FEDERAL LANDS AND FOSSIL FUELS: MAXIMIZING SOCIAL WELFARE IN FEDERAL ENERGY LEASING

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Pursuant to several statutes, the Department of the Interior is tasked with managing the nation's mineral resources under the principles of "multiple use" and "sustained yield" and must earn "fair market value" for the use of federal lands and their resources. In recent years, Interior's coal, oil, and natural gas leasing programs have been criticized for failing to keep pace with developments in modern technology, shortchanging taxpayers, and failing to adequately account for climate change and other environmental effects. This Article suggests a rational path forward for federal fossil fuel leasing. Just as a private company would seek to maximize net revenue in its operations, Interior should seek to manage its program to provide maximum net benefits to the public. Yet distinct from a private actor, Interior is the steward of federal lands for current and future generations and must balance production with environmental preservation. This Article argues that Interior should account for all of the costs and benefits of leasing—including environmental and social costs—and adjust the fiscal terms of its fossil fuel leases to recoup unmitigated externality costs. In doing so, Interior can arrive at a social welfare-maximizing leasing program. The Article describes how a social welfare-maximizing framework is consistent with the best interpretation of Interior's statutory mandates as confirmed by legislative history, judicial precedent, and principles of executive-level review in place since the Reagan Administration that instruct agencies to maximize the net benefits of their policy choices. The reforms suggested here can significantly increase revenue for states and the federal government while reducing greenhouse gas emissions, illustrating the utility of using fiscal reform as a policy lever in the absence of comprehensive climate change legislation.

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Introduction

In his 2016 State of the Union address, former President Barack Obama signaled a critical policy shift in federal fossil fuel leasing, stating: "I'm going to push to change the way we manage our oil and coal resources, so that they better reflect the costs they impose on taxpayers and our planet."[1] Shortly after the President's remarks, the U.S. Department of the Interior ("Interior") announced that it would pause all new coal leasing and launch a comprehensive review of the federal coal program to identify reforms that would better account for the environmental costs of coal production and assess whether the public is receiving a fair return.[2] This was the first time in thirty years that Interior is-

1. Press Release, White House, Remarks of President Barack Obama–State of the Union Address as Delivered (Jan. 13, 2016), https://perma.cc/7TGJ-SEJ7.

2. Dep't of the Interior, Secretarial Order No. 3338 7–8 (2016).

sued a moratorium on coal leasing; it signaled the possibility of a new era in federal natural resources management more attuned to the climate impacts and other social costs of fossil fuel production.

However, such executive branch actions are susceptible to amendment or revocation in new presidential administrations. In the first six months of the Trump Administration, Interior issued a Secretarial Order ending the coal leasing moratorium and programmatic environmental review,[3] and stayed or repealed multiple regulations designed to increase fiscal transparency and reduce oil and natural gas pollution on federal lands.[4] As a Presidential candidate, Donald Trump made his views on federal energy production known, stating that: "America is sitting on a treasure trove of untapped energy—some $50 trillion dollars in shale energy, oil reserves and natural gas on federal lands, in addition to hundreds of years of coal energy reserves. It's all upside: more jobs, more revenues, more wealth, higher wages, and lower energy prices."[5] Thus, just as the "keep it in the ground" movement was gaining traction—with its proponents touting the need to curb fossil fuel leasing in order to reduce greenhouse gas emissions—the United States now finds itself on the precipice of a "drill, baby, drill"[6] era.

Contrary to President Trump's remarks, fossil fuel leasing is not "all upside." There are real costs—including pollution costs—that should be taken into consideration in managing these programs in order to provide maximum net benefits to the public. Central to this Article, the externalities[7] of fossil fuel

3. DEP'T OF THE INTERIOR, SECRETARIAL ORDER 3348 (2017), https://perma.cc/L2SF-RCXJ.

4. *See, e.g.*, Waste Prevention, Production Subject to Royalties, and Resource Conservation; Postponement of Certain Compliance Dates, 82 Fed. Reg. 27,430 (June 15, 2017) (postponing certain compliance dates under the Waste Prevention, Production Subject to Royalties, and Resource Conservation Rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016)); Postponement of Effectiveness of the Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform 2017 Valuation Rule, 82 Fed Reg. 11,823 (Feb. 27, 2017) (postponing the effectiveness of the Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform Rule, 81 Fed. Reg. 43,338, (July 1, 2016)); Repeal of Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform, 82 Fed. Reg. 36,934 (Aug. 7, 2017) (repealing the Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform Rule, 81 Fed. Reg. 43,338 (July 1, 2016)). Each of these actions has been challenged in federal court.

5. *Full Speech: Trump Addresses Charlottesville Violence in Energy Speech*, THE HILL (Sept. 22, 2016), https://perma.cc/22HJ-ZAVT.

6. Sarah Palin, Governor of Alaska, Biden-Palin Vice Presidential Debate (Oct. 2, 2008), https://perma.cc/2P2T-LDG9 ("The chant is 'drill, baby, drill.' And that's what we hear all across this country in our rallies because people are so hungry for those domestic sources of energy to be tapped into.").

7. Externalities are positive or negative spillover effects that affect the welfare of others. Pollution is a traditional example of a negative externality. *See, e.g.*, Thomas Helbling, *Externalities: Prices Do Not Capture All Costs*, INT'L MONETARY FUND: FIN. & DEV., https://perma.cc/8W4U-XF7J.

production—including air pollution—are not accounted for when leasing. This results in fossil fuel production on public lands imposing significant social costs. In addition, several government studies have shown that federal fossil fuel leasing programs are riddled with loopholes and stagnant fiscal terms that short-change federal taxpayers, to whom the nation's mineral resources belong.[8] President Trump has indicated his intention to run the United States more like a business,[9] but a well-run business would not give away its assets for a fraction of their true value, nor allow outside actors to impose uncompensated costs on its bottom line. Moreover, Interior's leasing programs have never been tailored to meet any past or present national climate change goals, despite their significant contribution to domestic greenhouse gas emissions.[10]

This Article presents a path forward for Interior's fossil fuel leasing programs that would instill more rationality into the process, with the goal of maximizing social welfare. The approach considered here draws from basic economic principles, including cost-benefit analysis. From an economic perspective, leasing provides potential benefits to taxpayers and consumers from access to fossil fuels. An economic perspective also recognizes the environmental and social harms associated with the extraction, transportation, and consumption of fossil fuels, including the social cost of greenhouse gas emissions. Cost-benefit analysis, then, can serve as a useful tool to weigh the tradeoffs inherent in natural resources management decisions.[11] However, to date, Interior employs cost-benefit analysis sparingly and inconsistently across its leasing

8. *See generally* U.S. Gov't Accountability Office, GAO-14-140, Coal Leasing: BLM Could Enhance Appraisal Process, More Explicitly Consider Coal Exports, and Provide More Public Information (2013), https://perma.cc/8MME-ZDPU [hereinafter GAO, Coal Appraisal]; *see also* The White House, Office of the President, The Economics of Coal Leasing on Federal Lands: Ensuring a Fair Return to Taxpayers (2016), https://perma.cc/Q5N2-NUU7 [hereinafter "CEA Coal Report"].

9. The third presidential debate included an exchange in which Donald Trump defended his business skills against Hillary Clinton's critiques, saying "[i]f we could run our country the way I've run my company, we would have a country that you would be so proud of." Donald Trump, Presidential Debate at the University of Nevada in Las Vegas (Oct. 19, 2016), https://perma.cc/B8SK-7PZH.

10. On June 1, 2017, President Trump announced that the United States would withdraw from the United Nations "Paris Accord," under which it had previously committed to reduce greenhouse gas emissions by 26 to 28 percent by 2025 against a 2005 baseline; however, the Trump Administration has stated that the United States may be willing to "re-engage" in the agreement under terms more favorable to U.S. interests. Press Release, U.S. Dep't of State, Communication Regarding Intent to Withdraw from Paris Agreement (Aug. 4, 2017), https://perma.cc/36T6-W8UC.

11. Cost-benefit analysis has practical limitations and has been criticized by some legal scholars. Some of these limitations and critiques are discussed in Section II.C, *infra*.

programs. As a result, taxpayers are likely receiving less than they should from a social welfare maximizing perspective.[12]

This Article argues that Interior should conduct a net benefits analysis and account for the social and environmental costs of production by adjusting the fiscal terms of federal leases in making decisions with respect to when, where, and how to lease federal fossil fuels. Because environmental and social externalities vary with the amount of fossil fuels that are produced, these costs can theoretically be recouped through the royalty rate. In this manner, the royalty rate can function as a type of tax levied on an activity that generates negative externalities. Instead of advocating for a strict "keep it in the ground" approach, this Article explores reforms that would likely have the effect of reducing production on marginal tracts where the cost of production—including environmental costs—would outweigh the benefits. The reforms explored here can earn taxpayers more revenue from the resources they own, and better account for the cost of environmental externalities associated with drilling and mining.

This Article proceeds in four parts. Part I reviews the current state of affairs at Interior, focusing on the recent boom in fossil fuel production in the United States and the concomitant regulatory policy lag. The regime governing the fiscal terms for leasing extraction rights on federal lands has been in place for several decades, and the terms of leases have seen little update during that time. Policy has not kept pace with recent developments in the extractive industries, most significantly the large-scale deployment of hydraulic fracturing ("fracking") technology in oil and gas production that has made production much more efficient, as well as regulatory changes, which have benefitted low-sulfur coal largely produced in federal basins. Problems with uncompetitive bidding for tracts and inefficiently low minimum bids and royalty rates create substantial potential for economic windfalls, especially to coal producers. These windfalls may lead to unjustified transfers of social assets, as well as inefficiently high levels of production of the public's non-renewable resources. Furthermore, there is no mechanism to account for many significant externalities associated with fossil fuel extraction, transportation, and consumption; existing regulations address some, but not all, of the environmental and social effects of mineral resource extraction.[13] To achieve more efficient levels of fossil fuel extraction, reforms to minimum bids and royalty rates are needed.

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12. Classical economics posits (1) that maximizing net social welfare is desirable; (2) that the market usually lands on efficient equilibria; and (3) that, when the market fails, regulatory intervention may be warranted. *See generally* N. Gregory Mankiw, Principles of Economics 3–16 (7th ed. 2012).

13. There are many complex and interconnected regulatory programs that touch on fossil fuel extraction. The Surface Mining Control and Reclamation Act, 30 U.S.C. §§ 1201–1328 (2012), regulates some of the environmental effects of mining, with a focus on surface reclamation. General environmental statutes, such as the Clean Water Act, 33 U.S.C. §§ 1251–1388 (2012), Clean Air Act, 42 U.S.C. §§ 7401–7515 (2012), and National Envi-

Part II introduces the procedural mechanisms and economic tools at Interior's disposal in managing fossil leasing for public benefit. Unlike a private actor extracting fossil fuels, Interior has the duty to manage federal natural resources for the benefit of current and future generations. Interior is a social decisionmaker stewarding natural resources on behalf of the American public. In addition, Interior is both a major driver of, and significant cost center for, the impacts associated with climate change, such as wildfires, droughts, and reduced snowpack. Procedurally, Interior can develop multiyear plans for leasing and corresponding programmatic environmental impact statements ("EISs") prepared pursuant to the National Environmental Policy Act ("NEPA") to guide its decision-making. Economic tools at Interior's disposal include the Interagency Working Group's Social Cost of Carbon and the Social Cost of Methane, as well as energy substitution analysis that enables it to model potential reforms and changes to its program, including adjustments to lease fiscal terms. These economic tools and methods empower Interior to account for costs that have historically been omitted from its leasing calculus. Interior's offshore leasing program has taken advantage of some of these tools in recent plans and analyses, although imperfectly. Interior's onshore and offshore programs, alike, still suffer from inefficiencies and flaws that render lease sales and long-term planning suboptimal from a social welfare maximizing perspective.

Part III describes how, under several statutes, Interior is charged with managing federal onshore and offshore fossil fuel leasing to private parties. Interior is tasked with ensuring a fair return for the American public for the use of federal resources and with harmonizing resource extraction with environmental and other values. This Part develops the argument that maximizing social net benefits when setting fiscal terms for mineral leases on federal lands is consistent with Interior's legal obligations. The Federal Land Policy and Management Act ("FLPMA") requires that Interior harmonize energy production with environmental preservation and manage public lands in accordance with the principles of "multiple use" and "sustained yield."[14] The Act also requires that Interior earn "fair market value" for the extraction of coal, oil, and natural gas from public lands.[15] The Outer Continental Shelf Lands Act ("OCSLA"), which governs offshore oil and gas production, contains similar provisions and requires preparation of five-year plans for offshore leasing. Interior has considerable discretion to define and effectuate the lofty mandates described in these statutes, pursuant to relevant legal precedent, administrative law doctrine, and

ronmental Policy Act, 42 U.S.C. §§ 4321–4370m-12 (2012), affect fossil fuel production, as well. These general statutes also govern the consumption of fossil fuels, as in the Clean Air Act's requirements that apply to electricity generating facilities. Each of these legal regimes come with an array of requirements that are administered by multiple federal agencies. This Article focuses on externalities that are not fully regulated by existing statutes or regulations.

14. 43 U.S.C. §1701 (2012).

15. *Id.* § 1701(a)(9).

presidential directives in place since the Reagan Administration that direct agencies to maximize the net benefits of their policy choices. As such, this Article argues that "fair market value" should be interpreted in light of Interior's obligations to harmonize energy production with other social goals, to include not only the market price of the resource, but also social costs.

Part IV suggests a suite of reforms that should be implemented by Interior in order to run a more strategic program that moves towards maximizing net benefits for American taxpayers. While it may be difficult to implement federal programs that maximize social welfare given practical constraints, such as the influence of incumbent resource owners,[16] this Article highlights viable opportunities for Interior to work towards a more socially optimal leasing framework. Interior should build more rationality into its leasing process at early stages by establishing regular plans for leasing and conducting a net-benefit analysis before moving forward with leasing. Interior should also conduct regular programmatic environmental reviews pursuant to NEPA for all of its fossil fuel leasing programs. As part of this review, Interior should evaluate the fiscal terms of leases and account for at least some of the externality costs of leasing through adjusted royalty rates. As shown by recent empirical studies of coal royalty rate reform, accounting for climate change costs is both feasible and rational. Interior should also enact reforms to its bidding processes to increase competition and help ensure a fair return. The reforms suggested in this Article are designed to benefit all taxpayers, including those in mineral-producing states, and would likely result in less production, fewer greenhouse gas emissions, and more revenue than under existing rules.

The Article concludes with a call to move beyond partisanship in federal energy policy. The reforms noted in this Article have the potential to pay significant dividends to the American public for decades to come by identifying opportunities to increase revenue and reduce greenhouse gas emissions and other externalities.

I. The Fossil Fuel Boom and Legal Lag

Interior oversees more than 260 million surface acres and 700 million subsurface acres of mineral resources onshore, and more than 1.7 billion acres offshore in the waters of the Outer Continental Shelf.[17] Despite its extensive

16. *See* Bruce R. Huber, *The Fair Market Value of Public Resources*, 103 Cal. L. Rev. 1515, 1521 (2015).

17. U.S. Gov't Accountability Office, GAO-14-50, Oil and Gas Resources: Actions Needed for Interior to Better Ensure a Fair Return 2 (2013), https://perma.cc/CV96-ELRT. In addition, BLM and the U.S. Forest Service coordinate the leasing of oil and gas rights underlying 192 million acres of National Forest System Lands. U.S. Bureau of Land Mgmt. & U.S. Forest Serv., Memorandum of Understanding Between the U.S. Department of the Interior Bureau of Land Management

public land and mineral holdings, Interior has consistently been criticized for failing to earn more from its mineral resources and for failing to protect environmental values. This Part provides an overview of modern energy market trends, the existing legal regime governing fossil fuel production on public lands, and recent critiques of federal leasing programs.

A. The Fossil Fuel Boom

Domestic oil and natural gas production has risen steadily for the past ten years, providing an important source of energy and revenue for the federal government and states.[18] Spurred by advances in technology, such as fracking, that have made fossil fuel production more efficient, the United States became the world's top producer of both oil and natural gas in 2015, surpassing Russia and Saudi Arabia.[19]

The United States produced about 90 percent of the energy it consumed in 2014, which reduced energy imports and contributed to a decrease in global energy prices.[20] The U.S. Energy Information Administration ("EIA") projects that domestic crude oil and natural gas production will continue to rise through 2020,[21] and that the United States will become a net oil exporter in high oil price scenarios.[22] The United States became a net exporter of natural gas in 2017, and the EIA projects that this trend will continue into the future.[23]

Federal energy production generates one of the largest non-tax sources of revenue for the United States, accounting for approximately $6.23 billion in fiscal year 2016.[24] Crude oil royalties account for the greatest share of federal revenue, the majority of which comes from offshore oil production in the Gulf

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AND THE U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE CONCERNING OIL AND GAS LEASING AND OPERATIONS 2 (Apr. 14, 2006), https://perma.cc/9LX2-7L33.

18. Oil production increased 75 percent between 2007 and 2016, and natural gas production increased 32 percent. *Petroleum and Other Liquids*, U.S. ENERGY INFO. ADMIN., https://perma.cc/55KW-4UMZ; *Natural Gas*, U.S. ENERGY INFO. ADMIN., https://perma.cc/4ZUB-29TY.

19. *See* Rakteem Katakey, *U.S. Ousts Russia as Top World Oil, Gas Producer in BP Data*, BLOOMBERG BUS., (June 10, 2015), https://perma.cc/Y3YV-3TS3.

20. *Id.*

21. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2017 20 (2017), https://perma.cc/E4RZ-FJXJ.

22. *See id.* at 47.

23. U.S. ENERGY INFO. ADMIN., SHORT-TERM ENERGY OUTLOOK: NOV. 2017 tbl.5a (2017) (comparing LNG Gross Imports and Pipeline Gross Imports with LNG Gross Exports and Pipeline Gross Exports), https://perma.cc/DRB9-U272; *see also* U.S. Energy Info. Admin., *United States Expected to Become a Net Exporter of Natural Gas This Year*, TODAY IN ENERGY (Aug. 9, 2017), https://perma.cc/4CLG-5FET.

24. Press Release, U.S. Office of Nat. Res. Revenue, Interior Department Disburses $6.23 Billion in FY 2016 Energy Revenues: Federal Revenues Support State, Tribal, National Needs (Nov. 25, 2016), https://perma.cc/N9WX-EV6Y.

of Mexico.[25] Together, coal, oil, and natural gas produced on federal lands account for approximately 25 percent of the total fossil fuels produced annually in United States.[26]

Federal oil and gas production has been decreasing as a share of total U.S. production, as new technology like fracking has greatly increased production in shale basins under state and private ownership.[27] Coal mining on federal lands, by contrast, has grown as a proportion of the domestic total as demand for low-sulfur coal produced predominantly in federal basins increased over the past decade, in response to air quality regulations.[28] In 1960, federal coal accounted for only 1.3 percent of the total coal mined in the United States.[29] In 2015, federal coal accounted for 42 percent of the total coal produced in the United States, the majority of which is produced in Wyoming's Powder River Basin.[30]

In recent years, there has been a decline in coal-fired electricity generation and, consequently, a decline in coal production.[31] Domestic coal consumption is projected to continue to decrease over the next few years, driven by lower natural gas prices, as well as by the retirement of coal-fired power plants in response to deadlines for compliance with the EPA's Mercury and Air Toxics Standards.[32]

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25. U.S. Energy Info. Admin., Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2014 9 (2015), https://perma.cc/AG74-3H3U. The federal Gulf of Mexico produced 68 percent of total federal and Indian lands crude oil in fiscal year 2014. *Id.* at 1.

