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HEADWATERS ECONOMICS

An Assessment of U.S. Federal Coal Royalties

Current Royalty Structure, Effective Royalty Rates, and Reform Options

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ABOUT HEADWATERS ECONOMICS

Headwaters Economics is an independent, nonprofit research group whose mission is to improve community development and land management decisions in the West.

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I. EXECUTIVE SUMMARY

Coal extracted from federal land is an important source of energy and revenue in the United States. The U.S. government owns roughly one-third of total coal reserves. Bonus payments and royalty revenue from minerals extracted from public lands and waters represent the largest non-tax source of income for the federal government. Despite the importance of this revenue stream, little information is available to describe accurately the return to the public from taxation of federal coal resources. This paper analyzes how revenues from federal coal are obtained, estimates current effective royalty rates, reviews problems with the current system, and assesses policy reform options.

Challenges with Royalty Structure

The Bureau of Land Management (BLM) and the Office of Natural Resources Revenue (ONRR) administer the federal coal leasing program and have multiple and diverse objectives: a fair return for U.S. taxpayers, economic development and jobs, energy costs and security, and environmental protection. Royalties are the owner's share of the resource value, but the ONRR often accepts less than full value—the effective royalty rate is 4.9 percent of the gross market value of coal extracted between 2008 and 2012 (compared to the average statutory rate of 12.3 percent). Evaluating the effective returns earned by the ONRR under the current royalty structure reveals several problems:

- The first problem is transparency. The royalty rates applied to each lease, prices used to determine royalties due, and allowable cost deductions are all considered proprietary and data are withheld. As a result, there is little outside oversight of the royalty structure, engendering uncertainty about how the government is balancing competing interests.
- Second, the cost of administering the current royalty structure is high. Royalties are often based on non-market transactions where prices are uncertain and the ONRR uses complex valuation methods that are expensive to administer.
- Third, coal valuation procedures raise questions about fair returns to the U.S. government. The ONRR values coal for royalties at the first point of sale at or near the mine, limiting royalty collections when the coal is remarketed at significantly higher prices, including for export.

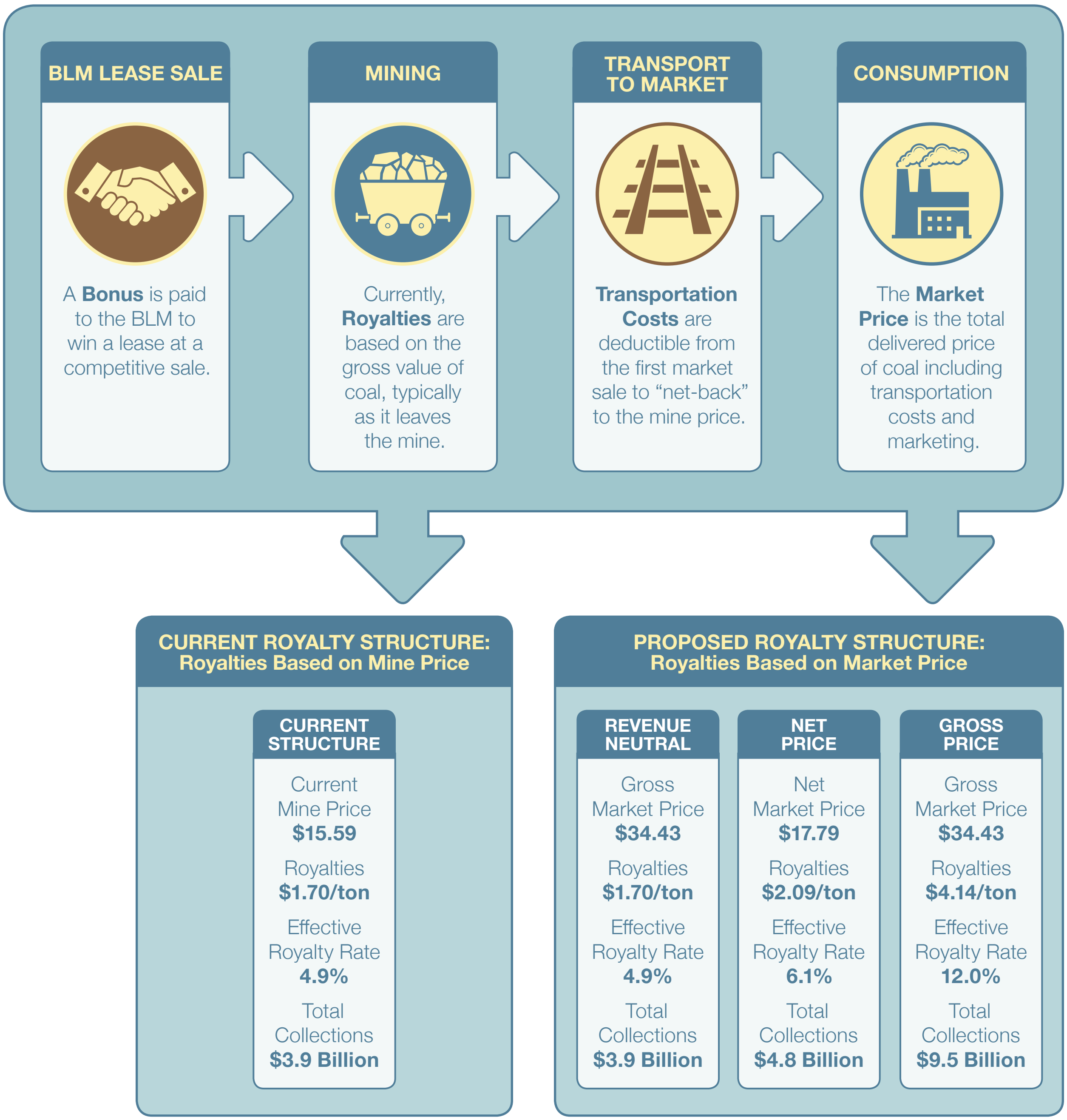
Royalty Reform Options

A range of alternative policy options would remedy problems with the current system and offer benefits to the U.S. public. The figure on the next page illustrates the current coal royalty structure, valuation policy, and returns, and illustrates the projected outcomes of reforms that would value coal for royalties using market prices. Changing the point of valuation would achieve several benefits:

- Moving the point of valuation would improve transparency. Market prices of coal are known. The BLM and the public would have easy access to coal valuation data.
- Reform would greatly simplify the valuation process and reduce administrative costs.
- Reforming the royalty structure also makes it easier to assess what a fair return is, and balance these returns against other competing interests.

The figure compares the current royalty structure to three reform options. For current policy, the analysis uses actual coal sales and royalty collections between 2008 and 2012. The figure shows that the effective royalty rate over this period was 4.9 percent, and royalty collections averaged about $1.70 per ton. The price used to determine royalties averaged $15.59 for all federal coal sales.

Current U.S. Coal Royalty Structure, Valuation Policy, and Reform Options



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The first reform option would be revenue neutral, achieving transparency and administrative cost reductions without changing royalty collections.

The second reform option shows that had coal valuation been based on net market prices during the same period, the effective royalty rate would have been 6.1 percent, royalty collections would have averaged $2.09 per ton, and total collections more than $850 million higher ($4.8 billion in total revenue compared to $3.9 billion in revenue under the current system). Royalty collections would have been higher because the average net market price paid for coal delivered from states with federal leases between 2008 and 2012 was $17.72, about two dollars per ton higher than the current reported sales price. The difference is an estimate of the margins (or profits) earned by affiliated and non-affiliated brokers that paid a low price at the mine for federal coal, and then remarketed this coal at higher domestic and export market prices.

The third reform option shows that had coal been valued for royalties using the gross market value—meaning transportation costs would no longer be deductible expenses—the effective royalty rate would have been 12 percent and average collections per ton would have been about $4.14 per ton. Total royalty collections would have been about $5.5 billion higher than actual royalties.

Interpreting Results

The Office of Natural Resources Revenue (ONRR) is currently proposing to change the regulations governing valuation of coal for royalty purposes. While this paper does not specifically address the rulemaking process, the results can inform the public comment and ultimately the rule that ONRR adopts.

The ONRR proposes to retain royalty valuation at or near the lease, using gross proceeds from the first arm's-length transaction (or market sale) as the basis for royalties. The rule is specifically designed to address situations where the first sale is to an affiliate broker—in other words, it is not at arm's-length and may be structured only to avoid paying royalties on the higher market value of federal coal. In making this change, ONRR would use the first market sale to determine royalty valuation.

One way to interpret our results is that the rule would effectively change royalty valuation to the net market price of coal (if transportation costs are still deductible). However, non-affiliated brokers may still play an important role in the coal market, and the rulemaking would do little to affect royalty collections. Our results define the upper end of the possible outcomes that could range from very little change up to an increased royalty payment per ton averaging about $0.18 for federal coal in Montana and Wyoming (after accounting for state severance tax and corporate income tax interactions).

If the rulemaking additionally limits transportation costs deductions to 50 percent of actual costs, the effect of the rulemaking could be an average increase in royalty payments per ton of about $0.85 per ton (after accounting for state severance tax and corporate income tax interactions). Again, this estimate should be considered the upper end of costs that would accrue only if closing the affiliate broker loophole results in mines in Montana and Wyoming marketing all federal coal directly to consumers. If, however, brokers remain an important player in the market structure (and they still retain a cost advantage over a mine marketing coal directly by avoiding royalty payments), then changing royalty valuation and transportation deductions will have little, if any, effect on collections.

Data Withholdings and Error

Throughout this report we endeavor to use publically available data. We do this for two reasons: so that our methods and data can be easily assessed and replicated; and to document the challenges created by federal data withholdings. Understanding the current coal royalty structure is limited primarily by data availability. Detailed descriptions of data, methods, and results are presented in three appendices. In Wyoming, coal sales from federal leases account for 93 percent of all coal sales in the state. As a result, we are more confident in estimates of effective tax rates in Wyoming compared to results in states where sales from federal leases account for a small share of all coal sales in the state.

II. INTRODUCTION

This report presents data and analysis to help decision makers evaluate possible updates to the federal coal leasing and royalty valuation program. It is intended to contribute to a growing body of literature evaluating the federal coal program that includes recent reports from the U.S. Government Accountability Office (GAO)[1] and the Department of Interior (DOI) Inspector General.[2]

Coal extracted from federal land is an important source of energy and revenue in the U.S. The U.S. government owns roughly one-third of total coal reserves. Production from federal leases has increased steadily from a low of about three percent of all mining in 1960 to 43 percent of total domestic coal production today. The increase in federal coal production was ushered in by a shift toward large western surface mines—80 percent of federal production now comes from the Powder River Basin in Wyoming and Montana.[3]

Coal extracted from federal land generates revenue for the United States through bonus payments, annual royalties, and taxes paid by private companies that negotiate for rights to mine the public resource. Bonus payments and royalty revenue from minerals extracted from public lands and waters represent the largest non-tax source of income for the federal government. Royalties are paid to the U.S. Treasury, and roughly half (49%) are returned to the states where the production activity takes place.[4]

Despite the importance of this revenue stream, little information is available to accurately describe the return to the public from taxation of federal coal resources. The topic has gained currency lately because of recent reports and press suggesting the BLM now is not receiving fair compensation for federal coal resources,[5] and because the Office of Natural Resources Revenue (ONRR) is undertaking a rulemaking process to reform aspects of the royalty and leasing structure.[6] In addition to this agency-led reform process, members of the Senate and Energy Natural Resources Committee have called for a larger review.[7] The BLM also is facing a lawsuit intended to force a review of the agency's coal leasing program in light of concerns about coal's role as a major source of greenhouse gas emissions.[8]

This report evaluates royalties on federal coal. One important step in the report is estimating the effective royalty rates under the current royalty structure and coal valuation policy. Our study discusses why effective rates fall below statutory rates and the potential outcomes of reforms that move the point of royalty valuation from the price received by the lessee at the first point of sale, typically as it leaves the mine (the mine price), to the delivered price, or market price of coal. The benefits of moving the point of valuation include increased transparency, lower administrative costs, and flexibility to consider higher royalty returns.

This report begins with a brief review of findings followed by documentation of data and methods. The first section of the report surveys the current federal royalty structure for federally owned coal. The second section presents findings on the effective royalty rate on federal coal with comparisons to reported rates and rates on other energy resources extracted from federal lands. Finally, the report defines several reform options and describes the outcomes of these potential reforms on effective rates, royalty revenue, and costs on the extraction of federal coal. An appendix at the end of this report describes data sources and methods.

III. U.S. FEDERAL ROYALTY STRUCTURE: HOW IT WORKS CURRENTLY

Bonus payments and royalties are part of a broader fiscal regime that collects revenue at the local, state, and federal level from the value of resources extracted from public lands. Internationally, countries generate revenue from state-owned resources in a variety of ways, including state-owned corporations, production agreements, and variations on the tax and royalty structure. Resource owners commonly structure leases, bonus payments, royalties, and taxes to ensure a fair and predictable return to the public and to share in windfall profits. In the U.S. the bonus and royalty structure provides a minimum return, and corporate income taxes are typically used to share in the profits and risks of mineral extraction and to incentivize exploration, new technologies, and production.

The U.S. is unique in that private individuals and companies own the majority of natural resources, and where the public does own resources, these resources are leased to private developers. The government uses the corporate income tax to tax profits as well as to provide subsidies and create incentives including cost recovery for exploration and mining activities that are not deductible from royalties. Subsidies in the corporate tax structure can be significant.[9] The sidebar *"Revenues from Oil, Natural Gas, and Coal Production on Federal Lands"* on the next page defines the several bonuses, royalties, and taxes coal companies pay.

Figure 1 focuses on the bonus and royalty structure, particularly the point of valuation for royalty determination. It shows that the federal coal royalty structure begins when a bonus payment is made to the BLM to win the right to extract coal through a competitive lease sale. Once mining is underway, the lease can be renewed and companies pay an annual royalty on the gross value of the coal extracted.[10] The valuation of coal for royalty purposes typically takes place as the coal leaves the mine. "Downstream" from the mine, the coal is transported primarily by railroad, but also by truck, waterway, and conveyor belt to a domestic power plant, or exported to foreign markets. At the end of this process, the coal is resold at the market rate depending on its energy content and other qualities.

In addition to lease bonus payments and royalties on extraction, companies pay state and federal corporate income taxes, state severance taxes, and a variety of sales and property taxes to state and local governments. Royalties often influence other aspects of the producer's tax liability. For example, the royalty interest in coal extracted from public land, including federal, state, tribal, and local government ownership, is exempt from state severance taxation. Royalties are also deductible from corporate income tax liability. If the federal rate (or share of production) increases, or if actual collections change, severance taxes and income taxes will rise and fall accordingly. An implication of these tax interactions is that companies do not pay the full cost of higher royalties. These will be offset by lower corporate income taxes and state severance taxes.

