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LEGAL IMPLICATIONS OF THE CLEAN POWER PLAN

HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED FOURTEENTH CONGRESS

FIRST SESSION

MAY 5, 2015

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C O N T E N T S

LEGAL IMPLICATIONS OF THE CLEAN POWER PLAN

TUESDAY, MAY 5, 2015

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY,
Washington, DC.

The committee met, pursuant to notice, at 2:59 p.m. in room 406, Dirksen Senate Office Building, Hon. Shelley Moore Capito (chairwoman of the committee) presiding.

Present: Senators Capito, Carper, Barrasso, Crapo, Inhofe, Cardin, Whitehouse, and Markey.

OPENING STATEMENT OF HON. SHELLEY MOORE CAPITO, U.S. SENATOR FROM THE STATE OF WEST VIRGINIA

Senator CAPITO. I would like to thank everybody for being here today. This is our first Clean Air and Nuclear Safety Subcommittee hearing on the EPA's Clean Power Plan.

I would like to thank all the witnesses for appearing before us today and say a special thank you to my State's attorney general, Patrick Morrisey, who has been leading the national legal fight against this rule, which would have, we believe, a devastating impact in our home State of West Virginia. So thank you and thank you, Attorney General Morrisey, for traveling across the mountain. Appreciate it.

Back in February, in a full committee hearing in this room, I asked EPA Acting Assistant Administrator Janet McCabe to explain why the EPA did not hold a public hearing on its proposed Clean Power Plan in the State of West Virginia, one of those States very heavily impacted. Despite the large role that coal has in our economy, in our electricity generation, and despite the multiple invitations issued by me and many, many others, Federal and State legislators, to have them come to our State, she told me basically that public hearings were held where people were "comfortable." That response was unacceptable to me then and to the people of my State.

As Attorney General Morrisey will also point out in his testimony, this rule will have a devastating impact on our State, other coal-producing States, electricity ratepayers across the Country, and the reliability of our grid.

We know from nearly five decades of experience that the Clean Air Act works best when implemented in the spirit of cooperative federalism. When the Federal Government works with the State as

partners, we can and have improved our air quality, protected our economy and the electricity grid at the same time.

However, the Clean Power Plan does none of this, in my opinion. Instead, we have an EPA dictating to the States and effectively micro-managing interstate electricity policy decisions to a degree even the Agency admits is unprecedented. This raises a broad array of legal issues and is quite simply bad policy.

As a result, many States, including West Virginia and Oklahoma, whose attorneys general will be here today, have raised grave concerns about the legality of the rule and the implications for their citizens and ratepayers. In addition to significant constitutional and other legal questions, States have expressed concerns about the feasibility of EPA's proposed requirements and the likely impacts on electricity costs and reliability.

At risk is the ability the States have always had to make the decision about their electricity generation. West Virginia has chosen to rely on coal to provide affordable and reliable electricity for our consumers and businesses. Other States have made different choices that best serve their citizens. But under the Clean Power Plan, each State's electricity plan will have to make EPA's criteria for reducing carbon dioxide emissions and be approved by the EPA.

Other EPA regulations like Utility MACT rule is already contributing to rising electricity rates and growing concerns about reliability. We have had testimony in this committee in other hearings. With the economy still far from fully recovered, the last thing job creators need is another expensive regulation likely to drive up our energy prices. And the last things our families and senior citizens need is to see their electric bills continue to go up.

Next week I will be introducing greenhouse gas legislation with my colleagues that will preserve the proper balance of State and Federal authority, help ensure reliable and affordable electricity, and protect jobs and our economy. I look forward to working with many colleagues on the committee to advance this bill.

I would also like to say anecdotally that throughout the State of West Virginia we have such uncertainty and such disappointment, I think, that our voices haven't been heard in our State with the EPA coming to the State to listen, and we don't feel that the calculation of the economic impact in our communities has been fully explored, nor even taken into consideration as we move forward with these rules.

With that, I would like to yield to the ranking member, Senator Carper, for an opening statement.

[The prepared statement of Senator Capito follows:]

STATEMENT OF HON. SHELLEY MOORE CAPITO,
U.S. SENATOR FROM THE STATE OF WEST VIRGINIA

Thank you all for being here today for the first Clean Air and Nuclear Safety Subcommittee hearing on EPA's Clean Power Plan. I would like to thank all of our witnesses for appearing before us today, and say a special thank you to my State's Attorney General, Patrick Morrisey, who has been leading the national legal fight against this rule, which would have such devastating impacts on our home State of West Virginia.