26. *Id.* Coal produced on federal lands accounted for about 40 percent of U.S. total coal production; crude oil and natural gas produced from federal lands account for about 25 percent of U.S. production. Office of Policy Analysis, U.S. Dep't of the Interior, U.S. Department of the Interior Economic Report FY 2015 1 (2016), https://perma.cc/WD39-YYXR.

27. *See, e.g.*, Cong. Research Serv., R42432, U.S. Crude Oil and Natural Gas Production in Federal and Non-Federal Areas (2016) ("Any increase in production of natural gas on federal lands is likely to be easily outpaced by increases on non-federal lands, particularly because shale plays are primarily situated on non-federal lands and are where most of the growth in production is projected to occur.").

28. U.S. Energy Info. Admin., Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2014 (2015), https://perma.cc/HFZ3-LYH4; U.S. Energy Info. Admin., December 2015 Monthly Energy Review 97 (2015), https://perma.cc/TS5K-U4KP.

29. *See* Nat. Res. Def. Council v. Hughes, 437 F. Supp. 981, 983 (D.C. Cir. 1977).

30. U.S. Dep't of Interior, Federal Coal Program: Programmatic Environmental Impact Statement - Scoping Report Vol. I, ES-1 (2017), https://perma.cc/J9FB-ENS3 [hereinafter Coal PEIS Scoping Report Vol. I].

31. Coal-fired electricity made up 50 percent of U.S. generation in 2005 and by 2015 had declined to 33 percent. *Id.*

32. In a 5-4 ruling in June 2015, the U.S. Supreme Court sent the Mercury and Air Toxics Standards back to the D.C. Circuit, finding that EPA should have considered costs when it found that it was "appropriate and necessary" to regulate hazardous air emissions from power plants. Michigan v. EPA, 135 S. Ct. 2699 (2015). The Supreme Court left the rule in effect

B. The Governing Regime

Congress granted Interior broad authority to "prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of" the Mineral Leasing Act.[33] Pursuant to this authority, the Secretary of the Interior has promulgated detailed regulations for oil, gas, and coal leases.[34] If Interior determines that federal land is suitable for leasing, the Act establishes certain terms that all leases must contain, including bid, rental, and royalty provisions.[35]

Interior's Bureau of Land Management ("BLM") manages approximately 23,657 active oil, gas, and coal leases on 256 million onshore surface acres and 700 million onshore subsurface acres.[36] Interior's Bureau of Ocean Energy Management ("BOEM") manages approximately 8,300 active oil and gas leases across 1.7 billion Outer Continental Shelf offshore acres.[37]

For offshore oil and gas exploration and production, OCSLA grants Interior the power to determine where and when to issue oil and gas leases. The Secretary of the Interior must prepare a five-year program consisting of a schedule of oil and gas lease sales indicating the size, timing, and location of proposed leasing activity that the Secretary determines will best meet national

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on remand. EPA requested that the D.C. Circuit keep the rule in place while it addressed the costs. On April 14, 2016, EPA confirmed that it is appropriate and necessary to regulate air toxics, including mercury, from power plants after including a consideration of costs. EPA found that, "the cost of compliance with MATS is reasonable and that the electric power industry can comply with MATS and maintain its ability to provide reliable electric power to consumers at a reasonable cost." EPA, FACT SHEET: FINAL CONSIDERATION OF COST IN APPROPRIATE AND NECESSARY FINDING FOR THE MERCURY AND AIR TOXICS STANDARDS FOR POWER PLANTS 1 (2016), https://perma.cc/7MVU-84QJ.

33. 30 U.S.C. §§ 187, 189 (2015) (federal lands); *see also* 25 U.S.C. §§ 396, 396d (2015) (tribal lands); 43 U.S.C. § 1334(a) (2015) (Outer Continental Shelf).

34. Regulations governing BLM's coal, oil, and gas programs are found in title 43, subtitle B, chapter II, subchapter C, parts 3000 to 3480 of the Code of Federal Regulations. *See, e.g.*, 43 C.F.R. § 3100 (Onshore Oil and Gas Leasing); 43 C.F.R. § 3160 (Onshore Oil and Gas Operations); 43 C.F.R. § 3400 (Coal Management).

35. *See* 30 U.S.C. §§ 226(b)–(c) (2015).

36. JAYNI FOLEY HEIN, INST. FOR POLICY INTEGRITY, N.Y. UNIV. SCH. OF LAW, HARMONIZING PRESERVATION AND PRODUCTION: HOW MODERNIZING THE DEPARTMENT OF THE INTERIOR'S FISCAL TERMS FOR OIL, GAS, AND COAL LEASES CAN ENSURE A FAIR RETURN TO THE AMERICAN PUBLIC (2015), https://perma.cc/9297-5EYH; *see also* U.S. BUREAU OF LAND MGMT., ADVANCE NOTICE OF PROPOSED RULEMAKING: OIL AND GAS LEASING; ROYALTY ON PRODUCTION, RENTAL PAYMENTS, MINIMUM ACCEPTABLE BIDS, BONDING REQUIREMENTS, AND CIVIL PENALTY ASSESSMENTS, 22149 (2015); Steve Tryon, Bureau of Land Mgmt., Presentation to the Production Accountants Society of Oklahoma (Feb. 6, 2013), https://perma.cc/N37S-ZZMM.

37. BUREAU OF OCEAN & ENERGY MGMT., OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, https://perma.cc/7ZCZ-N6V6.

energy needs.[38] Preparing a five-year program involves an extensive public comment process and requires the Secretary to balance the potential for the discovery of oil and natural gas, the potential for environmental damage, and the potential for adverse effects on the coastal zone.[39] There is an additional public process for each lease sale to determine whether to hold the lease sale, and what terms and conditions will apply to those leases.[40]

Unlike for offshore leasing, Interior does not prepare a five-year program for onshore oil, gas, or coal leasing. Instead, Interior's onshore leasing policy is more reactive in nature, allowing fossil fuel companies to nominate tracts for lease.[41] For onshore fossil fuels, Interior prepares "Resource Management Plans" that establish federal land areas open to oil, gas, and coal leasing. Any parcels in areas identified as suitable for leasing in a Resource Management Plan may be nominated for lease.[42] Once BLM accepts an application for a lease, the agency prepares either an Environmental Analysis ("EA") or EIS required by NEPA.[43] Leases are then sold at auction to the highest bidder.

All federal leases—both onshore and offshore—must provide the American people with "fair market value" for the rights surrendered and the resources extracted.[44] The fiscal components of federal leases primarily consist of three terms: bids (also called "bonus payments"), annual rental payments, and royalties paid for produced resources. Total revenue from federal onshore production is divided evenly between the federal government and each state in which the production takes place.[45] One exception is Alaska, which is entitled to 90 percent of federal royalties for oil, gas, and coal production in the state.[46]

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38. Outer Continental Shelf Lands Act § 18(a)(2), 43 U.S.C. § 1344(a)(2) (2012).
39. *Id.* § 18(a)(3), 43 U.S.C. § 1344(a)(3).
40. *See* 43 U.S.C § 1337(a)–(b), (l) (2012).
41. Since 1990, all federal coal leasing has taken place through a lease-by-application process. *See* GAO, Coal Appraisal, *supra* note 8, at 2.
42. *See Planning and NEPA in the BLM*, U.S. Bureau of Land Mgmt., https://perma.cc/5VH2-3PMT; *Leasing*, U.S. Bureau of Land Mgmt., https://perma.cc/HGX8-DU9V; *see also* U.S. Bureau of Land Mgmt., Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office (2015) (on file with author). For example, in the May 2015 Buffalo Resource Management Plan, BLM estimated that it would issue 28 coal leases encompassing 106,400 acres with approximately 10.2 billion tons of coal in two "high potential" areas over the next 20 years. *Id.* at 823.
43. Leases are subject to the terms and conditions of the standard lease form and any additional stipulations or lease notices identified in the relevant Resource Management Plan or in site-specific environmental analysis. *See, e.g.*, U.S. Bureau of Land Mgmt., Final Environmental Assessment, December 2017 Competitive Oil and Gas Lease Sale 1 (2017), https://perma.cc/2TXH-Y9JX.
44. 43 U.S.C. § 1344(a) (2012); 43 U.S.C. § 1701(a)(9) (2012).
45. 30 U.S.C. § 191(a)–(b) (2012).
46. *Id.* Further, Native American tribes and allotment owners are allowed to retain 100 percent of the royalties collected from leases on their lands.

For offshore production, federal Outer Continental Shelf jurisdiction begins three nautical miles from the coast; the coastal state closest to federal offshore production receives 27 percent of revenues from leases in an area extending up to six miles off its coast.[47] Gulf-producing states (defined as Alabama, Mississippi, Louisiana, and Texas) receive up to 37 percent of revenues from certain offshore leases.[48] Coastal states have advocated for greater revenue share due to actual and potential impacts to coastal infrastructure and the environment from fossil fuel production.[49]

C. Program Deficiencies and Calls for Reform

Interior does not systematically evaluate or update the fiscal terms for oil, gas, and coal production on federal lands.[50] Some of its fiscal terms—including royalty rates for onshore oil and gas production—have not changed since 1920. The U.S. Government Accountability Office ("GAO") has repeatedly called for Interior to reform its fiscal system, which may be depriving tax payers of hundreds of millions of dollars each year from domestic energy production.[51] And because Interior excludes many environmental and social considerations when setting lease terms, federal leases are currently undervalued from a social welfare-maximizing perspective.[52] While fossil fuel leasing provides valuable public benefits, including revenue and jobs, the environmental and social costs of fossil fuel leasing have traditionally been omitted from Interior's decision-making

47. 43 U.S.C. § 1337(g)(5). This provision was included in section 8(g) of the OCSLA amendments of 1985 (Pub. L. No. 99-272, sec. 8003, § 8(g) 100 Stat. 148 (1985)).

48. *See* Gulf of Mexico Energy Security Act, Pub. L. No. 109-432, 120 Stat. 3001 (2006).

49. *See* Marc Humphries, Cong. Research Serv., No. R40645, U.S. Offshore Oil and Gas Resources: Prospects and Processes 19 (2010).

50. *See* U.S. Gov't Accountability Office, GAO-08-691, Oil and Gas Royalties: The Federal System For Collecting Oil And Gas Revenues Needs Comprehensive Reassessment 7–10 (2008).

51. *Id.*; U.S. Gov't Accountability Office, *supra* note 17; U.S. Gov't Accountability Office, GAO-07-676R, Oil and Gas Royalties: A Comparison of the Share of Revenue Received from Oil and Gas Production by the Federal Government and Other Resource Owners (2007); *see also* Inst. for Energy Econ. & Fin. Analysis, The Great Giveaway: An Analysis of the Costly Failure of Federal Coal Leasing in the Powder River Basin (2012) (estimating that the federal government lost $28.9 billion in revenues over 30 years due to BLM's failure to receive fair market value for coal mined in the Powder River Basin, which produces more than 40 percent of the nation's coal).

52. This argument is also highlighted in some of my earlier work. *See generally* Jayni Foley Hein & Peter Howard, Inst. for Policy Integrity, N.Y. Univ. Sch. of Law, Illuminating the Hidden Costs of Coal (2015), https://perma.cc/4QRK-M9QY [hereinafter Hein & Howard, Illuminating Coal Costs]; Jayni Foley Hein, Inst. for Policy Integrity, N.Y. Univ. Sch. of Law, Priorities for Federal Coal Reform (2016), https://perma.cc/9A2P-TXP9.

process, and until recently, unquantified.[53] Some of the most salient issues with respect to Interior's planning processes, fiscal terms, and treatment of environmental externalities are described below.

1. Uncompetitive Leasing

The Mineral Leasing Act of 1920 and Federal Coal Leasing Amendments Act of 1976 require that federal oil, gas, and coal leases be offered competitively.[54] In 2013, GAO found that approximately 90 percent of all federal coal lease sales since 1990 attracted only one bidder.[55] This is likely the result of a structural issue: coal companies frequently nominate tracts for lease adjacent to their existing coal mines and operations. While this may be efficient from a private company perspective, it all but ensures that there will be minimal competition for new coal leases from different companies, for whom the cost to mine the lease would be much greater. In addition, the Energy Policy Act of 2005 increased the amount of land that can be added to an existing coal lease through noncompetitive lease modification from 160 acres to 960 acres.[56] BLM approved 45 lease modifications from 2000 to 2013.[57]

Low competition is not unique to federal coal; about 40 percent of oil and gas leases in effect as of 2015 were issued noncompetitively, for the minimum bid price of $2 per acre.[58] Further, all onshore coal, oil, and gas leasing is done by application, which allows private companies to design lease boundaries.[59] Leasing by application permits companies to decide where and when it is privately optimal to locate a mine or well site, rather than where it is socially optimal, which may be very different, given environmental externalities and other factors.

Pursuant to OCSLA, offshore leasing must be done competitively, as well.[60] But Interior commonly offers large regions of the Outer Continental

53. This problem is not unique to federal fossil fuels. For analysis on the history of environmental cost quantification in regulatory decision-making, *see generally* Richard L. Revesz & Michael A. Livermore, Retaking Rationality: How Cost-Benefit Analysis Can Better Protect the Environment and Our Health (2008).

54. 30 U.S.C. § 201(a)(1) (2012).

55. *See, e.g.*, U.S. Gov't Accountability Office, *supra* note 17.

56. *See* 30 U.S.C. § 203 (2012); Energy Policy Act of 2005, Pub. L. No. 109-58, § 432, 118 Stat. 594, 761 (2005).

57. U.S. Dep't of the Interior, Office of Inspector General, No. CR-EV-BLM-0001-2012, Coal Management Program 13 (2013), https://perma.cc/7GMK-LLC7.

58. Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 76 (proposed Apr. 21, 2015) (to be codified at 43 C.F.R pt. 3100), https://perma.cc/QYS4-KWTU. In 2014, about 10 percent of new leases were issued non-competitively. *Id.*

59. *Coal Operations*, U.S. Bureau of Land Mgmt. (2016), https://perma.cc/GBD7-BSTP.

60. 43 U.S.C. § 1337(p)(3) (2012).

Shelf for lease in single auctions in a practice known as "area wide leasing"; in a 2015 lease sale in the Western Gulf of Mexico, for instance, BOEM offered more than 4,000 tracts for lease; 33 tracts were bid on, and 33 total bids were received.[61] Uncompetitive auctions for oil and gas leases may indicate that the government is offering too many tracts for lease at once.

2. Stagnant Minimum Bids and Royalty Rates

Given the lack of robust competition for federal fossil fuel leases, the method Interior uses to set minimum bids, rental rates, and royalty rates determines whether taxpayers receive a fair return. However, minimum bids have failed to even keep up with inflation.[62] Royalty rates have likewise remained stagnant, and, in some cases, have not changed since the passage of the Mineral Leasing Act of 1920.[63] Rental rates have likewise failed to keep pace with inflation.[64]

Interior, through BLM, allocates onshore oil and gas leases for a primary term of 10 years, and coal leases for a primary term of 20 years, through a bidding process.[65] A bid is a one-time payment made to the federal government by the lessee at the time leases are granted. Leases grant the exclusive right to explore, develop, and produce fossil fuels for a specific initial period.

The Mineral Leasing Act, as amended, gives the Secretary of Interior authority to set the national minimum bid for onshore oil and gas leases at $2 per acre or greater.[66] Interior has allowed the minimum bid for onshore oil and gas to remain at $2 per acre since 1987.[67] The minimum bid for coal leases has been set at $100 per acre since 1982.[68] Accounting for inflation, alone, would more than double the minimum bid for coal to $247 per acre.[69] All leases offered at

61. Dep't of the Interior, Bureau of Ocean Energy Mgmt., Gulf of Mexico OCS Region, All Lease Offerings (2016), https://perma.cc/H89X-BBHC.

62. *See infra* note 69 and accompanying text.

63. Onshore oil and gas royalty rates have been set at 12.5 percent since 1920. *See* 30 U.S.C. § 226(b)(1)(A) ("A lease shall be conditioned upon the payment of a royalty at a rate of not less than 12.5 percent in amount or value of the production removed or sold from the lease.").

64. Because rental rates make up a very small portion of revenue from fossil leasing, they are not discussed further in this Article. For discussion of potential rental rate reforms, *see* Hein, *supra* note 36.

65. 30 U.S.C. §§ 226 (oil and gas); *id.* § 207(a) (coal).

66. 30 U.S.C. § 226(b)(1)(B) (2012). The Mineral Leasing Act requires that the minimum bid be uniform nationwide, and prohibits BLM from setting minimum bids on a tract-by-tract basis. *See id.*

67. *Id.*

68. *See* 43 C.F.R. § 3422.1(c)(2) (1982).

69. The minimum bid of $100 per acre, or the equivalent in cents per ton, was set by regulation in 1982. *See id.* The minimum rental rate of $3 per acre was set in 1979. *See id.* § 3473.3-1(a).

auction that do not receive any bids are offered the following day in a noncompetitive sale for the minimum bid price.[70] Ideally, the starting bid at an auction should be set at a level to ensure a fair return for U.S. taxpayers.

For both coal and offshore oil and gas leases, Interior also formulates an estimate of the "fair market value" of every lease offered for sale. Interior's fair market value calculations are confidential and are only used to evaluate the bids received during lease sales.[71] The winning bid is the highest bid that meets or exceeds the tract's presale estimated fair market value.[72] Interior relies on two approaches to measure "fair market value." The first approach uses comparable lease sales and prior bids paid in similar mineral rights transaction to assess whether a bid is adequate.[73] The second approach uses projected revenue from the resource over time, under realistic conditions.[74] However, because many leases are uncompetitive, relying on comparable lease sales may perpetuate a pattern of accepting low bids. Further, coal sold overseas often sells at a higher price, yet BLM does not consistently account for export value when estimating coal's fair market value.[75] In addition, as discussed in Part II, *infra*, these two approaches do not account for the option value, or informational value of delay, of leasing these tracts at a later point in time when their value may be greater, or their environmental costs may be lower, due to better technology, infrastructure, or pollution mitigation techniques.

When a lessee successfully extracts mineral resources from federal land, the federal government is entitled to a royalty on the production. Royalties account for approximately 80 percent of all federal revenue from oil, gas, and coal leases.[76] The royalty rate is a percentage of the value of production; the royalty owed is the volume of production, times the unit value of production, times the royalty rate.