Recent government audits have considered coal lease sale and bonus payment processes extensively.[11] In separate reports, the GAO and the Inspector General of the DOI arrived at the conclusion that lease sales undervalue public coal. Specifically, the reports observe that nearly every lease sale since 1990 had only a single bidder, that the fair market valuation process was not transparent, and that overall it is difficult to determine if the BLM and ONRR is receiving full consideration for the public's coal.[12]

Revenues from Oil, Natural Gas, and Coal Production on Federal Lands

Bonus Payments and Rents: Companies pay bonuses (a premium paid to the BLM to win a leasing contract to mine in a specific area) through the competitive leasing process, and fees or rents to maintain a lease. Bonuses are one-time payments generally calculated on a price per ton basis. Rental payments are charged on a per acre basis and are paid annually to maintain the lease.

Royalties: Royalties are production taxes paid on the volume or value of coal extracted annually to the owner of the resource, including federal, tribal, state, and private landowners. Federal royalties are paid to the U.S. Treasury, and roughly half are returned to the states where drilling takes place. Federal royalties are 12.5 percent for surface coal, oil and natural gas; 18.75 percent for offshore oil and natural gas; and 8 percent for coal extracted from underground mines. Most states charge higher royalties of 16.67 to 25 percent on oil and natural gas while state coal royalty rates tend to mirror federal coal royalty rates.

Production Taxes: A production tax is any tax levied against the production value or volume of coal, oil, and natural gas extracted or "severed" from the earth. Production value is equal to the volume of the resource produced times the sales price. Wyoming and Montana's severance taxes are examples of state production taxes. In Colorado and Wyoming, local governments also levy ad valorem (property) taxes on the production value of fossil fuels, including coal, oil, and natural gas at the local level. The federal black lung excise tax and abandoned mine fees also are production taxes that are levied at a fixed rate on each ton of coal mined.

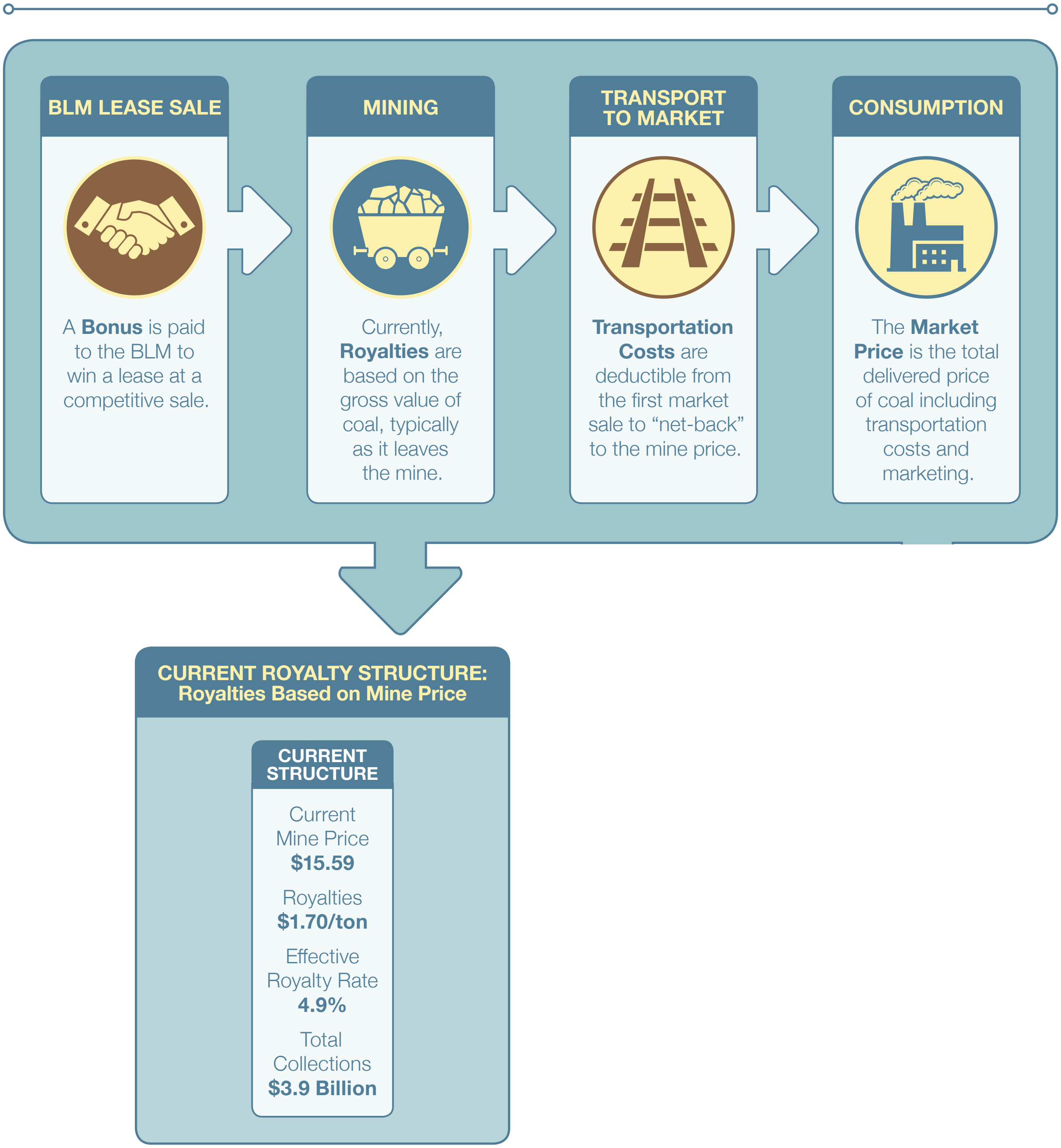
Corporate Income Taxes: Production taxes and royalties are distinct from corporate income taxes levied on net profits. Corporate income tax rates vary widely at the state level, ranging from zero (in Wyoming) up to about 10 percent for the highest tax brackets in several states, and 35 percent at the federal level. Compared to production taxes, bonus payments, and royalties, corporate income tax is paid on a smaller tax base (net profit compared to gross production value), and generates relatively less revenue for the federal and state governments.

General Taxes and Fees on Drilling and Mining Activity: State and local governments also levy taxes and fees on the value of labor, purchases, land, and equipment associated with drilling and mining activities. The general tax structure can be important to local governments, but the role they play varies from state to state. For example, sales taxes generate revenue in jurisdictions where activity takes place. In some states, however, sales taxes accrue to the state government and distributions are made on a formula unrelated to local impacts. Property taxes on land and equipment value are levied at the local government level.

This report address the royalty structure, including bonus payments, but does not address production taxes, corporate income taxes or aspects of the general tax structure specifically.

Figure 1:

Current U.S. Coal Royalty Structure



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Why Are Royalties Collected?

Royalties represent the owner's negotiated share of the value created when resources are used. The purpose of royalties is to provide a minimum, fair return to the resource owner for the depletion of non-renewable fossil fuels.[13] In the case of federally owned coal, the U.S. public owns the resource. The BLM oversees the leasing of the right to extract federal coal and the lessee pays annual royalties based on a percentage of the gross value of coal extracted from the lease (the mine price). The royalties accrue back to the public through the U.S. Treasury. Royalties are also paid to state, tribal, and private resource owners that lease the rights to extract fossil fuels.

When the BLM sells coal through a lease, the lessee agrees to take on the risk of developing the resources, including exploration, extraction, and marketing costs. The royalty interest is retained by the federal government and is paid by the lessee whether or not the mining company loses money on the sale, or earns a profit.

In practice, subsidies occur through two vehicles: direct subsidies offered at the discretion of the BLM in the form of royalty rates and rate reductions, and the coal market structure where brokers play a central role in delivering coal to markets, which serves to minimize the price used to determine royalties owed.

Royalty Rates and Rate Reductions

The BLM and coal operators negotiate royalty rates on a lease-by-lease basis, but generally are set at a minimum of 12.5 percent of the gross value of coal after it is extracted from surface mines and 8 percent for coal extracted from underground mines. Coal lessees can apply for a royalty rate reduction if the current royalty rate imposes economic hardship that would otherwise result in abandoning the lease, or in less than full recovery of leased coal. Rate reductions are also granted to encourage the greatest utilization of federal coal,[14] even in instances when high-cost or low-value coal would otherwise be uncompetitive in the domestic energy market.

The BLM makes a determination and has discretion to grant royalty rate reductions if three basic requirements are met:

1. The royalty rate reduction must encourage the greatest ultimate recovery of the coal resource.
2. The royalty rate reduction must be in the interest of conservation of the coal and other resources.
3. The reduced royalty rate is necessary to promote development of the coal resource.[15]

Royalty rate reductions occurred on at least 30 out of 83 leases (36 percent of leases) offered for sale since 1990.[16] The GAO found that the reported rate that lessees pay on the mine price used for royalty valuation varies between 5.6 percent in Colorado and 12.2 percent in Wyoming.[17] The lower reported rates are largely a function of the rate reductions offered for coal extracted from federal leases in these states.

How Coal Is Valued for Royalties

The valuation of coal for royalties is based on the gross value of the coal sold from the lease (the mine price).[18] To ensure full compensation, the lessee is required to place the coal in a "marketable condition" at no cost to the government. Costs for exploration, mining, and marketing are not deductible from royalty liability.

In the case where the mining company sells the coal in a market transaction, either directly to a consumer, such as a power plant, or to an unaffiliated broker, the contract price is used to determine royalties. If instead the mine sells coal to an affiliate, or to another company that is partly or entirely owned by the mining company, no arm's-length transaction occurs. An arm's-length transaction is defined as a sale of coal in which the buyer and seller are not affiliated and have competing economic interests. In other words, the seller attempts to sell his or her coal for the highest price possible, ensuring a fair market return for the government. In cases where sales are not at arm's-length (called "captive transactions") the ONRR is responsible for certifying that the price agreed to in the transaction is a fair price—or that it will provide a fair return to the government. In 2012, 42 percent of all coal sold in Wyoming was traded via captive transactions.[19]

The ONRR applies five benchmarks to determine the value—or price—that should be used for royalties. These methods include using comparable sales, the income approach, and "netback pricing" that uses a price earned downstream (typically the sale by the marketing affiliate) and deducts any costs. The ONRR's process of determining if a sale is an arm's-length sale or not, and auditing that the contract price reported to the agency is fair when no market transactions exist, is unwieldy and costly to administer, and opens a loophole that can be exploited to limit royalty liability.

Allowable Cost Deductions

Royalty regulations allow for certain deductions that can lower the value against which royalties are assessed. These deductions are netted out of gross sales value (the mine price), and include allowable transportation and washing costs.[20]

Transportation deductions are allowed when the valuation for royalty purposes is determined at a point remote from the mine. Deductions may be allowed for the "reasonable, actual costs incurred to transport coal" that may be required in order to move the coal from the lease to a point where it can be sold.[21] Transportation costs within the mine are not eligible for deduction. Transportation costs between a mine and a power plant or export terminal can be substantial, but these costs are typically outside of the royalty valuation process as value is determined at or near the mine. Long-distance rail shipments between the Powder River Basin and power plants on the East Coast, for example, are not part of the royalty valuation as the coal is typically sold (and valued) when it is loaded into trains at the mine.

Washing is defined as any process that improves the purity of the coal if it is required by the sales contract. The BLM may "allow a deduction in determining value for royalty purposes for the reasonable, actual costs incurred to wash coal" if they are considered to exceed what would normally be required to place coal in a "marketable condition."[22]

Data on coal extracted from leases sold since 1990 show that transportation cost deductions made up less than 0.3 percent of the sales value reported by mining companies for royalty valuation. In reality, transportation costs between the mine and domestic power plants average just less than half of the total delivered cost of coal (see Appendix B). The low value of allowable deductions reported by ONRR illustrate that coal is being valued for royalties at the mine in nearly every instance.

Problems with the Current Structure

Current federal policy for coal royalty payments appears to prioritize the maximum recovery of federal coal regardless of market conditions. The objective of obtaining fair return to the public is secondary both as a matter of policy and practice. Policy allows for reductions of royalty rates and taxable value; practice allows for a disparity between the valuation basis for royalties using mine prices and actual domestic and international market prices, which can be substantially higher.

To be sure, the government does not only seek to maximize return on federal resources. The BLM has multiple and diverse objectives, including a fair return, economic development and job creation, energy security, and environmental health, including climate mitigation. However, the trade-offs between these policy goals cannot be well understood in the context of the current royalty structure. Evaluating current effective returns primarily from the standpoint of ensuring a fair return to the public reveals several problems. These problems must be understood before the larger conversation about the correct balance between these competing uses can be fully informed.

The first problem is transparency. The entire valuation process is opaque with respect to public review. As a matter of practice, the BLM treats valuation methods—lease details including royalty rates, allowable cost deductions, and prices used for royalty assessment—as proprietary information. The BLM and ONRR explicitly exempt lease royalty rates and royalty valuation data from Freedom of Information Act (FOIA) requests. The timing, amount, and goals of royalty rate reductions could be important data points in understanding the competitiveness of coal as an energy commodity. With access to this information, U.S. policymakers could weigh the relative merits of subsidizing coal over other energy sources. But a thoughtful dialogue is more difficult when these important data are withheld.

Second, the ONRR's job is complicated by the regulation that values coal using the first arm's-length sale from the lease. The ONRR must determine if the first sale is in fact an arm's-length sale, and if not, if the reported mine price represents a fair return. The process for evaluating sales and valuing coal is unwieldy, expensive, and controversial.

Third, the same coal valuation process fails to ensure a fair return to the public. The ONRR's valuation policy clearly states that royalties must be assessed using the price received at the first point of sale, even when this first sale price is substantially lower than the market price for coal—meaning that the ONRR uses the lowest possible valuation of federal coal to determine royalties, reducing compensation for the extraction of public coal.

The rise of the Powder River Basin (PRB) as the main federal coal supplier has dramatically increased the role of affiliate and non-affiliate brokers. The PRB is so remote from most use, and the mines so huge, that the majority of coal is moved by rail to meet market demands, creating an opportunity for midstream exchanges through brokers. Brokers buy coal from these massive mines, and seek out the highest market price. The current structure that values coal for royalties based upon the first sale at or near the lease results in low royalty collections because this "mine price" can be substantially lower than the price coal is eventually sold for to consumers, including power plants, industrial users, and coal exports. The ONRR is investigating whether this current royalty valuation structure provides a fair return on federal coal and is proposing a rulemaking change to address valuation policies.

Often brokers are affiliates of the actual mining company, meaning that the exchange of coal does not occur under an arm's-length transaction. In these cases, the ONRR has to determine if the price agreed upon between related companies provides a fair return for the public. The ONRR's five benchmarks used to determine the appropriate "market' value are still designed around the policy of using the mine price for royalty valuation, and can be complex and costly.

