

**COMMENTS OF FRIENDS OF THE EARTH ON
PROPOSED CONSOLIDATED FEDERAL OIL & GAS AND
FEDERAL & INDIAN COAL VALUATION REFORM**

Friends of the Earth respectfully submits the following comments on the proposed changes to federal regulations proposed by the Department of Interior (DOI) governing the valuation of oil, gas and coal produced from federal leases and coal produced from American Indian-land leases for royalty purposes. An analysis completed by the Climate Accountability Institute for the Center for Biological Diversity (CBD) and Friends of the Earth finds that DOI leasing decisions account for approximately 25% of U.S. emissions from the consumption of all oil, natural gas and coal, which represents around 3-4% of global fossil fuel emissions over the past decade.¹ Based on the significance of the carbon emissions that stem from DOI's decision making, including how it values oil, gas and coal extracted from federal lands, these regulations have a material impact on the ability of U.S. to control its contribution to global carbon emissions. Moreover, the significance of the carbon emissions that stem from DOI's decision making, including how it values oil, gas and coal extracted from federal lands, have a material impact on DOI's ability to satisfy its most basic statutory obligations in how it manages the public land and resources over which it has responsibility.

Friends of the Earth (FoE) is a tax-exempt, nonprofit environmental advocacy organization founded in 1969. Incorporated in the District of Columbia, FoE has over 33,000 members across the country. FoE's primary mission includes defending the environment against harms caused by fossil fuels and greenhouse gas emissions and promoting climate change mitigation through energy conservation and clean energy sources. In support of these goals, FoE offers the following comments on the Office of Natural Resources Revenue's (ONRR) proposed changes to 30 C.F.R. §§1202 and 1206.

I. Introduction

The Department of the Interior (DOI) is responsible for mineral leasing programs on federal and American Indian lands. DOI's mission is to "protect[] and manage[] the Nation's natural resources and cultural heritage; provide[] scientific and other information about those resources; and honor[] the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities."² DOI manages 20 percent of the Nation's lands, including over 500 million acres of public lands, 700 million acres of subsurface minerals, and 1.7 billion acres of the Outer Continental Shelf.³ Federal law requires that DOI manage these lands under policies of "multiple use" and "sustained yield,"⁴ meaning that DOI

¹ See Rick Heede, *Memorandum to Dunkiel Saunders and Friends of The Earth*, at 5-6 (May 5, 2015) (attached as Exhibit 1-2).

² U.S. Department of the Interior, *Strategic Plan for Fiscal Years 2014-2018*, at 7 (available at <http://www.doi.gov/bpp/upload/DOI-Strategic-Plan-for-FY-2014-2018-POSTED-ON-WEBSITE.pdf>) (last visited May 5, 2015).

³ *Id.* at 8.

⁴ 43 U.S.C. § 1732(a).

must balance the competing uses of federal land taking into account “the needs of future generations for renewable and nonrenewable resources” and avoid “permanent impairment of the productivity of the land and the quality of the environment.”⁵

A critical part of the leasing program is the collection of royalty payments on behalf of the American people. The billions of dollars in royalties collected annually provide one of the largest sources of non-tax revenue for the federal government. Nonetheless, federal royalty rates remain lower than many oil and gas producing State royalty rates, reducing the revenue that could be returned and undervaluing the use of public lands and resources. These low rates also do not take into account the significant impact of climate change that result from the combustion of extracted fuels, thereby failing to quantify the true financial cost to the American public and American Indians of leasing such public resources to private interests.⁶ Additionally, these low federal rates represent a failure of DOI to avoid “permanent impairment” of the public land’s productivity and environmental quality.

The changes proposed by ONRR to 30 C.F.R. §§1202 and 1206 are to valuation methodologies for non-arm’s-length gas sales and non-arm’s-length coal sales only. No major changes to valuation methodologies for oil and arm’s-length gas and coal sales are proposed.⁷ In total, ONRR estimates the net impact of the changes to valuation will result in an increase of \$72.9 to \$87.3 million dollars in annual royalties.⁸ As ONRR notes, this number represents only “a slight increase” of between 0.8-1.0% of the total federal oil, gas and coal royalties in 2010.⁹

This level of reform is insufficient to address the inadequacies of current valuation methodologies to properly protect public lands. The burning of fossil fuels is the largest source of greenhouse gas emissions in the world, and therefore contributes more to climate change than any other human activity. As climate change impacts are more fully recognized and understood, DOI must account for their costs and impact on public lands, particularly in the leasing of public land for the extraction of fossil fuels. FoE therefore submits that valuation for federal oil, gas, and coal royalties must reflect the amount of greenhouse gases associated with the use and extraction of fossil fuel resources, and the costs of the associated climate change impacts on public lands. ONRR’s proposed changes fail to account for these impacts.

The following sections address the environmental basis for updating royalty valuation to include the cost of carbon emissions, potential methodologies, the impacts of carbon emissions from current federal leases, and the legal authority for enacting such change. Based on these comments, FoE respectfully requests that ONRR amend these regulations to include all federal fossil fuel royalty valuations, including arm’s-length gas and coal sales and all oil sales. We also

⁵ *Id.* at § 1702(c).

⁶ Center for Western Priorities, *A Fair Share: The Case for Updating Federal Royalties*, at 3 (June 20, 2013).

⁷ Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform, 80 Fed. Reg. 609 (Jan. 6, 2015).

⁸ *Id.* at 633.

⁹ *Id.*

request that ONRR incorporate the social cost of carbon so that at a minimum royalty payments meet the costs that resource extraction has on the American public, including American Indians.

II. Climate Change and the Need for Updated Resource Valuation in Federal Fossil Fuel Leasing Programs

Over the last few decades, climate change has become a well-studied and observed phenomenon, causing severe environmental impacts worldwide. The last ten years were the warmest decade for every region in the United States, and 2014 was the hottest year on global record.¹⁰ In addition to the significant economic costs and human health risks introduced by climate change, there have been heavy tolls on the natural environment through severe weather incidents and emergencies.¹¹ Public lands are among those deeply affected by climate changes; the Bureau of Land Management (BLM) has observed increasing droughts, declining snowpack and water supplies in critical areas, thawing of arctic permafrost, and an increase in wildfire size and frequency.¹²

In addition to observing the realities of climate change impacts, science has begun to better understand the causes of climate change. Currently it is estimated that carbon dioxide is 82% of all greenhouse gas (GHG) pollution in the United States, and the single biggest driver of climate change.¹³ Since the industrial revolution, the burning of coal, oil and gas, together with deforestation, has increased carbon dioxide concentration in the atmosphere by 40%.¹⁴ Climate change is now recognized by President Obama and administrative agencies, including DOI, as a critical point for regulatory reform. President Obama has committed to addressing climate change and set a U.S. GHG emissions reduction target of 17% below 2005 levels by 2020 and 83% below 2005 levels by 2050.¹⁵ DOI's strategic plan for 2014-2018 includes a commitment to "be a national leader" and "incorporate climate change strategies into management plans, policies, programs, and operations."¹⁶ Such commitment should extend to royalty collection for the very resources that are one of the largest causes of climate change.

¹⁰ The White House, *Climate Change and President Obama's Action Plan* (available at <https://www.whitehouse.gov/climate-change#section-impacts>) (last visited April 28, 2015).

¹¹ *Id.* (noting that climate and weather disasters in the U.S. alone cost more than \$100 billion in 2012); see also The White House, *The Health Impacts of Climate Change on Americans* (June 2014) (available at https://www.whitehouse.gov/sites/default/files/docs/the_health_impacts_of_climate_change_on_americans_final.pdf) (last visited April 28, 2015); U.S. Global Change Research Program, *Third National Climate Assessment* (May 2014).

¹² U.S. Department of the Interior, Bureau of Land Management, *Climate Change: BLM's Response* (<http://www.blm.gov/wo/st/en/prog/more/climatechange.html>) (last visited April 28, 2015); see also DOI Strategic Plan, *supra* note 1 at 14 (noting impacts observed by Federal resource managers "include drought, severe flooding, interrupted pollination of crops, changes in wildlife and prey behavior, warmer rivers and streams, and sea level rise").

¹³ Action Plan, *supra* note 10.

