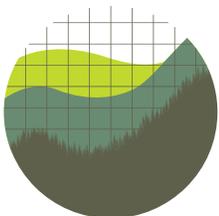




Illuminating the Hidden Cost of Coal

Summary for Policymakers



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Introduction

The Department of the Interior (“Interior”) can make strides in modernizing the federal coal program through straightforward royalty rate increases and fiscal reform. Coal mining on federal lands accounts for more than 40 percent of all coal produced in the United States.¹ Nearly 90 percent of federally produced coal comes from strip mines in the Powder River Basin in Wyoming and Montana. As our October 2015 report described in detail, the federal coal leasing program suffers from lack of robust competition; stagnant minimum bids and royalty rates that have not been raised since 1982; frequent royalty rate deductions; and inconsistent internal “fair market value” calculations,

which often fail to account for coal’s export value.² The fiscal terms of federal coal leases also fail to account for the many environmental and social externalities (or shared costs) imposed on the public by coal production.

If Interior had used a higher royalty rate that accounts for even a fraction of the public costs of mining, it could have earned an additional \$2 billion from 2009 to 2013.

This policy brief and its accompanying regulatory report aim to illuminate some of the hidden costs of coal production, which Interior should account for in order to modernize the federal coal program and earn “fair market value,” as required by federal law. If Interior had used a higher royalty rate that accounts for even a fraction of the public costs of mining, it could have earned an additional \$2 billion from 2009 to 2013, from coal production in four western states—Wyoming, Colorado, Montana, and Utah.

To modernize the coal program and earn a more fair return, Interior should:

- **Increase royalty rates for federal coal to account for the environmental costs of coal production, which are imposed on the public.**

For example, Interior should increase the minimum royalty rate from 12.5 to 18.7 percent for Powder River Basin surface-mined coal in order to account for the climate change damage caused by methane emissions. (See *Table 1*). If Interior had used this rate from 2009 through 2013, it could have earned up to an additional \$1.2 billion in total revenue from Powder River Basin coal, alone. (See *Table 2*).

- **Consider increasing coal royalty rates even higher, to account for transportation externalities.**

Transporting coal long distances by rail generates air pollution and additional greenhouse gas emissions, and contributes to public fatalities, congestion, and noise pollution. If those costs are accounted for, Interior would be justified in raising royalty rates as high as 82.6 percent, when accounting for both transportation and production externalities. (See *Table 3*).

Fully accounting for the public costs of mining would justify raising federal royalty rates from 12.5% to 82.6%, for Powder River Basin coal.

- **Revise its royalty rate reduction and transportation allowance regulations, to provide better incentives to coal companies.**

Interior should eliminate inefficient and market-distorting subsidies and royalty rate deductions, and instead use its discretion to provide incentives for coal companies to capture more pollution.

- **Increase minimum bids to account for inflation, fixed external costs, and option value, or the informational value of delay.**

Increasing the minimum bid for coal leases will help overcome persistent problems with uncompetitive leasing and inconsistent, internal “fair market value” calculations, both of which hinder a more robust return for taxpayers.

American taxpayers should not be saddled with all of the environmental costs of coal production.

Because coal revenue is split nearly evenly with the states in which federal coal production occurs, a greater share of public revenue from federal coal production would help support federal and state conservation measures, infrastructure improvements, climate preparedness, and education, among other public programs.

Moreover, as the United States makes progress on climate change policies to reduce domestic greenhouse gas emissions from electric utilities, transportation, buildings, and other sources, it should also take reasonable steps to reduce pollution from fossil fuel production on federal lands. Methane emissions from all coal mines in the United States account for about 13 percent of U.S. methane emissions.³ Adjusting the fiscal terms of coal leases to recoup some of the costs of this pollution, and creating incentives for operators to capture more methane, are practical solutions to addressing this potent climate change pollutant in the near term.⁴ Closing royalty reduction loopholes and increasing minimum bids would further improve the federal coal program. All of these reforms would help Interior uphold its requirement to balance energy production with environmental preservation, and earn fair market value for the public.

