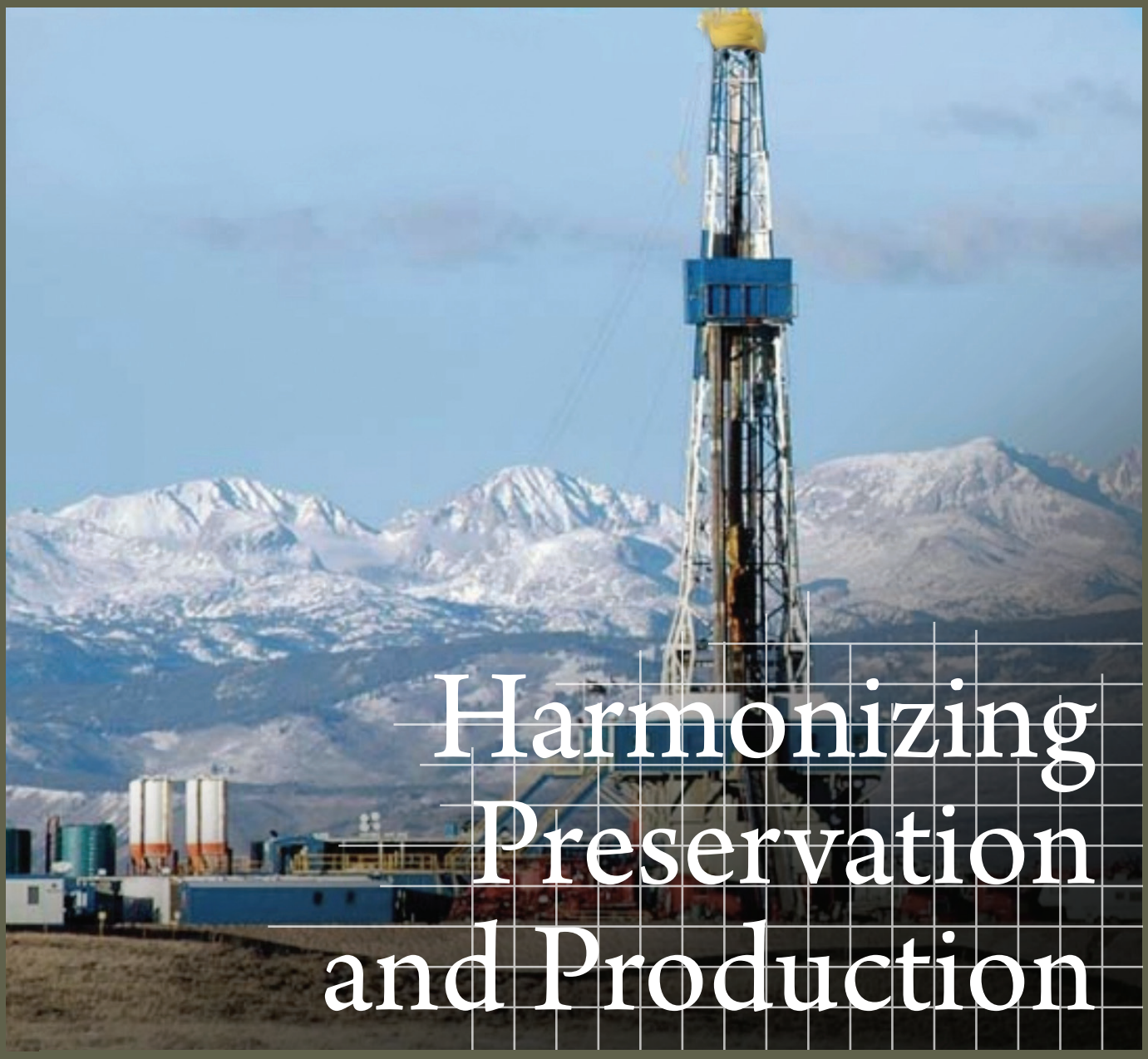

Photo by The Pinedale Field office of the BLM

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

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Executive Summary

Spurred by advances in technology such as hydraulic fracturing and directional drilling, 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.[1] Oil production increased 67 percent between 2005 and 2014, and natural gas production increased 36 percent.[2] The U.S. Energy Information Administration projects that U.S. crude oil and natural gas production will continue to rise through 2020, and that the United States will become a net natural gas exporter by 2017.[3]

The U.S. Department of the Interior ("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.[4] Federal energy production generates one of the largest non-tax sources of revenue for the United States, accounting for more than $14 billion in fiscal year 2013.[5] However, Interior does not systematically evaluate or update the fiscal terms for oil, gas, and coal production on federal lands.[6] In fact, some of its fiscal terms—including royalty rates for onshore oil and gas production—have not changed since 1920.

Photo by Sara Francis, U.S. Coast Guard

The U.S. Government Accountability Office has repeatedly called for Interior to reform its fiscal system, which may be depriving taxpayers of hundreds of millions of dollars each year from domestic energy production.[7] Among myriad issues, minimum bids are often set too low and fail to account for the option value of energy resources, 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 energy resources to private companies. Lease sales are often uncompetitive, exacerbating the problem of low minimum bids.[8] Low rents do not account for the externalities associated with exploratory drilling and mining, nor the lost value of the public's use and enjoyment of federal lands during the rental period.[9] Further, outdated royalty rates fail to account for externalities and contribute to a relatively low U.S. government take, compared to many states and foreign countries.[10] Together, these deficiencies mean that Interior fails to obtain a fair return for development of the public's natural resources, contrary to the agency's mandate under the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act.

This report focuses on one serious deficiency in the federal management of natural resources: the fiscal terms of federal leases do not require developers to internalize the environmental and social costs of fossil fuel extraction. In line with their statutory mandates under the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act, the U.S. Bureau of Land Management ("BLM") and Bureau of Ocean Energy Management ("BOEM"), each within the Department of the Interior, must account for these social and environmental costs when leasing and managing federal natural resources.

Interior's failure to value the environmental and social externalities associated with fossil fuel development on federal lands means that energy companies receive a financial windfall. The American public pays for the externalities associated with development that are not priced into the leasing contract and not otherwise addressed by environmental or tort law. These costs include local air pollution from exploration, development, and transportation to and from the well site; fugitive methane emissions, which contribute to climate change; habitat disruption; noise pollution; infrastructure wear and tear; and water contamination, among others. Failing to account for these costs in the terms of federal leases shifts them onto taxpayers, who already receive an improvidently low return for the right to exploit federal mineral resources.

Interior has the statutory authority and obligation to make changes to the current leasing program in order to earn a fair return for the American people and protect the environment. This report first discusses Interior's "dual mandate" both to develop energy resources and to preserve federal lands, as well as its requirement to secure fair market value for its leases. Next, the report describes how the current fiscal terms fail to earn a fair return for the public, and provides suggestions for reform. Specifically, Interior should:

- Raise minimum bids to account for option value, and evaluate methods to quantify option value for both offshore and onshore leasing;
- Ensure that rental rates incorporate the environmental and social externalities associated with exploration and resource development; and
- Increase royalty rates to reflect environmental and social costs that result from production.

The federal fiscal system for oil, gas, and coal leasing is long overdue for an update that could earn hundreds of millions of dollars for taxpayers each year and help ensure that the extent and timing of energy production on federal lands is efficiently balanced with conservation goals. This report's commonsense recommendations to modernize the fiscal terms of federal energy leases would help to provide a fair return for the public's valuable natural resources, and would harmonize the government's dual mandate of preservation and production.

Key Terms and Definitions Discussed in this Report

Externality: An effect that occurs when the production or purchase of market goods leads to costs or benefits that are not captured by the original producer or buyer. In other words, the transaction produces effects that are external to the market, leading to inefficient market outcomes. Pollution from mineral resource extraction that affects a third party is an example of an externality.

Fair Market Value: in the natural resources context, the value of the right to explore and, if there is a discovery, to develop and produce an energy resource. While "fair market value" is not defined in the relevant statutes governing oil, gas, and coal leasing, federal agencies have developed guidance to help ensure that the public receives fair return for the rights that it conveys.

Option value: the value of waiting to make an irreversible decision until critical new information arrives. One well-known example is stock options, which are valuable because they grant their holder the time to learn more about future stock prices before deciding whether to buy or sell. In the natural resource context, a conceptually identical methodology exists to determine the value of waiting to gain greater information about environmental, social, economic, and technological uncertainties, such as energy prices, extraction costs, and environmental sensitivities.

Part I: The Federal Leasing System

The Department of the Interior, through BLM and the BOEM, offers land to private parties for the extraction of oil, gas, and coal deposits through the sale of leases. BLM manages roughly 23,657 active oil, gas, and coal leases on 256 million onshore surface acres and 700 million onshore subsurface acres.[11] BOEM manages approximately 8,300 active oil and gas leases across 1.7 billion Outer Continental Shelf offshore acres.[12] 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.[13]

Three primary statutes set forth Interior's duties with respect to national energy production and federal land management: the Federal Land Policy and Management Act and the Mineral Leasing Act for onshore development, and the Outer Continental Shelf Lands Act for offshore development. These statutes articulate three important principles: First, Interior must balance orderly production of energy on federal lands with environmental preservation and other competing uses. Second, Interior must receive "fair market value" for the right to explore and develop federal mineral resources. And third, Interior has the authority to establish and revise regulations for the primary fiscal terms of leases: bids, rents, and royalties. We review these three components in turn.

Federal Law Requires BLM and BOEM to Uphold the Dual Mandate to Both Produce Energy and Preserve Federal Lands.