Back in February, in a full committee hearing in this room, I asked EPA Acting Assistant Administrator Janet McCabe to explain why the EPA did not hold a public hearing on its proposed Clean Power Plan in West Virginia, despite the large role

coal has in our economy and our electricity generation, and despite the multiple invitations by Federal and State legislators.

She told me public hearings were held where people were "comfortable" going. That response is unacceptable to me and to the people of my State. As Attorney General Morrisey will also point out in his testimony, this rule will have a devastating impact on our State, other coal producing States, electricity rate payers across the country and the reliability of our grid.

We know from nearly five decades of experience that the Clean Air Act works best when implemented in the spirit of cooperative federalism. When the Federal Government works with the States as partners, we can, and have, improved air quality and protected our economy and our electricity grid at the same time.

However, the Clean Power Plan does none of this. Instead, we have EPA dictating to States and effectively micromanaging intrastate electricity policy decisions to a degree even the agency admits is unprecedented. This raises a broad array of legal issues and is, quite simply, bad policy.

As a result, many States—including West Virginia and Oklahoma, whose Attorneys General we will be hearing from today—have raised grave concerns about the legality of the rule and the implications for their citizens and ratepayers. In addition to significant constitutional and other legal questions, States have expressed concerns about the feasibility of EPA's proposed requirements and the likely impacts on electricity costs and reliability.

At risk is the ability that States have always had to make decisions about their electricity generation. West Virginia has chosen to rely on coal to provide affordable and reliable electricity for our consumers and businesses. As a result, we have some of the lowest electricity rates in the Nation. Other States make different choices that best serve their citizens. But under the Clean Power Plan, each State's electricity plan would have to meet EPA's criteria for reducing carbon dioxide emissions and be approved by EPA.

Other EPA regulations like the Utility MACT rule have already contributed to rising electric rates and growing concerns about reliability. With the economy still far from fully recovered, the last thing job creators need is another expensive regulation likely to drive up energy prices. And the last thing our families and senior citizens need is to see their electric bills continue to go up.

Next week I will be introducing greenhouse gas legislation with my colleagues that will preserve the proper balance of State and Federal authority, help ensure reliable and affordable electricity, and protect jobs and our economy.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Thank you, Madam Chairman. Thanks so very much for holding our hearing today.

I want to welcome our witnesses. Nice to see you all today. And thanks for joining us for this important conversation.

Today's hearing will continue the discussion of the legal implications of EPA's proposed carbon regulations known as the Clean Power Plan. I was born, as some of you know, in Beckley, West Virginia, Raleigh County, West Virginia. One of the 15 founders of West Virginia, Raleigh County, was my great-great-great-great-great-grandfather, Joseph Carper. And as a native of a county where coal mining was important, remains important, and now as a Senator, recovering Governor, representing the lowest lying State in the Nation, I have a unique perspective on the balance that we must strike to make environmental regulation work; not just for my State, not just for your States, but for all of our States.

For those of us from States that are already being impacted by climate change, the EPA's Clean Power Plan to regulate our Nation's largest source of carbon pollution is not just important, but it is essential. Many States, such as Maryland, my home State of Delaware, have already taken action to reduce lower power plant emissions. However, we need all States to do their fair share to protect the air that we breathe and stem the tide of climate

change. In order for these standards to be effective, the EPA must ensure that all 50 States are capable of complying with these standards.

Today, the EPA has conducted an unprecedented level of State and local government outreach, not just to State and local governments, but to utilities, to businesses, in order to craft a comprehensive plan that works for each State. Under the Clean Power Plan, States can create their own plan for meeting their targets in a number of ways, including by increasing renewable energy, such as wind and solar, and increasing the efficiency of their electrical grid.

Unfortunately, since the day that EPA proposed the Clean Power Plan, it has been criticized as being outside the Agency's authority under the Clean Air Act and the U.S. Constitution. I believe these claims are without basis in fact.

In 2006, 10 States actually sued EPA to force it to regulate carbon pollution from power plants. Since then, the U.S. Supreme Court has ruled, not once, not twice, but three times in support of EPA's legal authority to control carbon pollution under existing law.