IV. CALCULATING ROYALTY RATES

We describe three ways of evaluating the rate of return on federal coal: the statutory rate, the "reported" rate, and the "effective" rate. Comparing these different rates allows for a better understanding of how the current structure works and how it returns revenue from coal extraction.

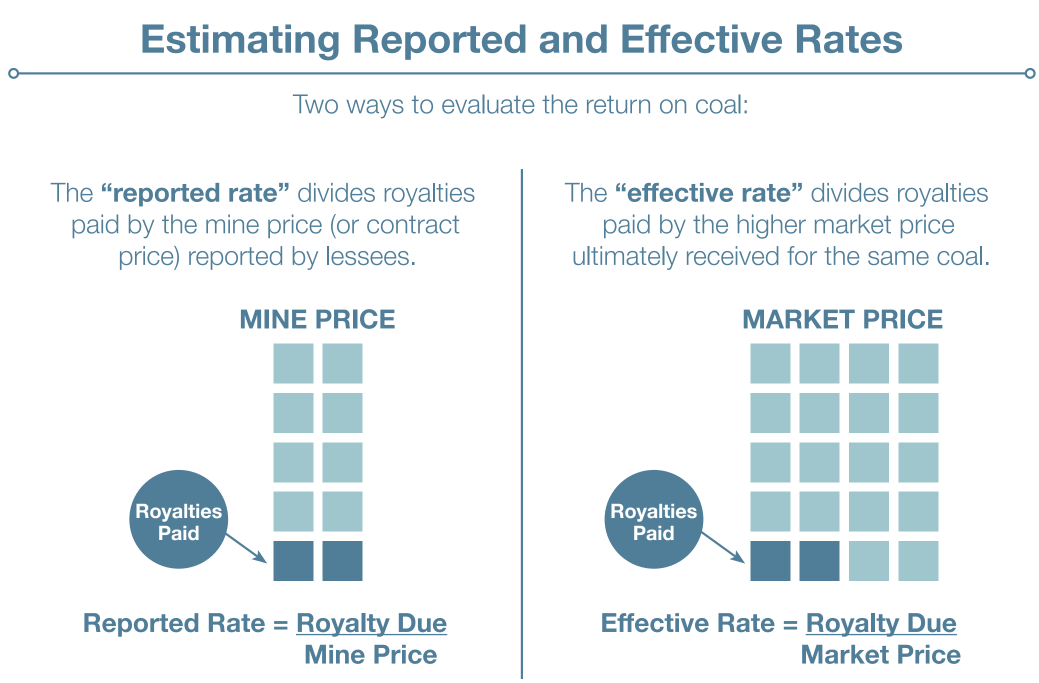
The statutory rate is set by regulation at a minimum of 12.5 percent of the gross value of coal extracted from surface mines. The regulation lowers the rate to 8 percent of the gross value of coal extracted from underground mines.

The "reported" royalty rate is calculated by dividing total royalties paid by the sales value reported by the lessee. The reported sales value is the contract price the lessee receives at the first arm's-length sale from the lease, or the "mine price."

The "effective royalty rate" is calculated by dividing total royalties paid by the market price ultimately received for the coal sold from federal leases. Figure 2 illustrates how the reported rate and effective rate are calculated.

Estimating the effective royalty rate offers significant improvements compared to the reported rate as the effective rate takes into account all incentives, deductions, and valuation policies. Kunce et al. (2003) write that "rather than itemize tax code details, effective tax rates are used to translate dynamic tax policy into a tractable form. Effective rates can be expressed as the ratio of taxes (or royalties) collected from a particular tax to the value of production. Thus, the calculation of specific effective tax rates fully account for exemptions, incentives, different tax bases, and frequent changes in tax law."[23]

Figure 2:



Importantly, we want to understand how royalty revenue would change if the tax base were redefined from the mine price to the market price. This comparison provides several outcomes: an estimate of what the BLM may be forgoing in royalty collections due to the affiliate loophole; a comparison to the return received from oil and natural gas production on federal lands; and estimates of the outcomes of reform options.

Reported Royalty Rates

Previous reports have established that royalty reductions and allowable transportation and washing cost deductions reduce the reported rate paid on federal coal downward from the statutory rate. The GAO, using 2012 data, found the actual rate lessees pay on the contract prices used for royalty valuation varies between 5.6 percent in Colorado and 12.2 percent in Wyoming.[24]

We replicated the GAO methods using additional years of sales value and royalty data[25] for all states with producing federal leases between 2008 and 2012. Figure 3 shows that North Dakota has the lowest reported royalty rate at 2.3 percent, and Wyoming the highest at 12.3 percent. The average reported rate for all federal coal produced from federal leases between fiscal years 2008 and 2012 is 10.9 percent. This compares to the average statutory rate of 12.2 percent nationally based on the share of coal extracted from surface mines and underground mines (See Appendix B).

Figure 3: Reported Royalty Rates and Size of Rate Reductions, FY 2008-2012

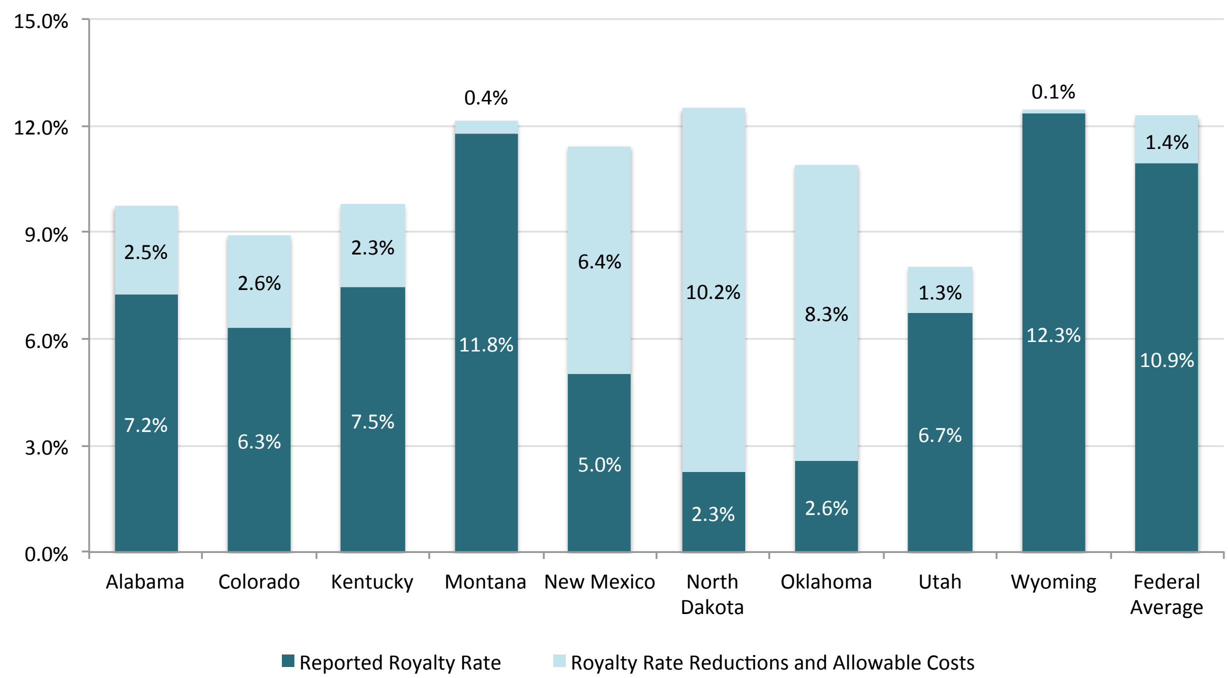


Table 1 shows that royalty collections per ton averaged $1.70 for all federal coal extracted between 2008 and 2012. The majority of federal coal extraction—and royalty value—comes from the Powder River Basin in Wyoming. Table 1 also shows that coal mined in the PRB received the lowest contract price (mine price) compared to mine prices in the other states. The five-year average mine price for coal sold from Wyoming was $13.07 compared to the national average of $15.59 and a high in Kentucky of $82.66.

Table 1: Sales Volume, Sales Value, Royalties, and Reported Royalty Rate, 2008-2012 (2013 $s)

State	Reported Sales Volume (tons)	Reported Sales Value	Reported Royalties Due	Reported Contract Price (Mine Price) ($/ton)	Reported Royalties Due ($/ton)	Reported Royalty Rate
Alabama	9,043,639	480,463,745	34,830,873	$53.13	$3.85	7.2%
Colorado	97,242,959	4,254,725,406	269,460,788	$43.75	$2.77	6.3%
Kentucky	977,116	80,768,664	6,019,775	$82.66	$6.16	7.5%
Montana	121,474,627	1,858,383,451	219,090,309	$15.30	$1.80	11.8%
New Mexico	18,418,053	913,339,362	45,911,763	$49.59	$2.49	5.0%
North Dakota	10,909,897	169,017,118	3,822,998	$15.49	$0.35	2.3%
Oklahoma	3,039,401	156,778,612	4,046,018	$51.58	$1.33	2.6%
Utah	55,144,127	1,982,399,360	132,991,300	$35.95	$2.41	6.7%
Wyoming	1,974,279,688	25,811,102,337	3,183,032,256	$13.07	$1.61	12.3%
Federal Total	**2,290,529,507**	**35,706,978,054**	**3,899,206,080**	**$15.59**	**$1.70**	**10.9%**

*Federal total reported contract price, reported royalties due and reported royalty rate are weighted averages.

The Value of Royalty Rate Reductions and Allowable Cost Deductions

The difference between the statutory rate and the reported rate in Figure 3 is the combined value of royalty rate reductions and allowable cost deductions. The majority of the difference is due to royalty rate reductions, with allowable costs making up only a small share of the difference. The BLM and Office of Natural Resources Revenue (ONRR) do not provide statistics on these costs. To estimate these values, we submitted a Freedom of Information Act (FOIA) request for a complete set of leases sold since 1990 for which we have actual production, total sales value, the value of cost deductions, and royalty payments data for coal produced.[26] These data are joined with lease statistics published by the BLM and specific data on royalty rate reductions (See Appendix A for data sources).

Data Used in This Report

Current Production, 2008 to 2012
The main findings presented in Figure 1 are based on the most current production data, including sales volume, sales value, royalties, transportation costs between the mine and consumers, and market prices between 2008 and 2012.

Lease Data, 1990 to 2013
Because of data withholdings, we requested data from ONRR for a known set of leases for which we have additional information on bonus payments, allowable transportation and processing cost deductions, and royalty rate reductions. We use these "lease data" to estimate the value of subsidies in the current royalty structure and to include statistics on the reported and effective bonus payment rates.

Using lease data since 1990, Figure 4 and Table 2 show the relative value of royalty rate reductions and allowable costs as a share of the reported royalty rate. Allowable transportation and processing costs combined to average about a third of one percent of total sales value for all coal produced from leases sold since 1990. Utah had the highest costs relative to sales value at 1.2 percent, while coal produced on federal lands in New Mexico and North Dakota had no allowable transportation or processing costs.

Table 3 shows that royalty rate reductions occurred on at least 30 out of 83 leases (36 percent of leases) offered for sale since 1990.[27] Royalty rate reductions can be applied for a fixed time period, often for a year, or can be granted for the life of the lease. In the case of Wyoming, nearly all coal is mined at the surface and only one of 21 leases sold since 1990 received a temporary royalty rate reduction. As a result, there is little difference between the estimated statutory rate and the estimated value of royalty rate reductions in Wyoming. In other states the reported rate is significantly lower than the estimated statutory rate, indicating that royalty rate reductions are more common in these states. For example, at least 11 of the 12 coal leases offered in North Dakota since 1990 have received royalty rate reductions to between 2 percent and 2.6 percent.

The value of these royalty rate reductions has lowered royalty payments by $294 million since 1990. The lease data describe about 34 percent of coal mined from all active federal leases between 1990 and 2013. The balance of total coal mined over this period is extracted from leases sold prior to 1990. If we assume royalty rate reductions are similar for leases sold prior to 1990, the total value of royalty rate reductions could be closer to $860 million from 1990 to 2013, or about $37 million annually (in 2013 dollars).

Figure 4: Allowable Cost Deductions as a Share of Sales Value, Based on Lease Data 1990-2013

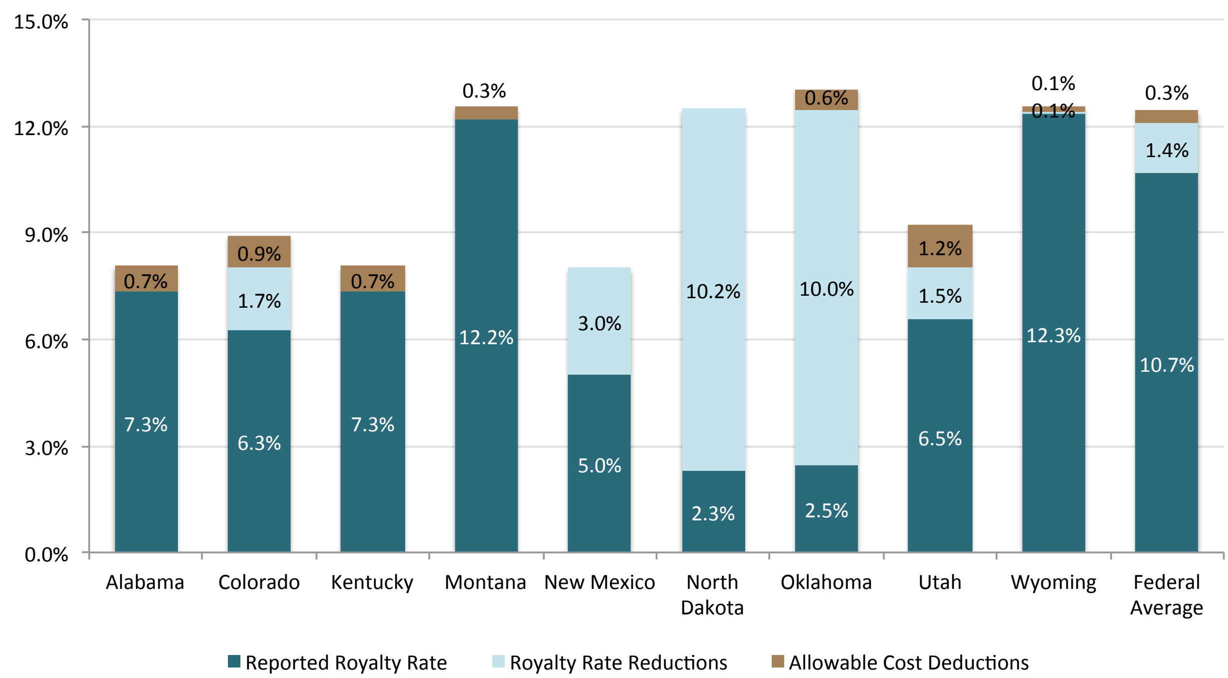


Table 2: Allowable Transportation and Processing Costs, Lease Data 1990-2013 (2013 $s)

State	Sales Value	Allowed Transportation Cost	Allowed Processing Cost	Net Taxable Value	Allowable Cost Deductions
Alabama	$648,199,202	$86,465	$4,633,541	$643,479,196	0.7%
Colorado	$5,646,464,779	$48,214,954	$3,640,680	$5,594,609,145	0.9%
Kentucky	$187,531,728	$202,056	$1,150,961	$186,178,711	0.7%
Montana	$567,928,408	$1,710,343	$154,711	$566,063,354	0.3%
New Mexico	$487,088,643	$0	$0	$487,088,643	0.0%
North Dakota	$432,262,237	$0	$0	$432,262,237	0.0%
Oklahoma	$479,159,488	$2,387,853	$359,145	$476,412,491	0.6%
Utah	$4,072,408,872	$48,143,213	$1,995,318	$4,022,270,341	1.2%
Wyoming	$32,129,773,453	$42,578,904	$0	$32,087,194,549	0.1%
Federal Total	**$44,650,816,810**	**$143,323,788**	**$11,934,355**	**$44,495,558,668**	**0.3%**

* Federal total allowable cost deductions is a weighted average.