The Onshore Dual Mandate

The Federal Land Policy and Management Act and the Mineral Leasing Act, as amended, give BLM authority to manage onshore federal lands and mineral resources. Enacted in 1976, the Federal Land Policy and Management Act provides that federal lands are to be used only for the advancement of the national interest.[14] 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.[15]

The Federal Land Policy and Management Act sets forth the dual mandate of development and preservation. Agen-

cies must both protect the environment[16] and manage federal lands in such a way as to provide for domestic sources of "minerals [including hydrocarbon energy resources], food, timber, and fiber."[17] The Act also requires agencies to develop land use plans,[18] and to manage public lands in accordance with them.[19]

The Federal Land Policy and Management Act requires agencies to manage public lands to allow for multiple uses.[20] "Multiple use" is defined 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.[21]

"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 that will give the greatest economic return or the greatest unit output."[22] The Act further requires that Interior "shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands."[23] The statute's references to "multiple use" and direction to prevent "undue degradation" imply a cost-benefit calculus balancing resource extraction on the one hand against competing uses of the land and environmental protection on the other.

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 economic development of domestic mineral resources."[24] Among many provisions dedicated to oil, gas, and mineral leasing, the Mineral Leasing Act also provides that the Secretary of the Interior can issue regulations requiring that operators prevent "undue waste."[25] The Mineral Leasing Act also specifically requires oil and gas lessees (but not coal lessees) to "use all reasonable precautions to prevent waste of oil or gas developed in the land," on pain of forfeiture of the lease.[26] Thus, even when encouraging the "orderly economic development of domestic mineral resources," federal law requires Interior to ensure that valuable public resources are not wasted. Indeed, the word "orderly" itself conveys a congressional desire for careful, rational management of America's valuable energy resources.

Read together, the Federal Land Policy and Management Act and Mineral Leasing Act instruct Interior to harmonize the need for domestic mineral production with long-term environmental protection and stewardship of public lands.

The Offshore Dual Mandate

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.[27] It details Interior's dual mandate to conduct expeditious and efficient leasing while also protecting the environment and

Photo by Whit Welles

other uses of our nation's waters, including fishing and commercial shipping.[28] The Outer Continental Shelf Lands Act Amendments of 1978 state that one of the purposes of the Act is to "make such resource[s] available to meet the Nation's energy needs as rapidly as possible."[29] Another equally important purpose is to "encourage development of new and improved technology for energy resource production which will eliminate or minimize risk of damage to the human, marine, and coastal environments."[30]

Section 18 of the Outer Continental Shelf Lands Act requires Interior to prepare and periodically revise a Program "indicating, as precisely as possible, the size, timing, and location of leasing activity" on the Outer Continental Shelf over the pertinent five-year program period.[31] The Act directs that management of the Outer Continental Shelf shall be "conducted in a manner which considers economic, social, and environmental values of the renewable and non-renewable 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."[32] 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."[33]

The Outer Continental Shelf Lands Act, then, much like the Federal Land Policy and Management Act, strongly emphasizes the need to balance energy production with environmental protection.

Federal Law Requires that Interior Receive Fair Market Value for the Rights It Conveys.

The Fair Market Value Requirement for Onshore Energy Production

The Federal Land Policy and Management Act 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."[34] The term "fair market value" is not defined in the statute itself. In 1982—the last time that Interior convened a working group to comprehensively review its "fair market value" procedures—the task force determined that "fair market value" was not merely the value of the oil or gas discovered or produced, but the value of "the right" to explore and, if there is a discovery, to develop and produce the energy resource.[35] Indeed, the statute refers not just to the value of the resources, but also to the value of using the lands.

The Mineral Leasing Act was enacted in 1920 to promote the orderly development of mineral resources and to provide Interior with the authority to determine where and when oil, gas, and coal leases would be issued.[36] The Mineral Leasing Act does not contain an explicit "fair market value" requirement. However, it 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."[37]

Fair market value is defined in BLM's economic valuation handbook as "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."[38] Fair market value, then, is a somewhat subjective assessment that should be understood within the broader context and goals of the Federal Land Policy and Management Act and Mineral Leasing Act.

The Fair Market Value Requirement for Offshore Energy Production

The Outer Continental Shelf Lands Act 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."[39] While the Act does not provide a definition of "fair market value," the statute refers 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 "ensur[e] the public receives a fair return for OCS oil and gas leases."[40] 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."[41]

BOEM also uses specific criteria designed to provide adequate returns to the public for the rights issued. BOEM states that "[t]he assurance of FMV [fair market value] is a multi-phase process including national Program-level analysis, lease sale-level analysis, and, finally, analysis done before the issuance of an individual lease following a lease sale."[42] At the Program development stage, BOEM uses a "hurdle price analysis" to filter out program areas where de-

laying a sale may provide greater future economic value.[43] Following size, timing, and location decisions formulated at the Program development stages, BOEM assesses other fair market value components—such as bidding systems and fiscal and lease terms—at the lease sale stage to safeguard against leases being awarded for less than fair market value.[44]

In its most recent 2017 to 2022 Draft Proposed Program for Outer Continental Shelf oil and gas leasing, BOEM also recognized that option value can be an element of the fair market value of a lease.[45] Option value is the value of waiting to make an irreversible decision until critical new information arrives. One well-known example is stock options, which are valuable because they grant their holder the time to learn more about future stock prices before deciding whether to buy or sell. Uncertainty around future energy prices similarly creates option value, as does the uncertainty around extraction costs, such as whether technological developments may, in the future, reduce the environmental risks of oil spills. As part of its decision on size, timing, and location, BOEM acknowledged that it should consider the state of available environmental and social cost uncertainties, as well as resource price, technology, and regulatory uncertainties.[46]

As discussed in Part II, Interior should account for option value and externalities when pricing leases; this would best effectuate the dual mandates of the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act, and ensure a fair return to the American public.

Interior Has Broad Authority to Set Minimum Bids, Rents, and Royalties.

For onshore oil, gas, and coal exploration and production, the Mineral Leasing Act gives Interior discretion to determine where and when to issue leases.[47] 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.[48] 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.[49] Pursuant to this authority, the Secretary of the Interior has promulgated regulations for onshore oil, gas, and coal leases.[50]

For offshore oil and gas exploration and production, the Outer Continental Shelf Lands Act grants Interior the power to determine where and when oil and gas leases will be issued. 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 energy needs.[51] Preparing a five-year program involves extensive public comment 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.[52] 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.

The fiscal components of the federal leasing program primarily consist of three terms defined in each lease: bids (also called "bonus payments"), annual rental payments ("rents"), and royalties. Total revenue from federal onshore production is divided evenly between the federal government and each state in which the production takes place (to account for administrative costs, the federal government receives 52 percent and each state receives 48 percent).[53] For offshore production, federal Outer Continental Shelf land ownership begins three nautical miles off 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.[54] Gulf-producing states (defined as Alabama, Mississippi, Louisiana, and Texas) receive up to 37 percent of revenues from certain Outer Continental Shelf Gulf leases.[55] Coastal states have advocated for greater revenue share due to impacts on coastal infrastructure and the environment.[56]

Federal leases must provide the American people with fair and adequate compensation for the rights surrendered and the resources extracted.[57] The remainder of this Part describes Interior's authority to set minimum bids, rents, and royalties at an amount that ensures receipt of fair market value. However, as Part II discusses in more detail, because Interior excludes many environmental and social considerations when setting each term, federal leases are currently undervalued.

Authority to Set Bids

Interior, through BLM, allocates onshore oil and gas leases for a primary term of ten years through a competitive bidding process.[58] Interested parties may nominate tracts for leasing, and tracts are then offered for leasing through an oral auction. Each bidder offers a fixed amount as an initial bid. A bid is a one-time payment made to the federal government by the lessee at the time oil, gas, or coal leases are granted. The bidder that makes the highest bid is awarded the lease, provided that the bid amount exceeds a set "minimum." If a qualified bid is not received for any tracts offered at a competitive auction, those leases are offered noncompetitively, for the minimum bid price. [59]

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.[60] The Secretary of Interior may "establish by regulation a higher national minimum acceptable bid for all leases based upon a finding that such action is necessary: (i) to enhance financial returns to the United States; and (ii) to promote more efficient management of oil and gas resources on Federal lands."[61]

Photo by Bureau of Land Management

However, Interior has allowed the minimum bid for onshore oil and gas to remain at $2 per acre for decades.[62] The Mineral Leasing Act prohibits BLM from setting minimum bids on a tract-by-tract basis. It states that "[t]he Secretary [must] accept the highest bid . . . which is equal to or greater than the national minimum acceptable bid, without evaluation of the value of the lands proposed for lease."[63] Thus, while the Secretary of the Interior has the authority to raise the national minimum bid, BLM cannot require higher minimum bids for specific leases.[64] All leases offered at auction that do not receive any bids are offered the following day in a noncompetitive sale for the minimum bid price.[65] In the aggregate, about 40 percent of existing onshore leases were issued non-competitively. In 2014, about 10 percent of new leases were issued non-competitively.[66]

For coal leases, the Mineral Leasing Act states that "[n]o bid shall be accepted which is *less than the fair market value*, as determined by the Secretary, of the coal subject to the lease."[67] The minimum bid for a coal lease is currently set at $100 per acre.[68] Before each lease sale, BLM formulates an estimate of the "fair market value" of the coal lease offered. BLM's fair market value calculation is confidential and is only used to evaluate the bids received during the sale.[69] BLM accepts sealed bids prior to the date of the sale. The winning bid is the highest bid that meets or exceeds the coal tract's presale estimated fair market value.[70]

The bidding and allocation process for offshore oil and gas leases is similar to that for coal. BOEM first solicits nominations of tracts for leasing.[71] Leases are allocated through a competitive bidding process, with interested parties submitting sealed bids.[72] For offshore leases, the Secretary of the Interior "is authorized to grant [the lease] to the highest responsible qualified bidder or bidders by competitive bidding."[73] To ensure that the government receives a fair return for these offshore lease rights, BOEM uses an evaluation process to assess bid adequacy.