In 2007, the Supreme Court confirmed in Massachusetts v. EPA that, as passed by Congress, the Clean Air Act gave the EPA the authority to regulate carbon pollution.

The legal precedent for the Clean Power Plan is, at least in my mind, clear; and attempts by Congress and other parties to challenge its legality are essentially an attempt to delay implementation of the Plan.

As we have seen in the past, litigation over carbon pollution regulations has the potential to be stuck in the courts for several years. The longer we wait to reduce our carbon output, the more severe and perhaps irreversible the effects of climate change will become; and, frankly, the more severe the changes that will have to be adopted to deal with this coming problem.

Meanwhile, public health and our economy will continue to be endangered by more frequent storms, intense droughts, and sea level rise.

Personally, I am committed to making sure Congress does all it can do to support the implementation of the Clean Power Plan, and I look forward to hearing from our witnesses today about our progress in doing so.

Let me just close with one thought. I was born in Beckley, West Virginia; family still in that area, all over the State, actually. I remember going as a little boy going to a little church, Grace Gospel Church just outside of Beckley in a town called Shady Springs, which you know, Madam Chairman. And at a very early age I was told the Golden Rule: treat other people the way we want to be treated. I think the Golden Rule is probably the most important rule of all, and I think it should be apply here as well.

I want to make sure that we treat West Virginia fairly. I want to make sure that we treat Delaware fairly. I want to make sure that the States that are seeing sea level rise, which poses enormous threat to us—the highest point in Delaware is a bridge; it is not a mountain. It is not a mountain, it is a bridge. We already see the effects of sea level rise in my State and we are concerned about it, and, frankly, so are a lot of other States. I want to make

sure we are fair to us in the First State; I want to make sure that we are fair to the folks in the Mountain State.

With that in mind, let's have a good hearing. Thank you.

Senator CAPITO. Thank you.

I would like to tell the audience and the witnesses that we are scheduled to have a vote somewhere between 10:15 and 10:30, so my plan would be to try to get through opening statements and then adjourn quickly and let us go vote, make that one vote and come back to the question portion. I reserve the right to change my mind. I might say we will just rotate inside and out. That might be a better way to do it. But at that point I just wanted to put you on alert.

At this time, I would like to recognize the chairman of the full committee, Mr. Inhofe, from Oklahoma, for purposes of making some comments.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. I thought that was just my wife that made that statement, about changing her mind.

[Laughter.]

Senator INHOFE. I appreciate it very much, Senator Capito.

We have some people here today from Oklahoma; they came up here, the Rural Electric Coop. They are concerned. You know, in Oklahoma we get this question all the time. They say, now wait a minute. If we are reliant upon fossil fuel for 50 percent of the power to run this machine called America and they take that away, how do you run the machine called America? And I said, come up and find out, because I don't know either.

Three things real quickly. Cap-and-trade started, this was way back in 2002, and at that time they first said the world is coming to an end, all the global warming and all that stuff. Now, they tried to pass it legislatively from 2002 up until the current time, and they are unable to do that. So what we are looking at now is the Federal Government coming in under the Obama administration, trying to do through regulation what they couldn't do through legislation.

Second, when Lisa Jackson was the Administrator of the EPA under Obama, I asked her the question, in this room, live on TV, I said, you know, if we were to pass, either through regulation or through legislation, would this have the effect of reducing CO_2 emissions worldwide? And she said, no, it wouldn't because this isn't where the problem is. So even if you are a believer in those things, it wouldn't work.

The last thing, I am not a lawyer, but I was on several radio shows this morning with Scott Pruitt, our attorney general, and I learned a lot, Scott, from you. But when the President's own law professor, Laurence Tribe, recently testified before the House, he said that the EPA was attempting an unconstitutional trifecta, usurping the prerogatives of the States, Congress, and the Federal Courts all at once. This was Barack Obama's Harvard Law professor.

With that, I look forward to the opening statements.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA

We are here today to talk with legal experts and Attorneys General about the Environmental Protection Agency's proposed CO_2 regulations for existing power plants. This proposal is another attempt by the Obama administration to circumvent the role of Congress and achieve through regulatory fiat what the President could not achieve through legislation.