¹⁴ Climate Assessment, *supra* note 11.

¹⁵ The White House, *Federal Climate Change Expenditures Report to Congress*, at 2 (Aug. 2013).

¹⁶ DOI Strategic Plan, *supra* note 2, at 14.

Deleted: 9

Deleted: 0

Deleted: 1

Nonetheless, while climate change science and research have progressed in the last few years, ONRR's valuation regulations have seen remarkably little change. ONRR notes that the current federal oil valuation regulations have been in effect since 2000, with only one amendment related to pricing for certain circumstances.¹⁷ Current federal gas and federal and Indian coal valuation regulations have been in effect since 1988 and 1989, respectively, with minor subsequent amendments.¹⁸ ONRR observes that in the intervening years, "the industry and marketplace have changed dramatically," prompting the need for reform to valuation methodologies.

However, the proposed reform recognizes changes only to the sale structure and pricing of these resources, and ignores dramatic changes to the environmental resources they are produced from and the substantial downstream costs to the public and to land resources from the resulting carbon emissions. Thus, in light of the known impacts of carbon-driven climate change, ONRR's proposed valuation changes are neither an accurate nor up-to-date capture of the value of fossil fuels when considered in terms of their carbon content. There is a cost to introducing carbon into the atmosphere that would not have otherwise been removed from the leased land. This cost should be included in the valuation of fossil fuels and it should provide a minimum price threshold for leases. In other words, fossil fuel prices should be valued higher than they currently are because of the cost of the carbon they contain and the subsequent impacts of that carbon as GHG pollution. Unless environmental externalities from climate change impacts are incorporated into the federal fossil fuel leasing structure, the royalties received will never be a fair assessment of the costs and values involved. As a result, FoE does not believe that these proposed amendments fulfill DOI's statutory responsibility to the public to receive the "fair market value for the use of public lands and their resources."¹⁹ FoE urges ONRR to amend its rulemaking to ensure the cost of carbon emissions are accounted for during fossil fuel valuations.

III. Federal Fossil Fuel Leases and Global Carbon Emissions

In order to estimate the carbon emissions due to fossil fuels produced from federal or American Indian leased lands, CBD and FoE commissioned a report by Richard Heede of the Climate Accountability Institute. His analysis (attached as Exhibit 1) covers oil, natural gas, and coal produced by private companies with leases on federal lands from 2003-2014 and estimates the emissions of carbon dioxide resulting from the marketing and end-use of these fossil fuels.

Based on the findings and conclusions provided by Mr. Heede, fossil fuels extracted from federal and American Indian lands represent a large portion of total U.S. fossil fuels, and are responsible for around a quarter of all U.S. emissions from the combustion of coal, oil and gas, and around 3-4% of global fossil fuel emissions (See Exhibit 2). There is a direct connection between emissions from these fossil fuels and climate change impacts, which would be reduced

¹⁷ Valuation Reform, *supra* note 6, 80 Fed. Reg. at 608.

¹⁸ *Id.*

¹⁹ 43 U.S.C. § 1701(9).

Comment [VW1]: Should this be Exhibit 1-2? MacCracken (fn 24 is also listed as Exhibit 2)

if these fossil fuels were not extracted, sold, and used. Because environmental and economic impacts from climate change can be attributed to the extraction of fossil fuels from federal and American Indian lands, these costs should be accounted for under the current valuation structure.

As Mr. Heede's research shows, the carbon emissions from these fossil fuels make up a substantial portion of all U.S. carbon emissions. Emissions traced to fossil fuels produced on federal and American Indian lands have ranged from a 1.46-1.19 billion tonnes of carbon dioxide over the past decade.²⁰ Cumulatively, this represents between 22-26% of the total U.S. carbon emissions from coal, oil and natural gas from 2003-2014.²¹ Approximately 15% of global fossil fuel emissions can be attributed to the U.S., and the fossil fuels extracted from federal and American Indian leased lands are responsible for between 3-4% of global fossil fuel emissions.

Mr. Heede's analysis further shows that in 2014 over 40% of U.S. coal production came from leases on public lands, while an additional 2% (1.9%) came from leases of American Indian lands.²² Together, coal extracted from federal and American Indian lands constitute almost 40% of all coal produced in the U.S. Oil and natural gas produced from federal onshore and offshore lands has reached as high as 39% of total production in the U.S. in 2004, and was roughly one-quarter in 2014.²³

According to Dr. Michael MacCracken, Chief Scientist for Climate Change Programs at the Climate Institute, the carbon emissions attributable to DOI's decision-making have a material and significant impact on U.S. and global carbon emissions.²⁴ The emissions resulting from DOI's decision-making materially contribute to the environmental impacts and economic costs attributable to climate change due to the release of fossil fuels and the resulting GHG emissions. More specifically, these emissions contribute to increased risks to human health, disruptions to agriculture and food production, the endangerment of water supplies, reduced land cover, and rising sea levels.²⁵ Thus, DOI's decisions, including those concerning valuation, have a material impact on whether DOI is satisfying its statutory obligations governing the management of federal public lands and resources under its supervision.

IV. The Social Cost of Carbon

Executive Order 12866 directs administrative agencies "[i]n deciding whether and how to regulate" to "assess all costs and benefits of available regulatory alternatives, including the

²⁰ *Id.* at 4.

²¹ *Id.* at 6.

²² See Rick Heede, *Memorandum to Dunkiel Saunders and Friends of The Earth*, at 5-6 (May 5, 2015) (attached as Exhibit 1).

²³ *Id.*

²⁴ See May 06, 2015 Letter from Dr. MacCracken (attached as Exhibit 2).

²⁵ See MacCracken, M. C., 2014: Declaration (Document 1-1) in *Western Org. of Res. Councils v. Jewell*, No. 14-CV-1993, at 24-26 (D.D.C., filed Nov. 24, 2014).

Deleted:

alternative of not regulating.”²⁶ Recognizing that there are “costs and benefits that are difficult to quantify, but nevertheless essential to consider,” agencies are responsible for weighing both qualitative and quantitative measures to the extent that they can be usefully estimated, and “should select those approaches that maximize net benefits.”²⁷

Pursuant to Executive Order 12866, a working group of federal regulatory agencies developed a method for estimating the climate benefits of rulemakings known as the social cost of carbon. The social cost of carbon (SCC) is “an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year.”²⁸ The SCC was developed using integrated assessment models as a method for agencies to evaluate costs and benefits of regulatory actions that impact cumulative global emissions by quantifying climate change impacts on, among others, changes in net agricultural productivity, human health, property damage, and the value of ecosystem services.²⁹ Essentially, the SCC represents the estimated economic damage worldwide associated with one metric ton of carbon dioxide emissions in a given year—or, alternatively, the dollar value of avoided damage if a metric ton of carbon dioxide is reduced.³⁰ By introducing a quantified cost of damages (or avoided damages), the SCC enables federal agencies to incorporate environmental externalities associated with energy production or expenditure into the rulemaking process, and to select regulatory approaches “that maximize net benefits” for the natural environment.

Initially introduced in 2010, the SCC estimates were updated in 2013³¹ to reflect the increasing knowledge of climate change impacts, but still do not contain all important damages due to limitations with current data and modeling.³² As a result, it is very likely that even the updated SCC underestimates damages from a single metric ton of carbon emissions.³³ Since the SCC was introduced in 2010, federal regulatory agencies such as the Environmental Protection Agency (EPA) and Department of Transportation have addressed the SCC in various rulemakings.³⁴ DOI itself has used the SCC in environmental assessments under the National Environmental Policy Act (NEPA) as recently as February 2015³⁵, and has addressed use of SCC

²⁶ Exec. Order No. 12866, Regulatory Planning and Review, 58 Fed. Reg. 190, § 1(a) (Sept. 30, 1993).

²⁷ *Id.*

²⁸ Interagency Working Group on Social Cost of Carbon, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*, at 2 (May 2013).

²⁹ *Id.*

³⁰ See Krupnick, A., et al., *Putting a Carbon Charge on Federal Coal: Legal and Economic Issues*, at 28 (Mar. 2015).

³¹ For current 2013 SCC estimates and a full description of values, discount rates, and the integrated assessment modeling assumptions, see IWGSCC Technical Support Document, *supra* note 20.