Table 3: Estimated Value of Royalty Rate Reductions, Federal Coal Leased Since 1990

State	No. of Leases Sold Since 1990	No. of Leases Granted Royalty Rate Reductions	Share of Leases Granted Royalty Rate Reductions	Royalty Rate Reductions	Value of Royalty Rate Reductions
Alabama	3	0	0.0%	0.0%	$0
Colorado	16	9	56.3%	1.7%	$97,965,234
Kentucky	6	0	0.0%	0.0%	$0
Montana	4	0	0.0%	0.0%	$0
New Mexico	1	1	100.0%	3.0%	$14,612,659
North Dakota	12	11	91.7%	10.2%	$44,070,704
Oklahoma	6	5	83.3%	10.0%	$47,902,834
Utah	14	3	21.4%	1.5%	$59,309,705
Wyoming	21	1	4.8%	0.1%	$23,651,618
Federal Total	**83**	**30**	**36.1%**	**1.4%**	**$287,512,755**

* Federal total royalty rate reductions is a weighted average.

Total Reported Bonus and Royalty Rates

Bonus payments add an important source of revenue for the public from federal coal sales. Bonus payments total $3.7 billion for leases sold since 1990 (2013 $s), about 44 percent of revenue derived from these leases to date.[28] On a per-ton basis, bonus payments averaged $0.60 cents per ton. The highest average bids were in Wyoming at $0.66 per ton and the lowest were in North Dakota at $0.01 per ton. The per-ton bonus bid is expressed as the total bonus bid received at the time the lease is sold divided by the estimated amount of coal sold with the lease.[29]

To estimate the average reported return from bonus payments, we divide the per-ton bonus payment by the average contract price received for the same coal as it has been mined. Figure 5 and Table 4 show that the total reported return on bonus payments based on the average mine price is 3.9 percent. The highest reported return on bonus bids was in Wyoming at 5 percent, and was lowest in North Dakota and Oklahoma at less than 0.1 percent of the eventual mine price of the same coal when it was sold.

Figure 5: Total Reported Bonus Payments and Royalties, Lease Data 1990-2013 (2013 $s)

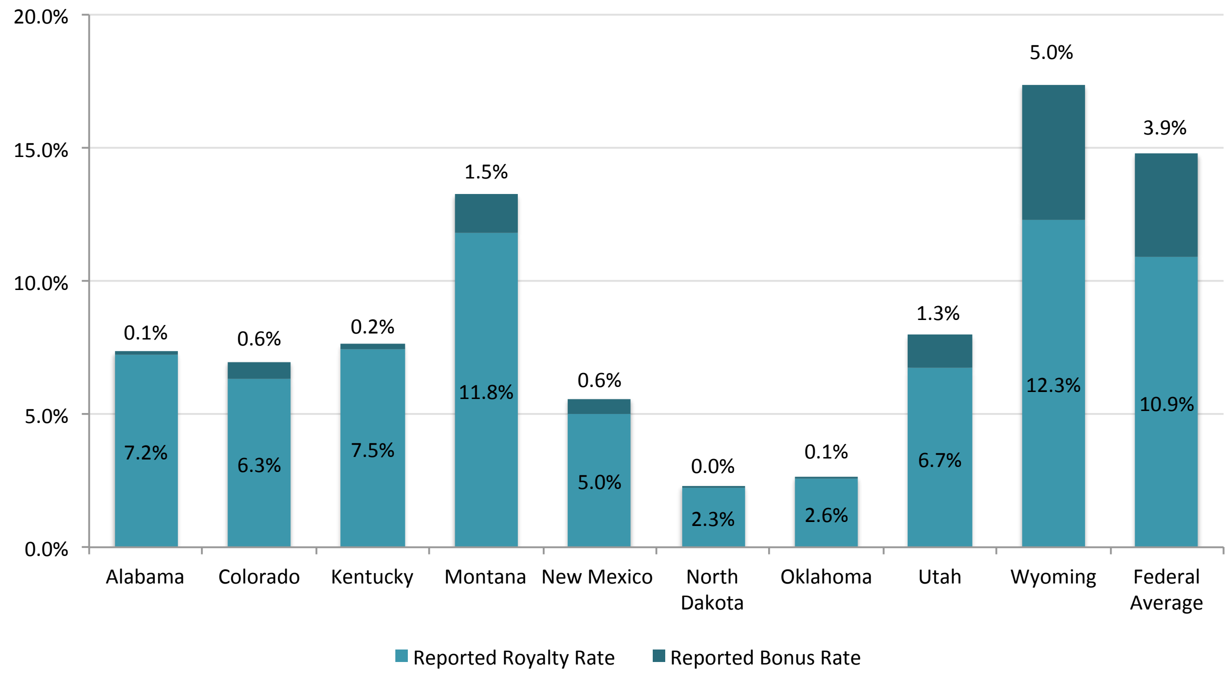


Table 4: Effective Bonus Rates, Coal Lease Data, 1990-2013 (2013 $s)

State	Estimated Amount of Coal Leased (thousand tons)	Total Accepted Bid (2013 $s)	Bonus Bid Per Acre (2013 $s)	Contract Price (2013 $s per ton)	Reported Bonus Rate	Total Reported Bonus and Royalty Rate
Alabama	19,014	955,923	$0.05	$53.13	0.1%	7.3%
Colorado	185,923	52,513,849	$0.28	$43.75	0.6%	7.0%
Kentucky	9,400	1,320,106	$0.14	$82.66	0.2%	7.6%
Montana	187,100	41,897,475	$0.22	$15.30	1.5%	13.3%
New Mexico	63,000	17,681,167	$0.28	$49.59	0.6%	5.6%
North Dakota	129,110	999,259	$0.01	$15.49	0.0%	2.3%
Oklahoma	58,409	2,432,282	$0.04	$51.58	0.1%	2.7%
Utah	198,786	91,546,365	$0.46	$35.95	1.3%	8.0%
Wyoming	5,426,092	3,568,766,373	$0.66	$13.07	5.0%	17.4%
Federal Total	**6,276,834**	**3,778,112,799**	**$0.60**	**$15.59**	**3.9%**	**14.8%**

* Federal total bonus bid per acre, contract price, reported bonus rate and total reported bonus and royalty rate are weighted averages.

Effective Royalty Rates

The effective royalty rate is calculated by dividing royalty collections by the gross market value of the same coal. Using current production data, we compared total royalties paid between 2008 and 2012 to market prices earned for coal sold by state of origin (the state where the coal is mined) to consumers including domestic power generators,[30] industrial users, coke plants,[31] and for export.[32]

Figure 6 shows that the effective royalty rate of return is lowest in North Dakota and Oklahoma at 0.7 percent and 2.2 percent respectively. The highest effective royalty rate is in Kentucky at 7.8 percent. Wyoming, which accounted for 86 percent of coal sales from federal leases between 2008 and 2012, had an effective rate of 5 percent. Montana, the second largest producer of federal coal, had an effective royalty rate of 4.6 percent over the same period. (See the sidebar on *Data Withholdings and Sources of Error* that follows Table 5.)

Figure 6: Reported and Effective Royalty Rates, 2008-2012

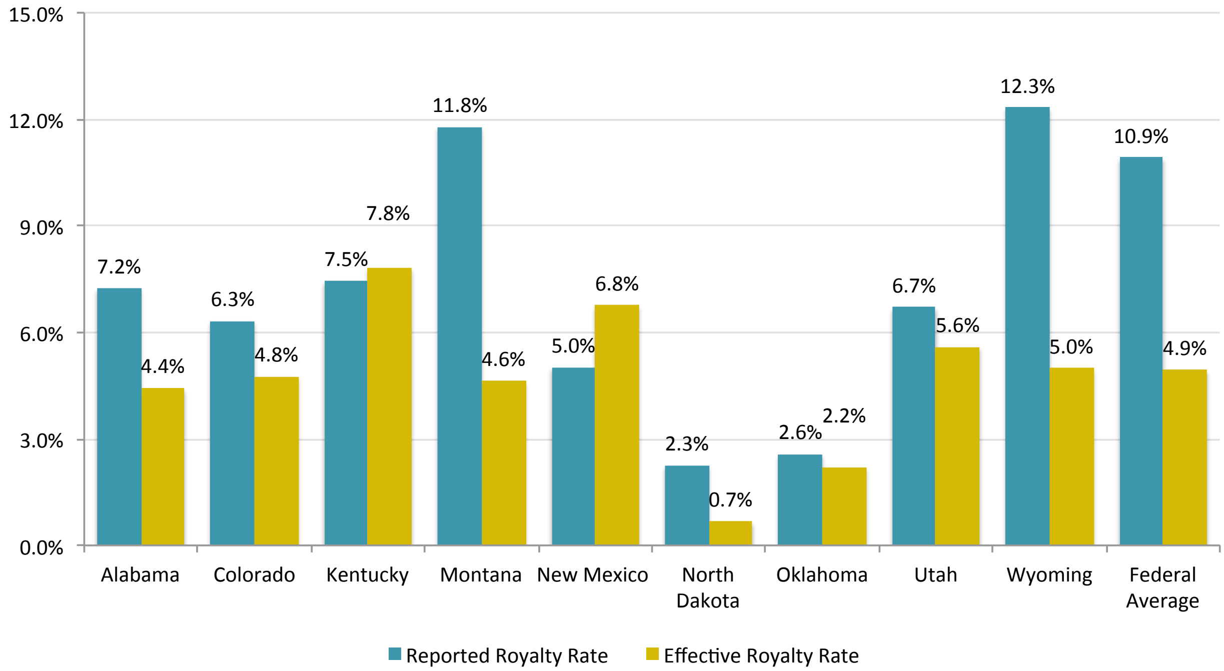


Table 5: Sales Volume, Gross Market Price, and Effective Royalty Rate, 2008-2012 (2013 $s)

State	Sales Volume (tons)	Gross Market Value of Federal Coal Sales	Gross Market Price	Total Royalties Due	Royalties Due ($/ton)	Effective Royalty Rate
Alabama	9,043,639	$784,434,555	$86.74	$34,830,873	$3.85	4.4%
Colorado	97,242,959	$5,651,339,647	$58.12	$269,460,788	$2.77	4.8%
Kentucky	977,116	$76,972,625	$78.78	$6,019,775	$6.16	7.8%
Montana	121,474,627	$4,724,611,243	$38.89	$219,090,309	$1.80	4.6%
New Mexico	18,418,053	$677,917,345	$36.81	$45,911,763	$2.49	6.8%
North Dakota	10,909,897	$561,134,088	$51.43	$3,822,998	$0.35	0.7%
Oklahoma	3,039,401	$182,653,002	$60.10	$4,046,018	$1.33	2.2%
Utah	55,144,127	$2,374,338,764	$43.06	$132,991,300	$2.41	5.6%
Wyoming	1,974,279,688	$63,828,848,193	$32.33	$3,183,032,256	$1.61	5.0%
Federal Total	**2,290,529,507**	**$78,862,249,462**	**$34.43**	**$3,899,206,080**	**$1.70**	**4.9%**

* Federal total gross market price, royalties due per ton, and effective royalty rate are weighted averages.

Data Withholdings and Sources of Error

In this report, we endeavor to bring together disparate datasets that have varying levels of specificity, data withholdings, and scales of assessment. This effort results in estimates with varying levels of accuracy, and introduces several sources of potential errors. Throughout the report, we document data sources and methods, and provide notes to orient the reader to how figures and tables should be interpreted.

Estimating effective royalty rates offers the first example of the challenges inherent in this project. To estimate effective rates, we compare sales values and royalty data reported by ONRR for federal leases in each state to the market price received for all coal sold from each state, including from leases on federal, tribal, state, and private land.

In Kentucky, for example, coal sales from federal leases account for one quarter of one percent of total coal sales. Prices received from this tiny fraction of all sales is unlikely to be representative of average market prices, and estimates that rely on comparing these two data sets will have high rates of error. Federal coal sales are a larger share in New Mexico (21% of total sales), but are still too small to provide reliable estimates of effective royalty rates. In Wyoming, coal sales from federal leases account for 93 percent of all coal sales in the state. As a result, we are more confident in estimates of effective tax rates in Wyoming.

Estimating Transportation Costs and Marketing Margins

The difference between the reported and effective rates in Figure 6 is the combined value of transportation costs between the mine and the consumer, and any margins earned when coal is remarketed by affiliates or independent brokers. In this case, transportation costs are costs incurred to move coal from the mine to the consumer.[33] In most cases, these costs are incurred after the coal has changed hands, and royalties have been paid, so they are outside of the royalty structure. Marketing margins are any profits earned by brokers who buy coal at a low price from the lessee at the mine, and sell the coal for a higher price for domestic consumption or for export.

To estimate the value of these marketing margins, we compare the net market price (gross market price less transportation costs) and the mine price. The difference is the increased value of coal, other than transportation costs that is created after royalties are assessed at the mine. Table 6 shows that the majority of the difference between net prices and mine prices is made up of transportation costs (about 92%). But the value of marketing margins is substantial, about $620 million in forgone royalties between 2008 and 2012. In other words, if lessees had paid royalties at current rates (including royalty rate reductions) on the net market value of coal during the five-year period, royalty collections could have been about $620 million higher, or $124 million annually. The majority of these gains would have been from Wyoming where the value of royalties forgone by not assessing them on marketing margins was about $520 million, or about $0.27 per ton.