Both BOEM and BLM (for onshore coal leases) primarily rely on two approaches to measure fair market value of their leases: the comparable approach and the net income approach.[74] The first approach uses comparable lease sales and uses prior bids paid in similar mineral rights transaction.[75] The second approach uses projected revenue from the resource over time, under realistic conditions.[76] This bid adequacy process relies on evidence of market competition, as well as in-house estimates of tract value.[77]

However, as discussed in Part II, below, these two approaches to measuring a fair return do not properly account for the option value associated with federal leasing. And because many leases are uncompetitive, with only one qualified bidder, relying on comparable lease sales may simply perpetuate a pattern of accepting improperly low bids.

Authority to Set Rents

Pursuant to the Mineral Leasing Act, a company holding an onshore oil or natural gas lease on public land, but not currently producing and paying royalties from production on that land, must pay the federal government an annual rental fee of at least $1.50 per acre, during the first five years, and at least $2 per acre each year thereafter.[78] When resource production begins, this rental requirement converts to a minimum royalty.[79] The Secretary of the Interior has the authority to establish a higher minimum rate.[80] Current BLM regulations set annual rents at the statutory minimum rate. BLM cannot require higher rents on a lease-by-lease basis unless this regulation is revised.[81] BLM has not increased the rental rates since they were last revised in 1987. The Mineral Leasing Act of 1920 originally established a rental rate of not less than $1 per acre, per year, for most oil and gas leases.

For coal, the statutory minimum rent is $3 per acre, per year; Interior has authority to charge a higher rent.[82] By the terms of its regulation, BLM also has the power to specify "the amount of the rental . . . in the lease."[83] This gives BLM greater flexibility to adjust rental rates for coal leases than it currently has for onshore oil and gas leases.

For offshore leases, the Outer Continental Shelf Lands Act grants the Secretary of the Interior discretionary authority to set rents for individual leases.[84] BOEM has been delegated this authority by the Secretary, and can set rents on a lease-by-lease basis.[85] BOEM commonly uses escalating rental rates to encourage faster exploration and development of leases, and earlier relinquishment when exploration is unlikely to be undertaken by the current lessee.[86] BOEM states that rental payments "serve to discourage lessees from purchasing marginally valued tracts too soon because companies will be hesitant to pay the annual holding cost to keep a low-valued or currently uneconomic lease in their inventory."[87]

Authority to Set Royalty Rates

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 federal oil, gas, and coal leasing.[88] 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.

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.[89] Although Interior is authorized by statute to set a higher rate than 12.5 percent for competitive leases, BLM's existing regulations set a flat rate of 12.5 percent for such leases.[90] For non-competitive leases, the royalty rate is fixed by statute at 12.5 percent.[91]

Photo by D Ramey Logan

The Mineral Leasing Act and the Federal Coal Leasing Amendments Act of 1976 set a royalty rate floor for coal production at 12.5 percent of the gross value of the coal produced from surface mines, and 8 percent for coal produced from underground mines.[92] The Mineral Leasing Act's coal royalty provision states that, "[t]he lease shall include such other terms and conditions as the Secretary shall determine."[93]

The Secretary of the Interior has the authority to increase the current royalty rates for oil, gas, and coal. Any new royalty rate would be applied to new leases and leases renewed in the future; leases currently in production are subject to renewal after the first 20 years of production, and every 10 years thereafter.[94]

With respect to offshore oil and gas leases, the Outer Continental Shelf Lands Act states that Interior must set royalties at or above 12.5 percent.[95] Interior is permitted to set a higher royalty rate.[96] If Interior raises royalty rates for offshore production, Congress can pass a resolution disapproving this change within 30 days of Interior's action.[97] In 2007, Interior increased the royalty rate for new offshore leases in the Gulf of Mexico from 12.5 percent to 18.75 percent.[98] Interior made this change in response to advances in production technology, increased oil and gas prices, and the competitive market for offshore leases.[99] Interior estimated that the royalty rate increase from 12.5 percent to 18.75 percent would increase oil and gas revenues by $8.8 billion over the next 30 years.[100] The royalty rate for Outer Continental Shelf areas off the Alaskan coast, as well as other frontier areas, remains 12.5 percent.

As the following section describes, Interior can use its authority to increase minimum bids, rents, and royalty rates based on option value and the consideration of environmental and social costs that will result from exploration and production. In any legal challenge, Interior's determination to adjust these fiscal terms would be subject to an arbitrary and capricious standard.[101] Interior's decision would likely be entitled to significant deference, as it has particular expertise in the stewardship and valuation of federal natural resources.[102]

Part II: Interior Should Revise the Fiscal Terms for Federal Leases to Provide a Fair Return to the Public and Effectuate its Dual Mandate

The current federal leasing system fails to provide a fair return to the public. By excluding relevant environmental and social costs from the fiscal terms of leases, Interior fails to collect a fair market value for taxpayers and fails to adequately preserve federal environmental resources. In line with its statutory mandates under the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act, Interior should:

- Secure a fair return for the American people by incorporating economic, environmental, and social option value into minimum bids for coal, oil, and natural gas leases;
- Raise annual rents to account for the foreseeable externalities associated with exploration and resource development; and
- Increase royalty rates to reflect environmental and social costs that result from production, and eliminate royalty relief provisions that provide improper incentives to energy companies.

Interior can secure a fair return for American taxpayers by incorporating option value into the minimum bid price for coal, oil, and natural gas leases.

Option value derives from the ability to delay decisions until later, when more information is available. The concept's most familiar application is in the financial markets, where investors calculate the value of options to wait for more information on stock prices before deciding whether to buy or sell shares (i.e., stock options). A conceptually identical and well-established methodology exists to quantify the value of waiting to gain greater information about environmental, social, economic, and technological uncertainties.[103] In the leasing context, the value associated with the option to delay can be large, especially when there is a high degree of uncertainty about resource price, extraction costs, and/or the social and environmental costs of drilling. Accounting for option value does not always require that the government postpone issuing leases; rather, it requires that the government is adequately compensated for the value of delay.

Interior currently fails to account for option value in setting minimum bids for natural resources leases. The minimum bid should be set at a level to ensure a fair return for U.S. taxpayers on parcels acquired by private companies. Accounting for economic, environmental, and social option value would very likely increase the minimum bid price above the current statutory minimums for oil, gas, and coal. Therefore, to ensure a fair return, Interior should raise national minimum bids to account for the full value of this option.

The federal government holds a perpetual option to develop energy resources, yet this option value is not accounted for in minimum bids.

The importance of option value to evaluating decisions under uncertainty has been widely recognized in the economics community for several decades.[104] The option value framework has long been applied to natural resource extraction decisions, including offshore oil drilling. In fact, the petroleum industry routinely accounts for the value of waiting for more information on uncertain future oil prices and production costs, which explains the frequent practice of companies purchasing offshore leases but waiting long periods of time to begin drilling.[105] A 2011 Interior report estimated that about 70 percent of offshore leases and 57 percent of onshore leases were not under any active or planned development.[106]

Option value is relevant for both price uncertainty, as well as environmental and social uncertainty. Interior's current minimum bids fail to account for the option value associated with each of these categories of uncertainty.

First, with respect to price uncertainty, Interior holds—on behalf of the American public—perpetual options to develop or lease oil, gas, and coal tracts; the agency must decide when and where exercising those options will be most opportune. When Interior sells a lease, the federal government's perpetual option is converted to time-limited option held by the lessee, lasting for the duration of the lease. The lessee must act within a set time period—between five and ten years for both onshore and offshore leases[107]—or it will lose the right to develop the tract. A perpetual option is more valuable than a time-limited option, as it gives the option holder the power to wait, indefinitely, for more information (or for prices to rise) before making an irreversible decision. Thus, when the federal government sells a private lessee the right to develop a tract for a set period of time, it extinguishes the perpetual option that the government holds on behalf of the American people, and sells a time-limited option. Interior does not account for the lost value of its perpetual option in the price of its leases.[108] As a result, the public does not receive the full value of the right to exploit its resources.

Photo by Mike Quinn

BOEM currently uses a "hurdle price analysis" at the program stage that is designed to account for some resource price uncertainty;[109] however, it does not conduct similar analysis at the lease sale stage, and also fails to account for environmental and social uncertainties in this analysis. BLM does not use a "hurdle price" analysis for any of its lease sales. Rather, BLM uses the $2 per acre minimum bid for all oil and gas leases, thus failing to account for price uncertainty in these minimum bids altogether.[110]

Second, Interior fails to account for environmental and social uncertainty when evaluating tracts to offer at auction, as well as when setting minimum bids and assessing fair market value. The environmental, social, and economic uncertainties associated with drilling and mining are many, and include:

- Uncertainty about the magnitude of risk of catastrophic oil spills, especially in relatively dangerous or unfamiliar areas like deep-water zones and the Arctic;
- Uncertainty about the development rate of spill-prevention, spill-remediation, and pollution-prevention technologies, as well as technologies that may better protect worker safety;
- Uncertainty about competing uses of federally-leased areas, such as the potential for renewable energy projects; and
- Sensitivities to threats associated with drilling and mining, such as the toxicity of spills or leaks, climate and marine conditions that may exacerbate the damaging effects of spills, and consequences for land values near spills and production sites.

These uncertainties can and should be accounted for when evaluating which parcels to offer for leasing, as well as when setting minimum bids and evaluating bid adequacy. The option value associated with each of these uncertainties, among others, is a component of the "fair market value" of the right to develop public resources.[111]

Lack of Robust Competition for Onshore Leases Underscores the Need to Raise Minimum Bids

Some concerns with respect to low minimum bids would logically be tempered in a truly competitive market, with multiple bidders. However, the majority of coal lease sales conducted by BLM are uncontested, with no bidders other than the initial applicant that nominated the tract.[112] This lack of robust competition means that many coal leases are sold for the statutorily-set minimum bid of $100 per acre, even though BLM has the power to require higher minimum bids on a lease-by-lease basis.[113] And for onshore oil and gas, about 40 percent of leases currently in force were offered noncompetitively, for the minimum bid of $2 per acre.[114] The non-competitive nature of many federal onshore lease sales all but guarantees that the full value of the government option is not captured in the bid price. Moreover, while robust competition might ensure that bidders account for some amount of price uncertainty, private actors do not have an incentive to account for environmental and social uncertainty, as they do not internalize the full cost of pollution or impairment of competing uses of the land. These effects are externalities, many of which do not rise to the level of legally actionable claims, or which would require costly and time-consuming litigation to recoup.