³² U.S. Environmental Protection Agency, *Fact Sheet: The Social Cost of Carbon*, at 1 (Nov. 2013).

³³ *Id.* (“The models used to develop SCC estimates do not currently include all of the important physical, ecological and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages . . .”).

³⁴ See, e.g., U.S. Environmental Protection Agency, *Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards: Regulatory Impact Analysis* (April 2010).

³⁵ U.S. Department of the Interior, Bureau of Land Management, *Environmental Assessment DOI-BLM-ID-B010-2014-0036-EA: Little Willow Creek Protective Oil and Gas Leasing*, at 80-84 (Feb. 10, 2015); see also U.S.

in DOI by BLM field offices in the context of increased consideration of climate change in DOI regulatory decisions.³⁶ FoE therefore submits that DOI/ONRR should apply the SCC to the present rulemaking, and incorporate the SCC into these royalty valuation regulations as an economic measure of climate change impacts due to fossil fuels extracted from federal and American Indian lands.

V. DOI Should Incorporate the Social Cost of Carbon into Royalties and Valuation for Federal Fossil Fuel Leasing Programs

While FoE supports the proposed amendments to the fossil fuel royalty valuation to the extent that the valuations are higher and therefore produce greater royalties, FoE does not believe that the proposed reform captures the necessary environmental externalities associated with the extraction and sale of these fuels. Rather, the current and proposed valuation regulations only focus on the sale price of the resource extracted, while ignoring the economic cost of the carbon content and subsequent emissions from that resource. Omitting downstream environmental impacts from the valuation of fossil fuels makes them more profitable for lessees, but denies the American public and American Indian groups a substantial amount of royalties that rightfully reflect the true cost of the extraction on the land and atmosphere. More importantly, it passes the cost of the billions of dollars of economic damage due to climate change on to the victims of GHG pollution, rather than assessing those costs on the producers of the fossil fuels that contribute to it.

FoE therefore requests that DOI/ONRR amend the royalty valuation regulations to include the SCC. As the May 2015 DOI memorandum to field offices acknowledges, SCC is currently used in regulatory proceedings. SCC is currently used by EPA and other federal agencies in rulemakings, some examples include:

- The Joint EPA/Department of Transportation Rulemaking to establish Light- Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards (2012-2016);
- Amendments to the National Emission Standards for Hazardous Air Pollutants and New Source Performance Standards (NSPS) for the Portland Cement Manufacturing Industry;
- Regulatory Impact Results for the Reconsideration Proposal for National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters at Major

Department of the Interior, Bureau of Land Management, *Environmental Assessment DOI-BLM-MT-C020-2014-0091-EA: Miles City Oil and Gas Lease Sale EA*, at 76-87 (May 19, 2014).

³⁶ DOI, *Internal Memorandum*, at 1-2 (available at http://www.eenews.net/assets/2015/04/15/document_gw_01.pdf) (last visited May 5, 2015).

Sources;

- Proposed National Emission Standards for Hazardous Air Pollutants (NESHAP) for Mercury Emissions from Mercury Cell Chlor Alkali Plants;
- Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units Standards;
- Joint EPA/Department of Transportation Rulemaking to establish 2017 and Later Model Year Light.

There is no legal reason why DOI could not incorporate SCC into federal mineral leasing at a number of different points (e.g., increased royalty rate to include the SCC, land rental rates that include the SCC, etc.), with regard to valuation regulations. Assigning a monetary value to the carbon content of fuel and assessing it as a charge in royalty valuation is an important step in recognizing that there is a real cost associated with carbon emissions that can be tied directly to the mineral resources being extracted from federal and American Indian lands. However, it is not the only way SCC could be used by DOI in conjunction with this rulemaking process.

DOI has broad rulemaking authority over the royalty valuation regulations, and incorporating the SCC into the valuation regulations is consistent with current administrative policies and DOI's statutory obligation. Using the SCC is supported by the President's climate change action plan, which prioritizes the reduction of GHG emissions, and with DOI's own climate change initiatives, which pledge to consider climate change as a "factor . . . in the planning and management of resources for utilization of energy" and "to bring the best science to bear to understand [climate change] . . . and will take steps to reduce carbon pollution."³⁷ Including the SCC in valuation of fossil fuel resources also fulfills DOI's statutory duty to receive a fair value for leased lands, as the "fair market value" does not currently reflect the carbon externality associated with fossil fuel production. Finally, recognizing and internalizing the environmental externalities into the fossil fuel valuation for royalty purposes is critical to satisfying DOI's statutory duty to manage federal lands responsibly for multiple use and sustained yield for future generations.

For the above stated reasons, FoE respectfully requests that ONRR redraft the proposed amendments to the royalty valuation regulations to include the SCC as part of its royalty valuation process.

³⁷ DOI Strategic Plan, *supra* note 2, at 14-15.

VI. The Proposed Amendments have Significant Consequences on the Physical Environment and therefore NEPA should apply

Even if ONRR does not incorporate the SCC into the proposed amendments, the current changes proposed should be subject to a detailed statement under NEPA. ONRR contends that the amendments are purely “of an administrative, financial, legal, technical, or procedural nature” and “would have no consequences with respect to the physical environment”³⁸ and therefore are not subject to NEPA review under 43 C.F.R. § 46.210(i).

FoE respectfully disagrees with ONRR that NEPA review is not required, as these regulations support the extraction and sale of fossil fuels that are directly linked to carbon emissions causing significant environmental impacts (*see discussion, Section III above*). FoE therefore contends that these amendments fall into several of the extraordinary circumstance exemptions to categorical exclusions under DOI NEPA regulations, as outlined in 43 C.F.R. § 46.215 that trigger review under NEPA. For example, the carbon emissions from fuel sales valued and facilitated by these regulations have “significant impacts on public health and safety,” and on “natural resources . . . and other ecologically significant or critical areas,” including national parks, rivers, drink water aquifers, prime farmlands, migratory birds, and endangered and threatened species.³⁹ Further, carbon emissions and GHG pollution have “highly controversial environmental effects”⁴⁰ that are part of an ongoing administrative effort to address and recognize the impacts of climate change. Additionally, if ONRR does not consider the SCC in its valuation regulations, that decision could be considered “[e]stablish[ing] a precedent for future action or represent[ing] a decision in principle about future actions with potentially significant environmental effects.”

Overall, as discussed in detail in the preceding sections, fossil fuels produced on federal and American Indian lands contribute a significant portion of the GHG emissions in the United States, which have substantial impacts on the natural environment. Because these regulations are responsible for the valuation of those fuels, they facilitate the sale and eventual release of the carbon responsible for significant climate change impacts. As such, any substantive change to the valuation methodologies should be subject to review under NEPA and 43 C.F.R. § 46.215.

VII. Conclusion

ONRR’s valuation regulations have a material impact on United States’ contributions to fossil fuel emissions, which must be reduced in light of increasing effects from climate change. Based on the substantial portion of United States and global fossil fuel emissions that are directly attributable to fossil fuels produced on federal and American Indian leased lands, extensive

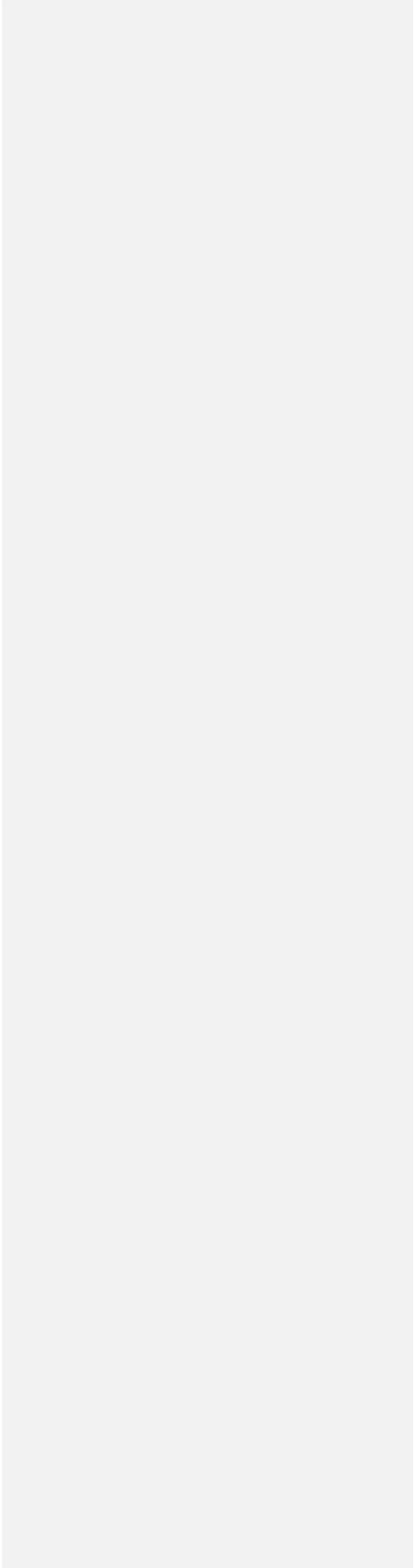
³⁸ Valuation Reform, *supra* note 7, at 642.

