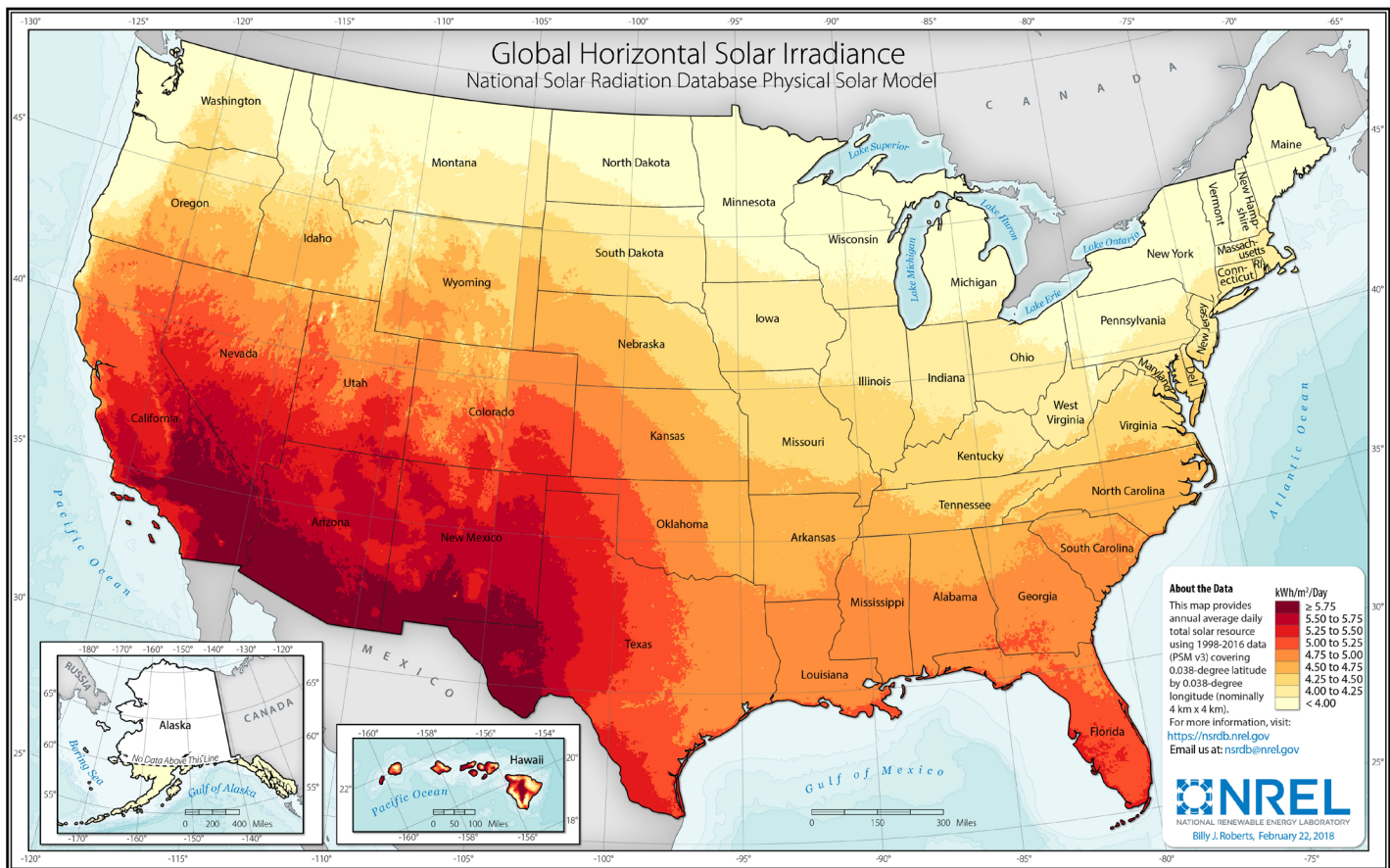
While politicians on both sides of the aisle have frequently touted the supposedly job-creating or job-killing nature of environmental policies, empirical research finds little evidence that environmental regulations have significant impacts on overall, economy-wide employment.³¹⁶ The Keystone Pipeline, for example, would have created just 10,000 temporary jobs lasting only 4–8 months each and only 35 permanent jobs.³¹⁷ Studies that have sought to quantify job effects for even the most significant environmental policies find comparatively small adverse national impacts that are dwarfed by environmental and public-health benefits.³¹⁸ Additionally, environmental policies may actually increase employment in some sectors because of a greater need for inspection, monitoring, and other labor intensive activities.³¹⁹

There are a number of reasons to believe that changes in land-management policies will similarly have a limited (and potentially positive) effect on overall employment. For one, oil and gas developers banked an enormous number of leases during the Trump administration.³²⁰ A recent analysis by the Center for American Progress found that companies control so many undeveloped parcels of federal lands that they could “begin new drilling operations on unused leases at the current rate for at least the next 10 years without access to any new leases.”³²¹ In the energy sector as a whole, moreover, many of the best paying jobs will still be in demand regardless of whether power is supplied by fossil fuels or renewable sources.³²² Utilities, for example, employ nearly as many workers as oil and gas drilling operations, and these jobs will be necessary even after a shift to clean energy.³²³ Recent data also suggests that renewable energy growth will create tens of thousands of new jobs per year by the end of the decade.³²⁴ As energy demand shifts from fossil fuels to renewable energy, so will employment and curtailing fossil-fuel extraction on public lands will simply hasten this transition.

However, even though land-management policies may have a negligible impact on overall employment or lead to increased demand for labor in some areas, certain communities may be disproportionately burdened by employment transitions.³²⁵ Labor markets do not always operate smoothly, and “[i]f workers have difficulty finding replacement employment, the social costs could be considerable, entailing relocation and training expenses, loss of skills and lifetime wages, and even psychological and health impacts.”³²⁶ In the case of oil and gas employees, it may be particularly difficult to shift employment if renewable energy jobs are created in other locations.³²⁷ Economic projections can help identify the specific sectors and regions expected to experience depressed labor demand because of employment redistribution.³²⁸ Interior should present such findings as part of any relevant analysis.

Once Interior identifies potential distributional effects from decreased oil and gas extraction, the federal government has several options to mitigate the adverse consequences for local communities. For instance, Interior could identify renewable resource generation potential in areas that are expected to experience a decline in fossil-fuel production and seek to site renewable projects in these areas.³²⁹ While there may be some constraints on siting particular projects because of geophysical conditions, such as sufficient exposure to wind or solar radiation,³³⁰ Interior could consider distributional impacts as a key factor in its determination.

Solar energy potential is particularly high in the southwest, where there is a high proportion of federal land



*Map provided by National Renewable Energy Laboratory, <https://www.nrel.gov/gis/assets/images/solar-annual-ghi-2018-usa-scale-01.jpg>.

One potential issue is the pay disparity between jobs in the fossil fuel and renewable sectors, with jobs in the latter commanding about \$45,000–\$64,000 annually compared to \$70,000–\$81,000 in the former.³³¹ The federal government can help close this gap by supporting unionization among renewable energy workers. According to the most recent U.S. Energy and Employment report, only about 4% of solar industry workers are unionized and 6% of wind industry workers are unionized.³³² In comparison, about 11% of workers in the natural gas generation sector are unionized as well as 10% in coal electric power generation, though only 4% of oil electric production workers are unionized.³³³

The Biden administration has repeatedly emphasized its desire to see high-paying union jobs as part of any transition to renewable energy.³³⁴ Interior has the statutory authority to directly support such jobs in the renewable energy sector by prioritizing projects that will be staffed by unionized and/or high-paying workers. BLM and BOEM are permitted to provide sites for renewable energy sources under FLMPA³³⁵ and OCSLA,³³⁶ respectively. Under current regulations, BLM has broad discretion to grant use of public lands for renewable energy projects, subject to exceptions for areas set aside for other specific uses.³³⁷ Using this authority, the agency could prioritize applications from developers that commit to offering high-paying and/or union jobs to construct and maintain renewable sources.

BOEM issues leases on a competitive basis,³³⁸ and has discretion to use a “multi-factor” bidding auction that weighs “public benefits” that could encompass employee unionization and compensation.³³⁹ BLM also has a competitive bidding process for the rights to build renewable energy facilities on public lands that are outside of designated leasing areas, and could similarly consider payroll impacts under this process.³⁴⁰ For instance, New York recently adopted a bonus

point system for renewable energy projects after concerns were raised that much of the current supply chain relies on overseas manufacturers.³⁴¹ Interior may also opt to prioritize developers who pledge to create jobs in areas expected to be affected by declines in federal oil and gas drilling production.³⁴² It may also be worth revisiting BLM's rule on the competitive terms for leasing public lands for solar and wind energy to improve renewables' competitiveness with oil and gas development.³⁴³

Other mechanisms for reducing the distributional employment effects on local communities include federal investment in capping abandoned oil and gas wells.³⁴⁴ There are currently about three million abandoned oil and gas wells across the U.S., and more than two million of these remain "unplugged."³⁴⁵ These wells can release millions of tons of methane, a potent greenhouse gas with vastly greater warming potential than carbon dioxide.³⁴⁶ A recent analysis of abandoned oil and gas wells in the Ohio River Valley found that a federal program to cap these wells could create annual job opportunities equivalent to those that have been lost in the oil and gas industry over the past several years, and noted that there is "a clear match between the skills of unemployed oil and gas workers and the requirements needed to plug orphaned and other abandoned wells properly."³⁴⁷ President Biden has recently made a commitment to invest \$16 billion in such projects, many of which are likely to occur on federal lands in Western states where numerous wells have been abandoned.³⁴⁸

Interior could also look to partner with agencies such as the Departments of Energy and Labor to identify communities that should receive research and development grants for new clean energy manufacturing. The Department of Energy recently announced the allocation of \$115 million for small businesses pursuing clean energy research and development projects, with the specific aim of fighting climate change while supporting job growth.³⁴⁹ President Biden's infrastructure proposal calls for an additional \$40 billion investment in a "Dislocated Workers Program" that would fund training in clean energy and manufacturing.³⁵⁰ By identifying the distributional consequences of land-management policy changes, Interior can help connect affected communities with these federal initiatives for a just transition to cleaner energy.

Finally, Interior should acknowledge that addressing climate change and local pollution through decreased oil and gas leasing will have positive distributional consequences. Minority and low-income communities are expected to suffer the most severe health effects from climate change, including harms from extreme heat, poorer air quality, allergens, and wildfires.³⁵¹ They are also more likely to experience energy insecurity from greater demand on the electric grid with higher temperatures, since they must spend a larger proportion of their income on utility bills.³⁵² These beneficial distributional effects from reductions in oil and gas extraction highlight the distributional tradeoffs of Interior's land-management policies. Rather than prompting Interior to maintain oil and gas development, employment effects should be addressed through separate programs that maintain the overall net societal benefits from reductions in greenhouse gases while ensuring that workers do not bear the brunt of our energy transition.

IV. Recommendations for Using Analytical Tools to Support Reform

Accurately estimating the impacts of reform is not just good practice. Interior can also use the tools discussed above to support bold reforms to the leasing program that curtail fossil-fuel leasing while ensuring that any leasing or extraction occurs on equitable terms that secures fair market value for American taxpayers. This section briefly lays out several recommendations for using the tools above to support potential reforms.

A. Increasing Royalty Rates to Account for Externalities (or Maximize Revenue)

There is widespread agreement that federal royalties for oil and gas are set too low. As detailed above, federal mineral royalties lag behind the royalty rates typically imposed by state and private landowners, depriving the federal government (and the state and local governments who share in federal royalties) of substantial revenue.³⁵³ Most royalties are still set at statutory minimums from decades ago, as Interior has failed to adjust them as the environmental harms from oil and gas extraction have come into focus, including the harms of climate change. The result is a system that encourages risky extraction without adequately compensating taxpayers.

From an economic standpoint, an attractive way for Interior to rein in costly extraction through its revenue policy is to set royalty rates at a level that internalizes the externalities of fossil-fuel extraction. Although Interior has not historically accounted for externalities in setting royalties rates, it should have ample legal leeway to do so. By law, Interior must receive “fair market value” for any onshore or offshore leasing³⁵⁴—a broad term that allows for a wide array of considerations. Particularly given the law’s concern for the environmental impacts of resource extraction on public lands and its charge for Interior to weigh those impacts in setting resource-management policy,³⁵⁵ it seems natural for Interior to account for externalities in assessing the “fair market value” of resource extraction. As one member of Congress explained before the statute’s enactment, the Mineral Leasing Act gives Interior “practically unlimited authority as to the granting and the terms and conditions of leases.”³⁵⁶ And there is substantial precedent both in legislative histories and academic literature to account for externalities in setting royalty rates.³⁵⁷

The Social Cost of Greenhouse Gases is a vital tool for capturing the externalities of fossil-fuel extraction. As detailed above, the Social Cost of Greenhouse Gases monetizes the climate change impacts of an incremental increase in greenhouse gas emissions.³⁵⁸ Those impacts can therefore be incorporated directly into the royalty rate. Other externalities from fossil-fuel extraction can also be accounted for in the royalty rate. Monetized impacts, such as economic losses from oil spills and pollutants like particulate matter, can also be directly incorporated into the royalty rate much like the Social Cost of Greenhouse Gases. Interior can also give qualitative consideration to unmonetized impacts, such as effects on wildlife, in setting royalty policy.

If Interior chooses to incorporate externalities into the royalty rate, it has several options for doing so varying by scale and purpose. One option is to account only for the externalities from upstream production, while deferring to other agencies to regulate downstream emissions. As some commentators have argued, this may minimize legal risk by avoiding the potential for “double counting” the cost of combustion externalities.³⁵⁹ To account for upstream externalities in the royalty rate, Interior would monetize upstream emissions using the Social Cost of Greenhouse Gases along with other upstream effects such as economic damage from oil spills. While fossil-fuel royalties are usually assessed *ad valorem*—that is, as a percentage of production revenues—Interior could consider the possibility of imposing externality costs on producers

on a per-unit basis, which would eliminate the confounding factor of resource price and potentially enable Interior to tailor the royalty charge to each producer depending on the amount of upstream greenhouse gas emissions or level of mitigation measures to reduce upstream emissions. If Interior takes an *ad valorem* approach (or even if it doesn't), it could assess upstream emissions by using average emissions figures.