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70. 30 U.S.C. § 226(b)(1)(A) (2012); *see also* 43 C.F.R. § 3110(1)(b) (2016).
71. *Coal Operations*, *supra* note 59; *How it Works: Offshore Oil & Gas*, U.S. Extractive Indus. Transparency Initiative, https://perma.cc/3ZBC-UBF8.
72. 43 U.S.C. § 1337(a)(1). Winning bids are publicly available. *See, e.g.*, *Powder River Basin Coal Leases by Application*, U.S. Bureau of Land Mgmt., https://perma.cc/D64V-6LR8.
73. U.S. Bureau of Ocean Energy Mgmt., 2017–2022 Outer Continental Shelf Oil and Gas Leasing Proposed Final Program, 2–6 (2016), https://perma.cc/KRV7-MV98 [hereinafter BOEM, 2017–2022 OCS Proposed Final Leasing Program]; *see also* U.S. Bureau of Land Mgmt., Coal Evaluation Handbook (2014), https://perma.cc/AA2D-VMPQ.
74. BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 2–4.
75. GAO, Coal Appraisal, *supra* note 8; *see also* Clark Williams-Derry, Sightline Inst., Unfair Market Value: By Ignoring Exports, BLM Underprices Federal Coal 1 (2014), https://perma.cc/J4HV-MSAS.
76. Office of Nat. Res. Revenue, Reported Revenues By Category: FY 2016 by Accounting Year (2017), https://perma.cc/CL2R-62FP (Select the "Reported Revenues by Category"; adding the reported royalties for federal onshore leasing of coal, oil, and natural gas—including NGLs—returns $1,982,924,783.00, which is 79.6 percent of $2,489,690,931.64, the total revenues from these sources.).

The Mineral Leasing Act of 1920 sets a floor for onshore oil and natural gas royalty rates at no less than 12.5 percent of the value of production.[77] BLM issued a new regulation in 2016 allowing it to set royalty rates for competitive leases at or above 12.5 percent, whereas before its regulations set 12.5 percent as a flat rate for all leases.[78] BLM postponed this regulation in June 2017, walking back its flexibility to set higher royalty rates for new and modified leases.[79] A federal district court vacated the agency's postponement of the regulation in October 2017,[80] but BLM has since issued a notice of proposed rulemaking to formally suspend it.[81] For non-competitive leases, the royalty rate is fixed by statute at 12.5 percent.[82] The Mineral Leasing Act and the Federal Coal Leasing Amendments Act set a royalty rate floor for coal production at 12.5 percent of the gross value of the coal produced from surface mines, but allowed the Secretary to set a lower rate for coal produced from underground mines.[83] The current royalty rate for coal produced from underground mines is 8 percent.[84] Interior has the authority to increase the royalty rate for new coal leases, as well as leases that are modified or renewed.[85]

For offshore oil and gas leases, OCSLA provides that Interior must set royalties at or above 12.5 percent.[86] Interior increased the royalty rate for new offshore leases in the Gulf of Mexico from 12.5 percent to 16.67 percent in 2007, and again to 18.75 percent in 2008.[87] Interior made this change in response to technological improvements that made exploration and production more efficient, increased oil and gas prices, and the competitive market for

77. 30 U.S.C. § 226(b)(1)(A) (2012) ("A lease shall be conditioned upon the payment of a royalty at a rate of not less than 12.5 percent in amount or value of the production removed or sold from the lease.").

78. Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016).

79. *See* Waste Prevention, Production Subject to Royalties, and Resource Conservation; Postponement of Certain Compliance Dates, 82 Fed. Reg. 27,430 (June 15, 2017) (postponing certain compliance dates under the Waste Prevention, Production Subject to Royalties, and Resource Conservation Rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016)).

80. *See* California v. Bureau of Land Mgmt., Nos. 17-cv-03804-EDL, 17-cv-3885-EDL, 2017 WL 4416409 (Oct. 4, 2017).

81. *See* Waste Prevention, Production Subject to Royalties, and Resource Conservation; Delay and Suspension of Certain Requirements, 82 Fed. Reg. 46,458 (Oct. 5, 2017).

82. 30 U.S.C. § 226(c) (2012).

83. 30 U.S.C. § 207(a) (2012).

84. 43 C.F.R. § 3473.3-2(a)(2) (2005).

85. *See* 30 U.S.C. § 207(a) (2012); 43 C.F.R. §§ 3473.3-2 (2009), 3432.2(c) (2000). Leases in production are subject to renewal after the first 20 years of production, and every 10 years thereafter. 30 U.S.C. § 207(a) (2012).

86. 43 U.S.C. § 1337(a)(1) (2012).

87. *See* U.S. Bureau of Ocean & Energy Mgmt., Proposed Final Outer Continental Shelf Oil & Gas Leasing Program 2012–2017 96 (2012), https://perma.cc/NTZ6-HRBQ. Alaskan offshore leases utilize a 12.5 percent royalty rate. *Id.*

offshore leases.[88] Interior Secretary Ken Salazar said increasing the offshore rate was necessary to ensure that "the American taxpayer is getting a fair return for the oil and gas that the American people own."[89] Interior estimated that the offshore royalty rate change would increase oil and gas revenues by $4.5 billion over the next 20 years.[90]

According to some estimates, if onshore federal oil and gas royalty rates were the same as the offshore 18.75 percent rate, the U.S. government would collect an additional $730 million each year.[91] Many energy-rich states in the United States set royalty rates for fossil fuel production on state lands at between 15 and 20 percent.[92] For example, some oil and gas leases on Texas State University lands use rates of 25 percent;[93] in addition, private royalty rates in states like Texas and Oklahoma range from 18.75 percent to more than 20 percent.[94] A 2008 Government Accountability Office report found that the United States receives one of the lowest overall "takes" worldwide for oil, gas, and coal leases.[95] This is so, even though the United States is an attractive place to do business given its relative political stability, abundant mineral reserves, and ample infrastructure, including oil rigs, refineries, pipelines, and railways.[96]

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88. *Id.* ("Considered in combination with increased resource prices, perceived improvements in discovery and extraction technology, especially in deep water, and the competitive market for OCS acreage, BOEM raised GOM deepwater royalty rates for new leases from 12.5 to 16.67 percent in 2007, then to 18.75 percent in 2008.").

89. *Interior, Env't, and Related Agencies Appropriations for 2013*, *Testimony before the House Comm. on Appropriations, Subcomm. on Interior, Env't, and Related Agencies*, 102d Cong. 46–47 (2012) (statement of Hon. Ken Salazar, Sec'y of the Interior), https://perma.cc/U393-8TXE ("The underlying principle is we are mandated by statute, mandated by fairness to make sure the American taxpayer is getting a fair return for the assets the American people own.").

90. *See, e.g.*, Cong. Research Serv., RL33493, Outer Continental Shelf: Debate Over Oil and Gas Leasing and Revenue Sharing 2 (2008), https://perma.cc/3UBJ-7XJ8.

91. Ctr. for W. Priorities, A Fair Share: The Case for Updating Oil and Gas Royalties on Our Public Lands 7 (2015), https://perma.cc/4Q8T-YT8P.

92. *See id.* at 6.

93. *See* 31 Tex. Admin. Code § 9.51(c)(3)(A), Fig.31; *see also* Oil and Gas Lease #116381 Between Texas and Pacesetter Energy Leasing (Mar. 19, 2014), https://perma.cc/V5NX-Q92Z (royalty rate of 25%); Oil and Gas Lease #117928 Between Texas and Forge Energy, LLC (Mar. 25, 2016), https://perma.cc/5KA3-SY95 (royalty rate of 25%).

94. Shannon Ferrell et al., Petroleum Production on Agricultural Lands in Texas: Managing Risks and Opportunities 4.1.4.1 (2016), https://perma.cc/QTW9-W87C.

95. U.S. Gov't Accountability Office, GAO-08-691, The Federal System for Collecting Oil and Gas Revenue Needs Comprehensive Reassessment 11 (2008) (citing a June 2007 Wood McKenzie report finding that the United States ranked 93rd lowest out of 104 oil and gas fiscal systems evaluated).

96. *Id.* at 6.

3. Ignoring the Cost of Production Externalities

Interior's planning processes and lease terms do not account for the externality costs of oil, gas, and coal produced on federal land. In 1920, when Congress first set minimum royalty rates at 12.5 percent for federal oil and natural gas production, legislators did not understand the direct link between producing, transporting, and burning fossil fuels, all of which emit greenhouse gases, and climate change, with its effects on human and environmental health and wellbeing. Today, the connection is clear; scientific understanding of the environmental impacts of fossil fuel production has advanced and economic tools to measure the cost of these impacts, such as the Social Cost of Carbon and Social Cost of Methane, have been used by several federal agencies to measure the costs and benefits of proposed regulations.[97]

Because environmental externalities vary with the amount of fossil fuels that are produced, these costs could theoretically be recouped through the royalty rate (as opposed to minimum bids which are paid prior to actual production). In this manner, the royalty rate can be used as type of Pigouvian tax: a tax levied on an activity that generates negative externalities.[98]

This Article focuses its recommendations on "upstream" externalities that stem directly from production on federal lands at the mine or well site, as opposed to "downstream" externalities from coal, oil, and natural gas combustion. Many upstream externalities are not addressed by existing regulations and therefore represent uncompensated social and environmental costs. Further, by focusing recommendations on upstream externalities, this Article avoids any potential "double counting" of greenhouse gas emission costs that could come into play if other regulations, like EPA's Clean Power Plan, target downstream combustion emissions.[99]

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97. *See, e.g.*, Paul R. Epstein, et al., *Full Cost Accounting for the Life Cycle of Coal*, 1219 ANNALS N.Y. ACAD. SCI. 73 (2011) (tabulating and describing a wide range of costs associated with the full life cycle of coal, including greenhouse gas emissions). *See* Part II, *infra*, for a description of the Social Cost of Carbon and Social Cost of Methane.

98. Economist Arthur Pigou suggested that governments should tax polluters an amount equivalent to the cost of the harm to others. *See generally* ARTHUR PIGOU, THE ECONOMICS OF WELFARE (1920); *see also* David D. Haddock, *The Relevant Theory of Irrelevant Externalities: Buchanan, Coase, and Pigou*, 10 J.L. ECON. & POL'Y 689, 697–98 (2014). In the case of fossil fuel royalties, the Pigouvian tax would be imposed as an ad valorem tax (a percentage of the good's market price). *See* Mark Dickie & Gregory A. Trandel, *Comparing Specific and Ad Valorem Pigouvian Taxes and Output Quotas*, 63 S. ECON. J. 388, 389 (1996).

99. The status of EPA's Clean Power Plan is uncertain as of the date of this article. The Trump Administration has proposed a repeal of the regulation, and reports suggest that EPA is likely to develop a replacement rule that would place targets for emissions reductions at the power plant level or "inside the fence line" rather than set limits for carbon emissions across the energy sector. *See* Niina Heikkinen, *Clean Power Plan: 4 Things to Watch*, E&E NEWS (Aug. 24, 2017), https://perma.cc/A8GQ-6924. On November 9, 2017, the D.C. Circuit Court of Appeals rejected a request by the Trump Administration to indefinitely suspend

The oil and gas industry is the nation's largest industrial source of methane pollution.[100] The United States loses at least 1 to 3 percent of its total natural gas production each year when methane, a potent greenhouse gas, is leaked, flared (burned), or vented to the atmosphere during natural gas and oil production and distribution.[101] Oil and gas production also contributes to smog, particulate matter emissions, and hazardous air pollution.[102] Injection wells used to dispose fracking wastewater can induce earthquakes.[103] Wildlife habitat is impaired by drilling infrastructure. Oil and gas production use large quantities of fresh water, which is an externality in regions without efficient water markets.[104]

Vented and flared methane is also a waste of a valuable resource: natural gas.[105] The Mineral Leasing Act directs Interior to "use all reasonable precautions to prevent waste of oil or gas developed in the land,"[106] yet taxpayers lose as much as $23 million in royalty revenue from fugitive methane emissions each year.[107] In November 2016, BLM finalized a rule governing venting and flaring on federal lands, which was expected to reduce methane emissions by 41 to 60 percent.[108] However, BLM has since stayed implementation of this rule;[109] and

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litigation while EPA plans its next steps. *See* Press Release, Envtl. Def. Fund, D.C. Circuit Rejects Trump Administration Request to Indefinitely Delay Clean Power Plan Litigation (Nov. 9, 2017), https://perma.cc/U867-YJUH.

100. *Overview of Greenhouse Gases, Methane*, EPA, https://perma.cc/53W7-QRVY.

101. *See* EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012 (2014), https://perma.cc/V9Y3-9K8V.

102. *See* Mead Gruver, *Wyoming's Natural Gas Boom Comes with Smog Attached*, Associated Press (Mar. 9, 2011), https://perma.cc/CMD3-NYRB; Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008, 83,014 (Nov. 18, 2016).

103. A University of Texas study found that earthquakes occurred more frequently near injection well sites in the Barnett Shale region. Cliff Frohlich, *Two-Year Survey Comparing Earthquake Activity and Injection-Well Locations in the Barnett Shale, Texas*, 109 Proceedings Nat'l Acad. Sci. 13,934 (2012).

104. Groundwater is a common resource, and as such suffers from a tragedy of the commons in regions without efficient water markets or direct regulation of groundwater withdrawals. *See, e.g.*, Paula K. Smith, *Coercion and Groundwater Management: Three Case Studies and a "Market" Approach*, 16 Envtl. L. 797, 805–12 (1986) (discussing groundwater resources as "a well recognized commons").

105. Methane is the primary component of natural gas. *Overview of Greenhouse Gases, Methane*, EPA, https://perma.cc/53W7-QRVY.

106. 30 U.S.C. § 225 (2012).

107. Bureau of Land Mgmt., Regulatory Impact Analysis for: Revisions to 43 CFR 3100 (Onshore Oil and Gas Leasing) and 43 CFR 3600 (Onshore Oil and Gas Operations) Additions of 43 CFR 3178 (Royalty-Free Use of Lease Production) and 43 CFR 3179 (Waste Prevention and Resource Conservation) 2 (2016), https://perma.cc/RWU3-DUVP (also on file with author).

108. *Id.* at 9 (describing expected impact of rule); *see also* Waste Prevention, Production Subject to Royalties, and Resource Conservation Rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016).

even with the new standards in place, some methane and carbon dioxide would still be released into the atmosphere.[110]

Coal mining accounts for about 10 percent of domestic methane emissions.[111] Unlike for oil and gas, BLM does not regulate methane emissions from coal production. Coal mining also emits other air pollutants and has the potential to pollute waterways and sensitive habitat with acid mine drainage and other byproducts. It also uses a significant amount of water for dust control, extraction, and processing.[112]

For offshore oil and gas development, environmental externalities include the risk of oil spills arising from accidents; improper treatment and disposal of produced wastewater; air pollution, including methane emissions and hazardous air pollutants; and habitat disruption, including seabed impacts and marine mammal ship-strike mortality.[113] Other externalities include negative effects on commercial fisheries, subsistence fishing, and tourism if there is a large offshore oil spill, as witnessed with the BP Deepwater Horizon disaster.[114]

The transportation of coal, oil, and gas also results in externalities, including greenhouse gas and particulate matter emissions, rail congestion, fatalities, noise, and congestion.[115] In fact, up to 70 percent of all rail traffic in the United

109. *See* Waste Prevention, Production Subject to Royalties, and Resource Conservation; Postponement of Certain Compliance Dates, 82 Fed. Reg. 27,430 (June 15, 2017) (postponing certain compliance dates under the Waste Prevention, Production Subject to Royalties, and Resource Conservation Rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016)).

110. Further, these standards were not calibrated to maximize social welfare by requiring companies to capture all of the methane that is cost-benefit justified from a social welfare maximizing perspective. *See id.; see also* Inst. For Policy Integrity, Comments on Proposed Rule for Waste Prevention, Production Subject to Royalties, and Resource Conservation (Nov. 6, 2017), https://perma.cc/5CT9-KZG8.

111. During coal mining, methane escapes into the atmosphere through fissures, surface air exposure, and venting. *See* EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2013 2-4–2-9 (2015), https://perma.cc/Z8PE-48HM.

112. The Department of Energy estimates that U.S. coal mining uses approximately 70 to 260 million gallons of water per day, with average uses of 10 gallons per ton of coal mined on the surface in the West, and 100 gallons per ton of coal mined underground in Appalachia. U.S. Dep't of Energy, Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water 20 (2006), https://perma.cc/2H4E-UTKY.

113. *See* Bureau of Ocean Energy Mgmt., Outer Continental Shelf Oil and Gas Leasing Program: 2017–2022 Final Programmatic Environmental Impact Statement 4-86–4-110 (2016), https://perma.cc/Z435-8475.

114. *See id.* at 4-186–4-189.

115. U.S. freight railroads carried more than 400,000 carloads (or 280 million barrels) of crude oil in 2013, compared to just 9500 carloads (or 6.65 million barrels) in 2011. Cong. Research Serv., R43390, U.S. Rail Transportation of Crude Oil: Background and Issues for Congress 1 (2014), https://perma.cc/3FUN-MCYY. In Wyoming, more than 90 percent of coal is transported by rail out of the state for use in power plants. U.S. Energy

States is dedicated to shipping coal.[116] Offshore, transportation of oil by barge increases the risk of oil spills, and also contributes greenhouse gas emissions.[117]

Failure to account for the externality costs of fossil fuel production through regulation, lease-specific mitigation requirements,[118] or adjustments to fiscal lease terms means that the public bears the burden of mitigating and adapting to such costs, including greenhouse gas emissions—the effects of which will continue to be felt decades from now. As a consequence, the market price of fossil fuels is less than the socially optimal price, which leads to inefficiently high levels of extraction. In other words, failure to account for the environmental costs of production prioritizes short-term fossil fuel industry profits over long-term public welfare.

4. Royalty Rate Loopholes and Deductions

Relevant to the question of whether royalties are properly structured to ensure a fair return is how royalties are calculated, including whether any deductions or loopholes affect the overall return to the public. Coal, oil, and gas lessees can apply for a royalty rate reduction if the current royalty rate imposes economic hardship that would otherwise result in abandoning the lease, or in less than full recovery of the resource.[119]

Royalty rate reductions occurred on approximately 36 percent of coal leases offered for sale since 1990.[120] The Government Accountability Office found that the reported rate that lessees pay ranged from 5.6 percent for federal leases in Colorado to 12.2 percent in Wyoming.[121] The lower reported rates were largely a function of rate reductions. Lessees are also allowed to deduct transportation and washing costs from the sale price upon which federal royalties are calculated, which reduces incentives for companies to find the most efficient mode of transportation.[122] These royalty rate reductions and deduc-

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INFO. ADMIN., ANNUAL COAL DISTRIBUTION REPORT 2013 42–43 (2015), https://perma.cc/9ZC7-256R.

116. *Id.*; Epstein, et al., *supra* note 97, at 75.

117. BOEM, 2017–2022 OCS PROPOSED FINAL LEASING PROGRAM, *supra* note 73, at S-5.

118. *See* George Pring, *"Power to Spare": Conditioning Federal Resource Leases to Protect Social, Economic, and Environmental Values*, 14 NAT. RESOURCES L. 305, 307–08 (1981) (arguing that the federal government has the power and the legal duty to regulate environmental impacts through lease conditions).