³⁹ 43 C.F.R. § 46.215 (a)-(b); *see, e.g.*, U.S. National Climate Assessment, *Full Report*, <http://nca2014.globalchange.gov/report> (last visited May 2, 2015).

⁴⁰ *Id.* § 46.215(C).

Deleted: 6

reforms to ONRR’s current royalty valuation structure are necessary in order for DOI to fulfill its statutory duties to value and manage the use of public lands. FoE therefore requests that ONRR amend these regulations to include the SCC and account for environmental costs associated with the extraction of fossil fuels on federal and American Indian lands.





May 6, 2015

Mr. Brian Dunkiel
Dunkiel Saunders Elliott Raubvogel & Hand, PLLC
91 College Street
Burlington, VT 05401

Dear Mr. Dunkiel:

I am submitting this information based on my experience and knowledge, accumulated in conducting scientific research and leading scientific projects on climate change and air quality over the past 45 years. Most of these activities have involved study and analysis of the influences on and changes in the climate resulting from natural factors such as volcanic eruptions and human activities such as emissions of carbon dioxide and other greenhouse gases. I received my Ph.D. in Applied Science from the University of California Davis in 1968, my dissertation having involved using a climate model to investigate the plausibility of various hypotheses for explaining glacial-interglacial cycling. My research career was primarily with the Department of Energy's Lawrence Livermore National Laboratory (LLNL) and included a nine-year assignment as a senior scientist with, and for four years as an executive director of, the interagency Office of the U.S. Global Change Research Program. Since my retirement from LLNL in 2002, I have been serving as the Chief Scientist with the Climate Institute, a non-profit, non-partisan, non-governmental organization based in Washington DC and have also served in a number of positions with professional scientific organizations and international assessment teams.

Attached to this letter, please find the legal declaration I submitted as part of a legal complaint filed against the Department of Interior and Bureau of Land Management¹ regarding the need for updating the Environmental Impact Statement being relied on to justify the policy of leasing public lands for extraction of coal. A more complete statement of my qualifications to provide the following opinion is provided on pages 3-12 of the declaration.

The declaration makes three key points:

- (1) The science linking human activities to changes in climate is solid and well supported, particularly with respect to the important contribution of combustion of coal, petroleum, and natural gas (see paragraphs 16-25 in the declaration).*
- (2) The need for actions to sharply reduce emissions is urgent in order to reduce the likelihood of extremely disruptive consequences for the climate, environment and society (see paragraphs 26-32).*

¹ MacCracken, M. C., 2014: Declaration (Document 1-1) in *Western Org. of Res. Councils v. Jewell*, No. 14-CV-1993 (D.D.C., filed Nov. 24, 2014).



(3) Release of the carbon contained in U.S. coal and shale reserves would directly contribute to disruptive climate change, while also undermining the U.S. commitment embraced in the UN Framework Convention on Climate Change to stabilize the climate in a manner that would “prevent dangerous anthropogenic interference with the climate system” (see paragraphs 33-38).

As Mr. Heede’s accounting demonstrates, the Department of Interior’s (DoI) management of public lands under its jurisdiction is responsible for significant and material contributions to U.S. and global emissions. While my legal declaration focused specifically on the role of coal extraction on the climate, the inventory of extracted coal, oil, and natural gas and resulting emissions as compiled by Mr. Rick Heede makes even more evident that the extraction of fossil fuels from public lands is making a very important contribution to the emissions of carbon dioxide (CO₂) that are contributing to global warming and disruption of the global and regional weather and climate.

I have closely followed Mr. Heede’s efforts over the past decade and more, from his compilation of greenhouse gas emissions from projects funded by the Export-Import Bank and Overseas Private Investment Corporation (which was critical evidence in the legal proceeding leading to these organizations agreeing to reduce their support for projects that would lead to emissions of CO₂ and other greenhouse gases) to his very comprehensive compilation of the amounts of carbon-based fuels extracted by major corporations and national corporations since the mid-19th century and now to his compilation of the amounts of carbon-based fuels extracted from public lands. His approaches are rigorous and well documented and the inventories have been compiled so conservatively that they generally actually underestimate their ultimate warming influence of the reviewed activities. For example, in this compilation of emissions from extraction of fossil fuels from US Federal and Indian Lands, Mr. Heede does not consider emissions resulting from leaks of methane from coalmines and from natural gas extraction and transport. In addition, his emissions calculations assume that all of the extracted methane is efficiently combusted to form carbon dioxide without any methane leakage. In that the warming influence for methane is much greater than for CO₂ (on a per unit mass basis being over 20 times as strong over a 100-year period and over 80 times as strong over a 20-year period), accounting for the effects of inadvertent emission of methane would further increase the projected warming influences and importance of extraction of fossil fuels from public lands.

Even though Mr. Heede’s inventory represents an underestimate, that more than 40% of US coal production (averaging 43 percent over 2003-2014) is from US Federal and Indian Lands and roughly a third of oil extraction is from these lands makes very clear that reducing US emissions by 80% by 2050, as called for in the President’s Climate Action Plan, will require that extraction of fossil fuels from these lands be very sharply reduced over the next few decades.



This official US policy was approved in order to limit the increase in global average temperature since the start of the Industrial Revolution to less than 2°C (about 3.5°F). This amount of warming has been clearly associated with potentially very disruptive impacts to the global climate, environment, and societal well-being. As made very clear in the five, unanimously accepted scientific assessments of the Intergovernmental Panel on Climate Change (IPCC) published over the period from 1990 to 2014, burning of coal, petroleum, and natural gas (collectively, fossil fuels) has been the primary cause of the increase of the CO₂ concentration from about 280 to 400 ppmv and of the atmospheric methane (CH₄, so natural gas) concentration from about 750 to over 1800 ppbv. These natural gases have contributed to a significant intensification of the Earth's natural greenhouse effect by enhancing the downward radiation from the atmosphere to the Earth's surface. This intensification has led to an increase in the global average surface temperature to date of about 0.8°C (approaching 1.5°F), with greater warming still to occur as the ocean gradually warms and snow and ice melt, leading to greater absorption of solar energy.

In addition to the increase in the global average temperature, the intensification of the greenhouse effect has been found to be the primary factor causing a gradual poleward shifting of the mid-latitude precipitation zones, an intensification of heavy precipitation, more extreme seasonal conditions, faster evaporation and onset of soil moisture stress and transition to drought, melting of land ice and thawing of permafrost, rising sea level, ocean acidification, and more. As pointed out 30 years ago in the proceedings of the joint *UNEP/WMO/ICSU International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts* held in Villach, Austria, 9-15 October 1985, the climate of the future will be, indeed, already is becoming, different from the past. The differences that are occurring have already begun to cause disruptive impacts on human health, water resources, food and agriculture, forests, biodiversity, coastal zones, indigenous societies, and cities and communities around the world.