Interior also has authority to mitigate downstream greenhouse gas emissions,³⁶⁰ which it too could do through the royalty rate. One option here is to simply apply a royalty adder to account for the full externality of downstream emissions—in other words, imposing the gross external costs on all fossil fuel extracted.³⁶¹ This approach would fully internalize the externalities of fossil-fuel extraction, but could lead to claims that the royalty rate is set too high because it does not account for substitution effects that offset the gross harms from fossil-fuel extraction on federal lands. Alternatively, Interior could apply a royalty adder that accounts for the net external costs of all fossil fuel extracted, accounting for leakage effects.³⁶² In that case, Interior would rely on its energy-market model to capture leakage and substitution effects and assess the net impacts from federal extraction. Interior would then apply the Social Cost of Greenhouse Gases, along with other monetization tools for additional externalities, to assess the damage costs from those net impacts, which it could incorporate into the royalty rate. Interior could assume full or near-full combustion under this approach,³⁶³ while potentially offering producers the opportunity to adjust the royalty charge if they can show that a lesser percentage of the extracted energy was combusted.

If Interior does not wish to directly account for externalities into the royalty rate,³⁶⁴ it could instead at least raise the royalty rate to maximize royalty revenue. When Interior raises royalty rates, it increases the cost of production and thereby incrementally disincentivizes production on federal lands. Accordingly, whether a rate increase will increase total revenues is a complicated question that requires modeling of market and substitution effects. Nonetheless, there is considerable evidence that current royalty rates are set well below the revenue-maximizing levels.³⁶⁵ To determine the revenue-maximizing royalty rate, Interior could apply its energy-market model to analyze how incremental royalty increases would affect energy substitution and federal production.

B. Using Cost-Benefit Analysis to Support Leasing Curtailments

The tools detailed above also provide the building blocks for Interior to assess the net benefits of its reforms through cost-benefit analysis. While cost-benefit analysis is routinely applied to assess the impacts of major regulations,³⁶⁶ it can also be “relevant to the choice among alternatives” under NEPA.³⁶⁷ Experience throughout the administrative state has shown that cost-benefit analysis is not only a good analytical tool for making policy choices,³⁶⁸ but if done correctly, can also insulate an agency's policies against rollbacks from future administrations.³⁶⁹

Cost-benefit analysis should support considerable leasing curtailments if those analyses make use of the analytical improvements recommended above. As an improved energy substitution model will likely show, substantial reductions in federal fossil-fuel extraction are expected to reduce total fossil-fuel extraction while accelerating a transition to renewable energy. The environmental benefits are therefore considerable, as curtailing fossil-fuel leasing eliminates the environmental and climate costs associated with the forgone production. Meanwhile, total economic costs, though real, are blunted by the fact that the avoided fossil-fuel extraction will largely be replaced by renewable-energy generation over the medium- and long-run.³⁷⁰ An improved energy-market model, combined with the use of established tools such as the social cost of greenhouse gases, should bring these effects to light.

In the past, however, Interior's use of cost-benefit analysis for project- or program-level determinations has been spotty. As noted above, for instance, BOEM's most recent five-year plan omitted the costs of catastrophic oil spills,³⁷¹ environmental option value,³⁷² and climate damages from its net benefits analysis.³⁷³ Additionally, because of the agency's deeply

flawed substitution model, its supplemental assessment of climate damages (which was omitted from the net benefits calculation) counter-intuitively concluded that expanding offshore drilling would reduce total greenhouse gas emissions.³⁷⁴

In contrast to BOEM's recent analyses, Interior should attempt to incorporate all monetizable costs and benefits into any cost-benefit analysis. As discussed above, an improved substitution model would enable the agency to reliably assess the market-wide effects of any reforms including impacts on prices, demand, and the mix of different energy sources (and attendant environmental impacts) over time. Social and environmental benefits could then be monetized using such tools as the Social Cost of Greenhouse Gases, existing tools to capture oil-spill risk, and (if possible) option value. This would enable Interior to fully capture the total economic costs of leasing curtailment and choose the option that maximizes social welfare after accounting for all unmonetized impacts.

C. Using Option Value to Tailor Reforms that Minimize Speculation

As detailed above, the informational value of delay—known as “option value”—can be quite substantial in the case of fossil-fuel extraction, as there are substantial uncertainties associated with drilling that the government would benefit from knowing in advance before granting producers the long-term option to drill.³⁷⁵ This is particularly the case when the uncertainties are especially high—as they often are in unexplored or environmentally sensitive regions.

As detailed above, Interior can and should take option value into account in making resource-management decisions. In particular, reforms to lease availability and terms that minimize speculation can rely heavily on Interior's consideration of option value. Starting with land management, consideration of option value can support numerous reforms that minimize speculation. For instance, option value strongly supports determinations not to lease low- or medium-potential lands, which are typically not extracted in the near-term. Option value also supports more stringent standards for lease renewals and extensions. Likewise, if Interior initiates reforms to the lease suspension process, it could also rely on option value.

Option value can also provide justification for reforms to the fiscal terms of leases that can reduce speculation. Most significantly, Interior may wish to consider raising minimum bids and rental fees to fairly compensate the public for its forgone option value. Quantitative evaluation of option value would be useful to help set monetary rates, but again, qualitative consideration would strongly support any reasonable increase.

D. Using Carbon Offsets to Minimize Greenhouse Gas Impacts

Although reforms such as curtailing leasing and revising royalty rates will limit extraction on lands that have not yet been leased, they do little to mitigate the effects from the vast amount of land that has already been leased but where production has not yet begun. At present, Interior often imposes certain requirements on leaseholders when they apply for a permit to drill to mitigate harms to the local environment.³⁷⁶ As part of the permitting process, Interior should require energy developers to purchase carbon offsets to mitigate the greenhouse gas impacts of the proposed extraction.

Carbon offsets enable applicants to compensate for the impact of greenhouse gas emissions associated with extraction by reducing emissions elsewhere. Examples of carbon offsets permitted in other governmental programs include mine and landfill methane capture, rice cultivation, destruction of ozone-depleting substances, livestock projects and agricultural methane avoidance, forestation, and end-use efficiency projects.³⁷⁷ Although carbon offsets have been criticized for failing to achieve their desired purpose³⁷⁸—and, for this reason, should be used as a last resort to mitigate greenhouse gas emissions, not a first resort³⁷⁹—they have been applied with relative success by the California Air Resources Board and the Regional Greenhouse Gas Initiative.³⁸⁰ If Interior requires offsets of unavoidable emissions, it should set standards

ensuring that offsets are “additional, quantifiable, real, and permanent.”³⁸¹ Offsets are a particularly attractive option for lands that have already been leased, where legal options for other avoidance and mitigation measures are fairly limited.

Requiring offsets of greenhouse gas emissions is a type of compensatory mitigation, a form of mitigation that is sanctioned in NEPA regulations³⁸² and that the Supreme Court has called “a hallmark of responsible land-use policy” by requiring project applicants to “internalize the negative externalities of their conduct.”³⁸³ Interior has made use of compensatory mitigation for more than thirty years,³⁸⁴ including requiring applicants to purchase carbon offsets to mitigate greenhouse gas emissions from individual projects. In 2008, BLM required a company seeking to expand its gypsum processing facility to “acquire recognized carbon credits to offset the Project’s increased [greenhouse gas] emissions.”³⁸⁵ And again in 2009, BLM approved an electric company’s application to construct a transmission project subject to the applicant’s commitment to either create greenhouse gas emission reductions or purchase carbon credits to fully offset emissions from project operation, maintenance, and inspection.³⁸⁶ More recently, BLM published a report embracing compensatory mitigation to offset greenhouse gas emissions resulting from the federal coal-leasing program.³⁸⁷ Interior also has authority to impose broad conditions on extraction as part of the planning, leasing, and permitting processes, which it could use to impose a net-zero emissions requirement.³⁸⁸ While such a requirement would be somewhat redundant with a carbon adder for new leases, it could be especially useful for restricting climate impacts from lands that have already been leased but not yet developed.

Interior has made use of compensatory mitigation for more than thirty years, including requiring applicants to purchase carbon offsets to mitigate greenhouse gas emissions from individual projects. A net-zero emissions requirement in federal planning, leasing, and permitting would follow this precedent.

If Interior imposes an offset requirement, it could begin by applying that requirement to direct emissions only, as direct emissions are relatively straightforward to quantify and fall squarely within the agency’s jurisdiction. Interior may also wish to consider extending this requirement to indirect emissions. The Commission could coordinate with agencies that exercise authority over midstream and downstream emissions, such as the Federal Energy Regulatory Commission and Environmental Protection Agency, to ensure consistency across government policy without either under- or double-counting the indirect greenhouse gas emissions. If Interior imposes an offset requirement for indirect emissions on its own, it could use its substitution model to calculate the net downstream emissions that need to be offset.

Conclusion

The ongoing programmatic review of Interior's oil and gas leasing program provides an opportunity to institute long-overdue reforms to curtail leasing, reform lease terms, and restore balance to federal land management consistent with national climate goals. This report endorses broad reforms and suggests numerous ways that Interior can support and inform those reforms using economic tools. Through use of these methodologies, Interior can both break from past policy and create a strong basis for reforms that will be difficult for a future presidential administration to roll back.

Endnotes

- ¹ Exec. Order 14,008 § 208 (Jan. 27, 2021).
- ² U.S. Dep’t of the Interior, Secretary Haaland Delivers Remarks at Interior’s Public Forum on the Federal Oil and Gas Program (Mar. 25, 2021), DOI NEWS, <https://perma.cc/W7JX-2C4N> [hereinafter “Haaland Remarks”].
- ³ See Cong. Rsch. Serv., *Federal Land Ownership: Overview and Data* 1, 6-9 (Feb. 21, 2020), <https://fas.org/sgp/crs/misc/R42346.pdf> (noting that this tally does not include lands in marine refuges or national monuments, nor lands in the Outer Continental Shelf).
- ⁴ See Nada Culver, Presentation at Public Forum on Federal Oil and Gas Program (Mar. 25, 2021) (on file with author).
- ⁵ See *Oil and Gas Energy: Facilitating the Responsible Development of Oil and Gas Resources on the OCS*, BOEM, [https://www.boem.gov/oil-and-gas-energy#:~:text=Breadcrumb&text=The%20Outer%20Continental%20Shelf%20\(OCS,3%20million%20OCS%20acres](https://www.boem.gov/oil-and-gas-energy#:~:text=Breadcrumb&text=The%20Outer%20Continental%20Shelf%20(OCS,3%20million%20OCS%20acres) (last updated May 1, 2021).
- ⁶ See generally Thomas Helbling, *Externalities: Prices Do Not Capture All Costs*, FIN. & DEV., June 1, 2018, at 38, <https://www.imf.org/external/pubs/ft/fandd/basics/38-externalities.htm> (“When there are differences between private and social costs or private and social returns, the main problem is that market outcomes may not be efficient.”).
- ⁷ See *id.*
- ⁸ See Josh Lederman & Denise Chow, *Biden Commits to Cutting U.S. Emissions in Half by 2030 As Part of Paris Climate Pact*, NBC NEWS (Apr. 22, 2021), <https://www.nbcnews.com/politics/white-house/biden-will-commit-halving-u-s-emissions-2030-part-paris-n1264892>.
- ⁹ Int’l Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector* 18 (2021), <https://www.iea.org/reports/net-zero-by-2050> (explaining that meeting international energy goals requires “a huge decline in the use of fossil fuels”).
- ¹⁰ See Matthew D. Merrill, Benjamin M. Sleeter, Philip A. Freeman, Jinxun Liu, Peter D. Warwick & Bradley C. Reed, *Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14*, U.S. GEOLOGICAL SURVEY 8 (2018), <https://pubs.usgs.gov/sir/2018/5131/sir20185131.pdf>.
- ¹¹ Federal Lands Emissions Accountability Tool, THE WILDERNESS SOC’Y, <https://www.wilderness.org/articles/article/federal-lands-emissions-accountability-tool> (last visited July 29, 2021).
- ¹² See Jamie Pleune, John Ruple & Nada Culver, *The BLM’s Duty to Incorporate Climate Science into Permitting Practices and a Proposal for Implementing a Net Zero Requirement into Oil and Gas Permitting*, 32 COLO. NAT. RES., ENERGY & ENV’T L. REV. (forthcoming 2021) at 29–30, <https://papers.ssrn.com/abstract=3756375>.
- ¹³ See U.S. Dep’t of the Interior, *Strategic Plan for Fiscal Years 2018–2022* (2017), <https://www.doi.gov/sites/doi.gov/files/uploads/fy2018-2022-strategic-plan.pdf>.
- ¹⁴ See Greenpeace USA, Friends of the Earth, Union of Concerned Scientists, *Briefing: Voices of Scientists at Interior Department Agencies* (2018), <https://www.greenpeace.org/usa/wp-content/uploads/2018/08/BOEM-BSEE-Science-Survey-Briefing-v1.pdf>.
- ¹⁵ See The Wilderness Soc., *Measuring the Climate Impact of Trump’s Reckless Leasing of Public Lands* 1 (2019), https://www.wilderness.org/sites/default/files/media/file/TWS%20Report_Measuring%20the%20climate%20impact%20of%20Trump%20careless%20leasing%20of%20public%20lands_July%202019.pdf.
- ¹⁶ See *id.* at 1, 7 (calculating that “the potential carbon emissions associated with the federal leases issued during just two years of the Trump administration represent around 38% of the burnable carbon allowed under a federal budget aligned with the 1.5-degree goal. That’s atop the 40 million acres of onshore and offshore leases already issued. Racking up this kind of carbon debt will limit the decision space for future efforts to reduce emissions and make solutions more expensive”).
- ¹⁷ See Am. Geosciences Inst., *Air Quality Impacts of Oil and Gas: Emissions from Production, Processing, Refining, and Use* 18-1, 18-1, 18-2 (2018), https://www.american-geosciences.org/sites/default/files/AGI_PE_AirQuality_web_final_0.pdf (“Oil- and gas-producing areas may have high levels of volatile organic compounds (VOC) that contribute to harmful ozone formation in the lower atmosphere. VOCs are emitted by vehicles and equipment used in oil operations as well as in surrounding roads and communities. VOCs also evaporate directly from the oil and gas being extracted, stored, and transported around the oilfield.”); see also Ctr. for Biological Diversity, *Federal Judge Rejects Approval of Federal Oil, Gas Leases in Utah* (Dec. 11, 2020), <https://biologicaldiversity.org/w/news/press-releases/federal-judge-rejects-approval-federal-oil-gas-leases-utah-2020-12-11/> (noting that oil and gas development in Utah’s Uinta Basin has elevated ozone pollution to levels comparable to urban areas like Los Angeles and Denver).
- ¹⁸ See, e.g., *Wildearth Guardians v. BLM*, 457 F. Supp. 3d 880, 885 (D. Mont. 2020).