At the lease sale stage, BLM and BOEM have information about specific risks and environmental, social, and economic uncertainties relevant to the leases at issue. The agencies should account for this option value in order to earn

a fair return and to avoid unnecessarily exposing the public to high-risk drilling. For example, where uncertainties are high, such as in more remote or extreme weather environments, as in the Arctic, the value of delay is greater. Thus, when done correctly, adjusting minimum bids to account for option value would help ensure that the government only leases when and where the present societal benefits outweigh the costs, including the value of delay.

In short, Interior should increase minimum bids in order to recoup the option value associated with leasing federal resources.

Both BOEM and the D.C. Circuit Court of Appeals recognize the relevance of option value to federal natural resources management.

In a deliberate move towards greater rationality, BOEM recently recognized the utility of option value in its proposed 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.[115] However, BOEM declined to quantify environmental option value, and instead only qualitatively addressed option value in its 2017-2022 draft program.[116]

In addition, the United States Court of Appeals for the D.C. Circuit recently affirmed the existence and validity of option value with respect to offshore oil and gas drilling. In *Center for Sustainable Economy v. Jewell*, Petitioner argued that OCLSA Section 18 required BOEM to explicitly consider and quantify the option value of delaying leasing in specific regions of the Outer Continental Shelf.[117] The Court's decision recognized the utility of option value to Interior's offshore leasing program:

> More is learned with the passage of time: Technology improves. Drilling becomes cheaper, safer, and less environmentally damaging. Better tanker technology renders oil tanker spills less likely and less damaging. 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.*[118]

Ultimately, the Court found that BOEM's failure to quantify option value in its 2012-2017 Program was not arbitrary or irrational at this time because the methodology for quantifying option value is not yet "sufficiently established."[119] But importantly, the Court's holding indicates that quantitative methods might be developed in the future, and that such methods would be preferable to qualitative treatment of option value.[120] The court noted: "Had the path been well worn, it might have been irrational for Interior not to follow it."[121] While the decision addressed offshore leasing, the Court's language on the utility of option value is equally applicable to both onshore and offshore leasing. And BLM, unlike BOEM, currently fails to address environmental and social option value in any manner, qualitatively or quantitatively.

RECOMMENDATIONS:
Interior should raise minimum bids to account for option value, and evaluate methods to quantify option value for both offshore and onshore leasing.

First and foremost, Interior should evaluate how to incorporate option value into minimum bids for oil, gas, and coal leases, both onshore and offshore. Interior has the authority, pursuant to the Mineral Leasing Act and the Outer Continental Shelf Lands Act, to increase minimum bids. It can and should evaluate what level of bid increase is necessary in order to account for the value of the government's perpetual option for natural resources leasing. Interior has allowed the minimum bid for onshore oil and gas to remain at $2 per acre for decades.

Second, BOEM currently evinces a more sophisticated understanding and application of option value than BLM, as detailed in its latest draft program for offshore leasing. Interior should take steps to ensure that BLM catches up with BOEM's valuation methods and understanding of option value. Further, BLM should review and adopt BOEM's language on the utility of option value to both its program-level and lease sale decisions.[122] As the D.C. Circuit affirmed, there is "a tangible present economic benefit to delaying the decision to drill," and failing to account for this value undervalues public resources.[123]

Third, Interior should revise its regulations to encourage or require BLM and BOEM to account for option value when setting lease-specific minimum bids for coal leases and offshore oil and gas leases.[124] Consistent with the D.C. Circuit's opinion in *CSE v. Jewell*, and as BOEM directly articulated, option value can be a component of the fair market value of a lease. BLM and BOEM should also update their handbooks and guidance manuals to require the consideration of option value when setting fiscal terms of leases. For example, a "social hurdle price" could be calculated for each lease sale, or subsection of tracts in a lease sale, in order to account for environmental, social, and economic uncertainty.

Photo by Daniel Foster

Fourth, Interior should consider organizing a working group to evaluate methods to use and quantify option value for both offshore and onshore leasing.[125] Government agencies play an important role in quantifying new categories of costs and benefits.[126] Indeed, the D.C. Circuit ruling strongly suggests that academic advancements in option value research could soon compel BOEM and BLM to quantify the option value associated with their leasing practices; the agencies should lead this effort now. While developing such a methodology will have a discrete upfront cost, once created, this model could be used and refined in future government natural resources leasing decisions, and could earn the American public billions of dollars in net benefits from more optimal timing, location, and lease terms, as well as avoided catastrophic oil spills and other costs of high-risk drilling.

In short, the initial investment required to quantify the option value associated with offshore leasing may be vastly outweighed by the long-term societal benefits. Such an approach would also be consistent with the Federal Land Policy and Management Act's dual mandate and the Outer Continental Shelf Lands Act's direction to weigh "economic, social, and environmental values."[127]

Interior should ensure that rents incorporate the environmental and social externalities of exploration and resource development.

Interior has discretion to set oil, gas, and coal lease rental rates at an appropriate level, yet often charges no more than the statutory minimums. Accounting for the full lost value of the public's use and enjoyment of federal lands during the rental period, as well as the anticipated externalities associated with exploratory drilling would likely raise the rent price above the current statutory minimums. BLM's rental rates of $1.50 or $2 per acre were last updated in 1987, and are lower than the rental rates charged by other oil and gas-producing states, such as Texas (which charges $5 per acre during the first three years, and $25 per acre thereafter if the lease still has no production).[128] Interior should consider raising minimum rental rates in order to receive fair market value for the rights it conveys.

Energy leaseholders impose uncompensated costs on the public as soon as exploration begins.

America's public lands offer millions of people a place to hike, camp, hunt, fish, and enjoy scenic beauty. They provide drinking water, clean air, critical habitat for wildlife, sites for renewable energy development, as well as natural resources including timber, minerals, oil, and natural gas. As soon as energy exploration begins, competing uses of federal land such as recreational enjoyment, commercial fishing, and renewable energy development are impaired, and continue to be foreclosed for the duration of production.

Energy companies also cause environmental and noise pollution through prospecting, exploratory drilling, and other activities undertaken in preparation for resource extraction. Often, companies do not pay for the full cost of this damage, because these negative effects are externalities, many of which do not rise to the level of actionable legal claims, or which would entail complex and costly litigation to establish causation or damages. During exploration, operators drill test wells and may use dynamite find minerals. Operators construct roads to and from the exploration site and build production facilities. Beginning with exploration, increased vehicular traffic due to drilling and mining operations contributes to wear and tear on roadways, as well as traffic-related fatalities. For example, a 2014 *Houston*

Chronicle investigation found a 50 percent increase in motor vehicle fatalities in the West Texas counties associated with the Permian Basin, and an 11 percent increase in Eagle Ford Basin and Barnett Shale counties.[129]

Neither BLM nor BOEM presently attempt to quantify these costs or charge lessees for them. As a result, energy companies may conduct more prospecting operations than are socially optimal, because they do not bear all of the costs of this damage. Because many of these externalities occur before resources are extracted, yet after leases begin, these costs are logically recoverable at the rent stage. A socially efficient rent price would fully compensate the public for these costs.[130]

RECOMMENDATION:
Interior should increase rents charged to account for impairment of recreational interests and environmental and social externalities.

First, the Secretary Interior has the authority to establish a higher minimum rental rate for oil, gas, and coal leases. To earn fair market value for the rights conveyed, Interior should raise the minimum rent price to account for the foreseeable externalities associated with holding leases, prospecting, and conducting exploratory drilling and mining.[131]

Second, because it has the authority to adjust rents for individual coal and offshore leases, Interior should use environmental impact statements or environmental assessments (required pursuant to the National Environmental Policy Act ("NEPA")), as well as company-provided exploration plans, to estimate the externalities associated with particular lease sales. Interior should charge higher rental rates for leases that are expected to result in greater local air pollution, commercial vehicle traffic, seismic exploration, drilling, or other anticipated externalities during the rental period.

Third, current BLM regulations set annual rents for onshore oil and gas leases at the level of the statutory minimums: $1.50 per acre for the first five years, and $2 per acre thereafter.[132] BLM cannot require higher rents on a lease-by-lease basis for oil or natural gas tracts unless this regulation is revised.[133] Interior should initiate a rulemaking to provide BLM with the flexibility to adjust rents upwards in any future lease, to account for environmental externalities, foregone recreational use, or other factors.

Finally, Interior should attempt to quantify the recreational utility of given tracts of land, and account for this in the rent price. Some lease sites may have greater recreational value than others; this value should be accounted for in setting the rental rate. BLM and BOEM might use data on visitor history to particular regions or lease sites to help assess this social cost of leasing. The Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act require receipt of fair market value for the rights conveyed; this should include the value of the right to temporarily restrict or permanently impair recreational use.

Interior should increase royalty rates to account for environmental and social costs that result from production.

Energy companies currently benefit from inefficiently low royalty rates, because Interior's rates do not account for environmental and social impacts. Underscoring the need for comprehensive reevaluation, onshore royalty rates for oil and natural gas have not increased in nearly 100 years, even as U.S. oil and gas producers have benefitted from rapid technological innovation, political stability, and relatively high resources prices—many of the same factors that led to an increase in offshore royalty rates in 2007.[134]

The royalty rates paid by energy companies do not compensate the federal government for the social and environmental costs of resource extraction.