Congress has already been very clear in its opposition to a federally mandated emission reductions scheme when cap-and-trade legislation failed under a Democrat controlled Senate, yet the President is choosing to ignore the will of Congress and the American people by mandating this country's energy system be restructured in an unprecedented, likely illegal and economically damaging way.

It's not just Republicans that disagree with the legal premise of the Clean Power Plan. The President's own constitutional law professor, Lawrence Tribe, recently testified before the House Energy and Commerce Committee hearing that his EPA was attempting an "unconstitutional trifecta usurping the prerogatives of the States, Congress and the Federal Courts—all at once."

It is very telling when even legal and environmental experts that agree with the Administration's overall objective, do not agree with the means by which they are attempting to achieve that objective.

The EPA, an agency of unelected bureaucrats, expects the States to cede authority over its intrastate energy systems, so that the EPA can then tell its citizens what type and how much energy they can use. This is counter to the purpose of the Clean Air Act and undermines the longstanding principle of cooperative federalism where the Federal Government is meant to work in partnership with the States to achieve environmental objectives.

This proposal is legally unsound, and comes with a $479 billion compliance cost, will result in double digit electricity price increases in 43 States and has negligible environmental benefits—environmental benefits the EPA did not even bother to measure and will be rendered pointless by 1 month of carbon emissions in China.

This is why 32 States oppose this rule and 12 have sued the EPA over this proposal. I am thankful that two of the States leading the charge against this rule—West Virginia and Oklahoma—are here to testify.

This is an unprecedented regulatory action where the agency is attempting to rewrite the law in a manner that Congress explicitly prohibited. Congress writes the laws and the agencies interpret them—even under President Obama.

I will not stand by and let the EPA force States to spend their resources in a manner that will harm local economies and force their citizens to pay for the President's misguided legacy. Especially when it is not a matter of if the Clean Power Plan will be ruled illegal, but when.

I thank all the witnesses for being here and I look forward to their testimony.

Senator CAPITO. Thank you.

I would like to recognize, we will go, from my view, left to right. Our first witness is Hon. Patrick Morrisey, who is the Attorney General of the State of West Virginia. Welcome.

STATEMENT OF HON. PATRICK MORRISEY, ATTORNEY GENERAL, STATE OF WEST VIRGINIA

Mr. MORRISEY. Well, thank you very much, Chairman Capito, Ranking Member Carper, and all of the distinguished members of this subcommittee. I very much appreciate the opportunity to be here today to testify against the President's so-called Clean Power Plan.

I do want to say at the outset I feel good about this hearing because West Virginia seems to have some support, both from the Chair and the ranking member side. So, Senator Carper, you are always welcome to come back to the great State of your birth. Thank you.

Now, I am here today to talk about the legal problems in the Obama administration's so-called Clean Power Plan, commonly known as the 111(d) Rule. This Rule seeks to require States to re-

duce emissions from existing coal-fired power plants by, on average, a staggering 30 percent over a 15-year period.

Now, make no mistake about it, finalizing this proposal would have a devastating impact on my State, other coal-producing States, and citizens from across the Country who feel the negative impact of high electricity prices, lost jobs, and a potential lack of reliability in the power grid.

Now, West Virginia is one of the poorest States in the Country, and yet we are the second largest producer of coal. It is a very important resource for us. This proposal would result in even greater economic dislocation in Appalachia at a time when we can least afford it.

Now, it is my duty as the chief legal officer of the State of West Virginia to fight against this unlawful power grab, which is hurting our citizens. West Virginia has already led a bipartisan coalition of 15 States before the U.S. Court of Appeals in D.C., and if this Administration elects to finalize this rule, West Virginia will challenge it in court, and we expect that the coalition of 15 States that we are currently working with will grow.

Today I would like to talk about just a few of the legal defects of this proposal.

Now, as you all know, the EPA bases its claim for legal authority to adopt this Rule entirely on Section 11(d) of the Clean Air Act. However, a nearby provision, Section 112 of the Clean Air Act, EPA prohibits the Agency from invoking Section 111(d) for any pollutant "emitted from a source category which is regulated under Section 112." We think that language is very clear.

And as EPA has repeatedly explained time after time, this text literally means that if EPA has already regulated a source category under Section 112, EPA may not then come in and require States to regulate any pollutants emitted from the same source category under 111(d).