119. For coal, see 30 U.S.C. § 209 (2012); 43 C.F.R. §§ 3473.3-2(e), 3485.2(c)(1) (2012). For oil and gas, see 43 C.F.R. § 3103.4-1(a) (2015).

120. MARK HAGGERTY, HEADWATERS ECONOMICS, AN ASSESSMENT OF U.S. FEDERAL COAL ROYALTIES: CURRENT ROYALTY STRUCTURE, EFFECTIVE ROYALTY RATES, AND REFORM OPTIONS 8 (2015), https://perma.cc/7KEN-P3WS.

121. GAO, COAL APPRAISAL, *supra* note 8, at 25.

122. *See* 30 C.F.R. § 1206.109 (2012) (oil and gas transportation); 30 C.F.R. § 1206.261 (2013) (coal transportation); 30 C.F.R. § 1206.258 (2013) (coal washing). As a practical matter, the

tions distort the energy market by subsidizing coal, oil and gas production, even when production may be uneconomical.

5. The Disconnect Between Fossil Fuel Leasing and Climate Change Goals

Interior's fossil fuel leasing programs operate separately from any past or present U.S. climate change goals. The plans and environmental reviews developed for these programs have never offered a strategy for reducing greenhouse gas emissions in line with past targets such as the United States' Intended Nationally Determined Contribution ("INDC") submitted to the United Nations Framework Convention on Climate Change for the 2015 Paris Climate Change 21st Conference of Parties. While the Trump Administration has announced its intention to withdraw from the Paris agreement,[123] the U.S. target had been to reduce greenhouse gas emissions by 26 to 28 percent below 2005 levels by 2025, and to make best efforts to reduce emissions by 28 percent.[124]

Fossil fuels produced from public lands, including their downstream combustion emissions, account for as much as 21 percent of all domestic greenhouse gas emissions.[125] Federal coal, alone, contributes approximately 10 percent of the nation's total greenhouse gas emissions.[126] As discussed in Part IV, *infra*, Interior should track these emissions in a public database and develop leasing plans that align leasing with any potential domestic climate change goals. As other efforts to curb greenhouse gas emissions appear unlikely to gain traction under the new administration, the fiscal reforms discussed here—which may also have the effect of increasing revenue—have the potential to become even more significant drivers of greenhouse gas emission reductions.

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coal transportation deduction is used sparingly by coal producers, as most companies sell their coal at the mine mouth, making transportation costs irrelevant to royalty assessments. *See* 30 C.F.R. § 1206.261 (2013). However, if Interior changes the point of valuation to the final delivery point (market price) or another point remote from the coal mine, transportation costs will become relevant to royalty payments. In such a scenario, the transportation deduction would reduce incentives to find the most efficient and lowest-cost mode of transportation, and subsidize coal production and transport over other energy sources.

123. Ari Natter, *Donald Trump Notifies UN of Paris Exit While Keeping Option to Return*, TIME (Aug. 5, 2017), http://perma.cc/78LT-8TBV.

124. Press Release, The White House, Office of the Press Sec'y, Fact Sheet: U.S. Reports Its 2025 Emissions Target to the UNFCCC (Mar. 31, 2015), https://perma.cc/25GR-JFF8.

125. STRATUS CONSULTING, GREENHOUSE GAS EMISSIONS FROM FOSSIL ENERGY EXTRACTED FROM FEDERAL LANDS AND WATERS: AN UPDATE 1, 11 (2014), https://perma.cc/8UBW-HH2K.

126. COAL PEIS SCOPING REPORT VOL. I, *supra* note 30, at 6-4 ("When combusted, this Federal coal contributes roughly 10 percent of total US greenhouse gas emissions.").

D. Planting the Seeds of Reform

In January 2016, Interior announced that it would pause all new coal leasing and launch a comprehensive review of the federal coal program—the first programmatic review conducted in over 30 years—to identify reforms that would better account for the environmental costs of coal production.[127] In its Programmatic EIS, Interior planned to address the issue of a fair return to taxpayers, as well as "whether the current Federal coal leasing program adequately accounts for externalities related to Federal coal production, including environmental and social impacts."[128] Interior's Scoping Report, released in January 2017, laid out options for further analysis through the review process, including many of the reforms suggested in this Article: increasing the federal coal royalty rate; assessing a carbon-based "externality adder" to be applied to the royalty rate; limiting the use of royalty rate reductions; increasing minimum bids and rental rates; and implementing an inter-tract bidding process to increase competition for leases.[129]

Interior's effort to review the federal coal program underscores the need to comprehensively examine its fossil fuel leasing programs. However, the Trump Administration moved swiftly to terminate the programmatic review and resume coal leasing according to the pre-existing, outdated terms.[130] This Article highlights the rationality of modernizing Interior's leasing programs even with the shift in presidential administrations. The following sections explore how Interior can use modern economic tools to advance a social welfare-maximizing framework that aligns with Interior's statutory mandates.

II. Interior, as the Steward of Public Lands, Should Maximize Net Social Benefits When Leasing

This Part introduces Interior's role as steward of public lands for the benefit of the public. It then describes the procedural and economic tools available to Interior in carrying out a federal program that attempts to maximize social welfare, including comprehensive planning processes, balanced cost-benefit analysis, the Social Cost of Carbon, energy substitution analysis, and option value. Interior's offshore leasing program has taken advantage of some of these

127. *See* U.S. Dep't of the Interior, Secretarial Order No. 3338, 1 (2016).

128. *Id.* at 7–8.

129. Coal PEIS Scoping Report Vol. I, *supra* note 30, at 6-6. The Scoping Report and its appendix cites some of my earlier work that recommends many of these changes. *See id.* at 5-46, 5-47; U.S. Dep't of the Interior, Federal Coal Program: Programmatic Environmental Impact Statement - Scoping Report Appendices Vol. II (Jan. 2017), https://perma.cc/HGV9-EJP6.

130. Exec. Order, No. 13738, 82 Fed. Reg. 16,093, 16,096 (Mar. 31, 2017); U.S. Dep't of the Interior, Secretarial Order No. 3348 (2017), https://perma.cc/4UER-NZAD.

tools; however, both its onshore and offshore programs would benefit from modernization in order to move towards maximizing social welfare.

A. Interior's Public Stewardship Posture

The Department of the Interior is a social decisionmaker acting on behalf of the public, to whom the nation's mineral resources belong. Interior has a dual mandate to manage development of resources while ensuring adequate protection of environmental and social values. Congress was unequivocal in tasking Interior with managing federal energy resources in order to benefit the public. The Mineral Leasing Act provides that the Secretary of the Interior can include coal, oil, or gas lease terms that he or she deems necessary "for the safeguarding of the public welfare."[131] FLPMA requires agencies to manage public lands in accordance with the "principles of multiple use,"[132] which are defined, in part, as: "meet[ing] the present and future needs of the American people."[133] With respect to offshore resources, the congressional statement of policy in the Outer Continental Shelf Lands Act declares that the Outer Continental Shelf is a vital natural resource held in trust by the federal government for the benefit of the American people, and directs Interior to balance economic, environmental, and social values in managing offshore resources.[134]

Interior's public stewardship posture distinguishes it from a private fossil fuel developer operating on privately owned land. While, as a matter of property law, lessees are generally expected to compensate lessors for many negative impacts to property,[135] Interior is not just any property owner and lessor; it is tasked with managing lands for the benefit of current and future generations, and it is directed to balance economic, environmental, and social values in managing resources. Ensuring the optimal rate and terms of mineral resource extraction on public land is akin to solving a principal-agent problem: the government (the principal) directs a fossil fuel firm (the agent) to efficiently extract the resource and return economic profits to the government.[136] Under another possible model, the government could itself extract natural resources on public lands, taking into account direct and indirect costs of production, and address negative externalities by choosing to forego or limit development of resources. In reality, the government does not extract the resources for itself and

131. 30 U.S.C. § 187 (2012).

132. 43 U.S.C. § 1712(a)–(c)(1) (2012).

133. *Id.* § 1702(c).

134. 43 U.S.C. § 1332(3) (2012).

135. *See* Michael Burger, Sabin Ctr. for Climate Change Law, Columbia Law Sch., Executive Summary: A Mitigation-Based Rationale for Incorporating a Climate Change Impacts Fee into the Federal Coal Leasing Program, 2 (2016), https://perma.cc/42C8-TY9Z.

136. *See* CEA Coal Report, *supra* note 8, at 10.

instead relies on private firms to do so.[137] This presents issues with respect to efficiently managing the externalities from production and determining the ideal timing of resource extraction, as private firms may have different incentives than the federal government in terms of conservation, timing, and externalities.

Interior is also distinct from a private landowner as its public lands are both a major driver of, and significant cost center for, the impacts associated with climate change, such as more frequent and severe wildfires, droughts, floods, and reduced snowpack. As just one example, climate change has led to fire seasons that are now on average 78 days longer than in 1970.[138] Interior must mitigate and adapt to climate change impacts on its more than 260 million onshore surface acres and 1.7 billion offshore acres. Interior has a greater incentive to manage production in order to reduce greenhouse gas emissions than a private actor does, as it will bear more of the cost of those emissions directly.

It is up to Interior to set rules and frameworks for how it leases public lands to private parties for resource extraction in order to uphold its statutory mandates to earn "fair market value" for the public and to harmonize energy production with resource conservation.[139] This Article argues that when the government is the mineral owner, its objective should be to develop the resource in such a manner as to generate maximum net benefits to the public. As explored in Part III, *infra*, this framework is consistent with Interior's statutory mandates, legislative history, and executive orders for agency decision-making that direct agencies to maximize the net benefits of their policy choices. In order to maximize net social benefits when leasing, Interior must first ensure that the benefits of leasing outweigh the costs—including externality costs. It should also assess whether revisions to its fiscal terms, timing of lease sales, and other factors can increase the net benefits of leasing. This section provides information on the planning and economic tools at Interior's disposal in managing its fossil fuel leasing programs for the benefit of the public.

B. Leasing Plans and Programmatic Environmental Impact Statements

Interior should develop multi-year plans for leasing and corresponding programmatic EISs prepared pursuant to NEPA to guide its decision-making.

137. *See id.* at 10; *see generally* Jayni Foley Hein & Caroline Cecot, *Mineral Royalties: Historical Uses and Justifications*, 28 Duke Envtl. L. & Pol'y F. 1 [hereinafter Hein & Cecot, *Mineral Royalties*].

138. An increasing portion of the U.S. Forest Service budget is directed to fighting wildfires on public lands. *See* U.S. Dep't of Agric., The Rising Cost of Wildfire Operations: Effects on the Forest Service's Non-Fire Work 2 (2015), https://perma.cc/Y3PX-QEDU.

139. 43 U.S.C. §§ 1344(a)(3)–(4), 1701(a)(8)–(9) (2012).

Yet as described in Part I, *supra*, Interior does not prepare regular strategic leasing plans or programmatic EISs for its onshore oil, gas, or coal leasing programs. This has resulted in uncompetitive programs that do not adequately serve the public interest.

NEPA requires federal agencies to take a "hard look" at the environmental consequences of a proposed activity before taking action.[140] Agencies are required to prepare EISs for all "major Federal actions significantly affecting the quality of the human environment."[141] EISs must contain, among other elements, a statement of the purpose of and need for the action, and a discussion of alternatives to the proposed action.[142] Alternatives analysis is the "heart" of the environmental review process.[143] Programmatic EISs, which are subject to the same requirements as EISs, assess the environmental impacts of proposed policies, plans, programs, or projects for which subsequent actions will be implemented.[144] Programmatic EISs can frame the scope of subsequent project-specific federal actions, identify geographically bounded areas within which future proposed activities can be taken, identify broad mitigation or conservation measures that can be applied to subsequent projects and their NEPA reviews, and analyze feasible alternatives to the way current programs are managed.[145]

One model for how Interior can instill more rationality into its lease planning process is BOEM's five-year planning process for offshore oil and gas leasing. The Outer Continental Shelf Lands Act requires BOEM to prepare a five-year Program that establishes a schedule of oil and gas lease sales in planning areas of the U.S. Outer Continental Shelf.[146] The Program specifies the size, timing, and location of potential leasing activity that the Secretary of the Interior determines will best meet national energy needs. Because the implementation of the five-year Program will have significant environmental and social effects, BOEM also prepares a programmatic EIS for each proposed Program, as required by NEPA. BOEM's programmatic EIS analyzes the potential environmental impacts of the activities that may result from the lease sale schedule as identified in BOEM's Draft Program; considers a reasonable range of alternatives to the proposed lease sale schedule (including a "no sale" option); and identifies opportunities for mitigation.

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140. 42 U.S.C. § 4332(C) (2012).

141. *Id.*

142. *Id.*; 40 C.F.R. § 1502.14 (1978).

143. 40 C.F.R. § 1502.14.

144. White House Council on Envtl. Quality, Effective Use of Programmatic NEPA Reviews 7 (2014), https://perma.cc/93PR-JTUJ. "Programmatic NEPA reviews are governed by the same regulations and guidance that apply to non-programmatic NEPA reviews." *Id.*

145. *See id.* at 10; *see also* Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989).

146. Outer Continental Shelf Lands Act, 43 U.S.C. § 1344 (2012).

Interior's decision to initiate a programmatic EIS for the federal coal program in 2016 is another example of the type of analysis that can and should be done regularly to determine whether taxpayers are receiving "fair market value" and whether the program is aligned with climate change or other environmental goals. Prior to 2016, the last time that the federal coal program was reviewed was 1986.[147] Such a review should be done far more frequently than every 30 years in order to keep pace with environmental knowledge, changes in the energy market, new technology, and more.

Interior should exert more control over where, when, and on what terms any leasing occurs, in order to run a more competitive program that appropriately balances federal land uses and provides maximum net benefits to the American public. Preparing strategic plans and programmatic EISs on a regular schedule would enable Interior to better weigh the trade-offs between competing uses of federal lands, as it must do under its "multiple use" mandate; analyze viable leasing alternatives and their environmental and social impacts; monitor changing market conditions; and evaluate lease timing and fiscal terms in order to manage a program that best serves the public interest.

C. Calculating the Net Social Benefits of Leasing

Key to maximizing social welfare, Interior should not lease any fossil fuels to private companies for extraction unless the social benefits of doing so outweigh the costs. Interior can determine whether this is the case by conducting a cost-benefit analysis of its leasing programs that accounts for the externality costs of production.

Cost-benefit analysis has limitations. It requires assigning monetized values to non-market benefits and costs, which can be difficult or even impossible in some cases (such as valuing the loss of a species). Moreover, in some cases, a policy may be desirable even if the quantifiable benefits to society do not outweigh its costs, particularly if there are ethical or equity concerns. The use of cost-benefit analysis in environmental policy has been criticized on these and other grounds.[148] Despite these critiques and limitations, cost-benefit analysis can provide a useful framework for comparing the social costs and benefits of

147. COAL PEIS SCOPING REPORT VOL. I, *supra* note 30, at 5–7.

148. *See, e.g.*, David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis*, 24 ECOLOGY L.Q. 545 (1997); Thomas O. McGarity, *A Cost-Benefit State*, 50 ADMIN. L. REV. 7 (1998); Amy Sinden, *Cass Sunstein's Cost-Benefit Lite: Economics for Liberals*, 29 COLUM. J. ENVTL. L. 191 (2004); FRANK ACKERMAN & LISA HEINZERLING, PRICELESS 234 (2004) ("Cost-benefit analysis of health and environmental policies trivializes the very values that gave rise to those policies in the first place."). In addition, increasing overall societal well-being need not be the only goal of policymaking. It may be weighed against other considerations, such as distributive concerns. *See, e.g.*, John Bronsteen et al., *Well-Being Analysis vs. Cost-Benefit Analysis*, 62 DUKE L.J. 1603, 1612 n.41 (2013).

proposed agency actions. This is especially true in light of advancements in calculating environmental costs, such as the Social Cost of Carbon.[149] Where, as here, federal agencies are directed by statute to manage federal fossil fuels in order to earn "fair market value" for the public, they can improve their decision-making by using balanced cost-benefit analysis that accounts for social and environmental costs and benefits, as well as "economic," or market based, costs and benefits.

BOEM's practice of calculating the "net social value" of offshore leasing in each area of the Outer Continental Shelf before keeping that area in its final program is a good starting point for illustrating how balanced cost-benefit analysis can be applied to fossil fuel leasing decisions. OCSLA requires BOEM to balance economic, environmental, and social values when managing offshore oil and gas leasing.[150] To help fulfill this mandate, the agency calculates the projected net benefits of leasing in each identified offshore region, as compared to not offering any tracts for lease in that region.[151] The D.C. Circuit Court of Appeals has upheld BOEM's methodology for calculating net social value, which uses a cost-benefit analysis that begins by calculating each planning area's "net economic value" (the market value of expected resources less the cost of production and transportation) minus environmental and social costs.[152] BOEM then compares the net benefits of producing oil and gas from the program areas to the net benefits of the "no leasing" alternative to calculate the incremental net benefits, if any, of including each area in the program.[153]

BOEM's net benefit analysis is a useful starting point, but it should not be the end point. Notably, in its Proposed Final Offshore Leasing Program for 2017–2022, BOEM's net benefit analysis did not account for the cost of greenhouse gas emissions from oil and natural gas production, transport, processing, and consumption.[154] BOEM did analyze life cycle greenhouse gas emissions and their costs, but it never factored these costs into its net benefits calculation,

149. More broadly, cost-benefit analysis contributes useful information to the decision-making process about how scarce resources can be valued and put to the best social use, including production or preservation. *See* EPA, Guidelines For Preparing Economic Analyses A-6–A-7 (2010), https://perma.cc/R6MX-VGDA.

150. 43 U.S.C. § 1344(a)(1) (2012).

151. *See, e.g.*, BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 5-11–5-13, 5-20–5-21.

152. California v. Watt (*Watt II*), 712 F.2d 584 (D.C. Cir. 1983). The Court also found that receipt of fair market value does not mean "maximization of revenues." *Id.* at 606; *see also* Nat. Res. Def. Council v. Hodel, 865 F.2d 288, 306–08 (D.C. Cir. 1988) (upholding the agency's use of cost-benefit analysis, as well as qualitative factors, to determine which areas to include in an offshore leasing program). These cases are described further in Part III.

153. *See* BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 5-13, 5-18, 5-20.

154. BOEM states: "The Net Benefits Analysis omits several conceivable effects of OCS oil and gas development, including, for both the PFP sale options and the No Sale Options, the

as it ultimately concluded that greenhouse gas emissions in the lease sale and "no action" scenarios would be very similar, due to energy substitution.[155] However, BOEM's model of the world oil market found that the "no action" alternative would decrease global carbon dioxide emissions by up to 2.3 billion metric tons over the duration of the 2017–2022 OCS Leasing Program[156]: this is more than the annual CO_2 emissions from the entire U.S. transportation sector.[157] This finding makes sense as a matter of supply and demand: decreasing global oil supply should lead to higher global oil prices, and consequently less oil consumption and greenhouse gas emissions.[158] Thus, BOEM arguably did not complete its "net benefits" analysis for the 2017–2022 Program, from the perspective of both upstream and downstream greenhouse gas emissions.