During gas, oil, and coal production, drilling and mining cause local and global air pollution. For example, the United States loses at least 1 to 3 percent of its total natural gas production each year when methane is leaked, flared (burned), or vented to the atmosphere during the production, processing, transmission, storage, and distribution of natural gas and oil.[135] This is a waste of a valuable resource—contrary to the goals of the Mineral Leasing Act to avoid all "undue waste"—as well as a potent source of greenhouse gas pollution.[136] Further, air quality near well sites can reach ozone levels that fail to meet EPA standards.[137] Injection wells used to dispose hydraulic fracturing wastewater can induce earthquakes.[138] And wastewater stored in pits and tanks has the potential to leak, causing water contamination.[139]

These concerns are not always adequately addressed through tort or environmental law. Fines and tort liability may address only major violations; even then, the harm will have already taken place. Further, what relief is available may entail costly and time-consuming litigation, where plaintiffs bear the burden of proving a violation.[140] Further, even if successful, plaintiffs may ultimately recover less than the total value of the damage.[141]

Bonding Requirements

Interior's bonding requirements are outdated and may be insufficient to cover the full cost of accidents or damage that occurs after production. Companies must pay bonds to BLM, pursuant to the Mineral Leasing Act, in order to ensure that they can perform reclamation of any federal land that may be disturbed by fossil fuel production. BLM's bond amounts were set in the 1950s and 1960s, and may be too low to ensure that companies can perform all necessary reclamation.[142] If a bond is not sufficient to cover well plugging and surface reclamation and there are no responsible or liable parties, the well is considered "orphaned," and BLM must use federal dollars to fund reclamation. Interior should review bonding requirements and revise them if necessary to ensure that reclamation costs are paid by responsible parties.

Outdated royalty valuation processes also reveal the need for reform.

Surveys of state and foreign government royalty rates also suggest that Interior does not set royalty rates in a manner that guarantees a fair return to the American people.[143] Most energy-rich states in the United States set royalty rates for fossil fuel production between 15 and 20 percent; Texas has a 25 percent rate for oil and gas production.[144] 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.[145] This is so, even as the United States is a very attractive place for companies to do business given its longstanding political stability, abundant oil and natural gas reserves, and ample existing infrastructure, including oil rigs, refineries, pipelines, and railways.[146]

Royalty Rates for Oil and Gas Produced on Federal and States Lands (as of June 2015)

JURISDICTION	ROYALTY RATE	AUTHORITY
Federal onshore	12.5%	30 U.S.C. § 226(b)(1)(A); 43 C.F.R. § 3103.3–1(a)(1)
Federal offshore	18.75% for Gulf of Mexico; 12.5% for other offshore leases	43 U.S.C. § 1337(a); Department of the Interior notices
California	16.67%, minimum	Cal. Pub. Res. Code § 6827
Colorado	16.67%	Colo. Oil and Gas Dev. Policy No. 500-001
New Mexico	18.75% for development leases; 16.67% for discovery leases	N.M. Stat. Ann. §§ 19-10-4.1; 19-10-4.3
North Dakota	16.67% or 18.75% depending on the county	N.D. Cent. Code §§ 15–05–09; 15–05-10
Pennsylvania	12.5%	Penn. P.L. 183, No. 60, § 1
Texas	20 to 25%	Tex. Nat. Res. Code Ann. §§ 52.022; 52.024; 32.1073

A 2013 Government Accountability Office report also criticized Interior's lack of documented procedures for determining how it sets royalty rates for new offshore leases.[147] The report points to the 2007 changes made by Interior to increase the royalty rate for new offshore leases in the Gulf of Mexico. Interior estimated that the royalty rate increase from 12.5 percent to 18.75 percent would increase oil and gas revenues by $8.8 billion over the next 30 years.[148] However, Interior did not comprehensively evaluate the entire federal oil and gas system, and therefore left onshore royalty rates unchanged, and did not produce written documentation of its analysis nor the specific rationale for the increase.

In addition, when calculating royalties owed to the government, Interior's Office of Natural Resources Revenue has been criticized for failing to account for higher export prices, especially for coal.[149] Companies may engage in "faux" arm's length transactions, for example, by selling coal to an affiliate which then sells the coal for a higher price overseas. Such companies then report only the initial domestic sale price to the agency, which uses that (lower) price to calculate the royalties due.[150] To ensure a fair return, Interior should establish procedures to verify arm's-length transactions and curtail any improper gaming of the system. The Office of Natural Resources Revenue's proposed rule, released in January 2015, would clarify the definition of arm's-length transactions and give the agency more authority to police this practice.[151]

RECOMMENDATION:
Interior should increase royalty rates to reflect environmental and social costs that result from production, and modernize antiquated royalty relief provisions.

First, Interior should comprehensively review onshore and offshore royalty rates at the same time, in order to assess how an increase in royalty rates might affect overall returns and better meet the mandates of the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act. Onshore royalty rates are due for an increase, and many of the factors that led Interior to update its offshore royalty rates in 2007 have been present in the onshore market for nearly as long, such as technological advancement, political stability, and relatively high resource prices.

Second, Interior should consider increasing minimum royalty rates above current levels to account for foreseeable environmental and social costs of production. For all leases obtained competitively, BLM and BOEM are permitted to negotiate royalty rates with energy leaseholders on a lease-by-lease basis; however, most federal onshore and offshore leases are set at or near the statutorily prescribed minimum: 12.5 percent for onshore oil, gas and surface coal production, and 18.75 for offshore oil and gas in the Gulf of Mexico.[152]

A minimum royalty rate that would assure a fair return to the public should account for: (1) negative externalities imposed on the local environment and communities, (2) infrastructure demand (e.g., water, power, roadways, processing facilities, and pipelines); and (3) any foreseeable "waste" of the resource, such as vented or flared methane (which is primarily composed of natural gas) associated with natural gas, oil, and coal production.[153] For example,

Photo of the Department of the Interior by Matthew Bisanz

a royalty rate adjustment to account for anticipated vented or flared methane may be particularly appropriate, as the Mineral Leasing Act requires oil and gas lessees to "use all reasonable precautions to prevent waste of oil or gas developed in the land."[154]

Third, for individual leases, BOEM and BLM should assess foreseeable environmental and social costs by converting projections found in site-specific assessments and environmental impact statements, required by NEPA, into "externality adjustments" that may raise the royalty rate by a certain percentage.[155] This adjustment could be made on a lease-by-lease basis or for each lease sale, and could account for the type of resource to be extracted, method of production, and type and extent of the anticipated externalities. Relying on NEPA documents would appropriately narrow the agencies' attention to "reasonably foreseeable environmental effects of the action," rather than every conceivable possibility.[156]

Finally, Interior should eliminate existing royalty relief provisions that provide improper incentives to energy companies that run counter to the dual mandates of the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act. Specifically, Interior's Office of Natural Resources Revenue currently allows companies to subtract transportation and processing costs from the federal royalties they owe, including fuel costs, terminal operator fees, and more.[157] This does not provide proper incentives for companies to locate production closer to refineries or end energy users, nor to use more efficient modes of transportation. More generally, it does not provide incentives for production to be located at a socially optimal place. Therefore, companies may emit more carbon dioxide in transporting oil, gas, and coal than is socially optimal, creating negative externalities. Interior should consider eliminating this royalty relief provision altogether, or strongly limiting its scope. This royalty relief provision runs counter to the explicit aims of the Mineral Leasing Act to prevent waste, and to the Federal Land Policy and Management Act's goal to protect the quality of "air and atmospheric" resources, and to "protect certain public lands in their natural condition."[158]

Conclusion

The fiscal terms of federal oil, gas, and coal leases do not require energy producers to internalize the foreseeable environmental and social costs of fossil fuel extraction. Failing to account for these costs in the terms of federal leases shifts them onto taxpayers, who already receive an improperly low return due to outdated valuation regulations. To ensure that the American public receives a fair return, the Interior should revise its fiscal terms to account for option value and environmental and social externalities. This report's recommendations would help to provide fair market value for the public's natural resources, and harmonize the government's dual mandate of preservation and production.

Endnotes

[1] U.S. Energy Information Administration, International Energy Statistics: Gross Natural Gas Production 2009 to 2010, *available at* http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=3&pid=3&aid=1&cid=regions&syid=2009&eyid=2010&unit=BCF. From 2007 through 2012, monthly crude oil production increased by 39 percent, and monthly natural gas production increased by 25 percent. U.S. Energy Information Administration, Oil and gas industry employment growing much faster than total private sector employment (Aug. 2013), *available at* http://www.eia.gov/todayinenergy/detail.cfm?id=12451.

[2] U.S. Energy Information Administration, Crude Oil Production, *available at* http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbblpd_a.htm (follow to View History: U.S. Production, Annual); U.S. Energy Information Administration, Natural Gas Gross Withdrawals and Production, *available at* http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_m.htm (follow to View History: U.S. Natural Gas Gross Withdrawals, Annual).

[3] U.S. Energy Information Administration, Annual Energy Outlook 2015 at ES-4 (April 15, 2015), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf ("In all the AEO2015 cases, the United States transitions from a net importer of 1.3 Tcf of natural gas in 2013 to a net exporter in 2017.") The United States becomes a net petroleum exporter in 2021 in high oil price scenarios. *Id* at ES-3 to ES-4; Figure ES3. In lower oil price scenarios, lower levels of domestic consumption of liquid fuels and higher levels of domestic production of crude oil push the net import share of crude oil and petroleum products supplied down from 33 percent in 2013 to 17 percent in 2040. *Id.* at ES-4; Figure ES4.

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[5] U.S. Gov't Accountability Office, No. GAO-14-238, Oil and Gas: Updated Guidance, Increased Coordination, and Comprehensive Data Could Improve BLM's Management and Oversight 1 (May 2014), *available at* http://www.gao.gov/products/GAO-14-238 .