1. Interior Should Raise the Royalty Rate for Federal Coal Leases to Account for the Environmental and Social Costs of Coal Production.

Interior has significant discretion to revise the fiscal terms of federal leases in order to earn fair market value. Accounting for the cost of just one major coal production externality—methane emissions—would justify an increase in both surface and underground coal royalty rates. Because environmental externalities vary with the amount of coal that is produced, these costs are best recouped through the royalty rate. Coal production methane emissions stem directly from mining on public lands, and are not otherwise regulated by federal law.

Our calculations use emission and price data from the U.S. Energy Information Administration (“EIA”) and EPA’s Social Cost of Methane, which has been used to justify and set the stringency of federal rules.⁵ Interior should use these economic tools when evaluating the “fair market value” for coal production on federal lands and setting royalty rates.

Accounting for Coal Production Externalities

Interior would be justified in increasing the current 12.5 percent statutory minimum royalty rate for Powder River Basin surface-mined coal by an additional 6.2 percent, leading to a new rate of 18.7 percent, based on average methane externality cost calculations. (See *Table 1*).⁶ This estimated adjustment is based on current Wyoming coal prices. If Interior had used the higher 18.7 percent royalty rate from 2009 through 2013, it could have earned an additional \$1.2 billion in total revenue from Powder River Basin coal. (See *Table 2*).⁷

For underground coal basins, such as the Uintah Basin in Colorado and Utah, methane emissions are greater. Interior would be justified in raising the current 8 percent federal royalty rate by an additional 20.7 percent, leading to a new rate of 28.7 percent. (See *Table 1*). These suggested royalty rate increases can be applied to new leases, modified leases, and lease extensions.⁸

If Interior had used these suggested surface and underground royalty rates for federal coal produced in four Western states—Wyoming, Colorado, Montana, and Utah—it could have earned an additional \$2 billion, between 2009 and 2013. Accounting for the benefits to the U.S. public in terms of increased revenue and decreased externalities from coal mining, this increase would have provided \$2.9 billion in additional benefits from 2009 to 2013.⁹

These estimates represent conservative lower bounds for externality costs, for several reasons. First, the only environmental externality quantified is methane emissions from coal production. This omits other known externalities including emissions of volatile organic compounds and hazardous air pollutants, water pollution, water use, habitat disruption, and noise. Some of these externalities are more difficult to quantify, as their cost varies depending on location, unlike methane, which is a global greenhouse gas pollutant. Second, the Social Cost of Methane, itself, omits certain damages and represents a lower-bound estimate of the cost of methane emissions.¹⁰ Third, these estimates do not account for the value of the marketable natural gas that is lost when methane escapes into the atmosphere.¹¹ Furthermore, these values do not account for the significant transportation externalities associated with transporting federal coal long distances using freight rail, nor the downstream greenhouse gas emissions emitted when coal is burned.¹²

Accounting for Coal Transportation Externalities

In Wyoming, approximately 90 percent of federal coal is transported by rail out of the state, mostly for end use in power plants. Transportation by freight rail causes multiple externalities including greenhouse gas emissions; emission of particulate matter and other air pollutants; increased fatalities and risks to public health due to accidents; and congestion and noise. Interior would be justified in raising the royalty rate for federal coal leases substantially higher than the 18.7 and 28.7 percent surface and underground rates, respectively, provided above, in order to account for the environmental and social costs of transporting coal by rail.

Accounting for both methane and transportation externality costs would justify adding 70.1 percent to the current 12.5 percent surface-mine royalty rate, for Powder River Basin coal. (See *Table 3 and accompanying regulatory report, appendices A and B*). This would justify a new royalty rate of 82.6 percent for federal surface-mined coal. In other words, coal transportation externalities impose significant public costs. These values illuminate the extent of federal coal production's societal costs. Moreover, these transportation externalities justify a change to existing regulations that are designed to generously subsidize coal transport.