- ¹⁹ See, e.g., *W. Watersheds Project v. Zinke*, 441 F. Supp. 3d 1042, 1085 (D. Idaho 2020) (finding that BLM had not sufficiently considered the impact of leasing on the threatened sage grouse species).
- ²⁰ See, e.g., Jonathan Thompson, *The Big Public Land Sell-Out*, HIGH COUNTRY NEWS (Jan. 31, 2018), <https://www.hcn.org/issues/50.3/energy-industry-the-big-public-land-sell-out> (discussing the threat to Chaco canyon from BLM's leasing plans).
- ²¹ Jennifer Oldham, *Oil Drilling on Sensitive New Mexico Public Lands Puts Drinking Water, Rare Caves at Risk*, NAT'L GEOGRAPHIC, (Feb. 3, 2021), <https://www.nationalgeographic.com/environment/article/oil-drilling-sensitive-new-mexico-public-lands-puts-drinking-water-rare-caves-at-risk>.
- ²² See *Mont. Wildlife Fed'n v. Bernhardt*, No. cv-18-69-GF-BMM, 2020 WL 2615631, at *12 (D. Mont. May. 22, 2020)
- ²³ See Juliet Eilperin & Darryl Fears, *Judge Voids Nearly 1 Million Acres of Oil and Gas Leases, Saying Trump Policy Undercut Public Input*, WASH. POST (Feb. 28, 2020), <https://www.washingtonpost.com/climate-environment/2020/02/27/judge-voids-nearly-1-million-acres-oil-gas-leases-saying-trump-policy-undercut-public-input/>.
- ²⁴ See Jodi Peterson, *The BLM Leases Lands Near Chaco Canyon for \$3 Million*, HIGH COUNTRY NEWS (Jan. 27, 2017), <https://www.hcn.org/articles/land-near-chaco-canyon-leased-for-oil-and-gas-development>.
- ²⁵ See Int'l Energy Agency, *The Future of Petrochemicals* 1–11 (2018), <https://iea.blob.core.windows.net/assets/86080042-1c55-4c37-9c20-d3390aa5e182/English-Future-Petrochemicals-ES.pdf> (explaining how oil and gas are being increasingly used for petrochemical products, including plastics).
- ²⁶ See Nat. Res. Def. Council, *Offshore Drilling: Putting the Nation's Coastline at Risk* (Apr. 2020), <https://www.nrdc.org/sites/default/files/offshore-drilling-coastline-risk-fs.pdf>.
- ²⁷ For a list of local governments, business groups, fishing interests, and state officials that oppose offshore drilling, see *Grassroots Opposition to Offshore Drilling and Exploration in the Atlantic Ocean and off Florida's Gulf Coast*, OCEANA, <https://usa.oceana.org/climate-and-energy/grassroots-opposition-offshore-drilling-and-exploration-atlantic-ocean-and>.
- ²⁸ See Oceana, *Offshore Drilling Fuels the Climate Crisis and Threatens the Economy 2* (Jan. 2021), https://usa.oceana.org/sites/default/files/2021/01/27/final_climate_economy_fact_sheet_m1_doi.pdf.
- ²⁹ BOEM, 2017–2022 Outer Continental Shelf Oil and Gas Leasing Proposed Final Program 5-16 (2016), <https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2017-2022/2017-2022-OCS-Oil-and-Gas-Leasing-PFP.pdf> (admitting that BOEM's oil-spill model does not “represent impacts on unique resources or from catastrophic oil spills”) [hereinafter “2017–2022 Final Program”].
- ³⁰ 43 U.S.C. § 1701(a)(9)..
- ³¹ Wilderness Soc'y & Ctr. W. Priorities, *America's Public Lands Giveaway* (Apr. 2020), <https://storymaps.arcgis.com/stories/36d517f10bb0424493e88e3d22199bb3>.
- ³² Kate Kelly, Jenny Rowland-Shea & Nicole Gentile, *Backroom Deals: The Hidden World of Noncompetitive Oil and Gas Leasing*, CTR. AM. PROGRESS (May 23, 2019), <https://www.americanprogress.org/issues/green/reports/2019/05/23/470140/backroom-deals/>.
- ³³ Emily Holden, Jimmy Tobias & Alvin Chang, *Revealed: The Full Extent of Trump's 'Meat Cleaver' Assault on US Wilderness*, THE GUARDIAN (Oct. 26, 2020), <https://www.theguardian.com/environment/ng-interactive/2020/oct/26/revealed-trump-public-lands-oil-drilling>.
- ³⁴ See Kelly et al., *supra* note 32 (“The free-for-all nature of the nomination process lends itself to abuse. An unscrupulous company or individual can easily and anonymously nominate parcels that they have no intention of bidding for in the competitive auction in order to buy it cheaply later. As-is, the system is rigged to allow for—and even encourage—speculation.”).
- ³⁵ See 43 C.F.R. § 3120.3-4; *id.* § 3120.3-1 (allowing BLM to reject an “expression of interest” in the informal nomination process).
- ³⁶ See *id.* § 3120.3-1 (describing the nomination process).
- ³⁷ BLM, *Acres Offered for Lease and Acres Sold, Calendar Years 2009-2018*, https://www.blm.gov/sites/blm.gov/files/Table%20_11_Acreage_Offered_at_Competitive_Lease_Sale_Auctions_Since_January_1_2009.pdf.
- ³⁸ See Cong. Budget Off., *Options for Increasing Federal Income from Crude Oil and Natural Gas on Federal Lands 2* (2016), https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51421-oil_and_gas_options-OneCol-3.pdf; see also 30 U.S.C. § 226(b)(3)(c) (outlining non-competitive leasing process).
- ³⁹ See The Wilderness Soc'y, *Land Hoarders: How Stockpiling Leases is Costing Taxpayers 1* (2015), <https://www.wilderness.org/sites/default/files/media/file/TWS%20Hoarders%20Report-web.pdf> [hereinafter “Land Hoarders”].
- ⁴⁰ Compare BLM, Oil and Gas Statistics, Table 6: Acreage of Producing Leases with Table 2: Acreage in Effect, <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics> (last visited July 29, 2021).
- ⁴¹ See *id.*
- ⁴² See Jayni Hein et al., Inst. for Pol'y Integrity, *Look Before You Lease: Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value* 11 (2020), https://policyintegrity.org/files/publications/Option_Value_Report.pdf

“The game of speculation is risky for private developers,⁷⁸ but perhaps more detrimental to the public. Typically, the term of a lease will expire with relatively little in the way of new information, in which case low-potential land has been excluded from playing a more beneficial environmental or social role. In the occasional cases where delay proves to enhance the value of a lease, this additional value accrues disproportionately to the private developer.”)

⁴³ BOEM, *Combined Leasing Report As of April 1, 2021*, at 1 <https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/oil-gas/Lease%20stats%204-1-21.pdf> (showing that nearly 9.98 million out of the 12.4 million of total leased acreage of active offshore leases—nearly 80%—is currently non-producing).

⁴⁴ See Tyler McIntosh, *The Oil Industry’s Forfeited Public Lands Stockpile*, CTR. WESTERN PRIORITIES (Mar. 23, 2021), <https://westernpriorities.org/2021/03/23/the-oil-industrys-forfeited-public-lands-stockpile/>.

⁴⁵ Land Hoarders, *supra* note 39, at 3.

⁴⁶ See Cong. Budget Off., *supra* note 38, at 23.

⁴⁷ See BOEM Econ. Div., *Recommended Discount Rates and Policies Regarding Special Case Royalty Relief for Oil and Gas Projects in Shallow Water 3* (2019), [https://www.boem.gov/sites/default/files/documents/oil-gas-energy/energy-economics/SW_SCRR_Discount_Rate_Paper.pdf#:~:text=In%20the%20most%20recent%20Gulf,or%2018.75%25%20\(in%20either%20shallow](https://www.boem.gov/sites/default/files/documents/oil-gas-energy/energy-economics/SW_SCRR_Discount_Rate_Paper.pdf#:~:text=In%20the%20most%20recent%20Gulf,or%2018.75%25%20(in%20either%20shallow).

⁴⁸ Cong. Rsch. Serv., *Mineral Royalties on Federal Lands: Issues for Congress 3* (updated Jan. 19, 2015), <https://crsreports.congress.gov/product/pdf/R/R43891>.

⁴⁹ See Gov’t Accountability Off., *Federal Oil and Gas Revenue: Actions Needed to Improve BLM’s Royalty Relief Policy 4–5*, 8 (Oct. 6, 2020), <https://www.gao.gov/assets/gao-21-169t.pdf>.; Rachel Frazin, *Land Management Bureau Lessens Requirements for Oil and Gas Royalty Cut Requests*, THE HILL (June 18, 2020), <https://thehill.com/policy/energy-environment/503411-land-management-bureau-alters-guidance-for-royalty-cuts-prompting>.

⁵⁰ Jayni Foley Hein & Caroline Cecot, *Mineral Royalties: Historical Uses and Justifications*, 28 DUKE ENV’T L. & POL’Y FORUM 1, 1 (2017) (“[I]t would be appropriate for governments to adjust mineral royalty rates to account for negative externalities not otherwise addressed by regulation or to otherwise promote public welfare. Such use of royalties is consistent with the historical record.”)

⁵¹ Exec. Order No. 14,008 § 208.

⁵² *Id.*

⁵³ *Id.* § 207.

⁵⁴ In February 2021, for instance, BOEM cancelled an oil and gas lease sale that would have auctioned off over 79 million acres in the Gulf of Mexico. See Record of Decision: Gulf

of Mexico, Outer Continental Shelf (OCS), Oil and Gas Lease Sale 257, 86 Fed. Reg. 6,365 (Jan. 21, 2021); Rescission: Gulf of Mexico, Outer Continental Shelf (OCS), Oil and Gas Lease Sale 257, 86 Fed. Reg. 10,132 (Feb. 18, 2021). BLM state offices also cancelled regularly scheduled quarterly lease sales.

⁵⁵ *Louisiana v. Biden*, No. 2:21-CV-00778, 2021 WL 2446010 (W.D. La. June 15, 2021).

⁵⁶ ONRR 2020 Valuation Reform and Civil Penalty Rule: Delay of Effective Date; Request for Public Comment, 86 Fed. Reg. 9286 (Feb. 12, 2021) (delaying the effective date of ONRR 2020 Valuation Reform and Civil Penalty Rule, 86 Fed. Reg. 4612 (Jan. 15, 2021)). Interior has now proposed to rescind the Trump-era regulation altogether. ONRR 2020 Valuation Reform and Civil Penalty Rule: Notification of Proposed Withdrawal, 86 Fed. Reg. 31,196 (June 11, 2021).

⁵⁷ See Benjamin Storrow et al., *Biden Offshore Wind Plan Faces Northeast Climate, Jobs Test*, EENEWS (Mar. 30, 2021).

⁵⁸ Dep’t of Interior Off. of the Solicitor, *Opinion M-37067: Secretary’s Duties under Subsection 8(p)(4) of the Outer Continental Shelf Lands Act When Authorizing Activities on the Outer Continental Shelf 1–5* (Apr. 9, 2021), <https://perma.cc/6JZN-KHKS>.

⁵⁹ Dep’t of the Interior, *Interior Department Announces Details for Public Forum on Federal Oil and Gas Program* (Mar. 18, 2021), <https://www.doi.gov/pressreleases/interior-department-announces-details-public-forum-federal-oil-and-gas-program>.

⁶⁰ Haaland Remarks, *supra* note 2 (“During the past four years, the Trump Administration offered vast swaths of our public lands and waters for drilling, prioritizing fossil fuel development above all other uses on public lands and waters. . . . In order to tackle the climate crisis and strengthen our nation’s economy, we must manage our lands, waters, and resources not just across fiscal years, but across generations.”).

⁶¹ Lease suspensions effectively enable fossil-fuel developers to maintain control over leases that should have expired years earlier. BLM in particular has liberally granted requests for suspensions and maintained those suspensions long-term. As of 2018, more than 2,700 leases were being suspended by BLM—nearly 1,000 of which had been suspended for ten years or longer. Gov’t Accountability Off., *Oil and Gas Lease Management: BLM Could Improve Oversight of Lease Suspensions with Better Data and Monitoring Procedures 17* (June 19, 2018), <https://www.gao.gov/assets/gao-18-411.pdf>. See also The Wilderness Soc’y, *Land Hoarders* at 3.

⁶² For instance, Interior may revise its rule on competitive terms for leasing public lands for solar and wind energy.