Now, this is where the EPA runs into some trouble because, as we know, in 2012 they already finalized a major rule affecting coal-fired power plants under Section 112.

Now, the EPA's legal argument for avoiding this Section 112 exclusion is not credible and defies all traditional rules of administrative law and statutory construction. Let me explain.

When Congress enacted the present version of the Section 112 exclusion in 1990, they actually made a mistake. It accidentally included two provisions in the statute at large, two amendments to the same exact text. One was a substantive amendment that replaced a cross-reference and exchanged the exclusion to its present form. The second was a conforming amendment, a technical amendment, if you will, that was made 107 pages later.

But once you actually applied the substantive amendment to the text, it made the conforming change wholly unnecessary, and that is why the technical error was never included in the U.S. Code.

Now, what happened there is actually consistent with the way Congress has always operated. To the extent that there are clerical errors in a text, when Congress goes back through the revisers to decide what goes in the Code, they analyze that and they apply traditional rules of statutory construction. And, in fact, we have never seen a situation before where a Federal agency has literally tried

to push such sweeping proposal on the basis of a typo. It is unprecedented.

But perhaps the most radical feature of Section 111(d) Rule is its sheer breadth. Rather than follow the traditional pathway of opposing an emission rule on a particular source category to make that source category more environmentally friendly, the Section 111(d) Rule requires States to replace coal-fired energy with other sources of energy, and even reduce consumer demand for energy. That means that the Section 111(d) Rule seeks not only to regulate power plant emissions, it is a mandate for States to fundamentally reorder their electricity sectors and pick winners and losers between those sectors. This Rule would regulate from power to plug.

Now, as Allison Wood, a well-respected attorney, recently indicated before the House Energy and Commerce Committee, the EPA's claim here is analogous to the Agency asserting that its authority to regulate automobile emissions provides it with the power to order citizens to take a bus to work or buy electric cars on the theory that the measures would reduce car emissions.

Section 111(d) simply does not grant the EPA such broad sweeping power.

Thank you very much.

[The prepared statement of Mr. Morrisey follows:]

TESTIMONY OF PATRICK MORRISEY, ATTORNEY GENERAL, STATE OF WEST VIRGINIA

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

HEARING ON

"LEGAL IMPLICATIONS OF THE CLEAN POWER PLAN"

PRESENTED ON

MAY 5, 2015

Thank you Senator Capito, Ranking Member Carper, and all the distinguished members of this subcommittee. I appreciate the opportunity to testify about the Administration's widely publicized effort to severely limit the use of coal in the United States.

When President Obama was running for President in 2008, he told *The San Francisco Chronicle* that his vision of environmental and energy policy included "bankrupt[ing]" coal-fired power plants.[1] In the last two years, the President's EPA has made it a top priority to carry out this threat, by proposing several interlocking regulations that are specifically designed to put many existing coal-fired power plants out of business, and to make building new coal-fired power plants virtually impossible.

I am here today to talk about the central component in the Obama Administration's so-called Clean Power Plan, commonly known as the Section 111(d) Rule. This Rule seeks to require States to reduce emissions from existing coal-fired power plants by—on average—a staggering 30% in just 15 years. The method the Rule uses to achieve this reduction has been widely described as radical and plainly illegal. Rather than merely setting a structure for States to reduce emissions from these plants, EPA has taken the view that it can force States to reduce the *use* of—including demand for—coal-based energy.

EPA has made very clear that it intends to finalize the Section 111(d) Rule this summer. The impacts of the Rule will be devastating in West Virginia and throughout the United States. Because coal-fired power currently constitutes approximately 40% of the total energy generated in the United States, the Rule will likely result in reductions in the use of coal and will necessitate the building of many new non-coal-fired power plants—an expense that will be borne

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[1] http://www.weeklystandard.com/blogs/obama-warned-his-policies-would-bankrupt-coal-power-plant-owners_644384.html.

by ratepayers in the form of higher electricity prices.[2] It will also further undermine the coal market, which provides numerous well-paying jobs to working men and women in some our most economically depressed communities. Make no mistake about it—finalizing this proposal would have a devastating impact on my State, other coal-producing States, and citizens from across the country, who will feel the negative economic impact of high electricity prices and reduced reliability of the power grid. West Virginia is one of the poorest States in the country and yet is the second largest producer of coal. This proposal will result in even greater economic displacement for Appalachia—at a time when we can least afford it.