2. Interior Should Revise Its Transportation Allowance and Royalty Rate Reduction Regulations, to Provide Better Incentives to Coal Companies.

Current regulations allow for unlimited transportation deductions, when royalties are calculated using the market price of coal. As a practical matter, this transportation deduction is used sparingly, as most companies sell their coal at the mine mouth, making transportation costs irrelevant to royalty assessments. However, if Interior changes the point of valuation for coal royalties to the final delivery point (market price) or another point remote from the mine, as it is considering, transportation costs will become relevant to royalty payments. In such a scenario, the transportation deduction would translate into an allowance for the full cost of transporting coal from the mine to a remote point of sale, reducing incentives for companies to find the most efficient and lowest-cost mode of transportation, and subsidizing coal production and transportation over other energy sources.

If the point of valuation changes, this transportation allowance should be eliminated. As noted above, there are significant externality costs associated with transporting coal from the Powder River Basin to end users by rail, including greenhouse gas and other air emissions, fatalities, and congestion. (See Table 3). A transportation allowance amounts to a subsidy for coal production and transport. In addition, if Interior changes the manner in which royalties owed are calculated to use the market sale price—a change that would likely increase transparency and public revenue—any royalty rate increase to account for externality costs should be based on the average U.S. price for coal delivered to the electric power sector. We provide these values in Table 1.

Interior’s Royalty Rate Reduction Regulations Should Be Revised

Interior should also revise its royalty rate reduction regulations. Currently, BLM has discretion to grant royalty rate reductions if the rate reduction: (i) encourages the greatest ultimate recovery of the coal resource; (ii) is in the interest of conservation of the coal and other resources; (iii) is necessary to promote development of the coal resource; or (iv) if the federal lease cannot be successfully operated under its terms.¹³ Royalty rate reductions occurred on approximately 36 percent of leases offered for sale since 1990.¹⁴ These reductions distort the energy market by subsidizing coal production, even when it is uneconomical.

It is not rational for the federal government to support uneconomical mineral resource production; this runs counter to its “fair market value” mandate. This regulation should be revised to remove duplicative and inefficient provisions. In addition, if Interior raises royalty rates, in accord with our recommendations, Interior could revise this regulation to allow for negotiating lower rates for coal lessees that demonstrate that they capture more methane than average surface or underground mines. This would allow Interior to raise royalty rates uniformly (as described above), and reward lessees that reduce more greenhouse gas pollution than the national average for surface and underground coal production.

3. Interior Should Raise Minimum Bids to Account for Inflation, the Fixed Social Costs of Mining, and Option Value.

In addition to royalty reform, Interior should make changes to its minimum bid regulations and internal fair market value calculations (used to establish adequate bonus bids), to help overcome persistent problems with uncompetitive leasing and inconsistent returns. The minimum bid for coal leasing has been set at \$100 per acre since 1982. Interior has the authority, pursuant to the Mineral Leasing Act and Federal Coal Leasing Amendments Act, to increase minimum bids. The minimum bid should be raised to account for inflation, fixed social costs, and the option value of leasing, in order to serve as a floor price for fair market value.

In the 95 years since the passage of the Mineral Leasing Act, economic and scientific tools have markedly improved. Interior should use these tools to modernize the fiscal terms of coal leases.

Accounting for inflation, alone, would raise the minimum bid to \$247 per acre. BLM should also account for the fixed social costs of mining, such as lost amenities (i.e., lost public access to recreation) and public funding of reclamation, in the minimum bid price. (See Table 3). Using data on the cost of publicly-funded reclamation, alone, we estimate this cost to be \$0.44 per metric ton.