With bipartisan Senate affirmation in 1992 of the UN Framework Convention on Climate Change, its objective of stabilizing “greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” became an important international commitment of the United States. Such stabilization can only be achieved by sharply limiting emissions of CO₂ and other greenhouse gases. As increasingly adverse impacts have emerged over the ensuing two decades as a demonstrated result of the changing atmospheric composition, international leaders have agreed that this phrase would be interpreted to mean that emissions need to be cut sufficiently to ensure that the increase in the global average temperature would be no more than 2°C (~3.5°F). Considering collective scientific understanding of how the global climate system is responding to the changing atmospheric composition, IPCC's Fifth Assessment Report issued in 2013-14 found that, to have about a 50% likelihood of staying below 2°C warming, cumulative global emissions of CO₂ over coming



decades need to be limited to less than ~1,000,000 million metric tons (MMT)². To increase the relatively low 50% likelihood threshold for not exceeding 2°C, emissions would need to be held to below this level of emissions. With global emissions still on an upward trend, allowable emissions are projected to be exhausted within roughly 25 years (about 22 years for a likelihood of 67%, 33 years for a likelihood of only 33%). While the periods could be extended if emissions were phased down, there is no other option than to be sharply cutting emissions in the near future. With US CO₂ emissions (not even counting emissions of other greenhouse gases, including CH₄, etc.) being of order 5000 MMTCO₂/year, which is of order 15% of global emissions, it will be essential for the US to be a global leader in taking these steps, especially given that per capita emissions in the US are three to four times larger than the global average. There is clearly no time to waste.

With respect to how this relates to the proposed regulatory action, economists agree that our market system works best at moving in directions that reduce adverse impacts of various activities if their costs are internalized into the price of providing and using the product or service. Therefore, in setting the valuation of fossil fuels extracted from public lands, the proposed regulations have the potential to play a critical role in facilitating proper pricing of these fuels, especially given that these fuels make up a substantial portion of US emissions. To be in support of US policy regarding emissions reductions to limit climate change and environmental damage and to promote appropriate market-based adjustment of the US energy system, the proposed royalties for extraction of fossil fuels from US Federal and Indian Lands therefore need to be fully accounting for the environmental and societal costs resulting from climate change, ocean acidification, release of mercury, and more. To do less is not facing up to an increasingly serious situation for Americans living today and for future generations and is simply not in accord with national policy and optimal land and resource management practices.

Sincerely yours,

Michael C. MacCracken, Ph.D.
Chief Scientist for Climate Change Programs

c. J. Topping, Climate Institute

² From the IPCC (2013) Working Group I Summary for Policymakers, page 27, the value given for total allowable CO₂-equivalent emissions for 50% likelihood was, after taking account of the effects of non-CO₂ greenhouse gases as well, 820 GtC (3010 GtCO₂) and that, through 2011, the central estimate for emissions was 515 GtC (1890 GtCO₂). The remaining allowable emissions, given scientific understanding and the 50% likelihood, are thus about 305 GtC (1120 GtCO₂) through 2011. With 2011 emissions (see page 12) being about 9.5 GtC/yr (34.9 GtCO₂/yr), the remaining allowable emissions are roughly 275 GtC/yr (1009 GtCO₂). Multiplying by 1000 to convert from GtCO₂ to MMTCO₂ and rounding gives allowable emissions of ~1,000,000 MMTCO₂.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Emissions from Coal, Oil, & Natural Gas produced on Federal Lands, Offshore & Onshore, 2003-2014																
2	Climate Accountability Institute																
3	ONRR data on sales from production on leased Federal lands, Federal FY (Oct-Sep)																
4	Richard Heede																
5	7-May-2015																
6	Deep Water Royalty Relief Act																
7	1 ton = 0.90718 tonne																
8			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Sum		
9	Coal																
10	Federal Onshore																
11		tons CO2	819,883,664	846,388,800	839,647,281	802,268,958	827,044,292	897,063,341	857,504,823	849,105,474	829,302,894	822,095,722	747,629,588	748,325,902	9,886,260,738		
12		million tons CO2	820	846	840	802	827	897	858	849	829	822	748	748	9,886		
13		tonnes CO2	743,785,949	767,831,004	761,715,201	727,806,156	750,281,961	813,802,173	777,915,290	770,295,528	752,330,930	745,792,693	678,238,153	678,869,839	8,968,664,877		
14		million tonnes CO2	744	768	762	728	750	814	778	770	752	746	678	679	8,969		
15		MTC	203	210	208	199	205	222	212	210	205	204	185	185	2,448		
16	Tribal Lands																
17		tons CO2	63,846,120	69,455,657	72,877,742	62,153,533	58,444,122	55,400,530	55,389,589	46,013,199	46,935,903	40,375,740	40,746,948	40,102,220	651,741,302		
18		million tons CO2	64	69	73	62	58	55	55	46	47	40	41	40	652		
19		Arizona: bituminous	57,920,226	63,009,112	66,113,575	56,384,737	53,019,616	50,258,515	50,248,590	41,742,472	42,579,535	36,628,255	36,965,009	36,380,122	591,249,764		
20		Montana: sub-bituminous	58	69	66	56	53	50	50	42	43	37	36	36	591		
21		MTC	16	17	18	15	14	14	14	11	12	10	10	10	161		
22	Federal + Tribal Lands																
23		tons CO2	883,729,784	915,844,457	912,525,023	864,422,491	885,488,414	952,463,871	912,894,413	895,118,673	876,238,796	862,471,461	788,376,535	788,428,122	10,538,002,040		
24		million tons CO2	884	916	913	864	885	952	913	895	876	862	788	788	10,538		
25		tonnes CO2	801,706,174	830,840,116	827,828,776	784,190,893	803,301,576	864,060,689	828,163,880	812,038,000	794,910,465	782,420,948	715,203,162	715,249,960	9,559,914,641		
26		million tonnes CO2	802	881	828	784	803	864	828	812	795	782	715	715	9,560		
27		MTC	219	227	226	214	219	236	226	222	217	214	195	195	2,609		
28	Crude Oil & Liquids																
29	Emissions Onshore																
30		tons CO2	58,340,673	56,644,606	55,804,880	57,125,242	60,690,558	62,845,694	62,148,541	74,113,111	78,736,717	86,119,197	82,005,610	89,196,495	823,771,326		
31		million tons CO2	58	57	56	57	61	63	62	74	79	86	82	89	824		
32		tonnes CO2	52,925,768	51,387,127	50,625,336	51,823,148	55,057,548	57,012,655	56,380,208	67,234,284	71,428,748	78,126,021	74,394,238	80,917,699	747,312,776		
33		million tonnes CO2	53	51	51	52	55	57	56	67	71	78	74	81	747		
34		MTC	14	14	14	14	15	16	15	18	19	21	20	22	204		
35	Emissions: Offshore																
36		tons CO2	257,712,738	259,895,160	244,582,319	211,535,982	234,603,234	210,658,762	241,288,923	276,009,660	239,007,893	213,310,787	213,592,071	224,930,228	2,827,127,758		
37		million tons CO2	258	260	245	212	235	211	241	239	213	213	214	225	2,827		
38		tonnes CO2	233,793,063	235,772,923	221,881,347	191,902,215	212,828,474	191,106,415	218,893,629	250,391,752	216,824,314	193,512,290	193,767,467	204,053,271	2,564,727,160		
39		million tonnes CO2	234	236	222	192	213	191	219	250	217	194	194	204	2,565		
40		MTC	64	64	61	52	58	52	60	68	59	53	53	56	700		
41	Emissions: Onshore + Offshore																
42		tons CO2	316,053,411	316,539,766	300,387,199	268,661,224	295,293,793	273,504,456	303,437,464	350,122,772	317,744,610	299,429,984	295,597,681	314,126,723	3,650,899,084		
43		million tons CO2	316	317	300	269	295	274	303	350	318	299	296	314	3,651		
44		tonnes CO2	286,718,831	287,160,046	272,506,683	243,725,363	267,886,023	248,119,069	275,273,837	317,626,035	288,253,062	271,638,312	268,161,706	284,970,970	3,312,039,936		
45		million tonnes CO2	287	287	273	244	268	248	275	318	288	272	268	285	3,312		
46		MTC	78	78	74	67	73	68	75	87	79	74	73	78	904		
47	Natural Gas & CBM																
48	Emissions Onshore																
49		tons CO2	134,024,689	138,458,467	149,269,462	154,232,776	168,263,808	179,566,410	186,528,845	177,037,290	170,584,183	170,060,318	155,341,767	146,181,090	1,929,549,105		
50		million tons CO2	134	138	149	154	168	180	187	177	171	155	146	146	1,930		
51		tonnes CO2	121,585,153	125,607,409	135,414,978	139,917,621	152,646,359	162,899,907	169,216,121	160,605,528	154,751,367	154,276,125	140,923,681	132,613,233	1,750,457,503		
52		million tonnes CO2	122	126	135	140	153	163	169	161	155	154	141	133	1,750		
53		MTC	33	34	37	38	42	44	46	44	42	42	38	36	478		
54	Emissions: Offshore																
55		tons CO2	266,353,372	237,085,692	207,482,395	162,216,994	159,054,631	146,259,487	130,375,665	122,535,970	99,662,721	80,903,828	70,543,368	62,963,271	1,745,437,395		
56		million tons CO2	266	237	207	162	159	146	130	123	100	81	71	63	1,745		
57		tonnes CO2	241,631,715	215,080,522	188,224,862	147,160,782	144,291,934	132,684,375	118,274,814	111,162,762	90,412,500	73,394,718	63,995,867	57,119,318	1,583,434,169		
58		million tonnes CO2	242	215	188	147	144	133	118	111	90	73	64	57	1,583		
59		MTC	66	59	51	40	39	36	32	30	25	20	17	16	432		
60	Emissions: Onshore + Offshore																
61		tons CO2	400,378,061	375,544,159	356,751,857	316,449,771	327,318,439	325,825,897	316,904,510	299,573,260	270,246,904	250,964,146	225,885,136	209,144,361	3,674,986,500		
62		million tons CO2	400	376	357	316	327	326	317	300	270	251	226	209	3,675		
63		tonnes CO2	363,216,868	340,687,930	323,639,841	287,078,403	296,938,293	295,584,282	287,490,935	271,768,290	245,163,867	227,670,844	204,919,548	189,732,502	3,333,891,673		
64		million tonnes CO2	363	341	324	287	297	296	287	272	245	226	205	190	3,334		
65		MTC	99	93	88	78	81	81	78	74	67	62	56	52	910		
66	Coal, Crude Oil, Natural Gas																
67	Emissions Onshore																
68		tons CO2	1,076,095,146	1,110,947,531	1,117,599,366	1,075,780,510	1,114,442,780	1,194,875,974	1,161,571,799	1,146,269,074	1,125,559,696	1,118,650,976	1,025,723,912	1,023,805,707	13,291,322,471		
69		million tons CO2	1,076	1,111	1,118	1,076	1,114	1,195	1,162	1,146	1,126	1,119	1,026	1,024	13,291		
70		tonnes CO2	976,217,096	1,007,834,647	1,013,869,090	975,931,662	1,011,005,484	1,083,973,250	1,053,760,210	1,039,877,812	1,021,090,580	1,014,823,095	930,521,081	928,780,914	12,057,684,920		
71		million tonnes CO2	976	1,008	1,014	976	1,011	1,094	1,054	1,040	1,021	1,015	931	929	12,058		
72		MTC	266	275	277	266	276	296	288	284	279	277	254	253	3,291		
73	Emissions: Offshore																
74		tons CO2	524,066,110	496,980,852	452,064,713	373,752,976	393,657,865	356,918,250	371,664,588	398,545,631	338,670,614	294,214,615	284,135,439	287,893,499	4,572,565,152		
75		million tons CO2	524	497	452	374	394	357	372	399	339	294	284	288	4,573		
76		tonnes CO2	475,424,778	450,853,445	410,106,210	339,062,997	357,120,408	323,790,790	337,168,443	361,554,514	307,236,613	266,907,009	257,763,335	261,172,589	4,148,161,329		
77		million tonnes CO2	475	451	410	339	357	324	337	362	307	267	258	261	4,148		
78		MTC	130	123	112	93	97	88	92	99	84	73	70	71	1,132		
79	Emissions: Onshore + Offshore																
80		tons CO2	1,600,161,257	1,607,928,382	1,569,664,079	1,449,533,487	1,508,100,645	1,551,794,224	1,533,236,387	1,544,814,704	1,464,230,310	1,412,865,591	1,309,859,352	1,311,699,206	17,863,887,624		
81		million tons CO2	1,60														