It is my duty as the chief legal officer for the State of West Virginia to fight against this unlawful power grab, which is harming our citizens. West Virginia has already led a bipartisan coalition of 15 States in a lawsuit before the U.S. Court of Appeals for the D.C. Circuit, which targets EPA's authority to issue *any* rule regulating existing power plants under Section 111(d) when EPA has already regulated the same source category under Section 112 of the Act. The D.C. Circuit held oral argument in our case on April 16, 2015, and a decision is expected sometime this summer. In that litigation, the Department of Justice has claimed that EPA still might not issue the Rule, but outside the courthouse walls, EPA has promised everyone from Main Street to the United Nations that it will finalize the Section 111(d) Rule this summer. If the D.C. Circuit has not already stopped the Rule by then, the finalized Section 111(d) Rule will raise a host of additional legal issues that we plan to bring to the D.C. Circuit as well. West Virginia would challenge a final Rule in court, and we expect that the coalition of 15 States we have gathered for our first D.C. Circuit lawsuit will only grow.

Given the entirely unprecedented and unlawful nature of the Section 111(d) Rule, the States and other interested parties will have no shortage of legal defects to bring to the D.C. Circuit. Today, I will discuss just three issues, which will be part of that litigation:

(1) The Section 112 Exclusion Prohibits The Section 111(d) Rule

EPA bases its claim for legal authority to adopt this Rule entirely upon Section 111(d) of the Clean Air Act.[3] First enacted in 1970, Section 111(d) authorized EPA to establish guidelines for States to follow in regulating a limited category of emissions from certain existing sources. In the first twenty years of the Clean Air Act, EPA invoked this provision only 4 times, all for narrow, localized pollutants emitted from specialized industries, such as acid mist from sulfuric acid plants. *See* 79 Fed. Reg. 34,830, 34,844 n.43 (June 18, 2014).

In 1990, Congress substantially revised the Clean Air Act, drastically expanding the program for regulating hazardous air pollutants under Section 112. As part of that revision, Congress narrowed the already-minor Section 111(d) program even further, providing a statutory Section 112 Exclusion that prohibits EPA from invoking Section 111(d) for any pollutant "emitted from a source category which is regulated under section [112]."[4] As EPA has

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[2] http://www.nera.com/content/dam/nera/publications/2014/NERA_ACCCE_CPP_Final_10.17.2014.pdf.

[3] 42 U.S.C. § 7411(d).

[4] 42 U.S.C. § 7411(d)(1).

repeatedly explained—starting with the Clinton Administration in 1995, and continuing through the Obama Administration—this text literally means that if EPA has already regulated a source category under Section 112, EPA may not require States to regulate any pollutants emitted from that source category under Section 111(d).[5] Consistent with this clear textual prohibition, in the 25 years since Congress enacted the 1990 Amendments to the Clean Air Act, EPA has never once sought to adopt a regulation of a source category under Section 111(d), where that source category was already regulated under Section 112.

In the Clean Power Plan, EPA seeks to break entirely new ground by effectively nullifying the prohibition on regulating under both Section 111 and 112 of the Clean Air Act. In 2012, EPA imposed extremely costly regulations on power plants under Section 112, which by EPA's own estimation will require compliance costs for those plants of more than $9 billion per year.[6] As such, under the plain terms of the Clean Air Act and EPA's uniform practice since 1990, EPA's proposed Section 111(d) Rule, requiring States to regulate those same power plants, is unlawful.

EPA's legal argument for avoiding the Section 112 Exclusion is not credible and defies all traditional rules of administrative law and statutory construction. Let me explain. When Congress enacted the present version of the Section 112 Exclusion in 1990, it accidentally included in the Statutes at Large two amendments to the same text: a substantive amendment that replaced a cross-reference to Section 112 and changed the Exclusion to its present form, and a conforming amendment 107 pages later that made a clerical update to the same cross-reference. Once the substantive amendment was applied, it made the conforming change wholly unnecessary, so the conforming amendment was not included in the U.S. Code. This is the uniform way the codifiers employed by Congress have always dealt with such clear drafting errors.[7] In 1995, the Clinton EPA acknowledged that the conforming amendment was a simple

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[5] EPA, Air Emissions from Municipal Solid Waste Landfills—Background Information for Final Standards and Guidelines, Pub. No. EPA-453/R-94-021, 1-6 (1995); 69 Fed. Reg. 4,652, 4,685 (Jan. 30, 2004); 70 Fed. Reg. 15,994, 16,031 (Mar. 29, 2005); Brief of EPA, *New Jersey v. EPA*, No. 05-1097, 2007 WL 2155494 (D.C. Cir. July 23, 2007); EPA, Legal Memorandum, at 26 (June 2014), EPA-HQ-OAR- 2013-0602-0419.