In order to provide "fair market value," federal leasing should provide net benefits to taxpayers. And ideally, leasing decisions should be calibrated to maximize net benefits. Through a programmatic EIS or separate planning process, Interior should explore how to account for the social and environmental costs of fossil fuel production through adjustments to federal lease fiscal terms, such as royalty rates. A royalty payment that targets the negative externalities not addressed by other policies (such as direct regulation limiting greenhouse gas emissions or an economy-wide carbon tax) would, in theory, allow the public to enjoy maximum net benefits from extraction by requiring private firms to

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costs associated with greenhouse gas (GHG) emissions related to oil and gas production, transport, processing and end use consumption." *Id.* at 5-23.

155. *Id.* at 5-23. *See also* U.S. Bureau of Ocean Energy Mgmt., OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon (2016), https://perma.cc/2MXN-QXBV) [hereinafter BOEM, OCS Lifecycle GHG Report]. Section 6.4 of the Proposed Final Plan provides detail on possible OCS production substitutes. For example, oil imports would replace 63 percent of anticipated OCS production under a No Sale option; onshore production 22 percent; and reduced consumption only 7 percent. BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 6-17.

156. BOEM, OCS Lifecycle GHG Report, *supra* note 155, at 23–24 ("[F]or the global oil market, MarketSim substitutions under the No Action Alternative show a reduction in foreign oil consumption of approximately 1, 4, and 6 billion barrels of oil for the low-, mid-, and high-price scenarios, respectively, over the duration of the 2017–2022 Program. GHG impacts for this reduction in oil consumption, as well as possible changes for natural gas, are not captured in this analysis."); Peter Erickson, *Final Obama Administration Analysis Shows Expanding Oil Supply Increases CO_2*, Stockholm Env't Inst. (Jan. 30, 2017), https://perma.cc/4MX6-F7QD (translating oil consumption projections from BOEM's OCS Lifecycle Greenhouse Gas Emissions report into estimated carbon dioxide emissions).

157. One year of U.S. transportation sector CO_2 emissions is about 1.7 billion metric tons of CO_2. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014, at ES-11 (2016).

158. *See* Peter Erickson, *Obama's Arctic Oil Ban Advances Key Climate Test*, Seattle Times (Dec. 30, 2016), https://perma.cc/FP59-YD2L.

internalize negative externalities and align their incentives with those of the government. These potential reforms are discussed in Part IV, *infra*.

D. Economic Tools: The Social Cost of Carbon, Energy Substitution Analysis, and Option Value

There are several economic tools at Interior's disposal in managing fossil fuel leasing for the benefit of the public. These tools include the Interagency Working Group's Social Cost of Carbon and the Social Cost of Methane.

The Social Cost of Carbon is a widely accepted methodology used by multiple federal agencies to quantify the costs of climate pollution for the purpose of designing federal rules and programs. The Social Cost of Carbon quantifies the economic damages associated with a small increase in carbon dioxide emissions, conventionally one metric ton, in a given year.[159] The Social Cost of Carbon was designed by an Interagency Working Group comprised of economic and scientific experts from the White House and multiple federal agencies.[160] It used the latest peer-reviewed science and economic models.[161] EPA's Social Cost of Methane builds on this framework and is also based on the latest peer-reviewed science and economic models.[162] While the Trump Administration disbanded the federal Interagency Working Group and withdrew its technical documents "as no longer representative of governmental policy,"[163] the Social Cost of Carbon and the Social Cost of Methane remain the best meth-

159. *The Social Cost of Carbon*, EPA, https://perma.cc/3NS6-ABVE.

160. *Id.*

161. In February 2010, the Interagency Working Group ("IWG") released estimated Social Cost of Carbon values, developed using the three most widely cited climate economic impact models known as integrated assessment models. *See* EPA, FACT SHEET: SOCIAL COST OF CARBON 2–3 (2016). These models were each developed by outside experts, and published and discussed in peer-reviewed literature. *See id.* at 3. An accompanying Technical Support Document released by the IWG discussed the models, their inputs, and the assumptions used in generating the Social Cost of Carbon estimates. *See* INTERAGENCY WORKING GRP. ON SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT (2016), https://perma.cc/A99J-YDZ4. The Government Accountability Office examined the IWG's process, and found that it was consensus-based, relied on academic literature and modeling, disclosed relevant limitations, and was designed to incorporate new information via public comments and updated research. *See* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-663, REGULATORY IMPACT ANALYSIS: DEVELOPMENT OF SOCIAL COST OF CARBON ESTIMATES (2014), https://perma.cc/BKE2-XDTY.

162. *See generally* INTERAGENCY WORKING GRP. ON SOCIAL COST OF GREENHOUSE GASES, ADDENDUM TO TECHNICAL SUPPORT DOCUMENT ON SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (2016), https://perma.cc/ZML3-N8J3 (describing the Social Cost of Methane); *see also* Alex L. Marten et al., *Incremental CH_4 and N_2O Mitigation Benefits Consistent with the US Government's SC-CO_2 Estimates*, 15 CLIMATE POL'Y 272, 279–90 (2015) (describing methodology for calculating the Social Cost of Methane).

163. Exec. Order No. 13783, 82 Fed. Reg. 16,093, 16,095 (Mar. 31, 2017).

ods available to analyze the social cost of greenhouse gas emissions.[164] In the absence of any better metric, Interior should continue to use these economic tools when preparing EISs, conducting net benefits analysis, and making policy decisions that rest, at least in part, on the social cost of greenhouse gas emissions.

Another tool in Interior's planning arsenal is energy substitution analysis. This method would enable the agency to model alternative leasing scenarios and potential changes to its programs, such as adjustments to fiscal terms. In its NEPA analysis, Interior should analyze the effect of each alternative, including the "no action" alternative, on energy markets and greenhouse gas emissions, including upstream and downstream emissions. In line with recent case law, federal agencies must disclose the upstream and downstream greenhouse gas emission effects of actions that require NEPA review.[165] Further, a growing number of federal courts have held that agencies must conduct proper energy substitution analysis in NEPA reviews.[166]

Economists measure how coal, natural gas, and other fuels act as substitutes in the electricity market by analyzing "cross-price elasticity," that is, how responsive producers are in swapping inputs when relative prices change.[167] Conducting proper substitution analysis in a leasing plan or EIS is critical to analyzing potential environmental impacts, and ultimately, to selecting the most efficient alternative. For example, increasing the federal royalty rate for

164. Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 SCI. 655, 655 (2017) (explaining that, even after the Trump Administration's Executive Order disbanding the Interagency Working Group on the Social Cost of Carbon, the social cost of greenhouse gas estimate of around $50 per ton of carbon dioxide is still the best estimate).

165. *See* Sierra Club v. FERC, No. 16-1329 (D.C. Cir. Aug. 22, 2017) (finding FERC's NEPA analysis deficient because the agency "should have estimated the amount of power-plant carbon emissions that the pipelines will make possible."); Michael Burger & Jessica Wentz, *Downstream and Upstream Greenhouse Gas Emissions*, 41 HARV. ENVTL. L. REV. 109, 147 (2017) ("Since 2014, there have been five district court decisions regarding the scope of downstream emissions that must be evaluated in NEPA reviews for coal lease modifications and other approvals involving the extraction of coal from federal lands. In four of these cases, district courts in Colorado and Montana determined that the responsible agencies failed to take the requisite 'hard look' at downstream emissions from the combustion of the coal."); *see also* 42 U.S.C. § 4332(2)(C) (2012) (requiring the preparation, as part of every "major Federal action[ ] significantly affecting the quality of the human environment," of a "detailed statement" discussing and disclosing the environmental impact of the action).

166. *See, e.g.*, WildEarth Guardians v. U.S. Bureau of Land Mgmt., No. 15-8109 (10th Cir. Sep. 15, 2017); Mid States Coal. for Progress v. Surface Transp. Bd., 345 F.3d 520, 549–50 (8th Cir. 2003); High Country Conservation Advocates v. Forest Serv., 52 F.Supp.3d 1174, 1197 (D. Colo. 2014).

167. *See* MANKIW, *supra* note 12, at 98. For example, the U.S. Energy Information Administration found that for the U.S. market, a 10 percent increase in the ratio of the price of coal to the price of natural gas leads to a 1.4 percent increase in the use of natural gas over coal. U.S. ENERGY INFO. ADMIN., FUEL COMPETITION IN POWER GENERATION AND ELASTICITIES OF SUBSTITUTION 1 (2012).

coal would be expected to lead to some substitution of natural gas and renewable energy for coal (as well as some substitution of coal produced on public lands to coal produced on private lands) in the overall energy mix, as well as greater energy conservation. This, in turn, should reduce total greenhouse gas emissions. Interior can choose from several sophisticated models in order to conduct substitution analysis and evaluate the effect of different leasing policies and royalty rates on the energy market. These models include ICF International's Integrated Planning Model ("IPM");[168] the U.S. Energy Information Administration's National Energy Modeling System ("NEMS");[169] and BOEM's MarketSim model, which it uses to analyze lease sale scenarios in its five-year planning process.[170] Each of these models has benefits and drawbacks; generally, there is a tradeoff between model transparency and model complexity.[171]

Interior has been inconsistent in conducting substitution analysis in some of its prior EISs and leasing plans. For example, in its 2010 EIS for the Wright Area coal leases, located in the Powder River Basin, BLM reasoned that if it were to select the "no action" alternative (not leasing the coal), other coal mines would increase production to entirely replace all 2 billion tons of coal anticipated from the leases.[172] As a result, it predicted that the amount of coal burned in the United States—and the resulting carbon dioxide and methane emissions—would be identical whether or not the leases were approved.[173] BLM's "perfect substitution" assumption was questionable in light of the economic principles of supply and demand, as well as the empirical state of knowledge concerning the U.S. coal market. In September 2017, the 10th Circuit Court of Appeals found BLM's "perfect substitution" assumption to be arbitrary and capricious, as it lacked support in the record and was contrary to basic economic

168. *Integrated Planning Model*, ICF International, Inc., https://perma.cc/8W39-86Z2.

169. *See* U.S. Energy Info. Admin., Annual Energy Outlook 2014 App. E (2014), https://perma.cc/4F4H-UVSW.

170. *See generally* Bureau of Ocean Energy Mgmt., Consumer Surplus Energy Substitutes for OCS Oil and Gas Production: The 2015 Market Simulation Model (MarketSim) (2015), https://perma.cc/BSH3-UVAM (providing a comprehensive description of the model).

171. For more information on the benefits and drawbacks of these three models for Interior's EISs and other analyses, see Peter H. Howard, Inst. for Policy Integrity, N.Y. Univ. Sch. of Law, The Bureau of Land Management's Modeling Choice for the Federal Coal Programmatic Review (2016), https://perma.cc/59LU-LVUV.

172. U.S. Bureau of Land Mgmt., Final Environmental Impact Statement for the Wright Area Coal Lease Applications, Vol. 1, 4-141 (2010) [hereinafter Wright Area EIS] ("It is not likely that selection of the No Action alternatives would result in a decrease of U.S. CO_2 emissions attributable to coal mining and coal-burning power plants in the longer term, because there are multiple other sources of coal that, while not having the cost, environmental, or safety advantages, could supply the demand for coal . . . .").

173. *Id.*

principles.[174] Other federal agencies, however, including the Surface Transportation Board and the State Department, have properly analyzed the effects of their energy management decisions in NEPA reviews, and have had those decisions upheld by federal courts.[175]

Finally, Interior should use available techniques to estimate option value, or the informational value of delaying irreversible decisions, such as when and on what terms to sell non-renewable resources to private companies. Interior holds—on behalf of the American public—perpetual options to develop or lease oil, gas, and coal tracts; it must decide when and where exercising those options will be most opportune.[176] When the federal government sells a private lessee the right to develop a tract, it extinguishes the perpetual option that the government holds on behalf of the American people, and sells a time-limited option, valid for the duration of the lease term. Interior does not account for the lost value of its perpetual option in the price of its leases. This failure to account for option value in minimum bids and internal fair market value calculations systematically undervalues public resources and contributes to leasing too much coal, oil, and gas too early, and at too low of a price.[177] Indeed, energy

174. WildEarth Guardians v. U.S. Bureau of Land Mgmt., No. 15-8109, slip op. at 23–24 (10th Cir. filed Sept. 15, 2017), https://perma.cc/DHS7-57P7. "The leases at issue would produce up to 230 million tons of coal per year—more than 20 percent of the total U.S. coal used for electricity in 2010 . . . . In the 'no action' alternative, removing over 20 percent of total U.S. production would be a non-marginal change that would affect coal prices, demand, and greenhouse gas emissions." Brief for Institute for Policy Integrity at N.Y. Univ. Sch. of Law as Amicus Curiae Supporting Petitioners-Appellants, WildEarth Guardians v. U.S. Bureau of Land Mgmt., No. 15-8109, 2011 WL 905656 (10th Cir., Feb. 5, 2016), https://perma.cc/V9WU-3NZB [hereinafter Policy Integrity 10th Circuit Amicus Brief].

175. The U.S. Court of Appeals for the Eighth Circuit criticized the Surface Transportation Board for "illogical[ly]" concluding that approving new railroad lines to Powder River Basin coal mines would not affect the demand for and consumption of coal, and for ignoring "widely used" models capable of forecasting such effects. Mid States Coal. for Progress v. Surface Transp. Bd., 345 F.3d 520, 549–50 (8th Cir. 2003). "On remand, the Board undertook such a study using the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) . . . '[which] not only forecasts coal supply and demand but also quantifies environmental impacts.'" Mayo Found. v. Surface Transp. Bd., 472 F.3d 545, 555 (8th Cir. 2006). The U.S. District Court of Colorado "[could] not make sense" of the Forest Service's assumption that approving road construction through national forests to reach Colorado coal mines would not increase coal production and consumption. High Country Conservation Advocates v. U.S. Forest Serv., 52 F. Supp. 3d 1174, 1197 (D. Colo. 2014). Finally, when the State Department concluded that a pipeline approval would not affect energy substitutes, the agency first analyzed the market and "conclude[d] that this amount of crude oil [3% of total U.S. processing] is not expected . . . to significantly impact end-use price or demand." Sierra Club v. Clinton, 746 F. Supp. 2d 1025, 1046 (D. Minn. 2010). The U.S. District Court of Minnesota found the analysis to be sufficient under NEPA. *Id.*

176. *See* Michael A. Livermore, *Patience is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 636–37 (2013).

177. *See id.* at 636–38.

companies routinely account for option value with respect to resource prices, which explains their longstanding practice of stockpiling leases, yet waiting years to begin production.[178]

While private companies have an incentive to account for some price uncertainty in their lease purchase decisions—and therefore, the government would receive some compensation for price uncertainty through lease bids if it held truly competitive auctions—Interior does not address the full spectrum of uncertainty that is relevant from a public perspective. Specifically, Interior's planning processes, minimum bids, and internal "fair market value" assessments omit environmental and social cost uncertainty. The environmental, social, and economic uncertainties associated with natural resources extraction are many, and include:

- resource prices, which are impacted by global energy markets, among other factors;
- the magnitude of risk from externalities, such as carbon dioxide, methane, and particulate matter emissions;[179]
- the development of pollution prevention or capture technologies;
- competing uses of federally-owned lands, such as the potential and need for more renewable energy production; and
- coal, oil, and natural gas reserve estimates, which may affect the long-term availability and price of resources.

BOEM recognized the utility of option value in its offshore leasing plan for 2017 to 2022. Specifically, BOEM noted that: (i) environmental and social cost uncertainties can affect the size, timing, and location of offshore leasing; (ii) option value can be a component of the "fair market value" of a lease; and (iii) BOEM can raise minimum bids, rents, and royalties for leases to account for option value.[180] Nevertheless, BOEM stopped short of quantifying the option value associated with offshore leasing. However, the agency's qualitative assessment of option value and its acknowledgement that option value is a component of fair market value is an important policy shift that should be extended to all federal leasing. These uncertainties should be accounted for when evaluating which parcels to offer for lease, and in determining fair market value for tracts. BLM, unlike BOEM, fails to address environmental and social option value in any manner, either qualitatively or quantitatively.

178. *See id.* at 642.

179. For example, methane leaks from natural gas gathering facilities were found to be 8 times higher than prior EPA estimates. *See* John Schwartz, *Methane Leaks in Natural-Gas Supply Chain Far Exceed Estimates, Study Says*, N.Y. Times (Aug. 18, 2015), https://perma.cc/7K6Y-G82C.

180. U.S. Bureau of Ocean & Energy Mgmt., 2017–2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program at 5-20, 8-3–8-19 (2015), https://perma.cc/8AU3-7MS4.

These economic methods, together with increasing scientific and technical understanding of the externality costs of fossil fuel production, enable Interior to account for costs that have historically been omitted from its decision-making. While BOEM has employed more of these planning and economic methods in its offshore leasing plans than BLM has for onshore leasing, both agencies should instill more rationality into the leasing process in order to maximize social welfare.

III. Interior's Statutory Mandates Are Consistent with Maximizing Social Welfare

Congress has instructed Interior to earn "fair market value" for the use and development of federal resources and to harmonize production with environmental preservation.[181] Interior's capacious statutory mandates, which provide minimal direction on how to carry out a national energy leasing program, may have contributed to the agency maintaining its historical, uncompetitive leasing practices.[182] But, as this Part explains, Interior has broad discretion to interpret its statutory mandates to move towards maximizing social welfare. This interpretation, grounded in sound economic principles, can help drive structural and methodological reforms to update and improve the federal leasing system. The social welfare-maximization framework is also consistent with legislative history, judicial precedent, and thirty years' worth of presidential directives instructing agencies to use their discretion to maximize the net benefits of their policy choices.

A. Interpreting Interior's Statutory Mandate

Four primary statutes set forth Interior's duties with respect to natural resources production on federal lands: for onshore leasing, FLPMA,[183] the Min-

181. *See* 43 U.S.C. § 1344(a)(4) (2012); *see also* 43 U.S.C. § 1701(a)(8)–(9) (2012).

182. Other factors may have also contributed to this problem, including the advantages of incumbent resource developers over potential new entrants to the market, information asymmetry between incumbent resource producers and the federal government, and potential regulatory agency "capture," or the ability of narrow interest groups to influence regulators and secure favorable terms or concessions like royalty rate reductions. *See, e.g.*, Huber, *supra* note 16 (discussing the advantages of incumbent resource developers). These other impediments to a more efficient federal leasing program are worthy of additional analysis, yet beyond the scope of this article.