Table 6: Estimated Value of Marketing Margins and Forgone Royalties due to Current Coal Valuation Policy 2008-2012 (2013 $s)

State	Sales Volume (tons)	Gross Market Price	Transportation Costs per ton	Net Market Price	Estimated Royalties at Current Rates	Estimated Total Royalties	Estimated Royalties Forgone
Alabama	9,043,639	$86.74	$4.21	$82.53	$5.98	$54,108,431	$19,277,557
Colorado	97,242,959	$58.12	$12.39	$45.73	$2.90	$281,636,042	$12,175,254
Kentucky	977,116	$78.78	$16.39	$62.39	$4.65	$4,543,465	-$1,476,311
Montana	121,474,627	$38.89	$19.09	$19.81	$2.34	$283,666,382	$64,576,073
New Mexico	18,418,053	$36.81	$9.73	$27.08	$1.36	$25,067,961	-$20,843,802
North Dakota	10,909,897	$51.43	W	NA	NA	NA	NA
Oklahoma	3,039,401	$60.10	W	NA	NA	NA	NA
Utah	55,144,127	$43.06	$2.55	$40.51	$2.72	$149,854,587	$16,863,287
Wyoming	1,974,279,688	$32.33	$17.08	$15.25	$1.88	$3,712,947,144	$529,914,888
Federal Total	**2,276,580,209**	**$34.43**	**$16.52**	**$17.79**	**$1.94**	**$4,511,824,011**	**$620,486,947**

* Federal total gross market price, transportation costs per ton, and net market price are weighted averages. "W" in the table indicates data withholdings.

Data Withholdings and Sources of Error:

Transportation costs are reported only for deliveries to domestic power plants, and not for deliveries for export markets, coke plants, and other industrial users. Where sales to these sectors other than domestic power plants are larger (as a share of total sales), transportation cost data may be poor proxies of costs for these markets.

All transportation costs are withheld for coal sales from North Dakota and Oklahoma, so it is not possible to estimate net market prices for these states at all. In Wyoming, by comparison, coal sales to domestic power generators account for 98.3 percent of all current coal deliveries (2008 to 2012). Montana coal sales to domestic power plants account for 95.7 percent of sales over the same period. As a result, the estimates for these two states are more realistic, and in total the value of forgone royalties during the five years is likely to be about $595 million.

Total Effective Bonus and Royalty Rates

To estimate the average effective return from bonus payments, we divide the per-ton bonus payment based on coal lease data between 1990 and 2013 by current market prices received for the same coal as it has been mined. Figure 7 shows that the total effective return on bonus payments in recent years for coal sold since 1990 is 1.7 percent. The highest effective return on bonus bids was in Wyoming at 2 percent, and the lowest was in North Dakota and Oklahoma at only 0.1 percent of the eventual mine price of the same coal when it was sold.

Bonus payments are included in this analysis because they are an important source of revenue and add to the total effective return on federal coal sales. There is also, in theory, some interaction between royalty costs to potential lessees and the price they are willing to bid to secure a federal coal lease. Finding that the average effective rate of bonus bids for coal sold since 1990 is less than two percent of the gross market value of coal sold over a recent five-year period suggests that bonus payments are less important than are royalties paid when coal is eventually mined from federal leases. On average, bonus payments contribute about a quarter of the total returns from federal coal leasing. Reforms to the royalty structure and coal valuation policy may have little or no effect on the BLM's fair market valuation determinations. Even if they do, the benefits of ensuring fair returns in the royalty structure will likely outweigh the potential for lower bonus payments.

Figure 7: Total Reported Bonus Payments and Royalties, Lease Data 1990-2013 (2013 $s)

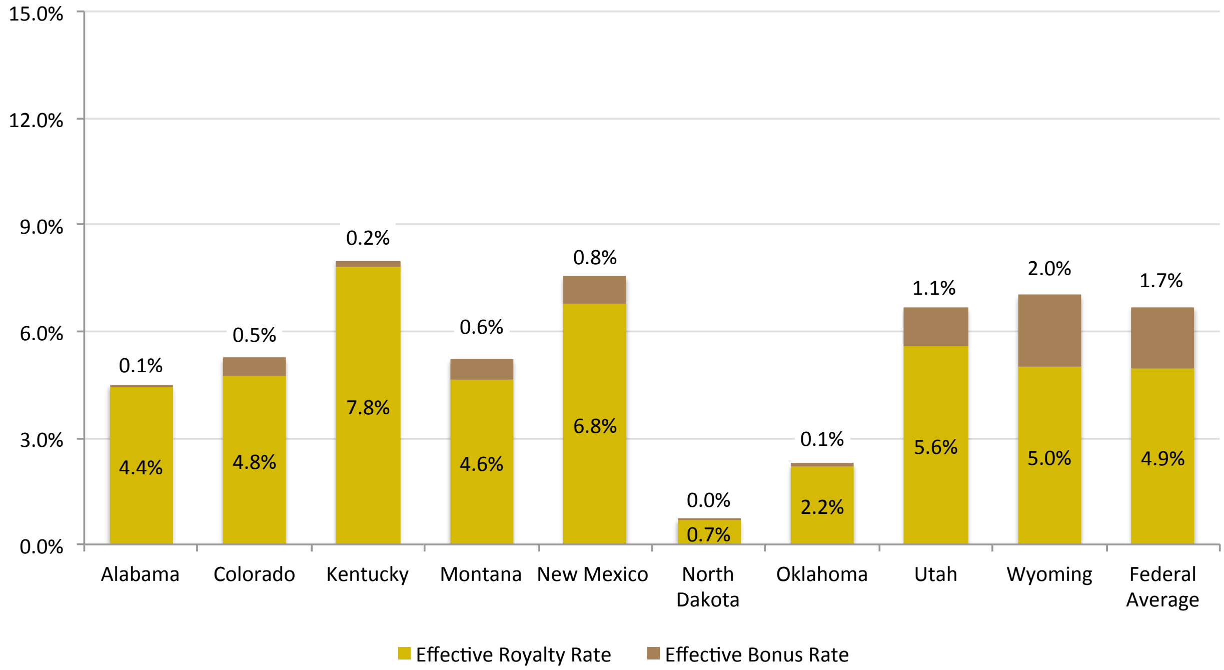


Table 7: Effective Bonus Rates, Coal Lease Data, 1990-2013 (2013 $s)

State	Estimated Amount of Coal Leased (thousand tons)	Total Accepted Bid (2013 $s)	Bonus Bid Per Acre (2013 $s)	Gross Market Price (2008-2012)	Effective Bonus Rate	Total Effective Bonus and Royalty Rate
Alabama	19,014	$955,923	$0.05	$86.74	0.1%	4.5%
Colorado	185,923	$52,513,849	$0.28	$58.12	0.5%	5.3%
Kentucky	9,400	$1,320,106	$0.14	$78.78	0.2%	8.0%
Montana	187,100	$41,897,475	$0.22	$38.89	0.6%	5.2%
New Mexico	63,000	$17,681,167	$0.28	$36.81	0.8%	7.5%
North Dakota	129,110	$999,259	$0.01	$51.43	0.0%	0.7%
Oklahoma	58,409	$2,432,282	$0.04	$60.10	0.1%	2.3%
Utah	198,786	$91,546,365	$0.46	$43.06	1.1%	6.7%
Wyoming	5,426,092	$3,568,766,373	$0.66	$32.33	2.0%	7.0%
Federal Total	**6,276,834**	**$3,778,112,799**	**$0.60**	**$34.43**	**1.7%**	**6.7%**

* Federal total bonus bid per acre, gross market price, effective bonus rate and total effective bonus and royalty rate are weighted federal averages.

Coal Compared to Federal Oil and Natural Gas Leasing

Oil and natural gas leased on federal lands generate revenue in the form of bonus payments, lease rentals, and royalties on the value of extraction. In general, the lease sale, bonus, and royalty structure are very similar to coal's: leases are sold through competitive lease sales, and lessees pay a bonus to the BLM to secure the lease and pay royalties based on gross value of the commodity when it is sold—in the case of oil and natural gas, typically at the wellhead. The statutory rate is 12.5 percent and rate reductions are available based on economic or cost considerations. Companies are also allowed to deduct transportation and processing costs.

Data on wellhead prices, gross taxable value, production, and benchmark market prices are more readily available for these commodities due to their different commercial and production characteristics. We use summary statistics for all oil and natural gas production between 1990 and

2013 to estimate total effective returns.[34] The effective rate is also estimated by dividing royalties paid by the market price of oil and natural gas.

Figure 8: Effective Bonus and Royalty Rate on Federal Oil, Natural Gas, and Coal Leases

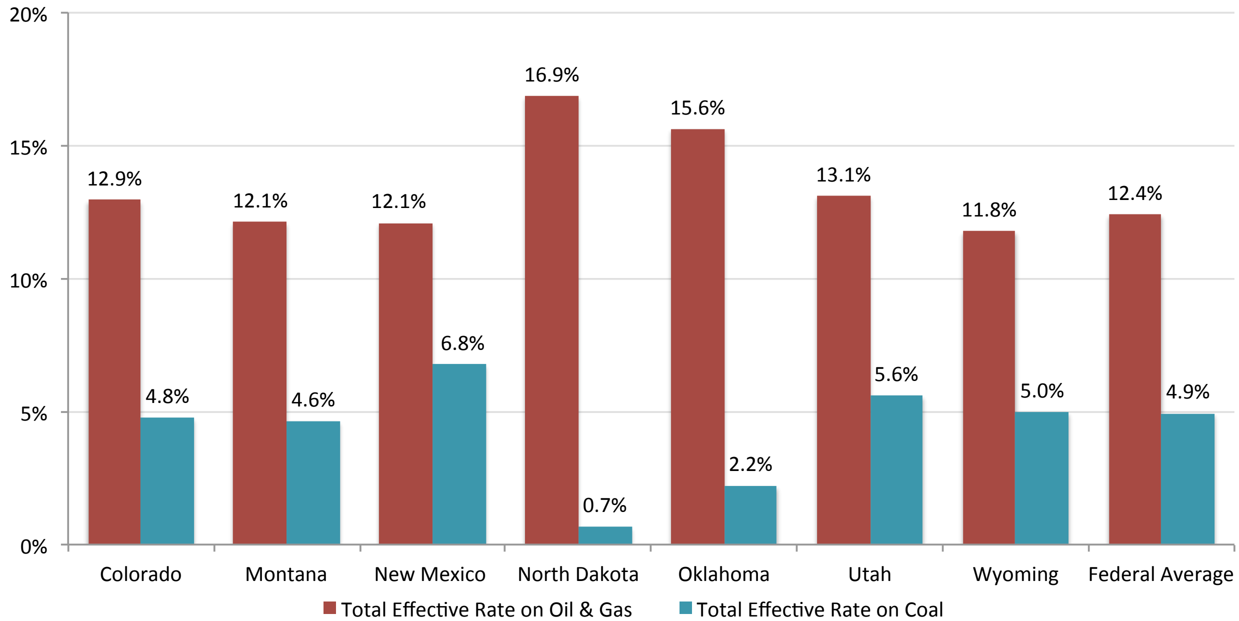


Figure 8 shows that oil and natural gas tends to pay a higher rate than coal. The difference has little to do with the royalty regulation, although it appears that royalty rate reductions are less often applied. More important is the different market for oil and natural gas. These resources are traded in global or national markets with many more individual producers and with greatly more value added in processing and refining after the resource is delivered to market. Transportation costs are lower, and the ability for brokers to earn margins by buying resources at low prices at the lease and remarketing them to consumers is more difficult—midstream brokers of oil and gas are typically selling to downstream brokers such as refiners who also buy in bulk. The difference between the wellhead price and the market price is therefore much smaller in oil and natural gas markets than in coal markets, and effective rates are much closer to the statutory rate.

The outcomes of similar royalty structures applied to commodities traded in different market environments are that oil and natural gas are subject to much higher effective royalty rates than coal extracted from public lands. Where coal and liquid fossil fuels (especially natural gas) compete as sources of electric energy, royalty policy confers an advantage to coal versus liquid fossil fuels, distorting energy markets.

Oil and natural gas also pay higher statutory rates when they are extracted from most U.S. states and from offshore federal waters. Royalty rates vary between 16.67 to 25 percent on state lands, and 18.5 percent in federal offshore waters.[35] By comparison, the U.S. onshore royalty rate of 12.5 percent for oil and natural gas is low, and the White House Office of Management and Budget (OMB) has initiated a review process to determine if the rate should be increased.[36]

V. STRUCTURAL REFORM OPTIONS: VALUING COAL USING MARKET PRICES

The Department of the Interior has identified coal valuation for royalties and current royalty rates as areas that deserve additional review and reform. The purpose of this report is to present data and analysis useful to decision makers as they evaluate options to update the federal coal royalty structure and valuation policy. The agency is already considering several reforms through a rulemaking process, including reconsidering current subsidies and closing marketing loopholes by addressing royalty valuation for coal sold through captive transactions (or non-arm's-length sales). It has also moved to improve transparency by making data more readily available to the public.

Addressing these issues independently may be ineffective and add to an already complex regulatory environment. Reforms may also fall short if they are not considered comprehensively. Reforming the current structure to use the gross market price of coal delivered for domestic use and export offers several benefits:

- Moving the point of valuation improves transparency. Market prices are known. The BLM and the public will all have easy access to coal valuation data.
- Because the structure would use published data, it greatly simplifies the valuation process and reduces administrative costs.
- Reforming the royalty structure also makes it easier to assess what a fair return is, and balance these returns against other competing interests.

Figure 9 illustrates the coal royalty structure and returns based on the current valuation policy of using the first sale, typically as coal leaves the mine. Figure 9 also illustrates the proposed reform that would value coal for royalties using market prices instead. The gross market price is the price paid by the ultimate consumers of federal coal, including domestic power plants, industrial users, coke plants, and coal sold for export. The net market price is the gross market price minus transportation costs incurred to move coal from the mine to the consumer.