[6] U.S. Gov't Accountability Office, No. GAO-08-691, Oil and Gas Royalties: The Federal System For Collecting Oil And Gas Revenues Needs Comprehensive Reassessment 7-10 (Sept. 2008), *available at* http://www.gao.gov/products/GAO-08-691.

[7] *Id*; U.S. Gov't Accountability Office, No. GAO-14-50, Actions Needed For Interior, *supra* note 4; U.S. Gov't Accountability Office, No. 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 (May 2007), *available at* http://www.gao.gov/products/GAO-07-676R; *see also* Tom Sanzillo, Institute for Energy Economics & Financial 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 43 percent of the nation's coal); John M. Broder, Undervalued Coal Leases Seen as Costing Taxpayers, N.Y. Times (June 11, 2013); U.S. Department of the Interior, Office of the Inspector General, Evaluation: Coal Management Program (June 2013), *available at* http://www.documentcloud.org/documents/712402-inspector-generals-report-on-coal-leases.html.

[8] Juliet Eilperin, Powder River Basin Coal Leasing Prompts IG, GAO Reviews, Washington Post (June 24, 2012); Brian Grow, Joshua Schneyer, and Janet Roberts, Special Report: Chesapeake and Rival Plotted to Suppress Land Prices, Reuters (June 25, 2012).

[9] *See* Center for Western Priorities, A Renters Market: Outdated Oil & Gas Rental Rates Fail Taxpayers (Aug. 2014), *available at* http://westernpriorities.org/rentersmarket/.

[10] *See* Center for Western Priorities, A Fair Share: The Case For Updating Federal Royalties (June 2013), *available at* http://westernpriorities.org/wp-content/uploads/2013/06/royalties-report.pdf; Headwaters Economics, An Assessment Of U.S. Federal Coal Royalties (Jan. 2013), *available at* http://headwaterseconomics.org/wphw/wp-content/uploads/Report-Coal-Royalty-Valuation.pdf; Law Library of Congress, Global Legal Research Center, Crude Oil Royalty Rates in Selected Countries (Jan. 2015), *available at* http://www.loc.gov/law/help/crude-oil-royalty-rates/crude-oil-royalty-rates.pdf.

[11] Department of the Interior, Bureau of Land Management, Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 22148, 22149 (April 21, 2015); Steve Tryon, BLM, *Presentation to the Production Accountants Society of Oklahoma* (Feb. 6, 2013), *available at* http://paso-tulsa.org/wp-content/uploads/2013/02/2-Steve-Tryon-BLM-Presentation-to-PASO.pdf.

[12] Bureau of Ocean and Energy Management, Oil and Gas Leasing on the Outer Continental Shelf, *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/5BOEMRE_Leasing101.pdf.

[13] U.S. Energy Information Administration, Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2012 (June 2014), *available at* http://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf. Coal represented 51 percent of fossil fuel sales from production on federal lands in fiscal year 2013, followed by natural gas (25%) and crude oil (22%). In 2013, coal produced on federal lands accounted for 40 percent of U.S. total coal production; crude oil from federal lands accounted for 23 percent of U.S. production; and natural gas production accounted for 16 percent of total U.S. production. *Id.* at 4. Crude oil royalties accounted for the greatest share of federal revenue, compared to coal and gas. *Id*. The federal Gulf of Mexico produced 69 percent of the federal and Indian lands crude oil total in fiscal year 2013. *See id.* at 1; Table 7.

[14] 43 U.S.C. § 1701(a)(1).

[15] 43 U.S.C. § 1701(a)(8).

[16] *Id.*

[17] 43 U.S.C. § 1701(a)(12).

[18] 43 U.S.C. § 1712(a).

[19] 43 U.S.C. § 1732(a).

[20] 43 U.S.C. § 1712(c)(1).

[21] *Id.* § 1702(c) (" 'Multiple use' means the 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; and 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 that will give the greatest economic return or the greatest unit output.").

[22] *Id.*

[23] 43 U.S.C. § 1732(b).

[24] 30 U.S.C § 21(a).

[25] 30 U.S.C. § 187.

[26] 30 U.S.C. § 225. The legislative history of the Mineral Leasing Act and its subsequent amendments reveal that Congress was concerned with the waste of oil and gas. *See Boesche v. Udall*, 373 U.S. 472, 481 (1963) (citing H.R. Rep. No. 398, 66th Cong., 1st Sess. 12-13; H.R. Rep. No. 1138, 65th Cong., 3d Sess. 19; H.R. Rep. No. 206, 65th Cong., 2d Sess. 5) ("The committee reports reveal that one of the main congressional concerns was the prevention of an overly rapid consumption of oil resources that the Government, particularly the Navy,

might need in the future … Conservation through control was the dominant theme of the debates … .The legislation provided for herein, it is thought, will go a long way toward reserve[ing] to the Government the right to supervise, control, and regulate the [development of natural resources], and prevent monopoly and waste and other lax methods that have grown up in the administration of our public-land laws.").

[27] 43 U.S.C. § 1332(3).

[28] 43 U.S.C. § 1332(2)-(3).

[29] 43 U.S.C. § 1802(2)(A).

[30] 43 U.S.C. § 1802(3).

[31] 43 U.S.C. § 1344(a)(1).

[32] *Id.*

[33] *Id.* § 1344(a)(3).

[34] 43 U.S.C. § 1701(a)(9).

[35] U.S. Gov't Accountability Office, No. GAO-07-676R, *supra* note 7 at 3.

[36] 30 U.S.C. § 181, *et seq.*

[37] 30 U.S.C. § 187.

[38] U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation of Oil and Gas Properties Handbook at I.C, *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.39460.File.dat/h3070-2.pdf.

[39] Outer Continental Shelf Lands Act ("OCSLA") Section 18(a)(4), 43 U.S.C. § 1344(a)(4).

[40] U.S. Bureau of Ocean Energy Management, Regulation and Enforcement Manual, 610.1: Fair Market Value § 1 (Oct. 25, 2010); *see also Cal. ex rel. Brown v. Watt* (*"Watt II"*), 712 F.2d 584, 606 (D.C. Cir. 1983) (upholding Interior's five-year offshore oil and gas leasing plan and finding that it provided for a fair market return in accordance with OCSLA).

[41] *Id.*

[42] U.S. Bureau of Ocean and Energy Management, 2017-2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program (2015) [hereinafter "2017-2022 Draft Proposed Program"] at 8-1, *available at* http://www.boem.gov/2017-2022-DPP/.

[43] *Id.*

[44] *Id.*

[45] *Id.* at 8-3.

[46] *Id.* at 8-3 to 8-12.

[47] 30 U.S.C. § 226(a), (g); *see also Udall v. Tallman*, 380 U.S. 1, 4 (1965) ("Although the Act directed that if a lease was issued on such a tract, it had to be issued to the first qualified applicant, it left the Secretary discretion to refuse to issue any lease at all on a given tract").

[48] See 30 U.S.C. § 226(b)(c).

[49] 30 U.S.C. § 189 (federal lands); see also 25 U.S.C. §§ 396, 396d (tribal lands); 43 U.S.C. § 1334(a) (Outer Continental Shelf).

[50] Regulations governing the Bureau of Land Management's coal, oil, and gas programs may be 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. Part 3100 (Oil and Gas Leasing), Part 3160 (Onshore Oil and Gas Operations), and Part 3400 (Coal Management).

[51] OCSLA Section 18(a)(2), 43 U.S.C. § 1344(a)(2).

[52] OCSLA Section 18(a)(3), 43 U.S.C. § 1344(a)(3).

[53] 30 U.S.C. § 191(a)-(b). One exception is Alaska, which is entitled to 90 percent of the federal royalties for oil, gas, and coal production in the state. *Id.*

[54] 43 U.S.C. § 1337(g)(5). This provision was included in Section 8(g)10 of the OCSLA amendments of 1985 (P.L. 99-272).

[55] Gulf of Mexico Energy Security Act, Pub. Law 109-432 (2006).

[56] *See* Congressional Research Service, No. R40645, U. S. Offshore Oil and Gas Resources: Prospects and Processes 19 (April 26, 2010), *available at* http://fpc.state.gov/documents/organization/142736.pdf.

[57] 43 U.S.C. § 1344(a); 43 U.S.C. § 1701(a)(9).

[58] 30 U.S.C. § 226.

[59] *Id.*

[60] 30 U.S.C. § 226(b)(1).

[61] *Id.*

[62] U.S. Government Accountability Office, No. GAO-14-50, Actions Needed for Interior, *supra* note 4.

[63] 30 U.S.C. § 226(b)(1)(A).

[64] 30 U.S.C. § 226(b)(1)(B); 43 C.F.R. § 3120.5-2; *see also* U.S. Bureau of Land Management, Handbook: H-3120-1 – Competitive Leases at 27 (Feb. 18, 2013), *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.71542.File.tmp/3120%20Handbook.pdf.

[65] 30 U.S.C. § 226(b)(1); *see also* 43 C.F.R. Part 3110. A non-competitive lease offer is a legally binding offer filed along with certain fees paid in advance.

[66] Department of the Interior, Bureau of Land Management, *Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments*, 80 Fed. Reg. 22148, 22150 (April 21, 2015), *available at* http://www.gpo.gov/fdsys/pkg/FR-2015-04-21/pdf/2015-09033.pdf.

[67] 30 U.S.C. § 201(a)(1) (emphasis added).

[68] U.S. Gov't Accountability Office, No. GAO-14-140, BLM Could Enhance Appraisal Process, More Explicitly Consider Coal Exports, and Provide More Public Information 9 (2013), *available at* http://www.gao.gov/assets/660/659801.pdf.

[69] U.S. Bureau of Land Management, Coal Operations: Competitive Leasing Process, *available at* http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy.html (last updated August 22, 2014).

[70] Winning bids are publicly available. *See, e.g.,* U.S. Bureau of Land Management, Powder River Basin Coal Leases by Application, *available at* http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/lba_title.html (last updated March 31, 2015).