183. 43 U.S.C. §§ 1701–1787 (2012).

eral Leasing Act,[184] and the Federal Coal Leasing Amendments Act of 1976;[185] and for offshore leasing, OCSLA.[186]

Enacted in 1976, FLPMA provides that federal lands are to be used only for the advancement of the national interest.[187] The Act declares that:

> [P]ublic 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; 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.[188]

The Act sets forth Interior's dual mandate of development and preservation. Agencies must both protect the environment[189] and manage federal lands in such a way as to provide for domestic sources of "minerals [including hydrocarbon energy resources], food, timber, and fiber."[190]

FLPMA requires agencies to develop land use plans, and to manage public lands in accordance with the "principles of multiple use and sustained yield."[191] The Act defines "multiple use" as:

> [T]he management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; . . . the *use of some land for less than all of the resources*; a combination of balanced and diverse resource uses that takes into account the *long-term needs of future generations* for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values.[192]

"Multiple use" also refers to the "harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses

184. 30 U.S.C. §§ 181–287 (2012).

185. Federal Coal Leasing Amendments Act of 1976, Pub. L. No. 94-377, 90 Stat. 1083 (amending Mineral Leasing Act of 1920, 30 U.S.C. §§ 181–287).

186. 43 U.S.C. §§ 1331–1356b (2012).

187. *Id.* § 1701(a)(1).

188. *Id.* § 1701(a)(8).

189. *Id.*

190. *Id.* § 1701(a)(12).

191. *Id.* § 1712(a)–(c)(1).

192. *Id.* § 1702(c) (emphasis added).

that will give the greatest economic return or the greatest unit output."[193] The terms "harmonious" and "coordinated" imply rational, reasoned decision-making. Further, the call to manage federal lands and leasing to avoid "permanent impairment of the productivity of the land and the quality of the environment" requires Interior to act in accordance with sound scientific and economic information in managing federal lands and their resources.[194] Indeed, this charge would appear to permit Interior to pause or restrict fossil fuel leasing, if, for example, the agency determined that the climate impacts or other environmental harms of leasing outweighed the benefits.

FLPMA defines "sustained yield" as "the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various *renewable* resources of the public lands consistent with multiple use."[195] Importantly, this definition emphasizes maintaining the output of renewable resources, but makes no mention of non-renewable resources, such as fossil fuels. In line with its attention to environmental values, the Act also tasks Interior with "tak[ing] any action necessary to prevent unnecessary or undue degradation of the lands."[196] This broad call appears to permit Interior to create incentives for producers to reduce environmental impacts, including externalities like air and water pollution.

The Mineral Leasing Act of 1920 declares that it is the policy of the federal government and in the national interest to foster and encourage private enterprise in "orderly and economic development of domestic mineral resources."[197] The term "orderly," itself, coveys a Congressional desire for careful, rational management of America's energy resources. The term "economic" is consistent with a cost-benefit analysis framework. Among many provisions dedicated to mineral leasing, the Act also provides that the Secretary of the Interior can issue regulations requiring that operators prevent "undue waste."[198]

Specific to coal resources, the Federal Coal Leasing Amendments Act of 1976 provides that the Secretary of the Interior is authorized to "divide any lands subject to this chapter which have been classified for coal leasing into leasing tracts of such size as he finds appropriate and *in the public interest*."[199] Congress was unequivocal in tasking Interior with managing federal coal resources in order to benefit the public. Read together, this statutory framework is highly consistent with Interior accounting for the environmental and social costs of fossil fuel leasing, as well as its economic benefits. Indeed, Interior

193. *Id.*

194. *See id.* § 1701(a)(8).

195. *Id.* § 1702(h) (emphasis added).

196. 43 U.S.C. § 1732(b) (2012).

197. 30 U.S.C § 21a (2012).

198. *Id.* § 187.

199. *Id.* § 201 (emphasis added).

already does this, in part, when deciding where and when to lease offshore resources through its net social value analysis.[200]

With respect to offshore resources, the congressional statement of policy in OCSLA declares that the Outer Continental Shelf is a vital natural resource held in trust by the federal government for the benefit of the American people.[201] It details Interior's dual mandate to conduct expeditious and orderly leasing while also protecting the environment and other uses of our nation's waters.[202]

Section 18 of OCSLA requires that management of the Outer Continental Shelf be "conducted in a manner which considers 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."[203] Congress further directed the Secretary of the Interior to "select the timing and location of leasing, to the maximum extent practicable, so as to obtain a *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*."[204] One reasonable way to interpret the call to "obtain a proper balance" is to manage the program in order to maximize social welfare. OCSLA, much like FLPMA, emphasizes rational management in phrases such as "expeditious and orderly development . . . subject to environmental safeguards."[205] And as described in Section III.C, *infra*, courts have upheld Interior's use of cost-benefit analysis to effectuate a "proper balance" between offshore development and environmental protection.

In addition to striking a proper balance between production and preservation, Interior is required to earn "fair market value" for the United States for the use of onshore and offshore public lands and resources. FLPMA requires that the United States "receive fair market value of the use of the public lands and their resources unless otherwise provided for by statute."[206] The Federal Coal Leasing Amendments Act of 1976 likewise specifies that no bid may be accepted which is less than "the fair market value, as determined by the Secretary, of the coal subject to the lease."[207] Interior has discretion to carry out this "fair market value" mandate in a manner that will maximize social welfare.

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200. *See* BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 5-11–5-13 (describing BOEM's methods of analysis).

201. 43 U.S.C. § 1332(3) (2012).

202. *Id.* § 1332(2)–(3).

203. *Id.* § 1344(a)(1).

204. *Id.* § 1344(a)(3) (emphasis added).

205. *Id.* § 1332(3).

206. *Id.* § 1701(a)(9).

207. 30 U.S.C. § 201(a)(1) (2012).

The term "fair market value" is not defined in FLPMA or Interior's other governing statutes. Interior last convened a working group to comprehensively review its "fair market value" procedures in 1982. The task force determined that "fair market value" was not merely the value of the resource discovered or produced, but the "value of 'the right' to explore and, if there is a discovery, to develop and produce the energy resource."[208] Indeed, the statute refers to the value of using the lands, and not solely to the value of the resources.

The Mineral Leasing Act requires that all coal be sold at "fair market value."[209] It also states that the Secretary of the Interior can include coal, oil, or gas lease terms that she or he deems necessary "to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, for the protection of the interests of the United States, for the prevention of monopoly, and for the safeguarding of the public welfare."[210] Protecting the interests of the United States and preventing monopoly are highly consistent with a social welfare maximizing framework.

With respect to offshore resources, OCSLA requires that "[l]easing activities . . . be conducted to assure receipt of fair market value for the lands leased and the rights conveyed by the Federal Government."[211] While the Act does not provide a definition of "fair market value," it does refer to the value of the lands and the rights pertaining thereto, rather than simply the resources to be extracted. BOEM's regulation and enforcement manual describes its fair market value process and bid adequacy procedures as intending to "ensure that the public receives a fair return for OCS oil and gas leases."[212] Fair market value is defined in BOEM's manual identically to the description in BLM's handbook: "the amount in cash, or on terms reasonably equivalent to cash, for which, in all probability, the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desired but is not obligated to buy."[213]

A knowledgeable owner would be expected to care about the externalities affecting them directly, such as potential air, water, and noise pollution from leasing their land for fossil fuel production. However, as explained in Part II, *supra*, Interior is not a private actor, but a social decsionmaker. As such, it has an incentive to reduce a broader array of externalities. Indeed, Interior is tasked

208. U.S. Gov't Accountability Office, GAO-08-691, Oil And Gas Royalties: The Federal System for Collecting Oil and Gas Revenues Needs Comprehensive Reassessment 3 (2008), https://perma.cc/65AG-DZKJ.

209. 30 U.S.C. § 201(a)(1) ("No bid shall be accepted which is less than the fair market value, as determined by the Secretary, of the coal subject to the lease.").

210. 30 U.S.C. § 187 (2012).

211. 43 U.S.C. § 1344(a)(4) (2012).

212. U.S. Bureau of Ocean Energy Mgmt., Regulation and Enforcement Manual, 610.1: Fair Market Value 1 (2010).

213. *Id.*

with managing a federal program to avoid "permanent impairment of . . . the quality of the environment,"[214] and to set fiscal terms for leases in order to "safeguard[ ] . . . the public welfare."[215]

In short, Interior has discretion to carry out its capacious statutory mandates in a manner that seeks to maximize social welfare. As the next sections show, this interpretation is supported by legislative history, relevant case law, and decades of agency guidance.

B. Legislative History

The legislative history of Interior's governing statutes supports the argument that Interior can use cost-benefit analysis to help guide its leasing decisions, and specifically, that Interior could justify a royalty rate increase on the basis of environmental and social externality costs. Indeed, the revenue share provision of FLPMA provides that the state share of revenue from federal leases "shall be . . . used by such State . . . giving priority to those subdivisions of the State *socially or economically impacted by development of minerals leased under this Act*, for (i) planning, (ii) construction and maintenance of public facilities, and (iii) provision of public service . . . ."[216] Thus, the Act directly links receipt of production revenues to compensation for the social and environmental costs of mineral production. In addition, environmental and social externalities have been consistently cited as a rationale for potential royalty rate increases and for royalty share agreements between states and the federal government in legislative history leading up to the passage of Interior's governing statutes, as well as other proposed legislation.[217]

Congressional testimony leading up to the passage of FLPMA reveals support for revenue sharing provisions that would direct a portion of the revenue from fossil fuel production to the states where the production occurs in order to "help county government[s] cope with energy development impact problems."[218] Another congressional witness bemoaned that, absent the passage of the Act, "[t]he public receives no compensation for the mineral values extracted from public lands, and the miner also escapes the social and environmental costs of his activities."[219]

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214. 43 U.S.C. § 1702 (2012).

215. 30 U.S.C. § 187 (2012).

216. *Id.* § 191 (emphasis added).

217. For more detailed discussion on the legislative history concerning federal royalty rates, as well as their economic rationales, see Hein & Cecot, *Mineral Royalties*, *supra* note 137.

218. *Bills to Provide for the Mgmt., Prot., and Dev. of the Nat'l Res. Lands, and for Other Purposes: Hearings on S.1507 and S.1292 Before the Subcomm. on Env't & Land Res. of the S. Comm. on Interior & Insular Affairs*, 94th Cong. 244 (1975) (statement of James Evans, Legis. Rep., Nat'l Ass'n of Ctys., Washington, D.C.).

219. *Id.* at 113 (statement of John A. McComb, Sw. Rep. of the Sierra Club).

Similarly, the legislative history of the Federal Coal Leasing Amendments Act of 1976 reflects a concern that states be paid a greater share of federal coal royalties to account for social and environmental externalities: "When an area is newly opened to large scale mining, local governmental entities must assume the responsibility of providing public services needed for new communities, including schools, roads, hospitals, sewers, police protection, and other public facilities, as well as adequate local planning for the development of the community."[220] The legislative history also reflects concern as to "the waste of valuable resources, and the creation of severe environmental impacts."[221]

Moreover, coastal states and their congressional representatives have repeatedly advocated for a greater portion of revenue from federal offshore oil and gas production due to significant impacts on coastal infrastructure and the environment.[222] In direct recognition of this link, the Gulf of Mexico Energy Security Act of 2006 directs coastal states to use their share of royalty payments from offshore drilling for "the purposes of coastal protection, including conservation, coastal restoration, hurricane protection, and infrastructure directly affected by coastal wetland losses," and "[m]itigation of damage to fish, wildlife, or natural resources," among other delineated uses.[223] And the federal Land and Water Conservation Fund, established by Congress in 1964, uses offshore federal oil and gas revenues to build and maintain public parks and protect open space and trails across the country.[224]

In short, the text and legislative history of Interior's governing statutes make explicit the relationship between Interior's royalty assessments and public compensation for foreseeable environmental, social, and economic impacts. In-

220. H.R. Rep. No. 94-681, at 38 (1975), *as reprinted in* 1976 U.S.C.C.A.N. 1943, 1975 WL 12515 (Leg. Hist.).

221. *Id.* at 20.

222. *See* Cong. Research Serv., No. R40645, U. S. Offshore Oil and Gas Resources: Prospects and Processes 19 (Apr. 26, 2010), https://perma.cc/JT7N-CMZB; *see also The Fair Act of 2013: Hearing on S.1273 Before the S. Comm. on Energy & Nat. Res.*, 113th Cong. (2013), https://perma.cc/EQ3S-7Z2U (stating, inter alia, "Revenue sharing is vital for these [coastal] areas to adequately respond to all sorts of impacts associated with enormous influxes of people and equipment"; "[t]here are also cumulative impacts of offshore energy development such as habitat degradation and coastal erosion that are typically not mitigated at the project level, and it is important for states to address these impacts. Therefore, a significant portion of a state's revenue share should be directed to addressing those unmitigated cumulative impacts, including through coastal protection and restoration and investments in natural infrastructure . . . .").

223. *See* 30 C.F.R. § 219.410(a)(1)–(2) (2016).

224. *Land and Water Conservation Fund*, U.S. Nat'l Park Serv., https://perma.cc/Q75H-4JC3 ("The Land and Water Conservation Fund was established by Congress in 1964 to fulfill a bipartisan commitment to safeguard our natural areas, water resources and cultural heritage, and to provide recreation opportunities to all Americans. Using zero taxpayer dollars, the fund invests earnings from offshore oil and gas leasing to help strengthen communities, preserve our history and protect our national endowment of lands and waters.").

terior would be acting in line with historical precedent by adjusting royalty rates to recoup some of the known social and environmental costs of fossil fuel production.

C. Judicial Review

Case law also supports the argument that Interior can use cost-benefit analysis to help guide its leasing decisions. Courts influence federal natural resources planning and development through their interpretation of broadly worded federal legislation and through their institutional responsibility to scrutinize the decisions of federal agencies.[225] Courts are generally deferential to Interior's factual decisions and policy judgments that have a rational basis, especially where a decision involves highly technical or scientific issues for which the agency has particular expertise. Courts have been more willing to scrutinize Interior's decisions where it has failed to consider an enumerated statutory factor, or to provide a rational explanation for its conclusions. This Part analyzes relevant case law that illustrates how a future court might review Interior's actions moving towards maximizing social welfare in fossil fuel leasing.

Under the landmark case *Chevron v. Natural Resources Defense Council*, courts give deference to an agency's interpretation of ambiguous statutory language.[226] If Interior interprets "fair market value" to allow cost-benefit analysis, it would likely be entitled to *Chevron* deference.[227] This would be true even if its interpretation reflected a departure from prior interpretations, as long as the agency provided a reasonable explanation for the change.[228] As the Supreme Court stated in *Chevron*, "[a]n initial agency interpretation is not instantly carved in stone. On the contrary, the agency, to engage in informed rulemaking, must consider varying interpretations and the wisdom of its policy on a continuing basis."[229] In recent years, courts, including the Supreme Court, have shown more willingness to scrutinize agency interpretations of broad statutory

225. Edward A. Fitzgerald, California v. Watt*: Congressional Intent Bows to Judicial Restraint*, 11 HARV. ENVTL. L. REV. 147, 148 (1987).

226. *See* Chevron v. Nat. Res. Def. Council, 467 U.S. 837, 843 (1984) (stating, "if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute.").

227. *See id.*

228. *Id.* at 863–64; *see also* FCC v. Fox Television Stations, Inc., 556 U.S. 502, 514–15 (2009) (holding that "agency action is not subject to heightened . . . review simply because it represents a change in administrative policy," and "not every agency action representing a change in policy need be justified by reasons more substantial than those required to adopt a policy in the first instance . . . ."). *But see* Encino Motorcars, LLC v. Navarro, 136 S. Ct. 2117, 2126 (2016) (holding that the Department of Labor "gave almost no reasons at all" for a new regulation issued under the Fair Labor Standards Act and therefore *Chevron* deference was not applicable).

229. *Chevron*, 467 U.S. at 863–64.

mandates, especially where those interpretations have great "economic and political significance," either by denying *Chevron* deference to an agency or by refusing to apply the *Chevron* framework altogether.[230] These cases may "portend more trouble ahead for administrative interpretations," and arguably limit the dynamism of executive branch agencies tasked with carrying-out capacious statutory mandates.[231] Yet, as the following cases illustrate, the weight of judicial precedent affording Interior discretion to use cost-benefit analysis in order to carry out its broad statutory mandates should tip the scale towards upholding the interpretation grounded in balanced cost-benefit analysis espoused here.

In *California v. Watt* ("*Watt I*"), the United States Court of Appeals for the D.C. Circuit ("D.C. Circuit") heard a challenge to Interior's five-year leasing program.[232] Petitioners' claims centered on assertions that the Secretary of the Interior had failed to comply with OCSLA section 18, which governs offshore oil and gas leasing.[233] In reviewing the Secretary's findings of fact, the court used a substantial evidence test.[234] The court subjected the Secretary of the Interior's policy judgments to "searching scrutiny to ensure that they are neither arbitrary nor irrational . . . ."[235] The court addressed the balancing factors listed in section 18(a)(2), and concluded that when creating a leasing program, the Secretary must consider all of the enumerated factors based on the existing information available.[236] While the court remanded the program back to the agency, it endorsed Interior's interpretation that OCLSA section 18(a)(3)'s requirement to strike a "proper balance" among competing uses of the Outer Continental Shelf could be achieved through cost-benefit analysis.[237] The court thus deferred to Interior's interpretation that it could effectuate a broad statutory mandate through quantitative analysis and rational decision-making.

230. Util. Air Regulatory Grp. v. EPA, 134 S. Ct. 2427, 2442–44 (2014) (quoting FDA v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 160 (2000)) (declining to defer to EPA's interpretation of a statute it is charged with administering and stating, "[w]e expect Congress to speak clearly if it wishes to assign to an agency decisions of vast 'economic and political significance'"); King v. Burwell, 135 S. Ct. 2480, 2487–89 (2015) (declining to apply the *Chevron* framework in considering whether federal subsidies could be available for health insurance purchased on the federal exchange, despite ruling consistently with the government's view).

231. *See* Lisa Heinzerling, *The Power Canons*, 58 WILLIAM & MARY L. REV. 1933, 1943 (2017) ("More fundamentally, these cases [Utility Air Regulatory Group v. EPA, King v. Burwell, and Michigan v. EPA] create a new trio of clear-statement principles, the result of which is to lodge interpretive power with the courts when the underlying statutory framework is too ambitious for the Court's comfort.").

232. California v. Watt (*Watt I*), 668 F.2d 1290, 1294 (D.C. Cir. 1981).

233. *See* 43 U.S.C. § 1344 (2012).

234. *Watt I*, 668 F.2d at 1302.

235. *Id.* at 1317 (internal citations omitted).

236. *Id.* at 1305–13.

237. *Id.* at 1317–18.