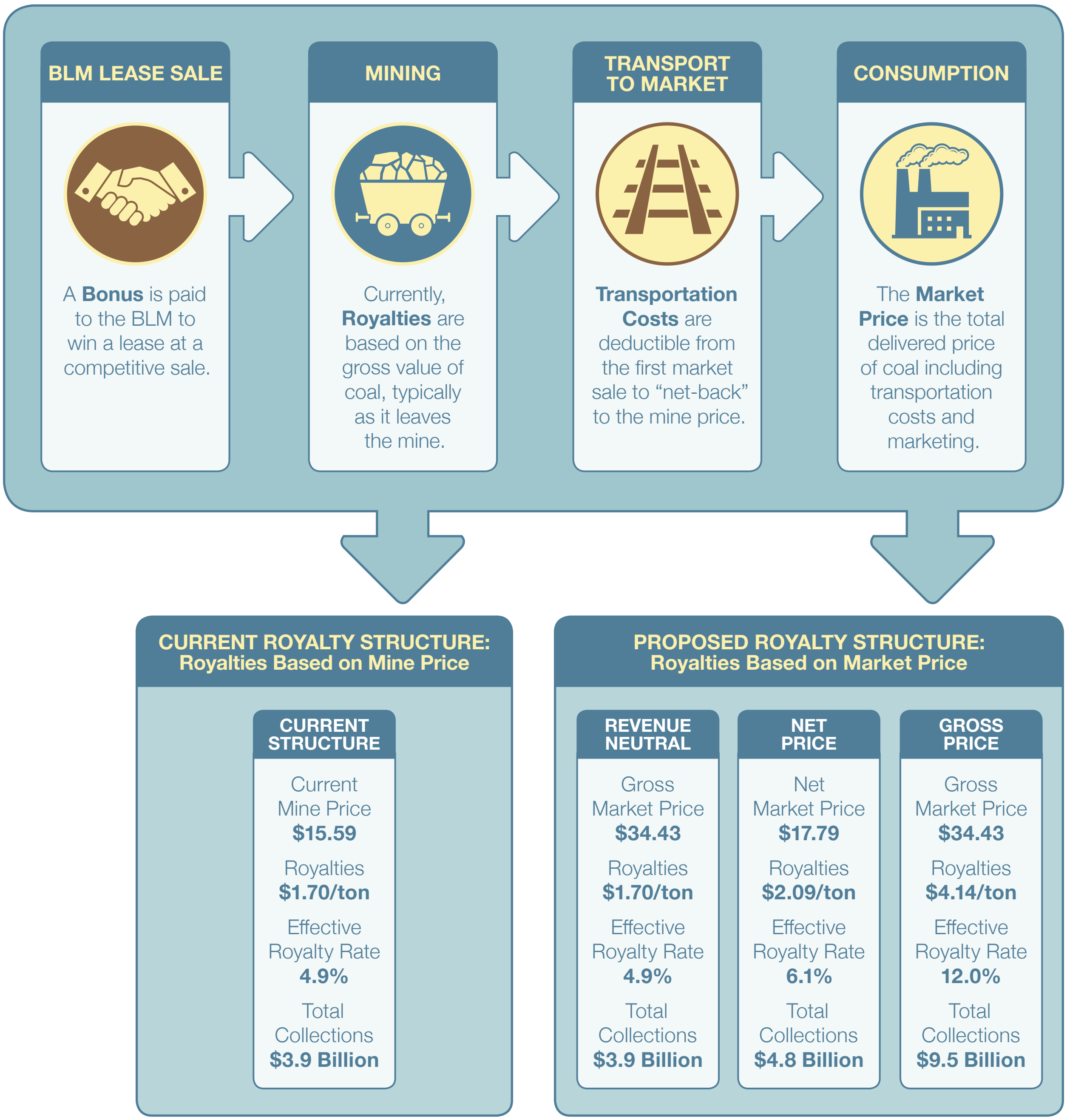
Revenue-Neutral Reforms

The BLM, which oversees the federal coal-leasing program, has multiple and diverse objectives: a fair return for U.S. taxpayers, economic development and jobs, energy security, and environmental protection. A royalty structure that is more easily understood will allow for a better assessment of how these goals are best met. The primary benefits of transparency, cost reductions, and policy flexibility can be achieved through revenue-neutral reforms. Moving the point of valuation from the mine price to the market price and lowering royalty rates to the current effective royalty rate would return the same revenue as the current royalty structure, but would do so with lower administrative costs.

The average effective rate for all federal leases between 2008 and 2012 was 4.9 percent. Ideally, the effective rate would be calculated and applied for each lease based on current production statistics. The data we provide here are all summarized at the state level, but provide the framework for how revenue-neutral reforms should be understood and implemented. The policy outcome would be a simple, transparent structure that effectively retains all current subsidies.

Figure 9:

Current U.S. Coal Royalty Structure, Valuation Policy, and Reform Options



http://headwaterseconomics.org

Royalty Valuation Based on Net Market Price

This reform option would apply current statutory rates to the net market price of coal. The policy outcome would be to simplify the royalty structure, eliminate subsidies in the regulation (royalty rate reductions), and close the affiliate broker loophole while retaining transportation cost deductions.

Figure 9 shows that the average net market price of coal delivered from states with federal production was $17.79 between 2008 and 2012. If royalties had been valued based on the net market price over this same period, total royalty revenue would have totaled $4.8 billion, or about $2.09 per ton. The effective rate would have been 6.1 percent. Had this reform been in place over the five-year period, royalty collections would have been about $865 million higher than actual collections.

The net cost to industry would have been smaller because higher royalty payments would result in lower state severance taxes and corporate income taxes.[37] For coal extracted from Montana and Wyoming (about 91 percent of total federal coal production), the total cost increase per ton would have been about $0.18, or about half a percent of the gross market price of coal. This additional cost may be passed forward as a higher delivered cost of coal, or it may be passed backwards onto the mining company or the marketing broker. If all costs are passed forward, it could result in a maximum increase in the delivered cost of coal of 0.5 percent.

Royalty Valuation Based on Gross Market Price

This option would apply current statutory rates to the gross market price of coal. The policy outcome would be to eliminate subsidies, cost deductions, and marketing loopholes—significantly raising royalty revenue. Figure 1 shows the average gross market price of coal delivered from states with federal production was $34.43 between 2008 and 2012. If royalties had been valued based on the gross market price over this same period, total royalty revenue would have totaled $9.5 billion, or about $4.14 per ton. The effective rate would have been 12.0 percent, compared to the actual effective rate of 4.9 percent.

In Montana and Wyoming, the reform would have produced more than $5.6 billion in additional royalty revenue. After considering the likely reduction in state severance and corporate income taxes, the net change in revenue would have been about $3.9 billion or $1.90 per ton.[38]

Interpreting Results

The Office of Natural Resources Revenue (ONRR) is currently proposing to change the regulations governing valuation of coal for royalty purposes. While this paper does not specifically address the rulemaking process, the results can inform public comment and ultimately the rule that ONRR adopts.

The ONRR proposes to retain royalty valuation at or near the lease, using gross proceeds from the first arm's-length transaction (or market sale) as the basis for royalties. The rule is specifically designed to address situations where the first sale is to an affiliate broker—in other words, it is not at arm's-length and may be structured only to avoid paying royalties on the higher market value of federal coal. In making this change, ONRR would use the first market sale to determine royalty valuation.

One way to interpret our results is that the rule would effectively change royalty valuation to the net market price of coal (if transportation costs are still deductible). However, non-affiliated brokers may still play an important role in the coal market, and the rulemaking would do little to affect royalty collections. Our results define the upper end of the possible outcomes that could range from very little change up to an increased royalty payment per ton averaging about $0.18 for federal coal in Montana and Wyoming (after accounting for state severance tax and corporate income tax interactions).

If the rulemaking additionally limits transportation costs deductions to 50 percent of actual costs, the effect of the rulemaking could be an average increase in royalty payments per ton of about $0.85 per ton (after accounting for state severance tax and corporate income tax interactions). Again, this estimate should be considered the upper end of costs that would accrue only if closing the affiliate broker loophole results in mines in Montana and Wyoming marketing all federal coal directly to consumers. If, however, brokers remain an important player in the market structure (and they still retain effectively a 12.5 percent cost advantage over a mine marketing coal directly), then changing royalty valuation and transportation deductions will have little, if any, effect on collections.

VI. CONCLUSION

Coal still supplies more than one-third of total U.S. electricity generation, and federal leases generate up to a billion dollars each year in bonus payments and royalties. Despite coal's importance to government revenue, the current royalty structure is opaque and costly to administer, and the returns to the U.S. public are unclear. Our assessment of the current royalty structure and estimates of effective tax rates suggest that the Bureau of Land Management is not receiving a fair return. The average effective tax rate of 4.9 percent (bonus payments contribute an additional 1.7 percent effective return) falls well short of statutory rates and is lower compared to the effective rates paid by oil and natural gas extracted from federal lands. We estimate that current subsidies in the regulation and marketing loopholes due to royalty valuation policy were worth about $850 million between 2008 and 2012.

The BLM and ONRR do not only manage the federal coal program to maximize returns. Federal coal leasing has multiple and diverse objectives: a fair return for U.S. taxpayers, economic development and jobs, energy costs and security, and environmental protection. However, significant changes in the structure of the coal market, including a larger share of production from western surface mines, an increasing role for brokers in the coal market, and the potential for significant new coal exports, have raised concerns about the current balance between competing interests.

The BLM and ONRR are undertaking several reforms, including a current rulemaking process to consider changes to the royalty valuation policy. The Department of the Interior is also revisiting royalty rates on oil, natural gas, and coal, and seeking to improve transparency of the lease sale and royalty program. This report concludes that moving the basis for coal royalty valuation from the mine price to the market price simplifies the royalty structure, creates transparency and lowers administrative costs, and allows for assessment of how the BLM is balancing competing interests in leasing federal coal.

APPENDIX A: DATA SOURCES

In order to calculate effective rates of return and assess the outcomes of reforms to the coal valuation structure, we combine statistics that describe annual production, total sales value, the value of cost allowances, royalties due, bonus bids, transportation costs between the mine and the point of consumption, and the market price of delivered coal. These data come from a variety of sources and must be joined to provide a full picture of the royalty structure.

BLM Lease Data

BLM lease data:

- Estimated amount of coal sold
- Bonus payment per ton
- Royalty rate reductions

ONRR Reported Royalties

ONRR revenue data:

- Sales value
- Sales volume
- Reported revenue (royalties and bonus payments)
- Allowable costs

Transportation Costs

EIA Transport Costs:

- Cost per ton for state-to-state deliveries by rail, truck, and waterway to the power sector

EIA Market Price Data

EIA Market Price Data:

- Delivered tons by consumer type and mine
- Market price by consumer type, including exports
- Primary transport mode to market

This section describes the various data and methods we use in this report.

Bureau of Land Management (BLM) Lease Data

Coal Lease Sales and Bonus Payment Statistics

Statistics for all leases sold from 1990 to the current year (2012) include the sale date, state, associated mine name, and lease-specific data including acres leased, estimated amount of coal leased, number of qualified bids, accepted bonus bid (total and per-ton), and the successful bidder.

Citation: U.S. Department of the Interior, Bureau of Land Management. "Total Federal Coal Leases in Effect, Total Acres Under Lease, and Lease Sales by Fiscal Year Since 1990." Washington, D.C. http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy/coal_lease_table.html.

Royalty Rate Reductions

Royalty rates are set for each lease and are considered proprietary and are withheld from public review. The Senate Energy and Natural Resources Committee conducted a review of the BLM lease process, including statistics that describe royalty rate reductions applied to BLM leases sold since 1990. These data were joined to the BLM Coal Lease Sales and Bonus Payment Statistics described above to estimate the value of royalty rate reductions granted to this same set of leases.

Citation: Royalty Rate Reductions for Leases Sold Since 1990. Personal communication, Senate Energy and Natural Resources Committee staff, June 13, 2014.

Office of Natural Resource Revenue (ONRR) Reported Royalties

Reported Sales Value, Sales Volume and Royalty Revenue

ONRR reports total sales volume and sales value for royalty purposes, and the resulting royalty, bonus, rental, and other revenue data. Statistics are organized by year and by state for specific commodity and product codes from 2003 to 2013. Royalty statistics prior to 2003 are only available at the commodity code, and bonus payment statistics are only available in total for all commodities combined. Statistics are reported for accounting year and sales year. Sales year statistics are used in this report.

Citation: U.S. Department of the Interior, Office of Natural Resources Revenue. Federal Onshore Reported Sales Value, Sales Volume, and Royalty Revenue. Sales Years 2003 to 2013. http://statistics.onrr.gov/.

Freedom of Information Act (FOIA) Request for Reported Sales Value, Sales Volume, and Royalty Revenue Associated with Leases Sold Since 1990

Data were requested through the Freedom of Information Act (FOIA) from the Office of Natural Resources Revenue (ONRR) on actual production, total sales value, cost deductions, and royalty payments data for coal produced from active leases sold since 1990.[39] Active leases are those that reported production since 2001.

In total, the BLM has leased over 6.3 billion tons of coal associated with the 83 leases since 1990. Cumulative production from these leases totals 3.3 billion tons, or a little more than half of the total coal sold over the same period. In real terms (expressed in 2013 dollars), the BLM received a total of $3.7 billion in bonus sales associated with these leases, and an additional $4.7 billion in annual royalty payments on actual production from these same leases.

Coal produced from the 83 leases in the dataset from 1990 to 2012 accounts for just more than a third of total federal coal production over the same period. The additional federal coal is produced from leases sold before 1990 that are still operating.

Citation: U.S. Department of the Interior, Office of Natural Resources Revenue. Reported Sales Value, Allowed Deductions, and Royalty Due for Federal Leases Sold Since 1990. FOIA Request no. 2014-0034, August 21, 2014.

Coal Production Data by Mine and Mine Type

These data are reported by operators at the mine scale on an annual and quarterly basis as part of their reporting requirements around mine safety. The original source is the quarterly Mine Safety and Health Administration survey that tracks production statistics as well as statistics on accidents, employment, and working hours by mine. U.S. Energy Information Administration makes these data available in several forms.

Citation: U.S. Department of Labor, Mine Safety and Health Administration Form 7000-2, Quarterly Mine Employment and Coal Production Report.
http://www.msha.gov/OpenGovernmentData/OGIMSHA.asp.

Data: U.S. Energy Information Administration. Coal Production Statistics.
http://www.eia.gov/coal/data.cfm#production.

EIA Transportation Costs

EIA Coal Transportation Rates to the Electric Power Sector

Transportation costs are reported by primary transportation mode (truck, waterway, and rail), by mine state, and destination state. The Energy Information Administration (EIA) compiles these data from form EIA-923. The reported data only include deliveries to electric power plants with at least 50 megawatt generating capacity. Data on transportation costs are withheld by EIA if there were too few mines or producers to maintain confidentiality.

Citation: U.S. Energy Information Administration. 2014. Coal Transportation Rates to the Electric Power Sector, Tables 4a, 4b, and 4c. http://www.eia.gov/coal/transportationrates/ Accessed 29 December 2014.

EIA Coal Price Statistics

EIA Delivered Prices to the Domestic Power Generation Sector

Data for the total quantity of coal delivered (measured in tons), average heat content (measured in millions of BTUs), and fuel cost (measured in cents per BTU) were obtained for individual coal deliveries monthly from 2008 through 2012 using data from the Fuel Receipts Data section of form EIA-923. These data report the state where the coal originated and the state where it was delivered.

Citation: U.S. Energy Information Administration. 2014. Electric Power Generation and Fuel Consumption, Stocks, and Receipts Monthly Time Series Data, Page 5 Fuel Receipts and Costs. http://www.eia.gov/electricity/data/eia923/ Accessed 30 December 2014.