Cell: B4

Comment: Rick Heede:

ONRR sales data are not audited, and are considered a "close proxy" to actual resource flows. ONRR uses the Federal Fiscal Year (Oct-Sep). Sales data exclude lessees use of produced fuels for on-site gen-sets, some re-injection of natural gas (though this is typically accounted for), flaring and vented natural gas is assumed to be all flared rather than vented as methane (flared quantities are not assessed royalties). Also, unknown, but probably fairly small, quantities of crude oil was diverted to the Strategic Petroleum Reserve (SPR) prior to the end of the "Royalty In Kind" system.
In our calculations we add Federal Onshore and Offshore Sales Volumes by type of fuel, and add Non Revenue Volumes -- chiefly from offshore regions in the Gulf of Mexico that are not subject to royalty payments per the Deep Water Royalty Relief Act.
Personal Communication with Patrick Etchart (Public Affairs, Denver; 303-231-3162, 800-525-7922 x3162, Patrick.Etchart@onrr.gov) 20 April 2015.

Cell: B6

Comment: Rick Heede:

The United States Deep Water Royalty Relief Act (DWRRA): quoted from wiki: "implemented a royalty-relief program that relieves eligible leases from paying royalties on defined amounts of deep-water petroleum production over Federal Outer Continental Shelf lands. After its expiration in 2000, the DWRRA was redefined and extended to promote continued interest in deep water. The Minerals Management Service (MMS) defines a "deep-water" lease as having a minimum water depth of 200 meters. The Energy Information Administration estimates there were 18,812 billion cubic feet (Bcf) of dry natural gas proved reserves and 4,144 million barrels (658,800,000 m3) of crude oil proved reserves in the Federal Gulf of Mexico as of the end of 2004. About 45 percent of the natural gas proved reserves and 79 percent of the crude oil proved reserves in the Federal Gulf of Mexico are in deepwater areas, although not all of this is subject to royalty relief. The following sections highlight provisions in several rules and regulations under which oil and natural gas production volumes may receive royalty relief."

Cell: C87

Comment: Rick Heede:

Source: U.S. Energy Information Administration
April 2015 Monthly Energy Review
Release Date: April 28, 2015
Next Update: May 22, 2015
Table 12.1 Carbon Dioxide Emissions From Energy Consumption by Source

Cell: C90

Comment: Rick Heede:

Global Carbon Project/CDIAC CO2 emissions from fossil fuel combustion, 2003 - 2013; 2014 is extrapolated by Heede, CAI.

7 May 2015

Memorandum to the Center for Biological Diversity and Friends of the Earth – USA

From: Richard Heede

Climate Accountability Institute

Introduction

The purpose of this monograph is to present the results of an analysis of the oil, natural gas, and coal produced by private companies that have leases on Federal lands for fiscal years 2003 through 2014, and to estimate the emission of carbon dioxide that results from the marketing and end-use of the carbon fuels made available through Federal leases.

This study is commissioned by Dunkiel Saunders on behalf of the Center for Biological Diversity and Friends of the Earth–USA.

My name is Richard Heede, Director & Co-Founder of the Climate Accountability Institute. I have worked on global warming issues since 1984, published a thesis on the geography of global recoverable fossil fuels with the National Center for Atmospheric Research in 1983, worked on energy and climate policy with Rocky Mountain Institute from 1984 to 2002, established Climate Mitigation Services (a consultancy) in 2002, and co-founded (with Harvard professor Naomi Oreskes) the Climate Accountability Institute in 2011.