[71] 43 U.S.C. § 1344(a)(2)(E).

[72] *Id.* § 1337(a)(1).

[73] *Id.*

[74] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42; U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation Of Oil And Gas Properties Handbook, *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.39460.File.dat/h3070-2.pdf.

[75] U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation, *supra* note 74; *see also* BOEM, 2017-2022 Draft Proposed Program, *supra* note 42.

[76] *Id.*

[77] See, e.g., U.S. Bureau of Ocean and Energy Management, Summary of Procedures for Determining Bid Adequacy at Offshore Oil and Gas Lease Sales: Effective July 1999, *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Energy_Economics/Fair_Market_Value/FMV174-3.pdf.

[78] 30 U.S.C. § 226(d).

[79] *Id.*; 43 C.F.R. § 3103.2-2(c).

[80] 30 U.S.C. § 226(d).

[81] *See* 43 C.F.R. §3103.2-2.

[82] 30 U.S.C. § 207; *see also* Federal Coal Leasing Amendments Act of 1975, Pub. L. No. 94-377, 90 Stat. 1083, 1087 (codified as amended at 30 U.S.C. § 181 et seq.).

[83] 43 C.F.R. § 3473.3-1(a).

[84] 43 U.S.C. § 1337(b)(6) ("An oil and gas lease issued pursuant to this section shall … contain such rental and other provisions as the Secretary may prescribe at the time of offering the area for lease …").

[85] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 8-18.

[86] *Id.* at 8-19. For example, in a 2009 Gulf of Mexico lease sale, rental rates were set at $7 to $11 per acre (depending on water depth) for the first five years of the lease, escalating to $14 to $44 per acre in the later years of the lease. *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf.

[87] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, supra note 42 at 8-19.

[88] Office of Natural Resources Revenue, Reported Revenues: Federal Onshore in All States for FY 2012 by Accounting Year (2013), *available at* http://statistics.onrr.gov/.

[89] 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."). The royalty rate for leases in "special tar sands areas" is fixed at 12.5 percent. *Id.* § 226(b)(2)(A).

[90] 43 C.F.R. § 3103.3-1(a)(1).

[91] 30 U.S.C. § 226(c).

[92] 30 U.S.C. § 207(a); Federal Coal Leasing Amendments Act of 1976, Pub. L. 94-377, 90 Stat. 1083 (Aug. 4, 1976).

[93] 30 U.S.C. § 207(a).

[94] *Id.* § 226(l).

[95] 43 U.S.C. § 1337(a)(1).

[96] *Id*. Courts have also recognized Interior's authority of to set royalty rates and calculate royalties owed to the government. *See Independent Petroleum Ass'n v. DeWitt*, 279 F.3d 1036, 1040 (D.C. Cir. 2002) ("[C]ourts have regularly applied Chevron in royalty cases. In California Co., we deferred to Interior's interpretation of the word "production" for purposes of calculating royalty, noting the Department's duties both to protect the public interest in royalties and to assure 'incentive[s] for development.' 296 F.2d at 388. Similarly, in Mesa Operating Limited Partnership v. Department of Interior, 931 F.2d 318 (5th Cir.1991), the Fifth Circuit applied Chevron in determining whether certain reimbursements were subject to royalty. *Id*. at 322."); *see also Enron Oil & Gas Co. v. Lujan*, 978 F.2d 212, 215 (5th Cir.1992) (applying Chevron to issue of whether state tax reimbursements are subject to royalty); *Marathon Oil Co. v. United States*, 807 F.2d 759, 765–66 (9th Cir.1986) (applying Chevron to Interior's use of a "net-back" method for calculating value for royalty purposes). If Interior raises royalty rates for offshore production, Congress can pass a resolution disapproving this change within 30 days of Interior's action.

[97] 43 U.S.C. § 1337.

[98] *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf. Alaskan offshore leases utilize a 12.5 percent royalty rate. *Id*.

[99] *Id*.

[100] *See* Congressional Research Service, Outer Continental Shelf: Debate Over Oil and Gas Leasing and Revenue Sharing (2008), *available at* http://www.au.af.mil/au/awc/awcgate/crs/rl33493.pdf.

[101] *See Motor Veh. Mfrs. Ass'n v. State Farm Ins.*, 463 U.S. 29, 43 (1983) (agency decisions are arbitrary if they entirely fail to consider an important aspect of the problem); *California v. Watt* (*"Watt I"*), 688 F.2d 1290, 1317 (D.C. Cir. 1981) (holding that courts can review Interior's leasing decisions for arbitrariness and failure to consider relevant factors).

[102] *See Boesche v. Udall*, 373 U.S. 472, 476 (1963) (noting that Interior has been vested with "general managerial powers over the public lands"); *N.W. 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") (citing *Natural Resources Defense Counsel v. Hodel*, 819 F.2d 927,980 (9th Cir. 1987)); *see also Amoco v. Watson*, 410 F.3d 722 (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).

[103] Michael A. Livermore, *Patience is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 589 (2013).

[104] *See generally*, Avinash K. Dixit & Robert S. Pindyck, INVESTMENT UNDER UNCERTAINTY (1994); James L. Paddock et al., *Option Valuation of Claims on Real Assets: The Case of Offshore Petroleum Leases*, 103 Q. J. Econ. 479 (1988); Jon M. Conrad & Koji Kotani, *When to Drill? Trigger Prices for the Arctic National Wildlife Refuge*, 27 Res. & Energy Econ. 273 (2005); Michael A. Livermore, *Patience Is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 591 (2013); *see also* Anthony C. Fisher, *Investment under Uncertainty and Option Value in Environmental Economics*, 22 Res. & Energy Econ. 197 (2000); W. Michael Hanemann, *Information and the Concept of Option Value*, 16 J. Envtl. Econ. & Mgmt. 23 (1989).

[105] *See* Michael Rothkopf et al., Rutgers Center for Operations Research, *Research Report No. 22-2006, Optimal Management of Oil Lease Inventory: Option Value and New Information* (2006); Ryan Kellog, National Bureau of Economic Research, Working Paper No. 16,541, The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling (2010); Timothy Dunne and Xiaoyi Mu, *Investment Spikes and Uncertainty in the Petroleum Refining Industry* (Fed. Reserve Bank of Cleveland, Working Paper No. 08-05) (2008); *see also* William Bailey et.al., *Unlocking the Value of Real Options,* Oilfield Review (Winter 2003), at 4 (describing how companies including Chevron Texaco, Anadarko, and El Paso Corporation incorporate real options into their decision-making processes); Soussan Faiz, *Real-Options Application: From Successes in Asset Valuation to Challenges for an Enterprise wide Approach*, J. Petroleum Tech. (Jan. 2001), at 42–47, 74 (analyzing Chevron Texaco's decision not to sell a marginally-performing lease because of its real options value).

[106] U.S. Dept. of Interior, Oil and Gas Lease Utilization – Onshore and Offshore; Report to the President (March 2011) at 4, 6, *available at* http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&pageid=239255.

[107] *See* 43 U.SC. § 1337.

[108] *Id.* at 585.

[109] BOEM's hurdle price analysis is designed to ensure that every area included in the Program is expected to "convey rights to at least one field where prompt exploration during the Program is consistent with an optimal allocation of resources." U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42.

[110] *See* 30 U.S.C. § 226(b)(1); 43 C.F.R. § 3120.5-2.

[111] *See* U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 5-20, 8-3 to 8-19.

[112] U.S. Department of the Interior, Office of the Inspector General, Evaluation: Coal Management Program 8 (June 2013), *available at* http://www.documentcloud.org/documents/712402-inspector-generals-report-on-coal-leases.html ("The FMV determination is critical in coal leasing because a competitive market generally does not exist for coal leases, therefore, the FMV serves as a substitute for competition. For example, we found that over 80 percent of the sales for coal leases in the Powder River Basin received only one bid in the past 20 years. No coal lease has had more than two bidders on a sale.")

[113] *Id.*

[114] U.S. Gov't Accountability Office, No. GAO-14-50, Actions Needed For Interior, *supra* note 4 at 8.

[115] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, supra note 42 at 5-20, 8-3 to 8-19.

[116] *Id.*

[117] *Center for Sustainable Economy v. Jewell*, 779 F.3d 588 (D.C. Cir. Mar. 6, 2015). Policy Integrity served as counsel to Petitioner, Center for Sustainable Economy. *See also* Opening and Reply Briefs for Petitioner.

[118] *Id.* at 610 (emphasis added).

[119] *Id.* at 611.

[120] *Id.* at 612 ("Our holding is a narrow one . . . the agency is not permitted to substitute qualitative assessments for well-established quantitative methods whenever it deems such substitutions convenient.").

[121] *Id.*

[122] *See* U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 5-20, 8-3 to 8-19.

[123] *Center for Sustainable Economy*, 779 F.3d at 610.

[124] As described above, the Mineral Leasing Act effectively prohibits BLM from setting minimum onshore oil and natural gas bids on a tract-by-tract basis. It states that "[t]he Secretary [must] accept the highest bid . . . which is equal to or greater than the national minimum acceptable bid, without evaluation of the value of the lands proposed for lease." Thus, while the Secretary of the Interior has the authority to raise the national minimum bid, BLM cannot require higher minimum bids for specific leases, absent a legislative revision.

[125] For practical guides to calculating options value, see, for example, Prasad Kodukula & Chandra Papudesu, Project Valuation Using Real Options: A Practitioner's Guide (2006) and Johnathan Mun, Real Options Analysis: Tools And Techniques for Valuing Strategic Investment and Decisions (2d Ed. 2005). *See also* Michael Rothkopf et al., *Optimal Management of Oil Lease Inventory: Option Value and New Information* (Rutgers Center for Operations Research, Research Report 22-2006, 2006); Ryan Kellog, *The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling* (Nat'l Bureau of Econ. Res., Working Paper No. 16,541, 2010); Timothy Dunne and Xiaoyi Mu, *Investment Spikes and Uncertainty in the Petroleum Refining Industry* (Fed. Reserve Bank of Cleveland, Working Paper No. 08-05, 2008); William Bailey et. al., *Unlocking the Value of Real Options*, Oilfield Review, Winter 2003, at 4 (describing how companies including ChevronTexaco, Anadarko, and El Paso Corporation incorporate real options into their decision-making processes).