In *California v. Watt* ("*Watt II*"), the D.C. Circuit upheld Interior's revised offshore leasing Program.[238] Among other claims, petitioners asserted that the large size of Interior's lease offerings and accelerated rate of leasing would drive the price of leases down, violating OCSLA section 18(a)(4)'s requirement that the program assure receipt of "fair market value."[239] The court noted that the challenges concerned factual findings and policy judgments—"matters on which the Secretary is entitled to greater deference."[240] The court held that the "fair market value" requirement "does not mandate the maximization of revenue, it only requires receipt of a fair return," and held that Interior acted reasonably in determining that the "government's prior use of its monopoly power may have produced prices in excess of fair market value and thus [was] not socially optimal."[241] The court, therefore, deferred to Interior's policy judgment to carry out the "fair market value" requirement in a way that would be most socially optimal, even if it did not maximize revenue. The court reserved its authority to set aside decisions based on "obviously incorrect results or methodology," but found Interior's analysis and methodology to be adequate.[242]

In *Natural Resources Defense Council v. Hodel*,[243] the D.C. Circuit applied a deferential standard of review in case challenging Interior's practice of tailoring minimum bids to specific leases as opposed to using a single minimum bid. It did so because, "in essence, petitioners are attacking the Secretary's policy judgment that a leasing program containing this discretionary feature will (in tandem with the bidding process and evaluation procedures) assure receipt of fair market value."[244] In articulating the standard of review, the court noted that Interior's factual determinations must be based upon substantial evidence, that its policy judgments must be based upon rational consideration of identified, relevant factors, and that its construction of the statute must be reasonable, in line with the Supreme Court's holding in Chevron.[245] The Court held that Interior's action of tailoring minimum bids to specific leases was permissible, stating: "the Secretary must nonetheless use his judgment and expertise to construct the particular procedures and methodology that will satisfy the pertinent statutory mandates."[246]

238. California v. Watt (*Watt II*), 712 F.2d 584, 606 (D.C. Cir. 1983).

239. *Id.* at 606.

240. *Id.* at 591.

241. *Id.* at 606.

242. *Id.* at 600.

243. 865 F.2d 288, 312–13 (D.C. Cir. 1988).

244. *Id.* at 312–13.

245. Pursuant to *Chevron*, if a court finds statutory ambiguity or silence, the court must determine whether the agency's construction of the statute is reasonable. Chevron v. Nat. Res. Def. Council, 467 U.S. 837, 843 (1984).

246. *Hodel*, 865 F.2d at 312.

Courts have also applied *Chevron* deference in prior instances where Interior interpreted ambiguous statutory provisions, and have upheld Interior's authority to calculate royalties owed to the government. In *Independent Petroleum Association of America v. DeWitt*, [247] the D.C. Circuit stated that "courts have regularly applied *Chevron* in royalty cases," and noted that, "Congress has granted rather sweeping authority 'to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of [the leasing statutes].'"[248] The court confirmed that this "sweeping authority" extended to "collecting royalties and determining the methods by which they are calculated."[249] The court held that it found "nothing unreasonable" in Interior's refusal to allow deductions for downstream marketing costs in a new rule.[250] However, the court found "no basis" for sustaining Interior's conclusion with respect to a different part of the rule because "[w]hile some reason may lurk behind the government's position, it has offered none."[251] In *California Co. v. Udall*[252]—a case decided prior to *Chevron*—the D.C. Circuit deferred to Interior's interpretation of the word "production" for purposes of calculating royalties, and noted that "[t]he Secretary of the Interior is the statutory guardian of this public interest."[253]

Finally, in *Center for Sustainable Economy v. Jewell*,[254] the petitioner argued that OCSLA required BOEM to explicitly consider and quantify the option value of delaying leasing in specific regions of the Outer Continental Shelf.[255] The D.C. Circuit acknowledged the applicability of option value to federal offshore oil and gas leasing, stating:

> More is learned with the passage of time . . . . The true costs of tapping OCS energy resources are better understood as more becomes known about the damaging effects of fossil fuel pollutants. Development of energy efficiencies and renewable energy sources reduces the need to rely on fossil fuels. As safer techniques and more effective technologies continue to be developed, the costs associated with drilling decline. *There is therefore a tangible present economic benefit to delaying the decision to drill for fossil fuels to preserve the opportunity to see what new technologies develop and what new information comes to light*.[256]

247. 279 F.3d 1036 (D.C. Cir. 2002).
248. *Id.* at 1039–40 (citing 30 U.S.C. § 189 (2012)).
249. *Id.* at 1040.
250. *Id.*
251. *Id.* at 1043.
252. 296 F.2d 384 (D.C. Cir. 1961).
253. *Id.* at 388.
254. 779 F.3d 588 (D.C. Cir. 2015).
255. *Id.* at 610.
256. *Id.* (emphasis added).

However, the Court held that BOEM's failure to quantify option value in its Program was not arbitrary or irrational because the methodology for quantifying option value was not yet "sufficiently established."[257] But the Court noted: "Had the path been well worn, it might have been irrational for Interior not to follow it."[258] Thus, if Interior amends its regulations to require the use of option value for offshore or onshore leasing, the D.C. Circuit's decision would support the rationality of that policy change.[259]

If Interior makes any of the changes recommended in this Article, such as using cost-benefit analysis in its leasing decisions, raising royalty rates in order to account for externality costs, or using option value to set higher minimum bids, its decision may be challenged as failing to comply with its statutory requirements or with the requirements of the Administrative Procedure Act. Interior's interpretation of its statutory mandates would likely be entitled to *Chevron* deference, especially as the agency has particular expertise in the stewardship and valuation of federal natural resources—a complex program for which Interior has been vested with broad authority.[260] The relevant statutes do not preclude Interior from considering environmental or social costs when setting fiscal terms, and provide little guidance on what factors may be considered, aside from "fair market value." Moreover, *Watt II* and *Hodel* reflect judicial deference to Interior's policy judgments as to how to best effectuate the "fair market value" requirement[261] and OCSLA's broad mandate to "balance economic and environmental interests."[262]

Implementation of the changes recommended in this Article would also likely survive review under the Administrative Procedure Act.[263] The Administrative Procedure Act requires courts to "hold unlawful and set aside agency action, findings, and conclusions found to be among other things arbitrary or

257. *Id.* at 611.

258. *Id.* at 612.

259. While the case addressed offshore leasing, the court's language on the utility of option value is equally applicable to onshore and offshore leasing of coal, oil, and natural gas resources.

260. *See, e.g.*, *Watt II*, 712 F.2d at 606; *Hodel*, 865 F.2d at 308–09, 313; *see also* Coal. for Alternatives to Pesticides v. Lyng, 673 F. Supp. 1019, 1024 (D. Or. 1987) ("So long as the BLM's decisions are not irrational or contrary to law, it may manage the public lands as it sees fit"); Amoco v. Watson, 410 F.3d 722, 729 (D.C. Cir. 2005) (upholding BLM's order to an energy company to pay additional royalties, as "deference is particularly appropriate in the context of a complex and highly technical regulatory program, in which the identification and classification of relevant criteria necessarily require significant expertise and entail the exercise of judgment grounded in policy concerns.") (internal citations omitted).

261. *See Watt II*, 712 F.2d at 606.

262. *See Hodel*, 865 F.2d at 308–09 ("The Secretary must make a good-faith effort to balance environmental and economic interests. So long as he proceeds reasonably, however, his decisions warrant our respect.").

263. *See* 5 U.S.C. §§ 500–706 (2012).

capricious."[264] Under the deferential "arbitrary and capricious" standard, an agency must "examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made."[265] An agency can change course, but it should show that "the new policy is permissible under the statute, that there are good reasons for it, and that the agency believes it to be better."[266] In line with the cases described here and the Supreme Court's decision in *FCC v. Fox*, Interior would be wise to support future policy changes with reasoned analysis, including an explanation for the change and an appropriate methodology.[267]

Interior would also be acting rationally by using modern economic tools, such as the Social Cost of Carbon and option value, to help evaluate fair market value for the "use of the public lands and their resources."[268] In fact, the Social Cost of Carbon was developed in response to a lawsuit challenging the Department of Transportation's failure to monetize climate benefits in its economic assessment of vehicle efficiency standards. In a 2008 decision, the Federal Court of Appeals for the Ninth Circuit found that, due in part to advancements in "scientific knowledge of climate change and its causes," the agency's failure to quantify any climate benefits when conducting its economic analysis was arbitrary and capricious.[269] And in 2016, the Seventh Circuit Court of Appeals upheld the Department of Energy's use of the Social Cost of Carbon in an energy efficiency rulemaking.[270] Thus, a reviewing court will likely find that the use of these tools is reasonable method by which to quantify the cost of relevant environmental externalities.

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264. 5 U.S.C. § 706(2)(A) (2012).

265. Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co. (*State Farm*), 463 U.S. 29, 43 (1983) (agency decisions are arbitrary if they entirely fail to consider an important aspect of the problem); Bowman Transp., Inc. v. Arkansas-Best Freight Sys., Inc., 419 U.S. 281, 290 (1974) ("[W]e can discern in the Commission's opinion a rational basis for its treatment of the evidence, and the 'arbitrary and capricious' test does not require more.").

266. FCC v. Fox Television Stations, Inc., 556 U.S. 502, 514–15; *see also* Nat'l Ass'n of Home Builders v. EPA, 682 F.3d 1032, 1037 (D.C. Cir. 2012) (stating that an agency must show "there are good reasons for the new policy"). *But see Fox*, 556 U.S. at 542 (Stevens, J., dissenting) (arguing that both the Administrative Procedure Act and the rule of law "favor stability over administrative whim.").

267. *See Fox*, 556 U.S. at 515 (stating, "the agency must show that there are good reasons for the new policy. But it need not demonstrate to a court's satisfaction that the reasons for the new policy are better than the reasons for the old one; it suffices that the new policy is permissible under the statute, that there are good reasons for it, and that the agency believes it to be better"); *see also Hodel*, 865 F.2d at 313–15 (upholding Interior's offshore leasing plan and referencing agency documents discussing "the methodology and factors used to determine fair market value").

268. *See* 43 U.S.C. § 1701(a)(9) (2012).

269. Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1197–98, 1203 (9th Cir. 2008).

270. Zero Zone v. U.S. Dep't of Energy, 832 F.3d 654, 678–79 (7th Cir. 2016).

D. Agency Guidance and Executive Level Review

A cost-benefit analysis framework is also consistent with executive orders for agency decision-making. While most commonly applicable to regulatory impact analysis accompanying proposed rules, the principles that inform executive level review provide a set of best practices that should inform natural resources extraction decisions.[271]

The process that Interior launched to comprehensively review the federal coal program would have analyzed whether the public receives a "fair return" when considering all of the benefits and costs of coal leasing, including social and environmental costs.[272] This process is similar to a proposed rule and its accompanying regulatory impact analysis; Presidential executive orders require agencies to conduct cost-benefit analyses of their regulatory decisions and submit those analyses to scrutiny by the Office of Information and Regulatory Affairs ("OIRA").[273] While Interior's programmatic EISs and offshore leasing programs are not subject to OIRA review, the guiding principles of executive review can help inform how Interior should best effectuate its broad mandates.

Executive Order 12,866, which has governed regulatory decision-making since 1993, instructs agencies to "propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs."[274] The Executive Order requires agencies to conduct a cost-benefit analysis that includes the benefits and costs anticipated from the regulatory action, including "the protection of the natural environment," on the benefit side of the ledger and any adverse effects on "health, safety, and the natural environment," on the cost side.[275] It also directs that benefits and costs be quantified, to the extent feasible.[276]

The Office of Management and Budget's Circular A-4, issued in 2003, provides best practices for agencies conducting cost-benefit analysis, and recommends that agencies assess costs and benefits comprehensively, because "[w]here all benefits and costs can be quantified and expressed in monetary units, benefit-cost analysis provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest

271. Livermore, *supra* note 176, at 628.

272. Press Release, Dep't of the Interior, Secretary Jewell Launches Comprehensive Review of Federal Coal Program (Jan. 15, 2016) (on file with author).

273. Exec. Order No. 12,866 § 1(b)(6), 58 Fed. Reg. 51,735 (Sept. 30, 1993); *see also* Exec. Order No. 13,563 § 1, 76 Fed. Reg. 3821 (Jan. 21, 2011) (affirming Exec. Order No. 12,866).

274. *Id.*

275. Exec. Order No. 12,866 § 6(a)(3)(C), 58 Fed. Reg. 51,735 (Oct. 4, 1993).

276. *Id.*

net benefits to society (ignoring distributional effects)."[277] Circular A-4 also cautions agencies against ignoring the potential magnitude of unquantified benefits, because the most efficient rule may not have the "largest quantified and monetized . . . estimate."[278]

Both Executive Order 12,866 and Circular A-4 remain valid even after President Trump's Executive Order on "Promoting Energy Independence and Economic Growth."[279] That Order states:

> when monetizing the value of changes in greenhouse gas emissions resulting from regulations, including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates, agencies shall ensure, to the extent permitted by law, that *any such estimates are consistent with the guidance contained in OMB Circular A-4* of September 17, 2003 (Regulatory Analysis), which was issued after peer review and public comment and has been widely accepted for more than a decade as embodying the best practices for conducting regulatory cost-benefit analysis.[280]

Social and environmental externalities fall squarely within the types of costs and benefits that Circular A-4 directs agencies to consider, and to quantify to the extent possible, when deciding how to regulate. Executive orders and agency guidance, therefore, are consistent with a natural resources leasing framework that analyzes the full spectrum of costs and benefits of leasing, and attempts to maximize social welfare through leasing and fiscal decisions.

IV. Recommendations for Reform

To better fulfill its statutory mandates under FLPMA, the Mineral Leasing Act, and OSCLA, Interior should update its leasing processes and fiscal terms. The Secretary of the Interior's 2016 decision to reevaluate the federal coal leasing program indicates that the comprehensive review and reassessment of federal fossil fuel leasing for which this Article advocates is both feasible and justified in light of modern production trends and the current knowledge of the externality costs of fossil fuel production and consumption.[281]

Interior should conduct a programmatic review of its fossil fuel leasing programs to analyze and weigh all of the costs and benefits of leasing, including upstream and downstream climate impacts. Consistent with NEPA, Interior should carefully evaluate the alternatives to leasing, including the alternative of

277. Office of Mgmt. & Budget, Circular A-4 at 1–2 (Sept. 17, 2003) [hereinafter OMB Circular A-4].

278. *Id.* at 2.

279. *See* Exec. Order No. 13,783, 82 Fed. Reg. 16,093 (Mar. 28, 2017).

280. *Id.* (emphasis added).

281. *See* U.S. Dep't of the Interior, *supra* note 2.

not leasing any new coal, oil, or natural gas, and evaluate the "energy substitution" effects that would result from different leasing scenarios.[282] Interior should also consider adjusting royalty rates to recoup at least some of the environmental and social costs of production, and eliminate royalty relief provisions that contribute to inefficiently high levels of production. Interior should also incorporate option value into its planning and bidding processes, to better account for economic, environmental, and social uncertainty.

A socially optimal definition of "fair market value," then, should include the market price of the resource, the option value of leasing that resource, and the social cost of production—the cost to taxpayers from production on public lands due to non-internalized externalities. These suggested reforms are described in more detail below.

A. Interior Should Prepare Strategic Leasing Plans and Evaluate Whether Its Current Leasing Programs Earn "Fair Market Value" for Taxpayers, by Conducting Cost-Benefit Analysis

In order to manage a federal fossil fuel leasing program that better serves American taxpayers, Interior should prepare strategic plans for leasing and regularly evaluate potential reforms that have the potential to increase social welfare.

Such strategic plans can be modeled on BOEM's five-year plans for offshore leasing and should be structured to harmonize with any existing Regional Management Plans. In fact, these regional plans should "tier to" strategic plans and provide information on region-specific energy needs and environmental considerations. These strategic plans should be accompanied by regular programmatic EISs that evaluate the environmental and social effects of alternative leasing scenarios. This analysis is critical to answering two important questions: does leasing now, pursuant to existing fiscal terms, serve the public interest? And, can Interior make adjustments to lease timing, size, or fiscal terms that would increase social welfare?

In its strategic planning process, Interior should evaluate whether it earns "fair market value" for taxpayers as required by FLPMA and OCSLA by analyzing the revenue and other benefits of leasing, as compared to the costs, including social and environmental costs. Interior should use the Social Cost of Carbon and Social Cost of Methane in this analysis. Pursuant to executive orders and legal precedent, if the full benefits of production are accounted for in such an inquiry (such as bonus bids, royalty revenue, and state tax revenue), the full suite of social and environmental costs must be accounted for, as well.[283]

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282. *See* 42 U.S.C. § 4332(C)(iii) (2012); 40 C.F.R. § 1502.14 (2017) (stating that alternatives analysis "is the heart of the environmental impact statement.").

283. *See* OMB Circular A-4, *supra* note 277, at 2–3; High Country Conservation Advocates v. Forest Serv., 52 F.Supp.3d 1174, 1190–91 (D. Colo. 2014) (holding that it was arbitrary and

Executive Orders 13,563 and 12,866, OMB Circular A-4, and EPA's guidelines for economic analysis all indicate that benefits and costs should be treated in parity, because where all benefits and costs can be quantified and expressed in monetary units, cost-benefit analysis provides decision makers with an indication of the most efficient alternative, that is, the alternative that generates the largest net benefits to society.[284] Relevant environmental and social costs include upstream and downstream greenhouse gas emissions (methane and carbon dioxide), transportation-related externalities (including particulate matter emissions, public fatalities, noise, and congestion), and habitat effects. To the extent that some of these costs and benefits are not quantifiable, they should be analyzed qualitatively.[285]

The result of this analysis would provide a baseline against which to measure potential royalty rate increases; increases to minimum bids; and other policy changes, such as tailoring fossil fuel production to meet any climate goals or ceasing to issue new leases altogether. As a starting point, Interior should adopt BOEM's practice of making a "net social value" determination before proceeding with leasing in any area. This would shine light on relative externality and other costs associated with production in certain regions, which in turn, could affect where, when, and on what terms Interior chooses to lease. From a social welfare maximization perspective, Interior should seek to provide maximum net benefits to the public.

B. Interior Should Analyze Optimal Fiscal Terms for New Leases, Including Social Cost of Carbon or Social Cost of Methane Royalty "Adders," Among Other Changes Geared to Maximizing Net Benefits

Interior should comprehensively review its royalty rates for coal, oil, and gas leases in order to assess how an increase in royalty rates might affect total revenue, externality costs, and better meet the mandates of its governing statutes. Interior should consider increasing minimum royalty rates above current levels to account for foreseeable environmental and social costs of production, which currently impose uncompensated costs on the public. The goal is to identify an alternative that maximizes net social benefits.

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capricious to quantify the benefits of coal lease modifications and not the costs, when such analysis was possible using the Social Cost of Carbon).

284. *See id.*; Exec. Order No. 13,563, 76 Fed. Reg. 3821 (Jan. 21, 2011); Exec. Order No. 12,866, 58 Fed. Reg. 51735 (Oct. 4, 1993); EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 11-2 (Dec. 17, 2010).

285. OMB CIRCULAR A-4, *supra* note 277, at 10 ("Even when a benefit or cost cannot be expressed in monetary units, you should still try to measure it in terms of its physical units. If it is not possible to measure the physical units, you should still describe the benefit or cost qualitatively.").