- ⁶³ See The White House, *Fact Sheet: List of Agency Actions for Review* (Jan. 20, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/20/fact-sheet-list-of-agency-actions-for-review/>.
- ⁶⁴ Waste Prevention, Production Subject to Royalties, and Resource Conservation; Rescission or Revision of Certain Requirements, 83 Fed. Reg. 49184 (Sept. 28, 2018) (rescinding Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016)). The 2018 rescission was judicially vacated by a federal district court in July 2020. *California v. Bernhardt*, 472 F. Supp. 3d 573 (N.D. Cal. 2020). Subsequently, in October 2020, the 2016 regulation was also vacated by a federal district court. *Wyoming v. United States Dep't of the Interior*, No. 2:16-CV-0280-SWS, 493 F. Supp. 3d 1046 (D. Wyo. Oct. 8, 2020). The two decisions are each currently on appeal, respectively, in the Ninth and Tenth Circuits.
- ⁶⁵ Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands; Rescission of a 2015 Rule, 82 Fed. Reg. 61924 (Dec. 29, 2017) (rescinding Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 80 Fed. Reg. 16,128 (Mar. 26, 2015)).
- ⁶⁶ Oil and Gas and Sulfur Operations in the Outer Continental Shelf—Blowout Preventer Systems and Well Control Revisions, 84 Fed. Reg. 21908 (May 15, 2019) (revising Oil and Gas and Sulfur Operations in the Outer Continental Shelf—Blowout Preventer Systems and Well Control, 81 Fed. Reg. 25,888 (Apr. 29, 2016)).
- ⁶⁷ This idea has gained traction in recent years. See, e.g., Pleune et al., *supra* note 12, manuscript at 81–88 (arguing that an offset requirement could be imposed after leasing, at the application for permit to drill stage).
- ⁶⁸ BLM, Federal Coal Program: Programmatic Environmental Impact Statement-Scoping Report 6-17 (2017) (proposing that the agency “receive compensation for unavoidable impacts associated with carbon-based externalities from lessees in the form of a fee paid at lease issuance based on the units of coal produced,” which BLM would then use to “ensur[e] that the desired outcomes of compensatory mitigation are achieved”).
- ⁶⁹ Exec. Order No. 14,008 § 208 (calling on Interior to “consider whether to adjust royalties” to “account for corresponding climate costs” from resource extraction).
- ⁷⁰ The Council on Environmental Quality specifically authorizes agencies to consider appropriate mitigation measures for any project, including “compensating for the impact by replacing or providing substitute resources or environments.” 40 C.F.R. § 1508.1(s)(5); see also Final Guidance for Federal Departments and Agencies on the Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact, 76 Fed. Reg. 3843, 3848 (Jan. 21, 2011) (explaining that “many agencies develop and consider committing to mitigation measures to . . . compensate for potentially significant adverse environmental impacts”). This is often referred to as “compensatory mitigation.”
- ⁷¹ A recent analysis estimated that a 44% carbon adder would increase government revenue by \$6.1 billion annually while decreasing aggregate carbon dioxide emissions by 42 million metric tons per year. Brian C. Prest & James H. Stock, *Climate Royalty Surcharges* 17 tbl.3 (Nat’l Bureau of Econ. Res. Working Paper No. 28564, 2021).
- ⁷² See 30 U.S.C. § 181 et seq.
- ⁷³ See 43 U.S.C. § 1701 et seq.
- ⁷⁴ See *id.* § 1331 et seq.
- ⁷⁵ *Id.* § 1701(a)(7).
- ⁷⁶ *Id.* § 1702(c).
- ⁷⁷ *Id.*
- ⁷⁸ See Thomas R. Delehanty, *Executive Authority to Keep it in The Ground: An Administrative End to Oil and Gas Leasing on Federal Land*, 35 UCLA J. ENV’T L. & POL’Y 145, 151 (2017).
- ⁷⁹ *Harvey v. Udall*, 384 F.2d 883, 885 (10th Cir. 1967) (citing S. Subcomm. of the Comm. on Interior & Insular Affairs, *The Investigation of Oil and Gas Lease Practices*, 84th Cong., 2d Sess. 2 (1957)).
- ⁸⁰ See 43 U.S.C. § 1331 et seq.
- ⁸¹ *Id.* § 1802.
- ⁸² See *id.* § 1344.
- ⁸³ See *id.* § 1344(a)(2)(A), (H).
- ⁸⁴ *Id.* § 1340(g)(3).
- ⁸⁵ *Id.* § 1712(c)(7).
- ⁸⁶ *Id.* § 1344 (a)(1).
- ⁸⁷ *Id.* § 1344 (a)(3).
- ⁸⁸ See 43 C.F.R. § 1601.0-6 (explaining the need to comply with NEPA in Resource Management Plans).
- ⁸⁹ See *WildEarth Guardians v. Zinke*, 368 F. Supp. 3d 41, 54 (D.D.C. 2019) (noting that “[a]t the leasing stage an EIS may be required, but is not mandated by regulation”).
- ⁹⁰ See 43 C.F.R. § 3162.5-1.
- ⁹¹ See 42 U.S.C. §§ 4332(2)(B), (2)(C)(i), (ii).
- ⁹² See 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.”).
- ⁹³ *Calvert Cliffs’ Coordinating Comm., Inc. v. United States Atomic Energy Com.*, 449 F.2d 1109, 1113 (D.C. Cir. 1971). See also, e.g., *Chelsea Neighborhood Ass’ns v. U.S. Postal Serv.*, 516 F.2d 378, 386 (2d Cir. 1975) (“NEPA, in effect, requires a broadly defined cost-benefit analysis of major federal activities.”); *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); *Nat’l Wildlife Fed’n 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.”).
- ⁹⁴ See Nada Wolff Culver, *Interior Department Ignores the Rule and Rulings of Law*, BLOOMBERG L. (Nov. 4, 2020), <https://news.bloomberglaw.com/environment-and-energy/interior-department-ignores-the-rule-and-rulings-of-law> (describing challenges to the Trump Administration’s oil and gas leasing for flouting NEPA’s requirements).
- ⁹⁵ See *High Country Conservation Advocs. v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014) (“Even though NEPA does not require a cost-benefit analysis, it was nonetheless 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 analysis was in fact possible and was included in an earlier draft EIS.”).
- ⁹⁶ *Center for Biological Diversity v. Bernhardt*, 982 F.3d 723 (9th Cir. 2020).
- ⁹⁷ See *WildEarth Guardians*, 368 F. Supp. 3d at 83 (finding that BLM failed to fulfill NEPA’s requirements by not considering greenhouse gas emissions in environmental impact assessments at the leasing stage).
- ⁹⁸ See *Mont. Env’t Info. Ctr. v. United States Off. of Surface Mining*, 274 F. Supp. 3d 1074, 1096 (D. Mont. 2017) (finding it was “arbitrary and capricious to quantify the benefits of an action while failing to quantify the costs of the action even though such an analysis was possible”).
- ⁹⁹ See, e.g., BOEM, *Economic Analysis Methodology for the 2017–2022 Outer Continental Shelf Oil and Gas Leasing Program 1-1* (2016), <https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2017-2022/Economic-Analysis-Methodology.pdf>.
- ¹⁰⁰ See Caroline Cecot, *Deregulatory Cost-Benefit Analysis and Regulatory Stability*, 68 DUKE L.J. 1593, 1623 (2019) (“When an agency wants to change course pursuant to a new CBA, it relies on a new summary of facts. That new CBA would have to explain the key differences and confront the fact that significant investments might have been incurred in reliance on the prior policy. This transforms the judicial review from a soft look that assesses technical inputs to a hard look that ensures that the agency provides reasoned explanations for any deviations.”).
- ¹⁰¹ See *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (describing how agencies should evaluate evidence before them and rely on their expertise in promulgating regulations).
- ¹⁰² *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2126 (2016) (quoting *FCC v. Fox Television Stations Inc.*, 556 U.S. 502, 515 (2009)); see also *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 516 (2009) (“[A] reasoned explanation is needed for disregarding facts and circumstances that underlay or were engendered by the prior policy.”); *id.* at 537 (Kennedy, J., concurring) (“An agency cannot simply disregard contrary or inconvenient factual determinations that it made in the past, any more than it can ignore inconvenient facts when it writes on a blank slate.”).
- ¹⁰³ *Bernhardt*, 472 F. Supp. 3d at 600 (finding that BLM did not provide a “reasoned explanation” for disregarding prior factual findings in its Waste Prevention Rule).
- ¹⁰⁴ See Bethany A. Davis Noll, “Tired of Winning”: *Judicial Review of Regulatory Policy in the Trump Era*, ADMINISTRATIVE L. REV. (forthcoming 2021) (manuscript at 37-41) https://policyintegrity.org/documents/Davis_Noll_-_Tired_of_Winning_Oct_28.pdf (finding that “contrary to the view that the Trump administration has succeeded in killing good cost-benefit analysis, courts have been setting aside agency rules that are based on bad analysis”).
- ¹⁰⁵ See *Bernhardt*, 472 F. Supp. 3d at 613 (faulting the agency for relying on an estimate that ignores the “important spillover effects given the global nature of climate change”). While the prior methane rule was later struck down by district court in Wyoming struck on a direct challenge, this does not undermine the point that agency reversals are less likely to be successful when the underlying regulation was supported by a strong cost-benefit assessment. See Davis Noll, *supra* note 104, at 40.
- ¹⁰⁶ *Center for Biological Diversity*, 982 F.3d at 723.
- ¹⁰⁷ *Ctr. for Sustainable Economy v. Jewell*, 779 F.3d 588, 609 (D.C. Cir. 2015) (“[F]orgoing additional leasing on the [Outer Continental Shelf] would cause an increase in the use of substitute fuels such as renewables, coal, imported oil and natural gas, and a reduction in overall domestic energy consumption from greater efforts to conserve in the face of higher prices”); see also Prest & Stock, *supra* note 71, at 7 (“In general, nonfederal production will increase by less than the decline in federal production because, at the higher price, consumer demand falls, so the total quantity of oil and gas used declines.”).
- ¹⁰⁸ Cheapest, that is, for the energy producer. Externalities borne by the public—such as climate and other environmental and health costs—do not factor into the producer’s business decisions unless they are internalized.
- ¹⁰⁹ See N. Gregory Mankiw, *Principles of Economics* 74–78, 80–81 (5th ed. 2008).
- ¹¹⁰ See Michael Burger & Jessica Wentz, *Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review*, 41 HARV. ENV’T. L. REV. 109, 150–52 (2017) (highlighting economic flaws and judicial rejection of “perfect substitution” hypothesis).

- ¹¹¹ See Charles Teplin et al., ROCKY MTN. INST., *The Growing Market for Clean Energy Portfolios: Economic Opportunities for a Shift from New Gas-Fired Generation to Clean Energy across the United States Electricity Industry*, (2019), available at <https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants> (demonstrating that the sharp decline in the cost of renewables likely will crowd out the demand for gas-fueled electricity in the coming decades).
- ¹¹² Burger & Wentz, *supra* note 110, at 113 & n.12 (collecting cases “holding that agencies are required to consider upstream and/or downstream emissions in the context of certain types of proposals, such as the approval of coal leasing plans and railways intended to transport coal from mines to power plants”).
- ¹¹³ The overwhelming majority of energy that enters the market is combusted. In 2020, for instance, 3.6% of natural gas was used for non-combustion purposes and 96.4% was combusted. See U.S. Energy Info. Admin., March 2021 Monthly Energy Review 24, 101 (Mar. 25, 2021), <https://perma.cc/FX6E-L8T8> (showing that 1,090 billion cubic feet of natural gas was used for non-combustion purposes in 2020, out of 30,482 billion cubic feet of natural gas consumed that year).
- ¹¹⁴ James Bradbury et al., *Greenhouse Gas Emissions and Fuel Use Within the Natural Gas Supply Chain*, DEP’T OF ENERGY 4 (2015) (attributing roughly 80% of all greenhouse emissions generated by natural-gas supply chain to combustion); see also BOEM, *OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon v* (2016) [hereinafter “Lifecycle Greenhouse Gas Emissions”] (“Most lifecycle GHG emissions are the result of the consumption of oil and gas products.”).
- ¹¹⁵ *Sierra Club v. Fed. Energy Reg. Comm’n*, 867 F.3d 1357, 1373–74 (D.C. Cir. 2017).
- ¹¹⁶ *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1082 (9th Cir. 2011).
- ¹¹⁷ *Diné Citizens Against Ruining Our Env’t v. Off. of Surface Mining, Reclamation & Enf’t*, 82 F. Supp. 3d 1201 (D. Colo. 2015); *WildEarth Guardians v. Off. of Surface Mining, Reclamation & Enf’t*, 104 F. Supp. 3d 1208, 1230 (D. Colo. 2015). Both decisions were vacated by the Tenth Circuit on unrelated jurisdictional grounds.
- ¹¹⁸ See, e.g., *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549 (8th Cir. 2003) (“[T]he proposition that the demand for [energy] will be unaffected by an increase in availability and a decrease in price, which is the stated goal of the [P]roject, is illogical at best.”).
- ¹¹⁹ *WildEarth Guardians v. BLM*, 870 F.3d 1222, 1236 (10th Cir. 2017).
- ¹²⁰ Jayni Hein et al., *Pipeline Approvals and Greenhouse Gas Emissions*, INST. POL’Y INTEGRITY 24 (2019), https://policyintegrity.org/files/publications/Pipeline_Approvals_and_GHG_Emissions.pdf.
- ¹²¹ BLM & OSM, Environmental Assessment, Federal Coal Lease (COC-62920) Modification and Federal Mine Permit (CO-0106A) Revision and Renewal 5 (Oct. 12, 2017), available at <https://bit.ly/2ufWNSL>.
- ¹²² *WildEarth Guardians*, 870 F.3d at 1238.
- ¹²³ *Mid States*, 345 F.3d at 549–50.
- ¹²⁴ *Indigenous Env’t Network v. U.S. Dep’t of State*, 347 F. Supp. 3d 561, 574–77 (D. Mont. 2018), order amended and supplemented, 369 F. Supp. 3d 1045 (D. Mont. 2018), and appeal dismissed and remanded sub nom. *Indigenous Env’t Network v. U.S. Dep’t of State*, No. 18-36068, 2019 WL 2542756 (9th Cir. June 6, 2019).
- ¹²⁵ See ONRR 2020 Valuation Reform and Civil Penalty Rule, 86 Fed. Reg. 4612, 4614–15, 4651 (Jan. 15, 2021).
- ¹²⁶ Executive Order 12,866 calls for agencies to conduct an assessment of the costs and benefits of all major regulations and to “adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.” Exec. Order No. 12,866 §1(b)(6), 58 Fed. Reg. 51,735 (Oct. 4, 1993).
- ¹²⁷ Off. of Mgmt. & Budget, *Circular A-4 on Regulatory Analysis* 38 (2003) (explaining that costs in a cost-benefit analysis reflect the reduction in “total resources available to society”) [hereinafter “Circular A-4”].
- ¹²⁸ The current version of MarketSim was developed in 2015. See BOEM, *Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2015 Revised Market Simulation Model (MarketSim)* (2015) [hereinafter “Revised Market Simulation Model”]. That version updated previous versions of MarketSim that BOEM had developed. See Industrial Economics, Inc., *Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The Revised Market Simulation Model* (2012) (describing 2012 version of the MarketSim model).
- ¹²⁹ Lifecycle Greenhouse Gas Emissions, *supra* note 114, at v.
- ¹³⁰ See Burger & Wentz, *supra* note 110, at 135 (“BLM’s approach to its assessment of downstream emissions remains inconsistent, however. For example, in two 2015 EISs for oil and gas development, BLM did not even mention let alone quantify emissions from combustion or transportation of the extracted fuels, nor did it explain why those emissions were omitted from the inventory. BLM has also repeatedly ignored downstream emissions in EAs for an oil and gas lease sales.”).
- ¹³¹ See *WildEarth Guardians*, 870 F.3d at 1236.
- ¹³² See, e.g., BLM, Uncompahgre Field Office Proposed Resource Management Plan and Final Environmental Impact Statement 4-32 to 4-33 (2020); BLM, Draft Eastern Colorado Resource Management Plan & Environmental Impact Statement B-73 to B-74 (2019).