EIA Metallurgical Coal and Industrial Consumer Prices

EIA provides average prices by the state of origin (the state where coal is mined) for deliveries to domestic power generators, industrial users, and coke plants (metallurgical coal).

EIA data sources are: U.S. Energy Information Administration Form EIA-923, Power Plant Operations Report, Form EIA-3, Quarterly Coal Consumption and Quality Report, Manufacturing and Transformation/Processing Coal Plants and Commercial and Institutional Coal Users, and Form EIA-5, Quarterly Coal Consumption and Quality Report, Coke Plants.

Citation: U.S. Energy Information Administration. Annual Coal Report. Table 34. Average Price of Coal Delivered to End Use Sector by Census Division and State. http://www.eia.gov/coal/annual/ Accessed 30 December 2014.

EIA Export Prices

Average price is based on the free alongside ship (f.a.s.) value for steam coal exports and metallurgical coal exports by foreign nation and regional totals. Data used in this report are total national average export prices, with the exception of exported coal originating in Wyoming and Montana. We use the total Asia export price for steam coal for these states (we assume since there are no domestic deliveries of metallurgical coal from these states that there are similarly no metallurgical coal exports).

EIA data source is Bureau of the Census, U.S. Department of Commerce, Monthly Report EM 545.

Citation: U.S. Energy Information Administration. Quarterly Coal Report. Average Price of U.S. Steam Coal and Metallurgical Coal Exports. http://www.eia.gov/coal/production/quarterly/ Accessed 30 December 2014.

APPENDIX B: METHODS

Estimating Average Statutory Rates

The average statutory rate is the weighted average of all surface coal mined in states with federal leases times 12.5 percent and all underground coal times eight percent. The formula is:

$$\text{Weighted Average Statutory Rate} = \frac{(\text{Surface coal (tons)} * 12.5\% + \text{Underground coal (tons)} * 8\%)}{\text{total coal (tons)}}$$

Table B1 shows the results of this calculation using current state production data. Data for surface and underground coal production are reported by MSHA for all coal extracted from each state, including federal, tribal, state, and private leases[40] (see the sidebar titled *Production Data: Federal vs. State Statistics*). These state data are compared to the reported royalty rate for federal production in Figure 3 to estimate the size of royalty rate reductions and allowable cost deductions.

Because not all state production comes from federal leases, comparing state production statistics to federal production statistics introduces error to the estimates. The ratio of surface and underground coal production in each state is more likely to be representative of the same ratio on federal lands if federal production makes up a large portion of total coal mined across the state. Table B2 shows the federal share of state production for each state, and the weighted average for all states with active federal leases. In Wyoming, federal production is more than 90 percent of all state production. In this case, the estimated average statutory rate is likely to be confident.

Table B1: Average Statutory Rate, Current State Production 2008-2012

State	State Surface Coal	State Underground Coal	Total State Production	Average State Statutory Royalty Rate
Alabama	37,967,229	59,747,469	97,714,698	9.7%
Colorado	29,106,476	111,807,443	140,913,919	8.9%
Kentucky	212,184,246	320,064,588	532,248,834	9.8%
Montana	191,530,083	16,175,839	207,705,922	12.1%
New Mexico	88,713,582	27,420,685	116,134,267	11.4%
North Dakota	144,281,418	0	144,281,418	12.5%
Oklahoma	3,652,006	1,976,744	5,628,750	10.9%
Utah	570,138	101,527,508	102,097,646	8.0%
Wyoming	2,162,916,368	18,471,802	2,181,388,170	12.5%
State Total	**2,870,921,546**	**657,192,078**	**3,528,113,624**	**12.3%**

*State total average royalty rate is a weighted average.

Table B2: Federal Share of Total Coal Mined by State, 2008-2012

State	Sales Volume from Federal Leases (tons)	Cumulative State Production, All Leases	Federal Share of State Total
Alabama	9,043,639	97,714,698	9.3%
Colorado	97,242,959	140,913,919	69.0%
Kentucky	977,116	532,248,834	0.2%
Montana	121,474,627	207,705,922	58.5%
New Mexico	18,418,053	116,134,267	15.9%
North Dakota	10,909,897	144,281,418	7.6%
Oklahoma	3,039,401	5,628,750	54.0%
Utah	55,144,127	102,097,646	54.0%
Wyoming	1,974,279,688	2,181,388,170	90.5%
Total	**2,290,529,507**	**3,528,113,624**	**64.9%**

*Total federal share of state total is a weighted average.

A second way to estimate an average statutory rate is to use the estimated amount of surface and underground coal leased since 1990 to describe current production from federal leases. Table B3 shows these results. These data indicate something about the resource base available for production in each state. However, it says little about actual production from all federal leases between 2008 and 2012. The leases sold since 1990 account for just more than a third of actual federal coal production during this recent five-year period.

The results vary very little regardless of which estimate of statutory rates are used. In Wyoming, where most federal coal production and coal value is produced, the difference in estimated statutory rate between the two methods is only .04 percent (four one-hundredths of one percent). The estimate of royalties that would be due if coal valuation were based on net market values would change by 3 cents, falling from an estimate of $2.09 in royalties due per ton to $2.06 in royalties due per ton. The effective rate estimate changes by less than a tenth of a percent (0.07%). In either case, is impossible to assess if the error introduced by poor data accuracy leads to over estimates or under estimates of actual statutory rates.

Table B3: Estimated Amount of Surface and Underground Coal Leased and Estimated Statutory Rate, All Leases Sold Since 1990

State	Estimated amount of coal leased	Coal leased from Surface Mines	Coal leased from Underground Mines	Percent of Coal from Surface Mines	Average Statutory Rate
Alabama	19,014	160	18,854	0.8%	8.0%
Colorado	185,923	0	185,923	0.0%	8.0%
Kentucky	9,400	0	9,400	0.0%	8.0%
Montana	187,100	187,100	0	100.0%	12.5%
New Mexico	63,000	0	63,000	0.0%	8.0%
North Dakota	129,110	129,110	0	100.0%	12.5%
Oklahoma	58,409	58,040	369	99.4%	12.5%
Utah	198,786	0	198,786	0.0%	8.0%
Wyoming	5,426,092	5,327,867	32,445	98.2%	12.4%
Federal Total	**6,276,834**	**5,702,277**	**508,777**	**90.8%**	**12.1%**

*The federal total average statutory rate is a weighted average.

Production Data: Federal vs. State Data

Production statistics are often available at the state level using MSHA and EIA reports. Equivalent data, including delivered costs, transportation costs, extraction from surface and underground mines, and others, are not available for production on federal leases reported by ONRR. When these data are not published for federal leases, we use the state data as a proxy, assuming that characteristics of federal production are similar to the broader production profile of all coal extracted from each state.

We use Federal Total and State Total to distinguish at which scale the data presented in a table or column are organized and reported. For example, Table B1 uses state data to estimate the average statutory rate paid by all coal extracted from each state—not only coal extracted from federal leases—based on the share of mining from surface and underground mines respectively.

See Appendix C for more.

Estimating Average Market Prices by State

Average market prices for each mine state and end use sector are estimated by combining total tons of coal distributed with the delivered price to calculate a weighted average. The EIA reports production and price statistics by state of origin for four types of domestic consumers, and for steam and metallurgical coal exports. Table B4 summarizes these data.[41]

Table B4: Domestic and Foreign Distribution of U.S. Coal by State or Origin and Consumer Type, 2008-2012 (thousand short tons)

State	Electric Power Sector	Commercial/ Institutional	Industrial Plants Excluding Coke	Coke Plant	Total Exports	Total State Distributions*
Alabama	38,786,509	0	6,490,079	5,913,879	46,993,100	98,183,567
Colorado	111,285,735	1,035,698	10,014,682	1,641	13,032,830	135,370,586
Kentucky	450,725,624	2,315,733	36,937,507	4,226,068	33,296,760	527,501,692
Montana	157,090,721	497,850	6,597,881	0	28,086,490	192,272,942
New Mexico	117,007,630	0	1,651,223	0	200	118,659,053
North Dakota	115,291,845	0	29,925,588	0	0	145,217,433
Oklahoma	2,194,940	0	2,141,078	96,375	6,000	4,438,393
Utah	83,977,784	37,655	12,967,191	0	3,498,110	100,480,740
Wyoming	2,115,595,143	280,318	36,538,888	0	20,480,830	2,172,895,179
State Total	**3,191,955,931**	**4,167,254**	**143,264,117**	**10,237,963**	**145,394,320**	**3,495,019,585**

*Note that Total State Distributions in Table B4 do not match Total State Production figures in Tables B1 and B2. Tables B1 and B2 include data from MSHA reports, while data included in B4 are from a variety of EIA reports on coal deliveries. These data sources rely on different methods and do not match perfectly.

Table B5 shows the price received for coal delivered to consumers[42] and for export[43] from each state. Market price estimates are based on EIA price data for domestic consumption and for export. We estimate weighted market prices by state of origin and by consumer type, including domestic consumption and export.

Table B5: Average Market Price of U.S. Coal Delivered to Consumer Types by State of Origin, 2008-2012 (2013 $s per ton)

State	Electric Power Sector	Commercial/ Institutional	Industrial Plants Excluding Coke	Coke Plant	Total Exports
Alabama	$81.52	$96.74	$70.38	$165.76	$83.36
Colorado	$54.66	$97.48	$70.34	$191.01	$75.09
Kentucky	$78.79	$96.33	$70.34	$172.76	$74.72
Montana	$33.42	$96.57	$70.54	$169.39	$61.05
New Mexico	$36.33	$96.74	$70.35	$169.39	$76.16
North Dakota	$46.49	$96.74	$70.48	$169.39	$74.13
Oklahoma	$46.36	$96.74	$70.18	$148.02	$72.78
Utah	$37.52	$96.41	$70.36	$169.39	$74.32
Wyoming	$31.24	$96.92	$70.50	$169.39	$75.60

Weighted average market prices for coal deliveries from federal land are calculated in two steps. First, the average market prices for all coal deliveries from each state (state total) are estimated by summing the gross proceeds for coal delivered to each end use sector (or consumer type), divided by total delivered tons to all sectors. The formula is:

$$\text{Weighted Average Market Price} = \frac{(\text{EP Value} + \text{CP Value} + \text{IP Value} + \text{CI Value} + \text{SE Value} + \text{ME Value})}{\text{Total Delivered Tons}}$$

Where:

EP Value = Delivered Tons * Delivered Price (Electric Power Sector)
CP Value = Delivered Tons * Delivered Price (Coke Plants)
IP Value = Delivered Tons * Delivered Price (Industrial Plants Excluding Coke)
CI Value = Delivered Tons * Delivered Price (Commercial/Institutional)
SE Value = Delivered Tons * Delivered Price (Steam Coal Exports)
ME Value = Delivered Tons * Delivered Price (Metallurgical Coal Exports)

The results are shown in Table B6.

Table B6: Total Gross Proceeds and Market Price for State Coal Distributions by State of Origin and Consumer Type, 2008-2012 (2013 $s per short ton)

State	Electric Power Sector	Commercial/ Institutional	Industrial Plants Excluding Coke	Coke Plant	Total Export	Total Gross Receipts	Average Gross Market Price (State)
Alabama	$3,161,809,501	$0	$456,760,209	$980,312,270	$3,917,444,542	$8,516,326,522	$86.74
Colorado	$6,082,859,024	$100,959,056	$704,442,020	$313,455	$978,578,654	$7,867,152,209	$58.12
Kentucky	$35,514,786,325	$223,084,092	$2,598,185,815	$730,101,088	$2,487,956,742	$41,554,114,061	$78.78
Montana	$5,249,951,047	$48,075,227	$465,421,015	$0	$1,714,780,271	$7,478,227,561	$38.89
New Mexico	$4,251,328,317	$0	$116,166,423	$0	$15,232	$4,367,509,971	$36.81
North Dakota	$5,359,812,923	$0	$2,109,226,601	$0	$0	$7,469,039,524	$51.43
Oklahoma	$101,765,335	$0	$150,257,904	$14,265,606	$436,674	$266,725,518	$60.10
Utah	$3,150,434,125	$3,630,284	$912,355,542	$0	$259,975,787	$4,326,395,738	$43.06
Wyoming	$66,098,624,933	$27,168,579	$2,576,029,876	$0	$1,548,302,450	$70,250,125,837	$32.33
Total States	**$128,971,371,529**	**$402,917,238**	**$10,088,845,405**	**$1,724,992,418**	**$10,907,490,352**	**$152,095,616,941**	**$43.52**

*The total state average gross market price is a weighted average.

Next, we apply the weighted average price for state coal to the total number of tons extracted from federal leases (federal total) within each state. This provides a weighted average national price for coal delivered from federal lands. The results are shown in Table B7.

Table B7: Total Gross Proceeds and Market Price for Federal Coal Distributions by State of Origin and Consumer Type, 2008-2012 (2013 $s per short ton)

State	Deliveries from Federal Leases 2008-2012	Gross Value of Federal Deliveries	Average Gross Market Price (Federal)
Alabama	9,043,639	$784,434,555	$86.74
Colorado	97,242,959	$5,651,339,647	$58.12
Kentucky	977,116	$76,972,625	$78.78
Montana	121,474,627	$4,724,611,243	$38.89
New Mexico	18,418,053	$677,917,345	$36.81
North Dakota	10,909,897	$561,134,088	$51.43
Oklahoma	3,039,401	$182,653,002	$60.10
Utah	55,144,127	$2,374,338,764	$43.06
Wyoming	1,974,279,688	$63,828,848,193	$32.33
Total Federal	**2,290,529,507**	**$78,862,249,462**	**$34.43***

*The Federal Average Gross Market Price is a weighted average price.

Estimating Transportation Costs and Net Market Prices

We estimate net market prices by subtracting transportation costs from the gross market price estimated above. Transportation costs are from EIA 923 Reports, and are only available for coal deliveries to the domestic power generation sector. The estimates assume that transportation costs for deliveries to other end use sectors (including deliveries to domestic coke plants and to export terminals) from each state will be similar, on average, to transportation costs for deliveries to the domestic power sector.

Table B8 shows total state deliveries by state of origin, the share of total state deliveries for which transportation costs are reported, and average state transportation costs per ton by state of origin.

Table B9 shows the weighted average for federal coal deliveries. The federal weighted average of transportation costs by state of origin is calculated in Table B9 by applying the average state transportation cost to the tons extracted from federal lands. We assume that federal coal is delivered to consumers in the same proportion as state deliveries.