Environmental and social externalities from fossil fuel production vary with the amount of the resource produced; therefore, these costs are best recouped through royalties. A royalty rate that would lead to a more socially optimal level of extraction would account for the cost of unregulated externalities, including carbon dioxide and methane emissions. In considering adjustments to royalty rates, Interior may wish to focus on externalities associated with "upstream" production on federal lands, as opposed to downstream combustion. This is because production externalities are within Interior's jurisdiction, as they occur on public lands and are closely tied to its statutory mandates to prevent "undue waste"[286] and undue degradation of lands.[287] By contrast, adjusting royalty rates to account for downstream combustion emissions may present somewhat greater legal risk for Interior, and the agency may run into potential issues with "double counting" the cost of combustion emissions if those emissions are addressed by other policies or regulations.

For these reasons, a study that I co-authored quantified and applied an "upstream" Social Cost of Methane adder that accounted for federal coal production methane costs. It used data on fugitive methane emissions from coal mines (which are currently unregulated) and applied the Social Cost of Methane to calculate a surface mine methane adder of approximately $1 per metric ton of coal (or $0.90 per short ton), and an underground coal adder of $8.79 per metric ton ($7.97 per short ton), as underground coal mining emits more fugitive methane.[288] It then calculated revised royalty rates that would incorporate this methane adder. Using average surface and underground coal prices in the relevant states, the adder would increase royalty rates from 12.5 percent to 18.7 percent for surface-mined coal, and from 8 percent to 28.7 percent for underground coal.[289]

This royalty rate adder would have yielded approximately $2 billion in additional royalty revenue between 2009 and 2013 for federal coal production in four western states: Wyoming, Colorado, Montana and Utah.[290] Moreover, this royalty rate increase would have provided up to $2.9 billion in net social benefits, accounting for both increased revenue and decreased externality costs from coal mining.[291] Pursuant to existing regulations, this higher royalty rate

286. *See* 30 U.S.C. § 187 (2012).

287. *See* 43 U.S.C. § 1732(b) (2012).

288. *See* HEIN & HOWARD, ILLUMINATING COAL COSTS, *supra* note 52, at A11 (surface mines); HEIN, PRIORITIES FOR FEDERAL COAL REFORM, *supra* note 52 at 13 (underground mines).

289. *See* HEIN & HOWARD, ILLUMINATING COAL COSTS, *supra* note 52, at 7. The royalty adjustment was based on 2015 production-weighted prices in Wyoming (for surface coal) and Colorado and Utah (for underground coal).

290. *Id.* In this study, we used an average elasticity of supply of between 1 and 3 to account for substitution effects from higher royalty rates between coal produced from different basins (federal, state, and private), and among coal, natural gas, oil, and renewable energy sources.

291. *Id.* at 7, app. B, tbl.B13.

could be applied to new leases, modified leases, and lease extensions.[292] And because the Social Cost of Methane rises over time, as methane is a stock pollutant, the royalty rate should also increase over time in order to recoup methane externality costs.[293]

A separate independent study examined the effect of policy scenarios that would increase the federal coal royalty rate or decrease production through a tonnage production cap. The study found that phasing in a lifecycle carbon dioxide royalty adder set at 20 percent of the Social Cost of Carbon—approximately $15.30 per short ton in 2016—would add nearly $3 billion in royalty receipts by 2025.[294] Introducing this higher royalty rate, phased-in over 10 years, would also reduce overall carbon dioxide emissions, with or without the Clean Power Plan in place.[295] Thus, both total financial returns and net social welfare would increase with a higher royalty rate.

Interior should also consider adjusting the fiscal terms of leases to account for the transportation externalities associated with transporting oil, gas, and coal long distances from the point of production to end users. Rail transportation, which is used to move approximately 70 percent of all domestic coal,[296] causes multiple externalities including greenhouse gas emissions, particulate matter emissions, increased fatalities, and more. Interior should quantify these costs, and consider charging lessees for them through royalty rate adders.[297] Even without any royalty rate adjustment, these transportation externalities jus-

292. *See* 43 C.F.R. §§ 3473.3-2(b), 3432.2(c) (2016).

293. Hein & Howard, Illuminating Coal Costs, *supra* note 52, at tbl.4. Stock pollutants accumulate in the environment over time.

294. Spencer Reeder & James H. Stock, Vulcan Philanthropies, Federal Coal Leasing Reform Options: Effects on CO_2 Emissions and Energy Markets: Executive Summary 4 (2016), https://perma.cc/4KXT-BGM8. This study opted to test an adder equivalent to 20 percent of the Social Cost of Carbon because some of the downstream costs of burning coal were set to be internalized by EPA's Clean Power Plan; using the 20 percent value would thus avoid charging energy producers for that externality cost twice. The study used ICF International's Integrated Planning Model, which is used by EPA and other agencies to model the effects of policy scenarios on energy markets.

295. *Id.* at 6 ("In the royalty adder cases, total royalty receipts for federal coal rise even though production declines."). The royalty increases are modeled as phasing in over 10 years, to roughly model the phasing in of a change in royalty rates as old leases expire and new or renewed leases are signed at the higher royalty rate.

296. U.S. Energy Info. Admin., *supra* note 115, at 47 (showing that of the 815,509,000 total short tons of coal transported in 2015, 560,039,000 or 68.67 percent, were transported by rail).

297. In the NYU study, we calculated a transportation adder for Powder River Basin coal, using data on freight train routes and quantifiable externalities, including greenhouse gas and other air emissions, public fatalities, noise, and congestion. These costs totaled approximately $10 per metric ton of coal (about $9 per short ton). Applied together, the fugitive methane and transportation adders would result in a larger royalty rate increase—from the current federal royalty rate of 12.5 percent to 82.6 percent for Powder River Basin coal. Hein & Howard, Illuminating Coal Costs, *supra* note 52, at 7.

tify changing or eliminating existing regulations that generously subsidize coal, oil, and gas transportation.

Each of these modeled reforms would induce some substitution of renewable energy and natural gas for coal, as well as increased energy conservation, resulting in a net decline in greenhouse gas emissions. Yet in all of the externality adder case studies described here, total royalties would increase over the non-adjusted royalty base cases, while coal production would decline.[298] As such, these royalty rate adjustments would result in significant net benefits to the public. Ramping coal production down (as opposed to raising the royalty rate) would achieve similar greenhouse gas emission benefits, but with diminished revenue for states and the federal government.[299] This illustrates one of the primary benefits of fiscal reform, as opposed to setting a cap on federal fossil fuel production: the additional revenue generated from royalty reform would go both to the federal government and to fossil fuel-producing states and communities, which can use this revenue for environmental mitigation, adaptation, education, and infrastructure investment.

Finally, the White House Council of Economic Advisers analyzed an optimal royalty rate from the perspective of maximizing the financial return to taxpayers, as opposed to maximizing social welfare. The study concluded that a policy goal of maximizing the return to taxpayers (leaving aside any environmental benefits) would require royalty rates of 304 percent (equal to approximately a $30 per short ton royalty charge on Powder River Basin coal), which would curtail future federal coal production by more than half from projected levels (partially offset by increased production from other regions) while increasing revenue by $2.7 to $3.1 billion when fully phased-in by 2025.[300]

Interior should analyze and model these or similar alternative royalty rate scenarios in future strategic plans and environmental reviews.[301] This analysis would provide decisionmakers and the public with an alternative that moves towards maximizing social welfare, and better upholds Interior's statutory man-

298. Reeder & Stock, *supra* note 294, at 6.

299. *See id.* at 8.

300. CEA Coal Report, *supra* note 8, at 3, 4, 25. The CEA study also found that the increase in royalty revenues was "vastly larger than the loss in bonus bid revenue." *Id.* at 25. If it pursues royalty rate adjustments, Interior should take steps to try to keep minimum bids and internal fair market value calculations at historical levels.

301. While a full analysis is beyond the scope of this article, there is also economic literature on the optimal timing of extraction of fossil fuel resources, typically drawing on the Hotelling Rule. *See, e.g.*, Hamid Beladi & Habib A. Zuberi, *Environmental Constraints and a Dynamic Model for Energy Development*, 10 Energy Econ. 18, 20 (1988). In addition, some empirical studies have extended the Hotelling Rule to specific case studies to analyze optimal royalty rates in those contexts. *See id.* at 20–28 (evaluating the social optimality of royalty rates in coal lease contracts between the Navajo tribe and coal companies). Other economic studies have analyzed the lifecycle costs of fossil fuel production. *See, e.g.*, Epstein et al., *supra* note 97.

dates to harmonize production with preservation. Economic and scientific understanding of the social and environmental costs of fossil fuel production has markedly improved in the 95 years since the passage of the Mineral Leasing Act. By increasing royalty rates to recoup at least some of the social and environmental costs of fossil fuel production, Interior can significantly increase revenue for states and the federal government, while simultaneously reducing greenhouse gas emissions.

C. For Each Alternative Scenario, Interior Should Model Energy Substitution and Climate Effects

Interior should model its selected alternatives' energy production, climate, revenue, and other effects, including downstream greenhouse gas emissions. As part of this analysis, it should analyze the substitution effects among coal, natural gas, oil, and renewable energy sources (on public and private lands) that result from changes in leasing policies, including royalty rates.[302]

It is well settled that coal competes directly with natural gas, nuclear, and renewable energy resources in the generation of electricity. Conducting substitution analysis in an environmental review process is critical to properly analyzing environmental impacts, and, ultimately, to selecting the most efficient alternative. Interior should model each alternative scenario's energy market and greenhouse gas emission effects, which requires accounting for the substitution effects induced by each alternative, as well as increased energy conservation.

In fact, the 2017 decision by the Tenth Circuit Court of Appeals, discussed in Part II, *supra*, highlighted the importance of conducting proper substitution analysis for fossil fuel leasing decisions and their underlying NEPA analysis.[303] As a result, Interior cannot make unsupported assumptions about the climate effects of its leasing decisions and must conduct proper substitution analysis in EISs.

As highlighted in Part II, *supra*, Interior can choose from several models to evaluate the effect of different leasing policies and royalty rates on the energy market and total greenhouse gas emissions. Further, these models can be tailored to adjust baseline scenarios to align with any remaining U.S. climate change goals.[304] Given its capacious statutory mandates, Interior has the au-

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302. Interior may wish to consult with the Council of Economic Advisors in conducting this analysis.

303. *See* WildEarth Guardians v. U.S. Bureau of Land Mgmt., 870 F.3d 1222, 1233 (10th Cir. 2017) (finding BLM's assertion—that leasing up to 230 million tons of coal per year would not have any effect on total greenhouse gas emissions because an identical amount of coal would be produced elsewhere to "perfectly substitute" for the production from these leases—to be arbitrary and capricious).

304. Secretarial Order 3338 called for an inquiry into how to manage the federal coal program "to meet both the Nation's energy needs and its climate goals, as well as how best to protect the

thority to manage federal fossil fuel production to help meet potential national climate change goals and commitments. As the steward of public lands for present and future generations, Interior has the duty to "take[ ] into account the long-term needs of future generations for renewable and nonrenewable resources," and to manage federal lands "without permanent impairment of the productivity of the land and the quality of the environment."[305] FLPMA also provides that federal lands are to be used only for the advancement of the national interest,[306] and that "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; that, where appropriate, will preserve and protect certain public lands in their natural condition . . . ."[307]

In light of this authority, Interior should analyze production scenarios in its planning and environmental review processes that would tailor federal production to any remaining U.S. climate change goals. For example, the government could set a national "carbon budget" for federal lands, based on what is needed to meet its climate change goals, and adjust leasing policies for fossil fuels in order to meet that budget. This could be done through an escalating royalty rate designed to decrease federal coal and oil production over time—which would also provide revenue benefits—or through a production cap or moratorium.[308] These options should be analyzed through a programmatic environmental review process and appropriately modeled in order to compare their net effects. Ultimately, Interior will need to weigh the tradeoffs of each alternative, and steer the leasing program to a system that best complies with its dual mandate and earns fair market value for taxpayers.

D. Interior Should Curb Royalty Rate Reductions and Loopholes, Which Impair a Fair Return to Taxpayers

Relevant to the question of whether federal leasing is structured to ensure a fair return is how royalties are calculated, including whether any deductions or loopholes affect the overall return to the public. Interior should eliminate its existing royalty relief regulations, as they provide improper incentives to companies and hinder the receipt of a fair return.

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public lands from climate change impacts." U.S. DEP'T OF THE INTERIOR, *supra* note 2, at 8.

305. 43 U.S.C. § 1702(c) (2012).

306. *See id.* § 1701(a)(1).

307. *Id.* § 1701(a)(8).

308. For discussion and analysis of a potential production cap, see Peter Erickson & Michael Lazarus, *How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO_2 Emissions and 2°C Goals?* 22 (Stockholm Env't Inst., Working Paper No. 2016-02, 2016), https://perma.cc/BCX4-ZQRW.

Under current law, the Secretary of the Interior has discretion to reduce or waive royalties "whenever in [his or her] judgment it is necessary to do so in order to promote development, or whenever in [his or her] judgment the leases cannot be successfully operated under the terms provided therein."[309] Pursuant to its current regulations, BLM has discretion to grant royalty rate reductions if three requirements are met: (i) the royalty rate reduction encourages the greatest ultimate recovery of the resource; (ii) the rate reduction is in the interest of conservation of the resource; and (iii) the rate reduction is necessary to promote development of the resource.[310] The second of these requirements appears to conflict with the first and third; it is unclear how reducing royalties would advance resource conservation.

Interior should eliminate, or at least amend, its royalty rate reduction regulations. Rate reductions that are "necessary to promote development" of the resource amount to a subsidy for fossil fuels; the government should not be in the business of supporting uneconomical production from public lands, especially at a loss to taxpayers. This regulation is at odds with managing federal fossil fuel programs to maximize the net return to taxpayers, and threatens the efficacy of any future royalty rate adjustments.

E. Interior Should Evaluate Bidding Reforms That Can Help Secure Fair Market Value for Taxpayers, and Consider the Alternative of Delayed Lease Sales in NEPA Analysis

At the lease sale stage, Interior should be compensated for the estimated market price of the resource to be leased, as well as the option value of mining or drilling. Furthermore, Interior should consider the alternative of delaying lease sales in its NEPA "alternatives analysis" for proposed lease sales.

Minimum bids should be raised to account for inflation and the option value of leasing, in order to serve as a floor price for fair market value, as originally intended. Accounting for inflation, alone, would raise minimum bids across Interior's programs.[311] Interior's minimum bid and fair market value appraisals also fail to account for the option value of fossil fuel leasing, which is the value of waiting for more information on energy prices and extraction risks before deciding whether and when to lease the public's non-renewable energy resources to private companies.[312] As the D.C. Circuit recently affirmed, there is "a tangible present economic benefit to delaying the decision to drill," and failing to account for this value undervalues public resources.[313]

309. 30 U.S.C. § 209 (2012).

310. 43 C.F.R. §§ 3473.3-2(e), 3485.2(c)(1), 3103.4-1(a) (2016).

311. *See supra* Section II.C.2.

312. *See* Livermore, *supra* note 176, at 589, 593–96.

313. Ctr. for Sustainable Econ. v. Jewell, 779 F.3d 588, 610 (D.C. Cir. 2015).

Option value is relevant for both Interior's planning processes and its minimum bids and internal "fair market value" assessments. First, option value should be part of the planning process, to determine when and where to lease tracts. Interior can look to BOEM's final 2017–2022 program for offshore leasing as a starting point. BOEM uses a hurdle price analysis to account for economic uncertainty, and qualitatively considers environmental and social option value when determining when and where to lease.[314]

Second, option value should be a component of minimum bids and bid adequacy procedures. Both BLM and BOEM should evaluate how to incorporate option value into minimum bids for coal, oil, and gas leases. Interior can draw from economic literature on option value in oil drilling, for example, and augment the existing research by providing research funding or organizing working groups to evaluate methods to use option value for leasing. Government agencies play an important role in quantifying new categories of costs and benefits.[315] Indeed, the D.C. Circuit's ruling in *Center for Sustainable Economy v. Jewell* suggests that academic advancements in option value research could even compel BOEM and BLM to quantify the option value associated with their leasing practices.[316] While developing such a methodology will have a discrete upfront cost, once created, this methodology could be used in future government natural resources leasing decisions and could earn the American public significant net benefits from more optimal timing, location, and lease terms.

Third, even setting aside any formal or quantitative use of option value, Interior should consider the alternative of delaying or strategically timing fossil fuel lease sales when it prepares its "alternatives analysis," pursuant to NEPA. Considering a delayed lease sale alternative would require Interior to assess the potential effects of leasing fossil fuels later, when resource prices may be higher, pollution mitigation techniques may be better, or more infrastructure is in place that would reduce transportation costs or externalities, among other possible changes.

Finally, Interior should consider taking steps to make leasing more competitive, such as by moving to a market-based system of leasing that would pit bidders against one another across tracts, based on the quantity of oil, gas, or coal that they seek to produce in a practice called inter-tract bidding.[317] Alternatively, Interior could simply offer fewer tracts for lease at once and eliminate

314. *See* BOEM, 2017–2022 OCS Proposed Final Leasing Program, *supra* note 73, at 5-20, 8-1–8-19.

315. *See* Richard L. Revesz, *Quantifying Regulatory Benefits*, 102 Cal. L. Rev. 1423, 1425, 1436 (2014). For example, both the Social Cost of Carbon and Value of a Statistical Life are examples of government agencies serving as catalysts for the quantification of important measures of regulatory costs and benefits.

316. *See* 779 F.3d at 611.

317. Coal PEIS Scoping Report Vol. I, *supra* note 30, at 6-11.

practices like area-wide leasing, which it uses in offshore auctions. This would help to increase competition for leases offered at each auction.

In short, Interior's leasing programs should be structured to provide net benefits to taxpayers by accounting for environmental costs. Structuring its programs in this way would require more analysis through environmental reviews and ongoing planning processes. However, the resulting programs could provide substantial net benefits to taxpayers, and best effectuate Interior's statutory mandates. While partisan politics has been an impediment to a comprehensive legislative response to climate change, the reforms suggested in this Article can be implemented at the agency level pursuant to existing discretionary authority, and have the potential to earn more revenue for fossil fuel producing states and the federal government, while also reducing greenhouse gas emissions.

Conclusion

The federal fossil fuel leasing program is in need of reform. Stagnant fiscal terms have failed to keep pace with inflation, advances in energy production technology, and most notably, scientific and economic understanding of the costs of fossil fuel extraction. Interior, as the steward of public lands, should structure its leasing programs to provide maximum net benefits to the public, including by accounting for climate change costs. Adjusting royalty rates to account for the externality costs of production would ensure that leasing provides net benefits to the public—not just short-term gains for private companies. And modernizing bidding to account for option value and to increase competition for leases would better effectuate Interior's duty to earn fair market value for the use and development of federal lands and resources. The social welfare-maximizing framework proposed here is consistent with legislative history, judicial precedent, and principles of executive agency review that instruct agencies to maximize the net benefits of their policy choices. By increasing revenue to states and the federal government while reducing greenhouse gas emissions, the reforms suggested in this Article can serve as effective policy levers even in the absence of comprehensive climate change legislation.