BLM's minimum bid and fair market value appraisals also fail to account for the option value of coal leasing, which is the value of waiting for more information on energy prices and extraction risks before deciding whether and when to lease the public's energy resources to private companies. To account for option value, Interior can look to the Bureau of Ocean Energy Management's ("BOEM") draft program for offshore leasing for 2017 to 2022 as a starting point. BOEM uses a hurdle price analysis to account for economic uncertainty, and qualitatively considers environmental and social option value when determining where and when to lease. Interior should consider organizing a working group to evaluate methods to use and quantify option value for natural resources leasing.

Conclusion

Federal coal production imposes substantial hidden costs, including methane emissions and transportation externalities. Economic and scientific understanding of these costs has improved in the 95 years since the passage of the Mineral Leasing Act. Armed with the knowledge that greenhouse gas emissions and other pollution from coal production impose significant costs on society, and the tools to measure those costs, Interior can and should account for these costs through royalty reform. Doing so would better fulfill its mandate to earn fair market value and manage public lands for the benefit of future generations. Failure to account for these costs amounts to a subsidy for coal production.

A more complete explanation of these issues, along with a discussion of Interior's legal authority to carry out the recommendations in this policy brief, can be found in our accompanying regulatory report. Our October 2015 report, *Reconsidering Coal's Fair Market Value*, provides additional background.

TABLE 1. Suggested Royalty Rate Increases and New Royalty Rates, Based on Net Methane Emission Externality Costs (EIA, 2011) by Region-Mining Type and Geographical Scope of Price

Region	Mining Type	Suggested Increase, Using State Mine-Mouth Price	Suggested Increase, Using Average U.S. Price of Coal Delivered to the Electric Power Sector	Suggested New Royalty Rate (Using State Mine-Mouth Price)
Colorado	Underground	19.5%	16.7%	27.5%
	Surface	2.2%	1.9%	14.7%
Wyoming	Underground	56.0%	16.7%	64%
	Surface	6.2%	1.9%	18.7%
Utah	Underground	22.6%	16.7%	30.6%
	Surface	2.5%	1.9%	15%
Montana	Underground	46.9%	16.7%	54.9%
	Surface	5.2%	1.9%	17.7%
Powder River Basin (Wyoming)*	Underground	–	–	
	Surface	6.2%	1.9%	18.7%
Uinta Basin (Colorado and Utah)**	Underground	20.7%	16.7%	28.7%
	Surface	2.3%	1.9%	14.8%
* The basin is assigned the Wyoming price because Wyoming makes up the majority (approx. 90%) of production.				
** The basin is assigned a production-weighted price of Colorado and Utah.				
*** The middle two columns are suggested royalty rate increases: the first is the royalty rate increase if the state mine-mouth price is used and the second is the royalty rate increase if the average U.S. price of coal delivered to power plants is used. Currently, the mine-mouth price is used to calculate royalty payments. The last column (on the right) is the suggested new royalty rate, based on state mine-mouth prices.				
**** Emissions are measured as net emissions: total methane emissions emitted during mining and from coal pores during transport, less methane captured (based on average emissions captured for each mining type).				

Sources:

- *Methane: Methane Emissions from 2005 to 2009: Table 18 of* http://www.eia.gov/environment/emissions/ghg_report/pdf/0573%282009%29.pdf
- *EIA Production Data from 2005 to 2009: www.eia.gov/totalenergy/data/annual/pdf/sec7_7.pdf and Table 1 of: http://www.eia.gov/coal/annual/pdf/acr.pdf*
- *EPA Estimate of the Social Cost of Methane Used in EPA Cost Benefit Analysis: Marten et al. (2015).*
- *EIA Price Data Averaged from 2009 to 2013 – Table 28 (State Price) and 34 (U.S. Electric Power Price) of* <http://www.eia.gov/coal/annual/pdf/acr.pdf>

TABLE 2. Lost Government Royalty Revenue (in USD) from Powder River Basin Coal from Using Current 12.5% Statutory Royalty Rate Versus Our Estimated Rate of 18.7% (using U.S. EIA data)