- ¹³³ BLM, Willow Master Development Plan Final Environmental Impact Statement app. E-2 (2020) [hereinafter “Willow EIS”]; BLM, Coastal Plain Oil and Gas Leasing Program Final Environmental Impact Statement app. R (2019) [hereinafter “Coastal Plain EIS”].
- ¹³⁴ See, e.g., BOEM, 2017–2022 Outer Continental Shelf Oil and Gas Leasing Proposed Final Program 5-17 to 5-18 (2016) (finding that five-year offshore leasing plan, if not approved, would lead to a reduction in energy demand by just 7% of the forgone extraction in federal waters, while increasing renewable energy generation by just 1% of the forgone extraction) [hereinafter “2017–2022 Final Program”]; Willow EIS, *supra* note 133, app. E-2 tbl.2 (2020) (finding nearly 97% leakage from project’s emissions, with renewable energy making up for less than 0.4% of substituted demand); Coastal Plain EIS, *supra* note 133, app. R (2019) (finding roughly 96% leakage and virtually no displacement from renewable energy).
- ¹³⁵ Lifecycle Greenhouse Gas Emissions, *supra* note 114, at 26; see also Liberty Development and Production Plan Final Environmental Impact Statement 4-52 (2018) (“Here, lifecycle GHG emissions associated with the No Action Alternative are estimated to be higher than those associated with the Proposed Action, despite the model’s assumption that a slightly lower amount of energy would be consumed domestically overall. This is because the lifecycle GHG emissions associated with the mix of replacement fuels estimated to be consumed under the No Action Alternative are, on average, greater than the lifecycle GHG emissions associated with oil produced from the Liberty prospect[.]”)
- ¹³⁶ Brian Prest, *Supply-Side Reforms to Oil and Gas Production on Federal Lands: Modeling the Implications for Climate Emissions, Revenues, and Production Shifts* 7 (Res. for the Future Working Paper 20-16, 2020).
- ¹³⁷ Peter Erickson & Michael Lazarus, *Would Constraining U.S. Fossil Fuel Production Affect Global CO₂ Emissions? A Case Study of U.S. Leasing Policy*, 150 CLIMATE CHANGE 29, 34 (2018); see also Peter Erickson & Michael Lazarus, *How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO₂ Emissions and 2°C Goals?* 24 (Stockholm Env’t Inst. Working Paper 2016-02, 2016) (“A comparison of World Energy Outlook 2015 scenarios suggests that, over the next few decades, the effect of price-induced decreases in oil consumption may be split roughly evenly between lower overall energy use and increased use of substitute fuels.”).
- ¹³⁸ Taran Foehn et al., *Climate Policies in a Fossil Fuel Producing Country: Demand Versus Supply Side Policies*, 38 ENERGY J. 77, 90 (2017).
- ¹³⁹ *Ctr. for Biological Diversity*, 982 F.3d at 736–40.
- ¹⁴⁰ *Id.* at 736.
- ¹⁴¹ *Id.* (internal quotation marks omitted).
- ¹⁴² *Id.*
- ¹⁴³ *Id.*
- ¹⁴⁴ *Id.*
- ¹⁴⁵ *Id.* at 738.
- ¹⁴⁶ *Id.* (citing Peter Erickson, *U.S. Again Overlooks Top CO₂ Impact of Expanding Oil Supply, but That Might Change*, Stockholm Env’t Inst. (Apr. 30, 2016), <http://www.sei.org/perspectives/us-co2-impact-oil-supply>; Peter Erickson & Michael Lazarus, *Impact of the Keystone XL Pipeline on Global Oil Markets and Greenhouse Gas Emissions*, 4 NATURE CLIMATE CHANGE 778, 778–80 (2014); Jason Bordoff & Trevor Houser, Columbia SIPA Center on Global Energy Policy, *Navigating the U.S. Oil Export Debate* 57 (2015)).
- ¹⁴⁷ Lifecycle Greenhouse Gas Emissions, *supra* note 114, at 20.
- ¹⁴⁸ *Id.*
- ¹⁴⁹ *Id.*
- ¹⁵⁰ Coastal Plain EIS, *supra* note 133, at S-656; accord BLM, Draft Eastern Colorado Resource Management Plan & Environmental Impact Statement B-65 (2019) (explaining that it is “unlikely” that “emission trajectories follow a historical growth curve . . . over the course of the remainder of the century”).
- ¹⁵¹ Revised Market Simulation Model, *supra* note 128, at 11.
- ¹⁵² See Abigail R Colson & Roger M Cooke, *Expert Elicitation: Using the Classical Model to Validate Experts’ Judgments*, 12 REV. ENV’T ECON. & POL’Y 113 (2018) (highlighting “the need for validation” from a multitude of experts).
- ¹⁵³ Revised Market Simulation Model, *supra* note 128, at 19.
- ¹⁵⁴ *Id.*
- ¹⁵⁵ See Prest, *supra* note 136, at 24 (surveying various elasticity estimates from 2009–18).
- ¹⁵⁶ U.S. Energy Info. Admin, *The National Energy Modeling System: An Overview 2018*, at 8 (2019), [https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581\(2018\).pdf](https://www.eia.gov/outlooks/aeo/nems/overview/pdf/0581(2018).pdf).
- ¹⁵⁷ *Id.*
- ¹⁵⁸ *Id.* at 1.
- ¹⁵⁹ Assumptions to AEO2021, U.S. Energy Info. Admin (Feb. 3, 2020), <https://www.eia.gov/outlooks/aeo/assumptions/>.
- ¹⁶⁰ U.S. Energy Info. Admin, *supra* note 156, at 9–10 (explaining how “NEMS has also been used for a number of special analyses at the request of the Administration, U.S. Congress, other offices of [the Department of Energy], and other government agencies, who specify the scenarios and assumptions for the analysis”).

- ¹⁶¹ Peter Howard, Inst. for Policy Integrity, *The Bureau of Land Management's Modeling Choice for the Federal Coal Programmatic Review* 9 (2016), https://policyintegrity.org/files/publications/BLM_Model_Choice.pdf; see also *Mayo Found. v. Surface Transp. Bd.*, 472 F.3d 545, 555 (8th Cir. 2006) (approving of Surface Transportation Board's use of NEMS to model air-pollution impacts resulting from increased demand due to proposed coal railroad); *Sierra Club v. United States Dep't of Energy*, 867 F.3d 189, 194 (D.C. Cir. 2017) (discussing Department of Energy's use of NEMS to project impacts of proposed export of liquefied natural gas).
- ¹⁶² Revised Market Simulation Model, *supra* note 128, at 2.
- ¹⁶³ U.S. Energy Info. Admin, *supra* note 156, at 21, 25.
- ¹⁶⁴ *Ctr. for Biological Diversity*, 982 F.3d at 736.
- ¹⁶⁵ U.S. Energy Info. Admin, *Annual Energy Outlook 2021*, at 1 (2021), https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf.
- ¹⁶⁶ See, e.g., AEE Institute, *Competitiveness of Renewable Energy and Energy Efficiency in U.S. Markets* 5–6 (2015), <https://info.aee.net/hubfs/PDF/RE-EE-Competitiveness.pdf>.
- ¹⁶⁷ U.S. Energy Info. Admin, *supra* note 156, at 14–15 (highlighting seven “primary” cases, including reference case, along with 18 additional cases).
- ¹⁶⁸ As a somewhat analogous example, in a recent Environmental Impact Statement for the Keystone XL pipeline, the State Department modeled alternative scenarios of 80% and 40% displacement (along with a complete substitution assumption), considering the greenhouse gas impacts of each. Dep't of State, Draft Supplemental Environmental Impact Statement for the Proposed Keystone XL Pipeline 4-83 (Oct. 4, 2019).
- ¹⁶⁹ The use of expert elicitation is widely accepted in economic forecasting. See Nat'l Acads. Sci., Eng'g & Med., *Valuing Climate Damages: Updating Estimates of the Social Cost of Carbon Dioxide* 57 (2017) (“[F]or input variables having a limited empirical or theoretical basis for quantification of projections and their uncertainty, expert elicitation conducted according to best practices provides a useful and necessary approach.”). Agencies have previously solicited expert opinion to generate parameters that are uncertain. For instance, EPA surveyed twelve experts in an expert elicitation on the mortality impacts of a decrease in PM_{2.5} 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).
- ¹⁷⁰ Nat'l Acads. Sci., Eng'g & Med., *supra* note 165, at 69; see also *id.* at 75–77. Note that this recommendation was in the context for developing a long-term emissions baseline, which is an important parameter in calculation the Social Cost of Greenhouse Gases.
- ¹⁷¹ *Mayo Found.*, 472 F.3d at 555–56
- ¹⁷² *Id.* at 555 (quoting *Mid States*, 345 F.3d at 550).
- ¹⁷³ *Id.* at 556.
- ¹⁷⁴ 42 U.S.C. § 7135(d) (“The Administration shall not be required to obtain the approval of any other officer or employee of the Department in connection with the collection or analysis of any information; nor shall the Administrator be required, prior to publication, to obtain the approval of any other officer or employee of the United States with respect to the substance of any statistical or forecasting technical reports which he has prepared in accordance with law.”).
- ¹⁷⁵ Revised Market Simulation Model, *supra* note 128, at 2 (describing alteration of NEMS baseline to reflect the proper no-action alternative).
- ¹⁷⁶ *Ctr. for Biological Diversity*, 982 F.3d at 738.
- ¹⁷⁷ Lifecycle Greenhouse Gas Emissions, *supra* note 114, at 23.
- ¹⁷⁸ *Id.*
- ¹⁷⁹ See, e.g., Gilbert E. Metcalf, *The Impact of Removing Tax Preferences for U.S. Oil and Gas Production*, Council on Foreign Relations (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 even further).
- ¹⁸⁰ See *supra* notes 136–138 and accompanying text.
- ¹⁸¹ Revised Market Simulation Model, *supra* note 128, at 2.
- ¹⁸² See *supra* notes 169–170 and accompanying text.
- ¹⁸³ See *supra* notes 151–152 and accompanying text (describing this error with MarketSim).
- ¹⁸⁴ See *supra* notes 153–155 and accompanying text (describing this error).
- ¹⁸⁵ Willow EIS, *supra* note 133, at app. E-2 tbl.2.
- ¹⁸⁶ *Id.* at 36 (projecting over 258 million metric tons of carbon dioxide equivalence in gross emissions from the project, but a net increase in only 35 million metric tons over the no-action alternative).
- ¹⁸⁷ See, e.g., *id.* at 226.
- ¹⁸⁸ See, e.g., *Bus. Roundtable v. SCC*, 647 F.3d 1144, 1148–49 (D.C. Cir. 2011) (chastising agency for “inconsistently and opportunistically fram[ing] the costs and benefits of the rule”); *Johnston v. Davis*, 698 F.2d 1088, 1094–95 (10th Cir. 1983) (remanding an environmental impact statement because “unrealistic” assumptions “misleading[ly]” skewed comparison of the project's positive and negative effects).

- ¹⁸⁹ Exec. Order No. 13,990 §5(a), 86 Fed. Reg. 7037 (Jan. 20, 2021).
- ¹⁹⁰ See Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 SCI. 6352 (2017) (co-authored with economists Michael Greenstone, Michael Hanemann, Peter Howard, and Thomas Sterner).
- ¹⁹¹ Interagency Working Group on the Social Cost of Carbon, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis* (2010), <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf> [hereinafter “2010 Technical Support Document”].
- ¹⁹² *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).
- ¹⁹³ *Id.* at 6–8.
- ¹⁹⁴ Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide – Interim Estimates under Executive Order 13,990* at 10 (2021) [hereinafter “2021 Technical Support Document”].
- ¹⁹⁵ Interagency Working Group on the Social Cost of Greenhouse Gases, *Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide 2* (2016), https://www.epa.gov/sites/production/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf.
- ¹⁹⁶ *Id.* at 3.
- ¹⁹⁷ Nat’l Acads. Sci., Eng’g & Med., *supra* note 165; Nat’l Acads. Sci., Eng’g & Med., *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update* (2016).
- ¹⁹⁸ See, e.g., Revesz et al., *supra* note 190; Richard L. Revesz, Kenneth Arrow, et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (explaining that the Working Group’s values, though methodically rigorous and highly useful, are very likely underestimated) (note that Kenneth Arrow is a Nobel Prize-winning economist).
- ¹⁹⁹ U.S. Gov’t Accountability Off., *Social Cost of Carbon: Identifying a Federal Entity to Address the National Academies’ Recommendations Could Strengthen Regulatory Analysis* (2020).
- ²⁰⁰ *Zero Zone, Inc. v. U.S. Dep’t of Energy*, 832 F.3d 654, 678 (7th Cir. 2016).
- ²⁰¹ BOEM, Cook Inlet Planning Area Oil and Gas Lease Sale 244 In the Cook Inlet, Alaska Final Environmental Impact Statement 4-190 to 4-191 (2016), <https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=224283>.
- ²⁰² See BLM, Little Willow Creek Protective Oil and Gas Leasing Environmental Assessment 81 (Docket No. DOI-BLM-ID-B010-2014-0036-EA) (2015), https://eplanning.blm.gov/public_projects/nepa/39064/55133/59825/DOI-BLM-ID-B010-2014-0036-EA_UPDATED_02272015.pdf; BLM, Miles City Oil and Gas Lease Sale Environmental Assessment 76 (Docket No. DOI-BLM-MT-C020-2014-0091-EA) (2014), https://www.blm.gov/sites/blm.gov/files/MT-DAKs%20MCFO%20EA%20October%202014%20Sale_Post%20for%2030%20day.pdf.
- ²⁰³ BOEM, Outer Continental Shelf Oil and Gas Leasing Program 2017-2022 Final Programmatic Environmental Impact Statement 2-32 (2016).
- ²⁰⁴ See, e.g., BLM, Record of Decision for September 2016 Oil and Gas Lease Sale 6 – 7 (“BLM finds that including monetary estimates of the Social Cost of Carbon (SCC) in its NEPA analysis for this proposed action would not be useful.”).
- ²⁰⁵ Exec. Order No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).
- ²⁰⁶ See, e.g., Coastal Plain EIS, *supra* note 133, at F-2 to F-3.
- ²⁰⁷ See, e.g., *id.* at 3-9 tbl.3-5 (comparing emissions from proposed Coastal Plain development to total U.S. and global emissions).
- ²⁰⁸ BLM, Regulatory Impact Analysis for the Final Rule to Rescind or Revise Certain Requirements of the 2016 Waste Prevention Rule 7, 41–42 (2018) (abandoning the Working Group’s valuation of the Social Cost of Methane and reducing the estimate of methane’s damages from \$1,300 per ton down to \$176). As a result of this single choice, BLM concluded that the Waste Prevention Rule was in fact net-costly, even though in 2016 it appropriately concluded that the rule resulted in up to \$204 million per year in net benefits. Compare *id.* at 52 with BLM, Regulatory Impact Analysis for the Waste Prevention Rule 111 (2016), https://www.blm.gov/sites/blm.gov/files/documents/files/oilandgas_WastePreventionRegulatoryImpactAnalysis.pdf.
- ²⁰⁹ Exec. Order No. 13,990 §5(b)(ii)(A).
- ²¹⁰ See 2021 Technical Support Document, *supra* note 194.
- ²¹¹ *Id.* at 3–4.
- ²¹² *Id.* at 5 tbl.ES-1.
- ²¹³ *Id.* at 5 tbl.ES-2.
- ²¹⁴ *Id.* at 6 tbl.ES-3.
- ²¹⁵ Exec. Order No. 13,990 § 5(b)(ii)(C).
- ²¹⁶ See 2021 Technical Support Document, *supra* note 194, at 16 (recommending use of Social Cost of Greenhouse Gases “in analysis of Federal regulatory and other actions”).