I have published peer-reviewed papers on climate change and emission inventories, and authored a number of publications on emission inventories on the oil and gas industry, steel industry, supply chain for liquefied natural gas supply (LNG), community inventories for cities, towns, and counties, verified inventories on behalf of corporate partners of the U.S. Environmental Protection Agency’s Climate Leaders Program, and clients in industry, non-governmental groups, and foundations. I have, over the last thirty years, developed thorough working knowledge of the protocols used by industry, governments, and municipalities to estimate emissions of greenhouse gases within well-defined boundaries. The emission inventory protocol used in this analysis is based on the best practices of corporate emission protocols adopted by industry, trade associations, and climate NGOs.¹

Data

This analysis is based on production data published annually by the U.S. Department of the Interior’s Office of Natural Resources Revenue (ONRR). The period covers 2003 through 2014. (ONRR uses the Federal fiscal year: October–September. Other data cited, such as national energy statistics from the EIA or emissions data from the EPA, are calendar years.)

Producers are required to report “sales volumes” of each fuel produced by end of the month following the month of production. Production reports are not audited. This analysis assumes that the reported quantities are accurate and complete. Emissions of CO₂ from the production of fossil fuels produced on Federal and Indian Lands, and product sales to end-users (motorists, airlines, utilities, industry, or commercial & residential building owners), are estimated from the production and sales volumes of oil, natural gas, and coal.

¹ Heede, Richard (2014) Tracing anthropogenic CO₂ and methane emissions to fossil fuel and cement producers 1854-2010, *Climatic Change*, vol. 122(1): 229-241; doi:10.1007/s10584-013-0986-y.

CAVEATS AND EXCLUSIONS: Lease holders do not report production or pay royalties on natural gas that is used in the field for electricity generation or operating field equipment; both are sources of CO₂ emissions but are not estimated (such field use is on the order of ~5 percent of natural gas produced). Natural gas produced but re-injected in oil wells for enhanced oil recovery is also excluded, since no royalties are paid to ONRR. Nor are royalties typically paid on natural gas that is flared or vented; ONRR data does show “gas lost – flared or vented” (5.5 Bcf in 2014), and this analysis quantifies CO₂ emissions on the assumption that the combined data of “flared or vented” gas is all flared (any vented produced gas would have a higher climate impact, since methane has a Global Warming Potential of 21 times CO₂ per unit of gas volume). I have not estimated fugitive emissions of methane from coal mining or natural gas production or pipelines (including methane would add ~8.5 percent and ~20.7 percent to emissions from coal and natural gas production, respectively, on a CO₂-equivalent basis (CO₂e)).

Vented CO₂ from the processing of natural gas to meet pipeline specifications is not estimated. The use of “own fuel” such as natural gas used in drilling operations, on offshore production platforms, and in pipeline compressor stations is excluded — as is fuel, chiefly diesel fuel, used in transportation and other equipment used to operate drill rigs, trucks, pumping, and injection equipment. The exclusions listed above would, if included, add ~6.0 percent to the combustion of oil & liquids as estimated below, ~29.5 percent to natural gas, and ~8.5 percent to coal.

Methodology

A peer-reviewed methodology for estimating emissions of CO₂ to the atmosphere of crude oil and other liquid fuels, natural gas and coal bed methane, and coal is applied to the ONRR fossil fuel sales data for each year.

COAL: Coal is reported in short tons per year for production on Federal Onshore and Indian Lands. Coal production is *not* reported by coal rank; accounting for the rank of coal mined is important in estimating emissions. I have therefore analyzed reported production of coal on Federal Lands by state (Table 1) and calculated each state’s production of coal by rank using data reported by the Energy Information Administration for each state.

Table 1. Coal production by coal rank in states with ONRR coal leases, 2012.

State	Total state Bituminous million tons	Total state Sub-bituminous million tons	Total state Lignite million tons	ONRR 2012 million tons
Alabama	19.32			2.33
Colorado	20.57	8.00		19.11
Kentucky	90.86			0.23
Montana	5.71	30.69	0.30	23.48
New Mexico	14.83	7.62		4.71
North Dakota			27.53	3.92
Oklahoma	1.05			0.45
Utah	17.02			13.37
Wyoming		401.44		374.25
Indian Lands				21.61
Sum of states	169.36	447.75	27.83	441.84
Total U.S. prod’n	485.36	449.80	78.93	na

Sources: EIA coal production by state and total US; US total 2012: 1,016 million short tons; ONRR for 2012.

The percentages generated from the coal produced in each state in Table 1 is applied to total coal mined in each state under ONRR leases. Estimated emissions by coal rank for each state is calculated using the emission factors in Table 2. Coal produced under leases on Indian Lands is not reported by state in ONRR data (19 million tons in 2012), and the average emission factor for U.S. thermal coal is applied in estimating emissions.

Table 2. Combustion emission factors (also account for non-energy uses)

Energy source	Carbon tC/unit	Carbon dioxide tCO₂/unit
Crude oil & NGLs	101.4 kgC/bbl	371.4 kgCO ₂ /bbl
Natural gas	14.6 kgC/kcf	53.4 kgCO ₂ /kcf
Lignite	328.4 kgC/tonne	1,203.5 kgCO ₂ /t
Subbituminous	495.2 kgC/t	1,814.4 kgCO ₂ /t
Bituminous	665.6 kgC/t	2,439.0 kgCO ₂ /t
Anthracite	715.6 kgC/t	2,621.9 kgCO ₂ /t
“Metallurgical coal”	727.6 kgC/t	2,665.9 kgCO ₂ /t
“Thermal coal”	581.1 kgC/t	2,129.3 kgCO ₂ /t

Crude oil: prior to non-energy deduction & adjustment for NGLs: 115.7 kgC/bbl, 423.8 kgCO₂/bbl;
 Gas: prior to non-energy deduction: 14.86 kgC/kcf, or 54.44 kgCO₂/kcf; (kcf = thousand cubic feet).

CRUDE OIL & OTHER HYDROCARBON LIQUIDS PRODUCTION: ONRR reports royalty production on Federal Lands for Offshore and Onshore areas by type of product. The largest reported quantities are crude oil (518 million bbl in 2014), condensate (45 million bbl), and gas plant products (109 million bbl), and smaller quantities of scrubber condensate, sweet crude, etc. Each of these products differ in emissions per bbl: natural gas liquids (NGLs) has an emission factor of ~250 kgCO₂/bbl, whereas crude oil emission factor is 432 kgCO₂/bbl. The methodology adopted for this analysis adjusts the combined crude oil and liquids emission factor from 432 kgCO₂/bbl to 404 kgCO₂/bbl to account for the proportion of lighter liquids such as NGLs and condensates. Significant non-energy uses of petroleum products — for petrochemicals, lubricants, waxes, and road oil (asphalt) — reduces the emission factor to 371.4 kgCO₂/bbl (Table 2). This adjustment is made to account for non-energy uses that sequester a proportion of petroleum products away from the atmosphere.

NATURAL GAS AND COAL BED METHANE: The majority of natural gas production on Federal Lands is reported as processed and unprocessed gas, flowed by coal bed methane from onshore coal regions. Quantities of Non Revenue produced gas are also reported. Pipeline quality natural gas has a fairly constant carbon factor of 54.4 metric tonnes CO₂ per billion cubic feet (Bcf) (54.4 tCO₂/Bcf). The emission inventory protocol accounts for relatively minor non-energy uses of natural gas, such as for fertilizer production, which reduces the emission factor to 53.4 tCO₂/Bcf.

Results

Fossil fuel production on Federal and Indian Lands, including offshore regions, has been a relatively constant proportion of fuel total oil, gas, and coal produced in the United States over the 2003-2014 period — ~75-78 percent of which is on private lands, and ~22-25 percent on Federal and Indian Lands; see Tables 3 and 4 and Figure 1.

Table 3. Coal, oil, and natural gas produced on Federal and Indian Lands, 2003-2014.

Year	Coal		Oil & liquids		Natural Gas & CBM	
	Federal Mt	Indian Mt	Onshore Mbbbl	Offshore Mbbbl	Onshore Bcf	Offshore Bcf
2003	436	30	142	629	2,275	4,522
2004	451	33	138	635	2,351	4,025
2005	447	34	136	597	2,534	3,523
2006	429	29	140	517	2,619	2,754
2007	443	27	148	573	2,857	2,700
2008	483	26	153	515	3,049	2,483
2009	462	26	152	589	3,167	2,213
2010	457	22	181	674	3,006	2,080
2011	447	22	192	584	2,896	1,692
2012	442	19	210	521	2,887	1,374
2013	401	19	200	522	2,637	1,198
2014	402	19	218	549	2,482	1,069

Mt = million short tons; Mbbbl = million bbl; Bcf = billion cubic feet. CBM = coal bed methane.