Variable	2013	2012	2011	2010	2009	Sum (USD)
Perfectly Inelastic Supply	290,343,838	309,165,604	331,235,289	324,298,504	312,572,969	\$1,567,616,205
Elasticity of 1	228,203,784	242,997,273	260,343,553	254,891,394	245,675,383	\$1,232,111,389
Elasticity of 3	103,923,675	110,660,609	118,560,080	116,077,175	111,880,217	\$561,101,756

Sources:

- U.S. EIA production and price data. We use Wyoming price data, as the majority of Powder River Basin coal is produced and sold in Wyoming, at the state mine mouth price.
- Elasticities of supply: Haggerty, M., Lawson, M., & Percy, J. (2015). Steam Coal at an Arm's Length: An Evaluation of Proposed Reform Options for U.S. Coal Used in Power Generation. Available at SSRN 2627865.

Interpretation:

- We assume an average elasticity of supply of between 1 and 3 (based on EIA's chosen elasticity of supply for U.S. coal (Haggerty et al., 2015)); this results in lost revenue of between approximately \$1.2 billion and \$600 million. Regional supply elasticity in the Powder River Basin may be more inelastic (lower), making the upper limit on lost revenue about \$1.6 billion.
- These estimates account for inflation, but not discounting. If we were to discount, the resulting estimates would be higher

TABLE 3. Externality Cost Detail and Suggested Royalty Rate Increases in the Powder River Basin

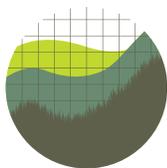
Relevant Category	Low	Best	High	Units	Source
Production					
Methane emissions from mines	\$0.44	\$0.98	\$2.74	2015 USD/metric ton	Author's estimate using U.S. EIA data
Air pollution, water pollution, and water use	–	–	–	–	–
Transportation					
Fatalities to public due to coal transport	\$1.73	\$2.64	\$9.95	2015 USD/metric ton	GAO (2011); Epstein et al (2011); Forkenbrock (2001)
GHG emissions from trains	\$0.56	\$1.75	\$5.17	2015 USD/metric ton	Author's estimate
Air pollution from trains	\$0.16	\$3.18	\$12.00	2015 USD/metric ton	Forkenbrock (2011); CBO (2015); GAO (2011)
Congestion	\$0.00	\$0.62	\$0.74	2015 USD/metric ton	CBO (2015); Gorman (2008); Gorman (2008)
Noise	\$0.00	\$1.02	\$1.02	2015 USD/metric ton	Forkenbrock (2001); Forkenbrock (2001)
Pavement	\$0.00	\$0.80	\$0.96	2015 USD/metric ton	CBO (2015); CBO (2015)
Total Variable External Costs	\$2.88	\$9.17	\$30.60	2015 USD/metric ton	–
Royalty Rate Increase - Production Only					
Wyoming mine-mouth price	2.8%	6.2%	17.4%	Externality Royalty Rate	EIA Coal Report – Table 28
Royalty Rate Increase - Production and Transport					
Wyoming mine-mouth price	18.4%	70.1%	207.7%	Externality Royalty Rate	EIA Coal Report – Table 28
Average U.S. price of coal delivered to the electric power sector	5.5%	20.9%	61.9%	Externality Royalty Rate	EIA Coal Report – Table 24

Sources:

- *Methane: Methane Emissions from 2005 to 2009 Using EIA (2011) Data: Table 18 of* http://www.eia.gov/environment/emissions/ghg_report/pdf/0573%282009%29.pdf
- *EIA Production Data:* http://www.eia.gov/totalenergy/data/annual/pdf/sec7_7.pdf and *Table 1 of* <http://www.eia.gov/coal/annual/pdf/acr.pdf>
- *Official EPA Estimate of the Social Cost of Methane Data Used in Recent CBA:* Marten et al. (2015)