- ²¹⁷ Secretarial Order 3399 §5(b), Department-Wide Approach to the Climate Crisis and Restoring Transparency and Integrity to the Decision-Making Process (Apr. 16, 2021).
- ²¹⁸ See, e.g., *Judgment Under Uncertainty: Heuristics and Biases* 192–94 (Daniel Kahneman et al. eds., 1982).
- ²¹⁹ Council on Env’t Quality, Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews 11 (Aug. 1, 2016; withdrawn Apr. 5, 2017; under review Feb. 19, 2021, for revision and update) (“[A] statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA.”). See also Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61 (2002) (describing probability neglect, a common mental heuristic whereby small probability risks are irrationally reduced to zero).
- ²²⁰ *WildEarth Guardians v. Bureau of Land Mgmt.*, 457 F. Supp. 3d 880, 894 (D. Mont. 2020).
- ²²¹ Off. of Surface Mining, Bull Mountains Mine No. 1 Federal Mining Plan Modification Environmental Assessment 57 (2018).
- ²²² This project was expected to result in the release of approximately 190 million tons of carbon dioxide equivalence, *id.* at 56, or about 172.36 million metric tons. Using the central Social Cost of Carbon estimate of \$51 per metric ton emitted in the year 2020, this amounts to \$8.79 billion in climate harm for 2020 emissions.
- ²²³ *Calvert Cliffs’ Coordinating Comm., Inc. v. U.S. Atomic Energy Comm’n*, 449 F.2d 1109, 1113 (D.C. Cir. 1971); see also, e.g., *Chelsea Neighborhood Ass’ns v. U.S. Postal Serv.*, 516 F.2d 378, 386 (2d Cir. 1975) (“NEPA, in effect, requires a broadly defined cost-benefit analysis of major federal activities.”); *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).
- ²²⁴ See *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1198–1203 (9th Cir. 2008) (rejecting rulemaking as arbitrary and capricious after agency failed to monetize climate impacts in regulatory cost-benefit analysis); *Zero Zone*, 832 F.3d at 678 (affirming regulation that relied on Working Group’s social-cost valuations in cost-benefit analysis).
- ²²⁵ *Ctr. for Biological Diversity*, 538 F.3d at 1216 (internal quotation marks omitted) (rejecting analysis under NEPA when agency “quantifie[d] the expected amount of [carbon dioxide] emitted” but failed to “evaluate the incremental impact that these emissions will have on climate change or on the environment more generally,” noting that this approach failed to “discuss the actual environmental effects resulting from those emissions” or “provide the necessary contextual information about the cumulative and incremental environmental impacts”).
- ²²⁶ *Id.* (internal quotation marks omitted).
- ²²⁷ 2010 Technical Support Document, *supra* note 191, at 5.
- ²²⁸ See, e.g., *High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1190 (D. Colo. 2014) (“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.”).
- ²²⁹ *WildEarth Guardians v. Bernhardt*, No. CV 17-80-BLG-SPW, 2021 WL 363955, at *9–10 (D. Mont. Feb. 3, 2021) (recognizing the widespread “consensus that [the Working Group’s] estimates constitute the best available science about monetizing the impacts of greenhouse gas emissions,” and praised the methodology as a “viable model tool for monetizing the costs of greenhouse gas emissions”); *Mont. Env’t Info. Ctr. v. U.S. Off. 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”).
- ²³⁰ *California*, 472 F. Supp. 3d at 623.
- ²³¹ See, e.g., *EarthReports, Inc. v. Fed. Energy Reg. Comm’n*, 828 F.3d 949, 956 (D.C. Cir. 2016); *Citizens for a Healthy Cmty. v. BLM*, 377 F. Supp. 3d 1223, 1239–41 (D. Colo. 2019); *WildEarth Guardians*, 368 F. Supp. 3d at 77–79.
- ²³² *Ctr. for Biological Diversity*, 538 F.3d at 1198 (criticizing agency’s “[f]ailure to monetize benefits of greenhouse gas emissions reduction”).
- ²³³ See Max Sarinsky et al., Inst. for Pol’y Integrity, *Broadening the Use of Social Cost of Greenhouse Gases in Federal Policy* 4–17 (2021). https://policyintegrity.org/files/publications/Broadening_the_Use_of_the_Social_Cost_of_Greenhouse_Gases_in_Federal_Policy.pdf.
- ²³⁴ See *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515–16 (2009) (“[A] reasoned explanation is needed for disregarding facts and circumstances that underlay or were engendered by the prior policy.”).
- ²³⁵ The section of the report from pages 39 to 49 is most relevant to this issue. See Jayni Hein et al., Inst. for Pol’y Integrity, *Pipeline Approvals and Greenhouse Gas Emissions* 39–49 (2019), https://policyintegrity.org/files/publications/Pipeline_Approvals_and_GHG_Emissions.pdf.
- ²³⁶ Iliana Paul & Max Sarinsky, Inst. for Pol’y Integrity, *Playing With Fire: Responding to Criticism of the Social Cost of Greenhouse Gases* (2021), https://policyintegrity.org/files/publications/Playing_With_Fire.pdf.

- ²³⁷ Coastal Plain EIS, *supra* note 133, at F-2.
- ²³⁸ See Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 COLUMBIA J. ENV'T L. 203, 270–84 (2017) (listing all uses by federal agencies through July 2016).
- ²³⁹ States have also used the social cost of greenhouse gases in decisions about electricity planning. See Iliana Paul et al., Inst. for Pol'y Integrity, *The Social Cost of Greenhouse Gases and State Policy: A Frequently Asked Questions Guide* (2017), http://policyintegrity.org/files/publications/SCC_State_Guidance.pdf.
- ²⁴⁰ See 2021 Technical Support Document, *supra* note 194, at 16 (recommending use of Social Cost of Greenhouse Gases “in analysis of Federal regulatory and other actions”).
- ²⁴¹ Exec. Order No. 13,990 § 5(b).
- ²⁴² *Id.*
- ²⁴³ Coastal Plain EIS, *supra* note 133, at F-2 to F-3.
- ²⁴⁴ See *High Country*, 52 F. Supp. 3d at 1191 (requiring monetization of climate impacts “[e]ven though NEPA does not require a cost-benefit analysis”).
- ²⁴⁵ 40 C.F.R. § 1502.22.
- ²⁴⁶ Coastal Plain EIS, *supra* note 133, at F-3.
- ²⁴⁷ *Pub. Citizen v. Fed. Motor Carrier Safety Admin.*, 374 F.3d 1209, 1221 (D.C. Cir. 2004).
- ²⁴⁸ *Mont. Wilderness Ass'n v. McAllister*, 666 F.3d 549, 559 (9th Cir. 2011).
- ²⁴⁹ *Carolina Env't Study Grp. v. United States*, 510 F.2d 796, 799 (D.C. Cir. 1975); accord *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973) (recognizing that “[r]easonable forecasting and speculation is . . . implicit in NEPA” because the statute requires agencies “to predict the environmental effects of proposed action before the action is taken”).
- ²⁵⁰ See U.S. Energy Info. Admin., *Annual Energy Outlook 2020* at 3 (2020), available at <https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf>.
- ²⁵¹ 2010 Technical Support Document, *supra* note 191, at 3 (“The central value is the average SCC across models at the 3 percent discount rate.”).
- ²⁵² Last year, for example, the Department of Energy acknowledged that the Working Group’s estimates represent “the best science available,” and applied both its central Social Cost of Carbon value and its value range to assess the benefits of revised energy-efficiency standards and compare them to regulatory costs. Energy Conservation Program: Energy Conservation Standards for Uninterruptible Power Supplies, 85 Fed. Reg. 1447, 1477–80 (Jan. 10, 2020).
- ²⁵³ See, e.g., 2021 Technical Support Document, *supra* note 194, at 5 (providing range from \$14–\$76 per metric ton of carbon dioxide emissions in the year 2020, depending on discount rate).
- ²⁵⁴ *Id.* at 4 (Working Group acknowledging that its current social cost valuations “likely underestimate societal damages from [greenhouse gas] emissions”).
- ²⁵⁵ 2010 Technical Support Document, *supra* note 191, at 26, 32.
- ²⁵⁶ See Peter Howard, *Omitted Damages: What’s Missing from the Social Cost of Carbon* 43 (2014), https://policyintegrity.org/files/publications/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf (“The inclusion of all omitted damages, including these more significant omitted damages, is likely to result in an increase in the [social cost of carbon].”).
- ²⁵⁷ BOEM, *Economic Analysis Methodology for the 2017-2022 Outer Continental Shelf Oil and Gas Leasing Program 3-1* (2016).
- ²⁵⁸ Economic disruptions in one country can cause financial crises that reverberate globally. See Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 249 (2008). As climate change disrupts the economies of other countries, decreased availability of imported inputs, intermediary goods, and consumption goods may cause supply shocks to the U.S. economy, and the U.S. economy could further experience demand shocks as climate-affected countries decrease their demand for U.S. goods. The human dimension of climate spillovers includes migration and health effects.
- ²⁵⁹ Each ton of greenhouse gases abated in another country benefits the U.S. along with the rest of the world. The U.S. stands to gain at least hundreds of billions (and potentially trillions) of dollars in direct benefits from foreign action on climate change. See Peter Howard & Jason Schwartz, Inst. for Pol'y Integrity, *Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action* (2015), <http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf>.
- ²⁶⁰ A domestic-only estimate based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens, including significant U.S. ownership interests in foreign businesses, properties, and other assets, the benefits to the 8.7 million Americans living abroad, as well as consumption abroad including tourism. See Jason A. Schwartz, Inst. for Pol'y Integrity, *Strategically Estimating Climate Pollution Costs in a Global Environment* 8–26 (2021), <https://policyintegrity.org/publications/detail/strategically-estimating-climate-pollution-costs-in-a-global-environment>.
- ²⁶¹ Global commons that stand to be harmed from climate change include the oceans and Antarctica. Additionally, U.S. citizens have great interest in protecting rainforests, charismatic megafauna like pandas, and other wildlife and environments in foreign countries.
- ²⁶² Circular A-4 recognizes that U.S. citizens may have “altruism for the health and welfare of others,” and instructs