[126] *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 ("VSL") are examples of government agencies serving as catalysts for the quantification of important measures of regulatory costs and benefits.

[127] *See* 43 U.S.C. § 1344(a)(1).

[128] *See* U.S. Government Accountability Office, No. GAO-09-74, Interior Could Do More to Encourage Diligent Development 13 (Oct. 2008), *available at* http://www.gao.gov/new.items/d0974.pdf.

[129] Lise Olson, Fatal truck accidents have spiked during Texas' ongoing fracking and drilling boom, Houston Chronicle (Sept. 11, 2014), *available at* http://www.houstonchronicle.com/news/article/Fracking-and-hydraulic-drilling-have-brought-a-5747432.php?cmpid=email-premium&cmpid=email-premium&t=1a9ca10d49c3f0c8a9#/0.

[130] A price is socially efficient at the point at which the marginal cost to society equals the marginal benefit to society; that is, where net benefits are maximized.

[131] Indeed, private landowners may already price these effects into lease terms; certainly, it would be rational for private landowners who live on or near a potential lease site that they are offering for sale to account for such anticipated impacts as noise pollution, local air pollution, and vehicle traffic when negotiating the sale price.

[132] 30 U.S.C. § 226(d).

[133] *See* 43 C.F.R. § 3103.2-2.

[134] *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf.

[135] *See* U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2012 (April 15, 2014), *available at* http://www.epa.gov/climatechange/ Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf.

[136] *See, e.g.*, Jayni Foley Hein, Institute for Policy Integrity at NYU School of Law, Capturing Value: Science and Strategies to Curb Methane Emissions from the Oil and Natural Gas Sector (Dec. 2014), *available at* http://policyintegrity.org/files/publications/Capturing_Value_-_Methane_Policy_Brief.pdf.

[137] Mead Gruver, Wyoming's Natural Gas Boom Comes with Smog Attached, Associated Press (Mar. 9, 2011), *available at* http://www.nbcnews.com/id/41971686/ns/us_news-environment/%20%20%22#.VUeFDiFVhBd.

[138] For example, a University of Texas study found that earthquakes occurred more frequently near injection well sites in the Barnett Shale region, with most of the epicenters located within two miles of injection wells. Cliff Frohlich, *Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Tex.*, 109 Proceedings of the Nat'l Acad. of Sciences 13934 (2012). The Ohio Department of Natural Resources attributed a series of earthquakes near Youngstown, Ohio in 2011 to injection into hydraulic fracking wastewater disposal wells. Ohio Dep't of Natural Res., Preliminary Report on the Northstar 1 Class II Injection Well And The Seismic Events In The Youngstown, Ohio, Area (2012), *available at* http://ohiodnr. com/downloads/northstar/UICReport.pdf.

[139] *See, e.g.*, Michael Kiparsky and Jayni Foley Hein, Regulation of Hydraulic Fracturing in California: A Wastewater and Water Quality Perspective, UC Berkeley (April 2013), *available at* https://www.law.berkeley.edu/files/ccelp/Wheeler_HydraulicFracturing_April2013.pdf; Stephen G. Osborn, et al., *Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing*, 108 Proceedings of the Nat'l Acad. of Sciences 8172 (2011); M. Dusseault and M. Gray, et al., *Why oil wells leak: cement behavior and long-term consequences*, Society of Petroleum Engineers International Oil and Gas Conference and Exhibition in China, Beijing, China (2000).

[140] For example, in order to prove causation in a case claiming contamination from fracking activities, plaintiffs need to show that contaminants in question were not naturally present in groundwater or environment. *See* Kiparsky and Hein, *supra* note 139 at 33 (citing *William G. Strudley v. Antero Resources Corporation, et al.*, 2012 WL 1932470 (Colo. Dist. Ct. May 9, 2012)). The trial court opinion

in *Strudley* was recently reversed by the Colorado Supreme Court. *See Strudley v. Antero Res. Corp.*, 347 P.3d 149, 151 (Colo. Sup. Ct. 2015) ("We hold that Colorado's Rules of Civil Procedure do not allow a trial court to issue a modified case management order, such as a Lone Pine order, that requires a plaintiff to present prima facie evidence in support of a claim before a plaintiff can exercise its full rights of discovery under the Colorado Rules."). *C.f., Lore v. Lone Pine Corp.*, No. L-33606-85, 1986 WL 637507 (N.J.Super., Law Div., November 18, 1986) (unpublished) (Reported at 1 Tox. Law Rptr. (BNA) 726) (requiring plaintiffs to demonstrate a prima facie case of causation in a case alleging pollution before allowing a case to proceed to discovery).

141 Perhaps the most famous example of this is the Exxon-Valdez oil spill. The catastrophe occurred in 1989, but litigation regarding the damage went on for nearly twenty-five years. When the settlement finally concluded, not only had the aggrieved parties gone nearly a quarter-century without full compensation, but the settlement was reduced about five-fold by the U.S. Supreme Court. *Exxon Shipping Co. v. Baker*, 554 U.S. 471 (2008).

142 BLM regulations establish minimum bond amounts: $10,000 for an individual lease, $25,000 to cover all leases of a single operator in a state, and $150,000 to cover all leases of a single operator nationwide. U.S. Government Accountability Office, No. GAO-10-245, Bonding Requirements and BLM Expenditures to Reclaim Orphaned Wells (Jan. 2010), *available at* http://www.gao.gov/assets/310/300218.pdf.

143 Center for Western Priorities, A Fair Share, *supra* note 10.

144 *Id.* at 7.

145 U.S. Gov't Accountability Office, No. GAO-08-691, The Federal System for Collecting Oil and Gas Revenue, *supra* note 6 at 5-8 (citing a June 2007 Wood McKenzie report finding that the United States ranked 93rd lowest out of 104 oil and gas fiscal systems evaluated).

146 *Id.* at 6. Interior might also consider using a tiered rate that increases and decreases with the global price of oil and natural gas, or as production reaches certain thresholds, as some foreign countries do. *See* Law Library of Congress, Global Legal Research Center, Crude Oil Royalty Rates in Selected Countries (Jan. 2015), *available at* http://www.loc.gov/law/help/crude-oil-royalty-rates/crude-oil-royalty-rates.pdf.

147 *Id.* at 17.

148 *See, e.g.*, Congressional Research Service, Outer Continental Shelf: Debate Over Oil and Gas Leasing and Revenue Sharing (2008), *available at* http://www.au.af.mil/au/awc/awcgate/crs/rl33493.pdf.

149 U.S. Gov't Accountability Office, Coal Leasing: BLM Could Enhance Appraisal Process, *supra* note 68; Tom Sanzillo, The Great Giveaway, *supra* note 7.

150 A December 2012 Reuters report alleged that companies including Peabody Energy and Cloud Peak Energy use trading affiliates to hide profits from overseas sales of Powder River Basin coal, to ensure they only pay royalties to the federal government based on lower U.S. sales prices. Patrick Rucker, Asia coal export boom brings no bonus for U.S. taxpayers, Reuters (Dec. 4, 2012), *available at* http://www.reuters.com/article/2012/12/04/us-usa-coal-royalty-idUSBRE8B30IL20121204.

151 Office of Natural Resources Revenue, Proposed Rule: Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform, 80 Fed. Reg. 608-613 (Jan. 6, 2015).

152 30 U.S.C. § 207(a) (surface coal mines); 43 C.F.R. § 3473.3-2 (underground coal mines); 30 U.S.C. § 226(b)-(c) (onshore oil and gas); 43 U.S.C. § 1337 (offshore oil and gas).

153 *See, e.g.*, Jayni Foley Hein, Institute for Policy Integrity at NYU School of Law, Capturing Value: Science and Strategies to Curb Methane Emissions from the Oil and Natural Gas Sector (Dec. 2014), *available at* http://policyintegrity.org/files/publications/Capturing_Value_-_Methane_Policy_Brief.pdf.

154 30 U.S.C. § 225.

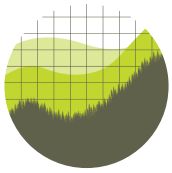
155 While raising royalty rates might have the effect of shifting some development to state and private lands, the most attractive federal parcels, where discovery and development prospects are strongest, would likely continue to be sold competitively at auction. Moreover,

potential production decreases resulting from higher royalty rates, if any, could result in environmental and social benefits, such as reduced habitat and surface disruption, reduced hazardous air pollution, greater mineral resource conservation, and more. *See* Department of the Interior, Bureau of Land Management, Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 22148, 22152 (April 21, 2015).

156 *See Theodore Roosevelt Conservation P'ship v. Salazar*, 605 F. Supp. 2d 263, 274 (D.D.C. 2009) *aff'd*, 616 F.3d 497 (D.C. Cir. 2010); *Hammond v. Norton*, 370 F.Supp.2d 226, 245–46 (D.D.C. 2005); *see also Pub. Utils. Comm'n of Cal. v. FERC*, 900 F.2d 269, 282–83 (D.C. Cir. 1990) (finding that NEPA does not require agencies to consider environmental effects of actions that are not reasonably foreseeable, especially in light of the agency's discussion of how it would mitigate any effects that may occur in the future); *cf. NRDC v. Hodel*, 865 F.2d 288, 298–99 (D.C. Cir.1988) (finding a "few sentences" in the Final Environmental Impact Statement insufficient to address the effects of "reasonably foreseeable" actions).

157 *See* 30 C.F.R. § 1206.109-1206.111.

158 *See* 43 U.S.C. § 1701(a)(8).



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