Endnotes

- ¹ U.S. ENERGY INFORMATION ADMINISTRATION, Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2012 at 4 (June 2014), available at <http://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf>.
- ² Jayni Foley Hein and Peter Howard, RECONSIDERING COAL'S FAIR MARKET VALUE, INSTITUTE FOR POLICY INTEGRITY, NYU SCHOOL OF LAW (Oct. 2015), available at http://policyintegrity.org/files/publications/Coal_fair_market_value.pdf.
- ³ U.S. EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2013 at Table 2-1 (April 15, 2015), available at <http://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2015-Main-Text.pdf>.
- ⁴ Methane's global warming potential is up to 86 times greater than carbon dioxide in the first 20 years after release, and 34 times more powerful on a 100 year timeframe. IPCC WORKING GROUP I, FIFTH ASSESSMENT REPORT, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, CHAPTER 8: ANTHROPOGENIC AND NATURAL RADIATIVE FORCING 633, 711-712, 714 (Table 8.7) (2014), available at https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf.
- ⁵ The federal government uses widely accepted economic tools—such as EPA's Social Cost of Carbon and Social Cost of Methane—to quantify the environmental and social costs associated with certain environmental impacts, such as greenhouse gas emissions. The Social Cost of Carbon was designed by an Interagency Working Group comprised of economic and scientific experts from the White House and multiple federal agencies. It was developed through an open and transparent process, and uses the latest peer-reviewed science and economic models. EPA's Social Cost of Methane builds on this framework and is also based on the latest peer-reviewed science. EPA has used the Social Cost of Methane in two proposed rules in 2015, thus far. See 80 Fed. Reg. 52,099 (Aug. 27, 2015) (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills); 80 Fed. Reg. 56,593 (Sept. 18, 2015) (Oil and Natural Gas Sector: Emission Standards for New and Modified Sources).
- ⁶ See 30 U.S.C § 207; 43 C.F.R. § 3473.3-2.
- ⁷ We assume an average elasticity of supply of between 1 and 3 (based on EIA's chosen elasticity of supply for U.S. coal (Haggerty et al., 2015)); this results in estimated lost revenue of between \$1.2 billion and \$600 million, from 2009 through 2013. Regional supply elasticity in the Powder River Basin may be more inelastic (lower), making the upper limit on lost revenue about \$1.6 billion.
- ⁸ See 43 C.F.R. §§ 3473.3-2; 3432.2(c).
- ⁹ This value assumes that there is no leakage to non-federal areas in the United States.
- ¹⁰ For more information on why the Social Cost of Methane is a lower bound estimate of the social cost of methane emissions, see: Institute for Policy Integrity, NYU School of Law, *Joint Comments on Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Heavy-Duty Engines and Vehicles; Phase 2* (Oct. 1, 2015), available at http://policyintegrity.org/documents/Oct2015_Joint_Comments_to_EPA-NHTSA.pdf.
- ¹¹ This issue is described in more detail in our October 2015 report, *Reconsidering Coal's Fair Market Value*, *supra* note 2 at 21.
- ¹² This policy brief focuses on “upstream” externalities produced at the mine site and “midstream” externalities produced by coal transportation, as opposed to “downstream” pollution that occurs at power plants or industrial end users. For an analysis of both upstream and downstream coal externalities and corresponding royalty rate increases, see Alan Krupnick, Joel Darmstadter, Nathan Richardson, and Katrina McLaughlin, PUTTING A CARBON CHARGE ON FEDERAL COAL: LEGAL AND ECONOMIC ISSUES, RESOURCES FOR THE FUTURE (March 2015), available at <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-15-13.pdf>.
- ¹³ See 43 C.F.R. §§3473.3-2(e), 3485.2(c)(1).
- ¹⁴ See Mark Haggerty, AN ASSESSMENT OF U.S. FEDERAL COAL ROYALTIES CURRENT ROYALTY STRUCTURE, EFFECTIVE ROYALTY RATES, AND REFORM OPTIONS, HEADWATERS ECONOMICS 8 (Jan. 2015), available at <http://headwaterseconomics.org/wphw/wp-content/uploads/Report-Coal-Royalty-Valuation.pdf>.



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