- agencies that when “there is evidence of selective altruism, it needs to be considered specifically in both benefits and costs.” Circular A-4, *supra* note 127, at 22.
- ²⁶³ *Zero Zone*, 832 F.3d at 679.
- ²⁶⁴ *Bernhardt*, 472 F. Supp. 3d at 627 (internal quotation marks omitted).
- ²⁶⁵ Nat’l Acad. Sci., Eng’g & Med., *supra* note 169, at 17.
- ²⁶⁶ *See, e.g.*, Howard & Schwartz, *supra* note 238.
- ²⁶⁷ Exec. Order No. 13,990 §5(a).
- ²⁶⁸ *Id.*
- ²⁶⁹ *Am. Ins. Ass’n v. Garamendi*, 539 U.S. 396, 414 (2003) (collecting cases).
- ²⁷⁰ *See* Michael A. Livermore, *Patience Is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. COLO. L. REV. 581, 589–91 (2013) (describing how passage of time can improve decisionmaking process when there are important unknowns).
- ²⁷¹ *See, e.g.*, Avinash K. Dixit & Robert S. Pindyck, *Investment Under Uncertainty* (1994).
- ²⁷² *See, e.g.*, Robert S. Pindyck, *Uncertainty in Environmental Economics*, 1 REV. ENV’T ECON. & POL’Y 45 (2007); Kenneth J. Arrow & Anthony C. Fisher, *Environmental Preservation, Uncertainty, and Irreversibility*, 88 Q.J. ECON. 312 (1974).
- ²⁷³ Livermore, *supra* note 270, at 591.
- ²⁷⁴ *Id.* at 605–14.
- ²⁷⁵ 668 F.2d 1290, 1319–20 (D.C. Cir. 1981).
- ²⁷⁶ 779 F.3d 588, 610 (D.C. Cir. 2015).
- ²⁷⁷ *See id.*
- ²⁷⁸ 2017–2022 Final Program, *supra* note 134, at 10-3 to 10-13.
- ²⁷⁹ *Id.* at 10-6.
- ²⁸⁰ *See supra* notes 275–276 and accompanying text.
- ²⁸¹ *See Jewell*, 779 F.3d at 610 (“Section 18 [of OCSLA, 43 U.S.C. § 1344] requires Interior to evaluate the advantages and disadvantages of delaying and forgoing leasing in determining when leases should issue.”).
- ²⁸² *Compare Oil and Gas Statistics*, BUREAU OF LAND MGMT. tbl. 2 (26,604,169 acres in effect), <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>, *with id.* tbl. 6 (12,711,111 acres of producing leases).
- ²⁸³ BOEM, Combined Leasing Report As of April 1, 2021, <https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/oil-gas/Lease%20stats%204-1-21.pdf> (showing 2,507,007 acres of producing leases versus 12,425,021 acres of total active leases, with 9,918,014 acres of non-producing leases).
- ²⁸⁴ Livermore, *supra* note 270, at 585, 589.
- ²⁸⁵ Mark K. DeSantis, Ctr. for Am. Progress, *Oil and Gas Companies Gain by Stockpiling America’s Federal Land* 1 (2018), https://cdn.americanprogress.org/content/uploads/2018/08/28124032/082918_FinancialIncentivesOilandGas-report1.pdf?_ga=2.140332720.2060394123.1627594096-753540997.1627594096; *see also* Taxpayers for Common Sense, *Gaming the System: How Federal Land Management in Nevada Fails Taxpayers* 4 (2019), https://www.taxpayer.net/wp-content/uploads/2019/07/TCS-Nevada-Federal-Oil-Gas-Report_July-2019.pdf (“Certain companies and interests take advantage of the low acquisition and ownership costs for federal leases to amass sizeable lease holdings Their aim is to profit by re-selling some fraction of the leases to major producers who might want to take a gamble and actually explore for oil and gas reserves on the federal land.”).
- ²⁸⁶ Eric Lipton & Hiroko Tabuchi, *Energy Speculators Jump on Chance to Lease Public Land at Bargain Rates*, N.Y. TIMES (Nov. 27, 2018), <https://www.nytimes.com/2018/11/27/business/energy-speculators-public-land-leases.html>.
- ²⁸⁷ Royalty payments make up roughly 90% of federal revenues from the leasing program. *See Revenue, Natural Resources Revenue Data*, Dep’t of the Interior, <https://revenuedata.doi.gov/?tab=tab-revenue> (last updated July 16, 2021). Lease and rental payments for the land itself are frequently negligible. *See generally* Cong. Budget Off., *supra* note 38, at 2.
- ²⁸⁸ 2017–2022 Final Program, *supra* note 134, at 10-3 (“The hurdle price analysis considers the uncertainty of oil and gas prices and the expected hydrocarbon endowment.”).
- ²⁸⁹ *See generally* Ctr. for Sustainable Econ., 779 F.3d at 612 (recognizing significance of “well-established quantitative methods”).
- ²⁹⁰ *See* Inst. for Pol’y Integrity, Comments on the Draft Proposed 2017-2022 Outer Continental Shelf (OCS) Oil and Gas Leasing Program app. C (Mar. 30, 2015), https://policyintegrity.org/documents/Comments_to_BOEM_2017-2022_Offshore_Program.pdf. Note that this comment letter only discusses the first three methodologies discussed herein. Additional references are provided in the citations for the fourth methodology.
- ²⁹¹ *Id.*
- ²⁹² *See supra* note 167 and accompanying text.
- ²⁹³ Inst. for Pol’y Integrity, *supra* note 290, app. C.
- ²⁹⁴ *Id.*
- ²⁹⁵ *Id.*
- ²⁹⁶ Peter Howard et al., *Option Value and the Social Cost of Carbon: What Are We Waiting For?* (Inst. for Pol’y Integrity Working Paper No. 2020/1, 2020).

- ²⁹⁷ See Hein et al., *supra* note 42, at 21–29 (analyzing case studies where consideration of option value could have supported curtailment of fossil-fuel leasing in regions with environmental or cultural sensitivities).
- ²⁹⁸ See, e.g., 2017–2022 Final Program, *supra* note 134, at 10-20 (“[T]he minimum bid can be adjusted to improve timing of activities where option value is found to be significant.”).
- ²⁹⁹ See *supra* Section III.A.1.
- ³⁰⁰ See *supra* notes 107–111 and accompanying text.
- ³⁰¹ BLM, Draft Eastern Colorado Resource Management Plan & Environmental Impact Statement B-559 & tbl.B.192 (2019).
- ³⁰² *Id.* at B-507 (“The quantitative regional economic impact analysis is not a benefit-cost analysis.”). As noted above, moreover, these analyses were inconsistent with Interior’s assessment of climate costs, which relied heavily on leakage and substitution impacts to minimize estimated greenhouse gas emissions. See *supra* notes 185–187 and accompanying text.
- ³⁰³ Numerous studies find that effects of government regulation on overall employment tend to be small, especially in the long term. See, e.g. Anna Belova et al., *Estimating the Job Impacts of Environmental Regulation*, 6 J. BENEFIT-COST ANALYSIS 625 (2015), Timothy J. Bartik, Social Costs of Jobs Lost Due to Environmental Regulations (Upjohn Inst. Working Paper 13-193, 2013); Marc A.C. Hafstead & Roberton C. Williams III, *Unemployment and Environmental Regulation in General Equilibrium*, 160 J. PUB. ECON. 50 (2018).
- ³⁰⁴ *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446 (4th Cir. 1996).
- ³⁰⁵ See *supra* notes 115–124 and accompanying text.
- ³⁰⁶ Circular A-4, *supra* note 127, at 38; *accord id.* (explaining that economic costs equate to the “net reduction in the total surplus”). Although Circular A-4 formally applies only to regulatory cost-benefit analysis under Executive Order 12,866, *id.* at 1, its recommendations can also be viewed as best practices for other economic analyses of administrative programs.
- ³⁰⁷ See *id.* (“Transfer payments are monetary payments from one group to another that do not affect total resources available to society.”).
- ³⁰⁸ See *id.* (“You should not include transfers in the estimates of the benefits and costs of a regulation. Instead, address them in a separate discussion of the regulation’s distributional effects.”).
- ³⁰⁹ See, e.g., Willow EIS, *supra* note 133, at app. E-2 p. 7 (“Economic impacts are distinct from ‘economic benefits,’ as defined in economic theory and methodology[.]”).
- ³¹⁰ *Mont. Env’t Info. Ctr.*, 274 F. Supp. 3d at 1096 n.9 (rejecting identical argument and requiring use of Social Cost of Greenhouse Gases in Interior fossil-fuel assessment).
- ³¹¹ Standard cost-benefit theory and practice require decision-makers to describe and evaluate unquantifiable effects. See Kenneth J. Arrow, et al., *Benefit-Cost Analysis in Environmental, Health, and Safety Regulation* 8 (1996) (“[G]ive due consideration to factors that defy quantification but are thought to be important.”); Robert W. Hahn & Cass R. Sunstein, *A New Executive Order for Improving Federal Regulation? Deeper and Wider Cost-Benefit Analysis*, 150 U. PA. L. REV. 1489, 1498 (2002) (“[C]ost-benefit analysis requires a full accounting of the consequences of an action, in both quantitative and qualitative terms.”). Executive guidance reflects this principle. See Circular A-4, *supra* note 127, at 2–3; Exec. Order No. 12,866 §1(a) (“[I]nclude both quantifiable measures . . . and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.”)
- ³¹² See *Grassroots Opposition to Offshore Drilling and Exploration in the Atlantic Ocean and off Florida’s Gulf Coast*, *supra* note 27.
- ³¹³ See Department of the Interior, *The BLM: A Sound Investment for America 2020* (2019), <https://www.blm.gov/sites/blm.gov/files/SoundInvest2019-6pages-FINAL-083019.pdf>.
- ³¹⁴ See Bureau of Labor Statistics, *The Employment Situation – June 2021* at 31 (2021), <https://www.bls.gov/news.release/pdf/empsit.pdf>. For comparison, there are more than four times as many workers employed in building material and garden supply stores and nearly ten times as many workers employed in food and beverage businesses. See *id.* at 31–34.
- ³¹⁵ See Jessica Lee, *Did Biden’s Order To Halt Keystone XL Pipeline “Destroy” 11,000 Jobs?*, SNOPEs (Feb. 8, 2021), <https://www.snopes.com/fact-check/keystone-pipeline-biden/>.
- ³¹⁶ See Cary Coglianese & Christopher Carrigan, *The Jobs and Regulation Debate*, in DOES REGULATION KILL JOBS? 2 (Cary Coglianese, Adam M. Finkel & Christopher Carrigan eds., 2014); Institute for Policy Integrity, *Does Environmental Regulation Kill or Create Jobs? 2–3* (2017), https://policyintegrity.org/files/media/Jobs_and_Regulation_Factsheet.pdf; see also *supra* note 303 and accompanying text (highlighting economic studies documenting the impact of environmental regulation on aggregate employment).
- ³¹⁷ See U.S. Dep’t of State, *Draft Supplemental Environmental Impact Statement: Keystone XL Project 5–6*, 24 (2013), <https://web.archive.org/web/20170203131326/https://keystonepipeline-xl.state.gov/documents/organization/205612.pdf>.

- ³¹⁸ See Michael A. Livermore & Jason A. Schwartz, *Analysis to Inform Public Discourse on Jobs and Regulation*, in DOES REGULATION KILL JOBS?, *supra* note 316, at 242 (“Many empirical studies raise serious questions about whether regulations will usually affect employment to a degree that would justify substantial changes in rule design.”); *see also* Richard D. Morgenstern, *Analyzing the Employment Impacts of Regulation, in Does Regulation Kill Jobs?*, *supra* note 316, at 35 (finding only limited evidence of adverse national-level impacts from empirical research on environmental regulations’ effects on employment); W. Reed Walker, *The Transitional Costs of Sectoral Reallocation: Evidence From the Clean Air Act and the Workforce*, 128 Q.J. ECON. 1787, 1791, 1832 (2013) (estimating that the 1990 Clean Air Act Amendments may have generated about \$5 billion in forgone wages, but these one-time transition costs are small compared with total net benefits as high as \$1.6 trillion).
- ³¹⁹ See Richard D. Morgenstern, William A. Pizer & Jhih-Shyang Shih, Res. for the Future, *Jobs Versus the Environment: An Industry-level Perspective* 22 (2000), https://grist.org/wp-content/uploads/2010/09/jobs_v_environment.pdf (describing positive employment effects from increased labor demand at petroleum refineries).
- ³²⁰ See Matthew Brown & Cathy Bussewitz, *Oil Companies Stockpile Drilling Permits, Challenging Biden on Climate*, THE DENVER POST (Jan. 10, 2021), <https://www.denverpost.com/2021/01/10/oil-companies-drilling-permits-biden-climate/>.
- ³²¹ Sahir Doshi, Jenny Rowland-Shea & Nicole Gentile, *Oil and Gas Companies Are Lying About How Much Oil They Control on U.S. Public Lands*, CTR. AM. PROGRESS (Mar. 23, 2021), <https://www.americanprogress.org/issues/green/news/2021/03/23/497366/oil-gas-companies-lying-much-oil-control-u-s-public-lands/>.
- ³²² See Grant Smith & Bill Walker, *The Promise of the Clean Energy Economy for American Workers*, ENV’T WORKING GROUP (Apr. 6, 2021), <https://www.ewg.org/research/promise-clean-energy-economy-american-workers> (noting that the Bureau of Labor Statistics reports the average median wage of utility line workers “exceeds \$65,500, and that of power plant operators tops \$90,000. Those jobs will still be needed in a low-carbon world”).
- ³²³ See *id.* (noting that utilities employ “about 240,000 workers to install and repair transmission lines, and more than 50,000 as power plant operators”).
- ³²⁴ See Feng Zhang, Maxwell Cohen & Aaron Barr, Wood MacKenzie, *Economic Impact Study of New Offshore Wind Lease Auctions by BOEM* 5 (2020), https://cleanpower.org/wp-content/uploads/2021/02/WM_Economic_Impact_Study_OSW_Lease_Auctions.pdf.
- ³²⁵ See Livermore & Schwartz, *supra* note 318, at 240 (“Even if a rule’s job gains and losses cancel out, leaving no discernible efficiency impact, certain communities may experience disproportionate employment burdens.”)
- ³²⁶ *Id.* at 240-41.
- ³²⁷ See Michael A. Livermore, Elizabeth Pienaar & Jason A. Schwartz, Inst. for Pol’y Integrity, *The Regulatory Red Herring: The Role of Job Impact Analyses in Environmental Policy Debates* 9 (2012), https://policyintegrity.org/files/publications/Regulatory_Red_Herring.pdf.
- ³²⁸ See *id.* at 9, 11.
- ³²⁹ See, e.g., Nikki Springer & Alex Daue, Yale Ctr. Env’t & The Wilderness Society, *Key Economic Benefits of Renewable Energy on Public Lands*, (2020), <https://cbey.yale.edu/sites/default/files/2020-05/Key%20Econ%20Ben%20of%20Renewable%20Energy%20on%20Public%20Lands.pdf> (highlighting economic benefits of renewable-energy generation on federal lands and potential for continued development).
- ³³⁰ See, e.g., Kyle Siler-Evans et al., *Regional Variations in the Health, Environmental, and Climate Benefits of Wind and Solar Generation*, 110 PROC. NAT’L ACAD. SCI. 11768 (2013) (describing the best locations for wind and solar generation in the continental U.S.).
- ³³¹ See Valerie Volcovici & Laura Sanicola, *Analysis: Biden’s Clean-Energy ‘Revolution’ Faces Challenge to Match Fossil-Fuel Jobs, Pay*, REUTERS (Oct. 30, 2020), <https://www.reuters.com/article/us-usa-election-labor-renewables-analysis/analysis-bidens-clean-energy-revolution-faces-challenge-to-match-fossil-fuel-jobs-pay-idUSKBN-27F1KN>.
- ³³² See Nat’l Assoc. of State Energy Officials & Energy Futures Initiative, *2020 US Energy & Employment Report* 59, 62 (2020), <https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/See78423c6fcc20e01b83896/1592230956175/USEER+2020+0615.pdf>.
- ³³³ See *id.* at 71, 74, 80.
- ³³⁴ See Exec. Order No. 13990 § 6(c), 86 Fed. Reg. 7037 (Jan. 25, 2021) (“The world must be put on a sustainable climate pathway to protect Americans and the domestic economy from harmful climate impacts, and to create well-paying union jobs as part of the climate solution.”); *see also* Press Release, The White House Briefing Room, Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies (Apr. 22, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/> (pledging to create millions of “good-paying, union jobs” as part of President Biden’s plan to halve U.S. greenhouse gas emissions from 2005 levels by 2030).
- ³³⁵ See 43 U.S.C. § 1761(a)(4) (granting BLM the authority to issue rights of way on public lands for “systems for generation, transmission, and distribution of electric energy”).