Table B8: Transportation Costs for State Coal Deliveries to the Domestic Power Generation Sector by State of Origin, 2008-2012 (2013 $s per ton)

State	State Coal Deliveries (tons) For Which Transportation Costs are Reported	Cumulative Value of State Coal Deliveries For Which Transportation Costs are Reported	Average State Transportation Costs per ton	Percent of Total State Deliveries For Which Cost Data are Reported
Alabama	30,252,466	$127,291,856	$4.21	79.0%
Colorado	64,604,974	$800,143,011	$12.39	59.5%
Kentucky	409,783,398	$6,715,100,463	$16.39	96.5%
Montana	87,672,678	$1,673,328,877	$19.09	87.9%
New Mexico	39,743,496	$386,755,239	$9.73	34.2%
North Dakota	0	$0	W	0.0%
Oklahoma	0	$0	W	0.0%
Utah	63,886,807	$162,857,815	$2.55	79.5%
Wyoming	1,390,646,171	$23,752,227,193	$17.08	86.4%
Total State	**2,086,589,990**	**$33,617,704,453**	**$30.72**	**87.3%**

*Total state average transportation cost is a weighted average.

Table B9: Transportation Costs for Federal Coal Deliveries to the Domestic Power Generation Sector by State of Origin, 2008-2012 (2013 $s per ton)

State	Federal Coal Production	Average State Transportation Costs per ton	Estimated Cumulative Value of Transportation Costs for Federal Coal Deliveries
Alabama	9,043,639	$4.21	$38,052,488
Colorado	97,242,959	$12.39	$1,204,369,713
Kentucky	977,116	$16.39	$16,011,952
Montana	121,474,627	$19.09	$2,318,476,016
New Mexico	18,418,053	$9.73	$179,231,301
North Dakota	10,909,897	W	NA
Oklahoma	3,039,401	W	NA
Utah	55,144,127	$2.55	$140,571,308
Wyoming	1,974,279,688	$17.08	$33,720,683,715
Federal Total	**2,276,580,209**	**$16.52**	**$37,617,396,492**

*Total federal average transportation cost is a weighted average.

Subtracting transportation costs from the gross market price provides an estimate of the average net market price received for coal delivered from federal lands in each state to all types of consumers. Table B10 shows the net market price estimates.

Table B10: Estimated Net Market Price for Federal Coal Deliveries by State of Origin, 2008-2012 (2013 $s per ton)

State	Total Coal Production from Federal Leases	Average Gross Market Price for Federal Deliveries	Transportation Costs per ton	Cumulative Net Value	Net Market Price per ton
Alabama	9,043,639	$86.74	$4.21	$746,382,067	$82.53
Colorado	97,242,959	$58.12	$12.39	$4,446,969,934	$45.73
Kentucky	977,116	$78.78	$16.39	$60,960,673	$62.39
Montana	121,474,627	$38.89	$19.09	$2,406,135,227	$19.81
New Mexico	18,418,053	$36.81	$9.73	$498,686,044	$27.08
North Dakota	10,909,897	$51.43	W	NA	NA
Oklahoma	3,039,401	$60.10	W	NA	NA
Utah	55,144,127	$43.06	$2.55	$2,233,767,456	$40.51
Wyoming	1,974,279,688	$32.33	$17.08	$30,108,164,478	$15.25
Federal Total	**2,276,580,209**	**$34.43**	**$16.52**	**$40,501,065,879**	**$17.79**

*Total state average market prices and transportation costs are weighted averages.

Estimating the Outcome of Levying Royalties on Net Market Prices

Royalties based on the net market price of coal deliveries from each state are estimated by applying the average statutory rate (Table B1) to the average net market price (Table B10). Using the average statutory rate implies that royalty rate reductions are eliminated and the statutory rate is levied on the net market price of coal deliveries from each state. Effective royalty rates are calculated by dividing the royalties due per ton by the average gross market price. Table B11 shows estimates of total royalties due, royalties due per ton, and the effective royalty rate.

Table B11: Royalties Due and Effective Royalty Rate Using Net Market Price by State of Origin for Royalty Valuation, 2008-2012 (2013$s)

State	Total Federal Coal Production	Estimated State Statutory Royalty Rate	Net Market Price per ton	Royalties Due Based on Net Market Price	Royalties Due per ton	Average Gross Market Price for Federal Deliveries	Effective Royalty Rate Using Net Market Price
Alabama	9,043,639	9.7%	$82.53	$72,760,932	$8.05	$86.74	9.3%
Colorado	97,242,959	8.9%	$45.73	$397,092,071	$4.08	$58.12	7.0%
Kentucky	977,116	9.8%	$62.39	$5,970,459	$6.11	$78.78	7.8%
Montana	121,474,627	12.1%	$19.81	$292,334,517	$2.41	$38.89	6.2%
New Mexico	18,418,053	11.4%	$27.08	$57,037,198	$3.10	$36.81	8.4%
North Dakota	10,909,897	12.5%	NA	NA	NA	$51.43	NA
Oklahoma	3,039,401	10.9%	NA	NA	NA	$60.10	NA
Utah	55,144,127	8.0%	$40.51	$179,262,722	$3.25	$43.06	7.6%
Wyoming	1,974,279,688	12.5%	$15.25	$3,752,047,662	$1.90	$32.33	5.9%
Total	**2,276,580,209**	**12.3%**	**$17.79**	**$4,756,505,562**	**$2.09**	**$34.43**	**6.1%**

*Total average market prices, royalties due, and royalty rates are weighted averages.

Table B12 shows a comparison between actual royalties collected between 2008 and 2012 and royalties that would have been due if statutory rates had been levied on the net market price over the same period. Table B12 includes gross royalty collections and effective tax rates.

Table B12: Comparison of Reported Royalties to Estimated Royalties Using Net Market Price, Current Production 2008-2012 (2013 $s)

State	Royalties Due Based on Net Market Price	Reported Royalties Due	Difference Between Royalties Based on Net Prices and Current Royalties	Effective Royalty Rate Using Net Market Price	Actual Effective Royalty Rate, 2008-2012
Alabama	$72,760,932	$34,830,873	$37,930,059	9.3%	4.4%
Colorado	$397,092,071	$269,460,788	$127,631,283	7.0%	4.8%
Kentucky	$5,970,459	$6,019,775	-$49,316	7.8%	7.8%
Montana	$292,334,517	$219,090,309	$73,244,209	6.2%	4.6%
New Mexico	$57,037,198	$45,911,763	$11,125,435	8.4%	6.8%
North Dakota	NA	$3,822,998	NA	NA	0.7%
Oklahoma	NA	$4,046,018	NA	NA	2.2%
Utah	$179,262,722	$132,991,300	$46,271,422	7.6%	5.6%
Wyoming	$3,752,047,662	$3,183,032,256	$569,015,406	5.9%	5.0%
Federal Total	**$4,756,505,562**	**$3,899,206,080**	**$865,168,498**	**6.1%**	**4.9%**

*Federal total royalty rates are weighted averages.

Royalties based on the gross market price of coal deliveries from each state are estimated by applying the average statutory rate (Table B1) to the average gross market price (Table B7). Using the average statutory rate implies that royalty rate reductions are eliminated and the statutory rate is levied on the gross market price of coal deliveries by state of origin. Effective royalty rates are calculated by dividing royalties due per ton by the average gross market price. Table B13 shows estimates of total royalties due, royalties due per ton, and the effective royalty rate.

Table B13: Royalties Due and Effective Royalty Rate Using Gross Market Price for Royalty Valuation, 2008-2012 (2013$s)

State	Total Federal Coal Production	Estimated Statutory Royalty Rate	Gross Market Price per ton	Royalties Due Based on Gross Market Price	Royalties Due per ton	Average Gross Market Price for Federal Deliveries	Effective Royalty Rate Using Gross Market Price
Alabama	9,043,639	9.7%	$86.74	$76,470,473	$8.46	$86.74	9.7%
Colorado	97,242,959	8.9%	$58.12	$504,636,235	$5.19	$58.12	8.9%
Kentucky	977,116	9.8%	$78.78	$7,538,662	$7.72	$78.78	9.8%
Montana	121,474,627	12.1%	$38.89	$574,018,838	$4.73	$38.89	12.1%
New Mexico	18,418,053	11.4%	$36.81	$77,536,772	$4.21	$36.81	11.4%
North Dakota	10,909,897	12.5%	$51.43	$70,141,761	$6.43	$51.43	12.5%
Oklahoma	3,039,401	10.9%	$60.10	$19,945,084	$6.56	$60.10	10.9%
Utah	55,144,127	8.0%	$43.06	$190,543,751	$3.46	$43.06	8.0%
Wyoming	1,974,279,688	12.5%	$32.33	$7,954,283,657	$4.03	$32.33	12.5%
Federal Total	**2,290,529,507**	12.3%	**$34.43**	**$9,475,115,233**	**$4.14**	**$34.43**	**12.0%**

*Federal total royalty rates and market prices are weighted averages.

Table B14 shows a comparison between actual royalties collected between 2008 and 2012 and royalties that would have been due if statutory rates had been levied on the gross market price over the same period. Table B14 includes gross royalty collections and effective tax rates.

Table B14: Comparison of Current Royalties Due to Royalties Due Using Gross Market Price, 2008-2012 (2013 $s)

State	Royalties Due Based on Gross Market Price	Reported Royalties Due	Difference Between Royalties Based on Gross Prices and Current Royalties	Effective Royalty Rate Using Gross Market Price	Actual Effective Royalty Rate, 2008-2012
Alabama	$76,470,473	$34,830,873	$41,639,599	9.7%	4.4%
Colorado	$504,636,235	$269,460,788	$235,175,447	8.9%	4.8%
Kentucky	$7,538,662	$6,019,775	$1,518,887	9.8%	7.8%
Montana	$574,018,838	$219,090,309	$354,928,530	12.1%	4.6%
New Mexico	$77,536,772	$45,911,763	$31,625,009	11.4%	6.8%
North Dakota	$70,141,761	$3,822,998	$0	12.5%	0.7%
Oklahoma	$19,945,084	$4,046,018	$0	10.9%	2.2%
Utah	$190,543,751	$132,991,300	$57,552,451	8.0%	5.6%
Wyoming	$7,954,283,657	$3,183,032,256	$4,771,251,401	12.5%	5.0%
Federal Total	**$9,475,115,233**	**$3,899,206,080**	**$5,575,909,153**	**12.0%**	**4.9%**

*Federal total royalty rates are weighted averages.

Appendix C: Data Withholdings, Database Comparisons, and Interpreting Results

To estimate the effective royalty rate received under the current royalty structure, and to assess the potential changes that would result if reforms are pursued, it is necessary to bring together disparate datasets that have varying levels of specificity, data withholdings, and scales of assessment. This effort results in estimates with varying levels of confidence, and introduces several sources of potential errors.

Data sources are described in Appendix A and the report provides detailed citations where they are used. We also identify in tables and text throughout the report where data withholdings and uncertainty that arises from comparing different databases are relevant to interpreting the results.

Throughout this report we endeavor to use publically available statistics. We do this for two reasons:

first so that our methods and data can be easily assessed and replicated; and second to provide a view of the challenges created by federal data withholdings. It is difficult to characterize accurately the effective rate of return received under the current royalty structure and to assess the potential outcome of reforms. This is not because of difficult assumptions or calculations that must be made. Understanding the coal royalty structure is limited primarily by data availability.

The two main data challenges are first, comparing production statistics for federal leases to total coal production from all land ownership. This challenge applies to production statistics and prices. Second, transportation costs are only provided for deliveries to domestic power providers. These issues are discussed in more detail below.

Lease Data vs. Current Data

Data to describe current royalties, royalty rate reductions, and allowable cost deductions are from two different sources.

Current Production, 2008 to 2012

The main findings presented in Figure 1 are based on the most current production data, including sales volume, sales value, royalties, transportation costs between the mine and consumers, and market prices between 2008 and 2012.

Lease Data, 1990 to 2013

Because of data withholdings, we requested data from ONRR for a known set of leases for which we have additional information on bonus payments, allowable transportation and processing cost deductions, and royalty rate reductions.

The size and value of royalty rate reductions and allowable costs deductions are calculated using the lease data. We use these averages as a share of current reported royalty rates to estimate their relative size and value for current production from all leases between 2008 and 2012. If royalty rate reductions and cost allocations are quite different as they apply to coal extracted from leases sold prior to 1990, then our estimates will contain error.

Federal vs. State Statistics

Production statistics are often available at the state level using MSHA and EIA reports. Equivalent data, including delivered costs, transportation costs, extraction from surface and underground mines, and others, are not available for production on federal leases reported by ONRR. When these data are not published for federal leases, we use the state data as a proxy, assuming that characteristics of federal production are similar to the broader production profile of all coal extracted from each state.

Transportation Costs

Transportation costs are reported only for deliveries to domestic power plants, and not for deliveries for export markets, coke plants, and other industrial users. Where sales to these sectors other than domestic power plants are larger (as a share of total sales), transportation cost data may be poor proxies of transportation costs to these consumers.

All transportation costs are withheld for coal sales from North Dakota and Oklahoma, so it is not possible to estimate net market prices for these states at all. In Wyoming, by comparison, coal sales to domestic power generators account for 97 percent of all current coal deliveries (2008 to 2012). Montana coal sales to domestic power plants account for 82 percent of sales over the same period. As a result, the estimates for these two states are more realistic, and in total the value of marketing margins during the five years is likely to be more than $4 billion dollars, and forgone royalties on these values are likely to be about $100 million annually during the same period.

Figure C1 provides a visual assessment of where error is likely to be higher or lower based on the quality of database comparisons. Throughout the report we use one database to make estimates that are applied to a second database. For example, we use data reported for all coal extracted from a state to draw conclusions about the makeup of coal extracted only from federal leases in the same state. When federal coal represents a large share of total state production, the comparisons are more likely to be robust than when the share of federal coal makes up only a small percent of total state production. The larger the percent listed in the table, the larger the correlation between the two datasets.

Table C1: Assessment of Data Withholdings, State and Federal Production and Price Statistics, and Transportation Costs

State	Federal Share of State Total	Share of State Production Delivered to Domestic Power Generators that Transportation Costs are Available	Share of Deliveries to Domestic Power Generators of Total
Alabama	9.3%	79.0%	39.5%
Colorado	69.0%	59.5%	82.2%
Kentucky	0.2%	96.5%	85.4%
Montana	58.5%	87.9%	81.7%
New Mexico	15.9%	34.2%	98.6%
North Dakota	7.6%	W	NA
Oklahoma	54.0%	W	NA
Utah	54.0%	79.5%	83.6%
Wyoming	90.5%	86.4%	97.4%

Reported Data as a Share of Estimated Data

(darkest)	90-99%
	80-89%
	70-79%
	60-69%
	50-59%
(white)	Less than half

Table C1 shows that certain data are withheld for North Dakota and Oklahoma, and we do not have estimates of transportation costs or net market prices for these states. By comparison, Wyoming has excellent data across all data sets. Wyoming's coal production is dominated by production on federal land (90.5 percent). Using statewide coal production data to estimate prices and costs for Wyoming's federal coal should produce confident results.

ENDNOTES

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