In 2014, two-fifths (40.2 percent) of U.S. coal production was from leases on Federal Lands; production on Indian Lands accounted for an additional 1.9 percent of U.S. coal production. One-quarter of total U.S. oil and NGL production was from Federal Onshore and Offshore regions in 2014, though production from Federal onshore and offshore reached 43 percent in 2010. The lion's share of ONRR production is from offshore (549 million bbl offshore, and 218 million bbl onshore). ONRR production of natural gas fell from 36 percent of total U.S. production in 2003 to 14 percent in 2014, and 70 percent of ONRR gas production is from Federal Onshore.

Table 4. Coal, oil, and natural gas produced on Federal and Indian Lands, and total U.S. production, 2003-2014.

Year	Coal		Oil & liquids		Natural Gas & CBM	
	ONRR Mt	U.S. total Mt	ONRR Mbbbl	U.S. total Mbbbl	ONRR Bcf	U.S. total Bcf
2003	466	1,072	772	2,062	6,798	19,099
2004	484	1,112	773	1,991	6,376	18,591
2005	482	1,131	734	1,891	6,057	18,051
2006	458	1,163	656	1,857	5,373	18,504
2007	471	1,147	721	1,853	5,557	19,266
2008	509	1,172	668	1,830	5,532	20,159
2009	488	1,075	741	1,953	5,380	20,624
2010	478	1,084	855	2,001	5,086	21,316
2011	470	1,096	776	2,060	4,588	22,902
2012	461	1,016	731	2,378	4,261	24,033
2013	420	985	722	2,724	3,835	24,334
2014	421	1,000	767	3,168	3,551	25,718

Mt = million short tons; Mbbbl = million bbl; Bcf = billion cubic feet. CBM = coal bed methane.

Emissions traced to production on Federal and Indian Lands range from a high of 1.46 billion tonnes of carbon dioxide (GtCO₂) in 2004 to a low of 1.19 GtCO₂ in 2013 and 2014; see Tables 5 and 6.

This analysis estimates emissions of carbon dioxide from the fossil fuel resources produced on Federal and Indian Lands and subsequently marketed to end-use consumers in the United States or to export markets (there is a growing export market for coal and natural gas in the form of liquefied natural gas (LNG)). This analysis does not account for or exclude carbon fuel exports. It quantifies the emissions from fuels produced on Federal Lands, after deducting for non-energy uses of petroleum products (which sequesters carbon in products such as petrochemicals, asphalt, and lubricants), regardless of whether the produced fuels are combusted in the United States or internationally.

Table 5. CO₂ emissions from coal, oil, and natural gas produced on Federal Offshore, Federal Onshore, and Indian Lands, 2003-2014.

Year	Federal Offshore MtCO ₂	Federal Onshore MtCO ₂	Indian Lands MtCO ₂	Total ONRR MtCO ₂
2003	475	913	58	1,446
2004	451	941	63	1,455
2005	410	944	66	1,421
2006	339	916	56	1,311
2007	357	953	53	1,363
2008	324	1,030	50	1,404
2009	337	1,001	50	1,388
2010	362	996	42	1,399
2011	307	976	43	1,326
2012	267	975	37	1,278
2013	258	890	37	1,185
2014	261	889	36	1,186

MtCO₂: million metric tonnes CO₂/yr.

This analysis is conservative overall, insofar as fuels produced on Federal Lands but used by the lessees in on-site generation or other equipment are not included in the ONRR production data. This analysis also excludes venting of process CO₂ and fugitive methane — significant sources that are not tracked in ONRR production data.

Table 6. CO₂ emissions from coal, oil, and natural gas produced on Federal and Indian Lands, onshore plus offshore, 2003-2014, and total U.S. fossil fuel emissions.

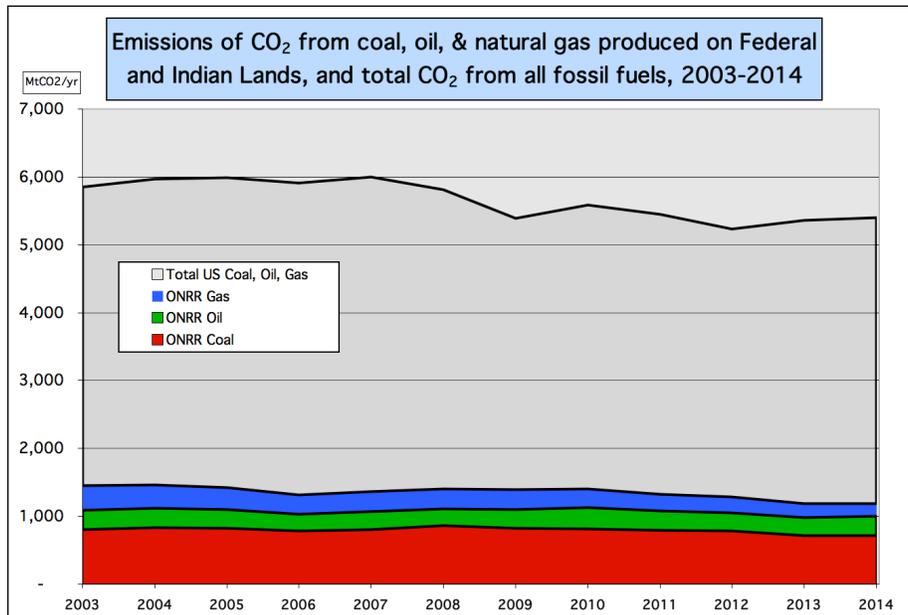
Year	Coal MtCO ₂	Oil & liquids MtCO ₂	Natural Gas & CBM MtCO ₂	Total ONRR MtCO ₂	Total U.S. MtCO ₂
2003	796	287	363	1,446	5,853
2004	827	287	341	1,455	5,970
2005	824	273	324	1,421	5,993
2006	781	244	287	1,311	5,910
2007	798	268	297	1,363	6,001
2008	861	248	296	1,404	5,809
2009	825	275	287	1,388	5,386
2010	810	318	272	1,399	5,582
2011	792	288	245	1,326	5,445
2012	779	272	228	1,278	5,232
2013	711	268	205	1,185	5,362
2014	712	285	190	1,186	5,414
2003-2014	9,560	3,312	3,334	16,206	67,957

MtCO₂: million metric tonnes CO₂/yr. CBM: coal bed methane. Heede calculations from ONRR data. Total U.S.: EIA.

Discussion

Using data from the Department of the Interior’s Office of Natural Resources Revenue (ONRR), I have traced reported production of coal, oil & other liquids (such as condensates and gas plant liquids), and natural gas (including coal bed methane) from 2003 to 2014. Emissions of carbon dioxide have been estimated based on combustion of carbon fuels supplied to domestic and international consumers. The analysis deducts for estimated non-energy uses of carbon products (such as for petrochemicals, fertilizers, lubricants, asphalt). The analysis excludes several sources of emissions, such as ubiquitous flaring, vented CO₂ from natural gas processing, lease holders’ field use of produced fuels, and all methane emissions that would have, based on my analysis, added 6.0 percent to the combustion of oil and liquids, 29.5 percent to natural gas, and 8.5 percent to coal.

Figure 1. Sum of CO₂ emissions from coal, oil, and natural gas produced on Federal and Indian Lands, compared to total U.S. emissions from fossil fuels, 2003-2014.



Source: Climate Accountability Institute. ONRR oil, gas, and coal emissions are additive.

Estimated emissions from fossil fuel production on Federal Lands, including Indian Lands, is consistently 22 to 26 percent of U.S. emissions from the consumption of all oil, natural gas, and coal over the period from 2003 to 2014 (Figure 1). The average contribution from 2003 to 2014 is 23.8 percent of total U.S. emissions from the consumption of oil, natural gas, and coal (table 6: emissions attributed to fuels produced on Federal and Indian lands 2003-2014 totals 16,206 MtCO₂, of total U.S. fossil fuel emissions of 67,957 MtCO₂).

Respectfully,



Richard Heede
 Director, Climate Accountability Institute