- ³³⁶ See *Id.* §1337(p)(1)(C) (granting BOEM the authority to issue rights of way on lands in the Outer Continental Shelf to “produce or support production, transportation, or transmission of energy from sources other than oil and gas”).
- ³³⁷ See 43 C.F.R. § 2802.10(a) (“In its discretion, BLM may grant rights-of-way on any lands under its jurisdiction except when: (1) A statute, regulation, or public land order specifically excludes rights-of-way; (2) The lands are specifically segregated or withdrawn from right-of-way uses; or (3) BLM identifies areas in its land use plans or in the analysis of an application as inappropriate for right-of-way uses.”).
- ³³⁸ 30 C.F.R. § 585.201.
- ³³⁹ See *id.* § 585.220 (describing the competitive multi-factor bidding process as including “technical merit, timeliness, financing and economics, environmental considerations, public benefits, compatibility with State and local needs, cash bonus, rental rate, and an operating fee rate,” though BOEM is not limited to the enumerated items).
- ³⁴⁰ See Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections, 81 Fed. Reg. 92,122 (Dec. 19, 2016).
- ³⁴¹ See Noam Scheiber, *For Clean Energy, Buy American or Buy It Quick and Cheap?*, N.Y. TIMES (May 11, 2021), <https://www.nytimes.com/2021/05/11/business/economy/clean-energy-biden.html>.
- ³⁴² For the current bidding procedures, see 43 C.F.R. § 2804.30.
- ³⁴³ Common criticisms of this rule include: a fee structure that may be too costly for renewables, especially as compared to fossil fuels; a capacity fee that may favor solar PV over wind energy without adequate justification; and a capacity fee that charges companies for the total capacity of the leasehold, not the amount of power actually being generated. Jayni Hein, Inst. Pol’y Integrity *A New Way Forward on Climate Change and Energy Development for Public Lands and Waters* 20 n.115 (2020), https://policyintegrity.org/files/publications/Climate_Change_and_Energy_Development_for_Public_Lands_and_Waters.pdf.
- ³⁴⁴ See WVU Law Ctr. for Energy & Sustainable Dev., West Virginia’s Energy Future 30 (2020), <https://energy.law.wvu.edu/files/d/b1ff1183-e9ae-4ad0-93bf-aa3afa1da785/wv-s-energy-future-wvu-col-cesd-final.pdf>.
- ³⁴⁵ See Silvio Marcacci, *Plugging Abandoned Oil Wells Is One ‘Green New Deal’ Aspect Loved By Both Republicans And Democrats*, FORBES (Sept. 21, 2020), <https://www.forbes.com/sites/energyinnovation/2020/09/21/plugging-abandoned-wells-the-green-new-deal-jobs-plan-republicans-and-democrats-love/>.
- ³⁴⁶ See *id.*
- ³⁴⁷ Ted Boettner, Ohio River Valley Inst., *Repairing the Damage from Hazardous Abandoned Oil & Gas Wells: A Federal Plan to Grow Jobs in the Ohio River Valley and Beyond* 8, 32 (2021) <https://ohiorivervalleyinstitute.org/wp-content/uploads/2021/04/Repairing-the-Damage-from-Hazardous-AOG-Wells-Report-1.pdf>; see also *id.* at 8 (“A federal program to plug and restore the estimated 538,000 unplugged abandoned oil and gas wells in the Ohio River Valley states of West Virginia, Kentucky, Ohio, and Pennsylvania could create about 15,151 jobs per year over 20 years or 303,000 jobyears at a total cost of \$25 billion This annual amount is nearly equivalent to the decline in upstream oil and gas jobs in the region from 2014 to 2019.”).
- ³⁴⁸ See Alexander Sammon, *Biden’s Promising, Problematic Plan to Plug Orphaned Oil and Gas Wells*, THE AM. PROSPECT (Apr. 14, 2021), <https://prospect.org/api/content/74598550-9cb4-11eb-a95b-1244d5f7c7c6/>.
- ³⁴⁹ See DOE Announces \$115 Million to Small Businesses for Clean Energy R&D Projects, DEP’T ENERGY (Mar. 4, 2021), <https://www.energy.gov/articles/doe-announces-115-million-small-businesses-clean-energy-rd-projects>.
- ³⁵⁰ See Press Release, The White House Briefing Room, Fact Sheet: The American Jobs Plan (Mar. 31, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>.
- ³⁵¹ See Iliana Paul, Christine Pries & Max Sarinsky, Inst. Pol’y Integrity, *Improving Environmental Justice Analysis Executive Order 12,898 and Climate Change*, 7–8 (2021), https://policyintegrity.org/files/publications/Improving_Environmental_Justice_Analysis.pdf.
- ³⁵² See *id.* at 8–9.
- ³⁵³ See *supra* notes 46–48 and accompanying text.
- ³⁵⁴ 43 U.S.C. § 1344(a)(4)(offshore); *id.* § 1701(a)(9) (onshore). Federal statutes provide minimum royalty rates for extraction on public lands, but do not impose maximum rates. See 30 U.S.C. § 226(b)(1)(A) (setting minimum royalty rate of 12.5% of onshore oil and gas revenues); *id.* § 207(a) (setting minimum royalty rate of 12.5% of surface coal revenues); 43 U.S.C. § 1337 (a)(1) (setting minimum royalty rate of 12.5% of offshore oil and gas revenues).
- ³⁵⁵ See, e.g., *id.* § 1701(a)(8) (setting forth the policy that “the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values” and “that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use”); *id.* § 1802(3) (calling for Interior to promote offshore energy development in a manner that “will eliminate or minimize risk of damage to the human, marine, and coastal environments).

- ³⁵⁶ 51 51 CONG. REC. H14,954 (Sept. 10, 1914) (statement of Rep. Mondell). The House Report for FLPMA also recognized that communities face “onerous” burdens from fossil-fuel exploration, and expressed particular concern for “severe environmental impacts.” H.R. Rep. No. 94-681, 1975 WL 12515, at 19–20 (1975).
- ³⁵⁷ See Hein & Cecot, *supra* note 50, at 14–19.
- ³⁵⁸ See *supra* notes 190–217 and accompanying text.
- ³⁵⁹ Jayni Foley Hein, *Federal Lands and Fossil Fuels: Maximizing Social Welfare in Federal Energy Leasing*, 42 HARV. ENV’T L. REV. 1, 52 (2018).
- ³⁶⁰ Cf. *Sierra Club v. Fed. Energy Reg. Comm’n*, 827 F.3d 36, 47 (D.C. Cir. 2016) (explaining that when “an agency has no ability to prevent a certain effect due to that agency’s limited statutory authority over the relevant action[], then that action cannot be considered a legally relevant cause of the effect for NEPA purposes” and thus the agency need not assess the effect under NEPA) (internal quotation marks omitted); *Sierra Club*, 867 F.3d at 1374 (recognizing that FERC has “legal authority” to mitigate indirect downstream greenhouse gas impacts and thus must assess those impacts under NEPA). Courts have held that Interior must rationally assess downstream greenhouse gas impacts under NEPA, implying that Interior has authority to mitigate those impacts as well. See *supra* notes 117–119, 122 and accompanying text.
- ³⁶¹ See Alan Krupnick et al., *Putting a Carbon Charge on Federal Coal: Legal and Economic Issues*, 46 ENV’T L. REP. NEWS & ANALYSIS 10,572, 10,587 (2015).
- ³⁶² See Prest, *supra* note 136, at 8–9, 30–33 (explaining that imposing an externality charge without accounting for leakage effects “strongly discourage[es] federal gas production,” which “suggests a lower optimal charge”). The author refers to an externality adder offset by leakage effects as the “welfare-maximizing adder,” since it theoretically maximizes social welfare by reining in on federal extraction without causing excessive leakage to non-federal lands.
- ³⁶³ Approximately 97% of all natural gas consumed in the United States is combusted. See U.S. Energy Info. Admin., *June 2021 Monthly Energy Review* 7, 24 (2021) (reporting that, in 2020, 1,090 Bcf of natural gas had a non-combustion use compared to 31,544 Bcf of total consumption).
- ³⁶⁴ Current Interior regulations do not incorporate externalities into an assessment of fair market value. See 30 C.F.R. § 1208.2 (defining “fair market value” for oil). Of course, this does not preclude Interior from adopting a different approach.
- ³⁶⁵ See Prest & Stock, *supra* note 71, at 17 tbl.3 (concluding that a revenue-maximizing royalty would impose a 39% surcharge, on top of existing base royalty rates).
- ³⁶⁶ See Exec. Order No. 12,866 §1(b)(6).
- ³⁶⁷ 40 C.F.R. § 1502.22.
- ³⁶⁸ See Cass R. Sunstein, *Some Benefits and Costs of Cost-Benefit Analysis* 2–3 (forthcoming 2021) (arguing that, due to the widespread use of cost-benefit analysis, “the role of dogmas, intuitions, and interest groups has diminished and . . . within the executive branch, at least, regulators have often focused insistently on the human consequences of what they are proposing to do”), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3825061.
- ³⁶⁹ See Davis Noll, *supra* note 104, at 37–41 (“[T]o roll back a previously finalized rule, an agency will likely have to contend with a cost-benefit analysis showing that the rule was net beneficial and thus that the roll back is harmful to society. Providing a reasoned explanation for a rule that is harmful can be difficult.”).
- ³⁷⁰ See Teplin et al., *supra* note 111.
- ³⁷¹ 2017–2022 Final Program, *supra* note 134, at 5-16.
- ³⁷² *Id.* at 10-3
- ³⁷³ See *supra* note 203 and accompanying text.
- ³⁷⁴ Lifecycle Greenhouse Gas Emissions, *supra* note 114, at 24 (finding reduced emissions under the proposed program versus the no-action alternative at the low-price, mid-price, and high-price scenarios).
- ³⁷⁵ See *supra* notes 271–274 and accompanying text.
- ³⁷⁶ See generally U.S. Gov’t Accountability Off., *Improved Collection and Use of Data Could Enhance BLM’s Ability to Assess and Mitigate Environmental Impacts* 18 (2017), <https://www.gao.gov/assets/690/684254.pdf> (“Once a drilling permit application is received, BLM field offices complete an environmental assessment to assess the potential environmental impacts of the proposed development. As part of this process, the agency can develop permit requirements, which are intended to mitigate environmental impacts.”).
- ³⁷⁷ *Compliance Offset Protocols*, CAL. AIR RES. BD., <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/compliance-offset-protocols>; *Offsets*, REG’L GREENHOUSE GAS INITIATIVE, <https://www.rggi.org/allowance-tracking/offsets>; see also U.S. Gov’t Accountability Off., *Climate Change Issues: Options for Addressing Challenges to Carbon Offset Quality* 1–2 (2011), <https://perma.cc/QHN5-DYJ5> (discussing various types of offset projects including forestation, carbon capture, and installation of energy-efficient equipment).
- ³⁷⁸ See, e.g., Anja Kollmuss et al., *Has Joint Implementation Reduced GHG Emissions?: Lessons Learned for the Design of Carbon Market Mechanisms* (Stockholm Env’t Inst., Working Paper No. 2015-07, 2015) (concluding that roughly three-quarters of offsets permitted under Kyoto Protocol likely did not represent additional emission reductions).
- ³⁷⁹ Government programs typically use offsets in conjunction with traditional avoidance and mitigation measures, permitting carbon offsets only to partially achieve compliance.

For instance, the California Air Resources Board permits covered entities to meet between 4-8% of their compliance obligations (depending on the year) through offsets. *Compliance Offset Program*, Cal. Air Res. Bd., <https://perma.cc/77DW-XV5X>.

³⁸⁰ See *supra* note 377.

³⁸¹ U.S. Gov't Accountability Off., *Carbon Offsets: The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants 2* (2008), <https://perma.cc/936C-KAN9>.

³⁸² Under NEPA, agencies must consider “[a]lternatives . . . other reasonable courses of action; and mitigation measures (not in the proposed action).” 40 C.F.R. § 1501.9(e) (2). The regulations define “mitigation,” in relevant part, as “measures that avoid, minimize, or compensate for effects caused by a proposed action.” *Id.* § 1508.1 (emphasis added).

³⁸³ *Koontz v. St. Johns River Water Mgmt. Dist.*, 570 U.S. 595, 605 (2013).

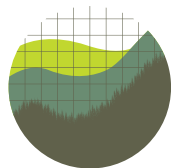
³⁸⁴ Pleune et al., *supra* note 67, manuscript at 73.

³⁸⁵ Amy L. Stein, *Climate Change Under NEPA: Avoiding Cursory Consideration of Greenhouse Gases*, 81 U. COLO. L. REV. 473, 479, 516-17 (2010) (citing BLM/, United States Gypsum Company Expansion/Modernization Project: Final Environmental Impact Report/Environmental Impact Statement 4.0-78 to -81 (2008)).

³⁸⁶ BLM & Dep't of the Interior, Record of Decision for the Sunrise Powerlink Transmission Project and Associate Amendment to the Eastern San Diego County Resource Management Plan, D.11-52 to -53 (2009), <https://perma.cc/E9RP-EAG3>.

³⁸⁷ BLM, Federal Coal Program: Programmatic Environmental Impact Statement Scoping Report 6-16 to -17 (2017), <https://perma.cc/78WH-WQ32>.

³⁸⁸ Pleune et al., *supra* note 12, manuscript at 75–88.



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