[6] 77 Fed. Reg. 9,304 (Feb. 16, 2012).

[7] See, e.g., Revisor's Note, 7 U.S.C. § 2018; Revisor's Note, 10 U.S.C. § 869; Revisor's Note, 10 U.S.C. § 1407; Revisor's Note, 10 U.S.C. § 2306a; Revisor's Note, 10 U.S.C. § 2533b; Revisor's Note, 12 U.S.C. § 1787; Revisor's Note, 14 U.S.C. ch. 17 Front Matter; Revisor's Note, 15 U.S.C. § 2081; Revisor's Note, 16 U.S.C. § 230f; Revisor's Note, 20 U.S.C. § 1226c; Revisor's Note, 20 U.S.C. § 1232; Revisor's Note, 20 U.S.C. § 4014; Revisor's Note, 22 U.S.C. § 3651; Revisor's Note, 22 U.S.C. § 3723; Revisor's Note, 26 U.S.C. § 105; Revisor's Note, 26 U.S.C. § 219; Revisor's Note, 26 U.S.C. § 4973; Revisor's Note, 29 U.S.C. § 1053; Revisor's Note, 33 U.S.C. § 2736; Revisor's Note, 37 U.S.C. § 414; Revisor's Note, 38 U.S.C. § 3015; Revisor's Note, 40 U.S.C. § 11501; Revisor's Note, 42 U.S.C. § 218; Revisor's Note, 42 U.S.C. § 290bb–25; Revisor's Note, 42 U.S.C. § 300ff–28; Revisor's Note, 42 U.S.C. § 1395x; Revisor's Note, 42 U.S.C. § 1396a; Revisor's Note, 42 U.S.C. § 1396r; Revisor's Note, 42 U.S.C. § 5776; Revisor's Note, 42 U.S.C. § 9601; Revisor's Note, 49 U.S.C. § 47115.

mistake, which should be given no meaning.[8] Yet, EPA now claims that the conforming amendment causes confusion as to the meaning of the Section 112 Exclusion, such that EPA can effectively disregard that Exclusion. This unprecedented argument should be offensive to every Senator, no matter his or her politics: under EPA's theory of statutory construction, if your staffers ever make an inadvertent error putting together conforming amendments, an agency will later be able to use that clerical error not only to disregard the substance of your legislative work and clear meaning but also to take over a purely legislative function and change congressional intent.

EPA also now claims that the text of the Section 112 Exclusion, as it appears in the U.S. Code, is ambiguous and thus the agency is entitled to deference. But never once in the 25 years since the 1990 Amendments has EPA ever made that claim or professed any inability to decipher the plain meaning of the text. The numerous alleged interpretations that EPA now offers for the first time are purely made-for-litigation attempts to torture ambiguity from the statute. As the D.C. Circuit has observed on numerous occasions, the mere possibility of multiple readings does not make a statute ambiguous for purposes of agency deference—*i.e.*, *Chevron* deference. In the court's words: "The existence of ambiguity is not enough per se to warrant deference to the agency's interpretation. The ambiguity must be such as to make it appear that Congress either explicitly or implicitly delegated authority to cure that ambiguity." *Hearth, Patio & Barbecue Ass'n v. U.S. Dep't of Energy*, 706 F.3d 499, 504 (D.C. Cir. 2013). Put more simply, "the sort of ambiguity giving rise to *Chevron* deference" is not simply a question of "definitional possibilities." *Id.* As we have explained in our briefs, none of the multiple newfound readings advanced by EPA is proof of actual ambiguity.

(2) The Section 111(d) Rule Is Illegal Because It Seeks To Transform The States' Energy Economies, Rather Than Just Regulating Particular Sources

Perhaps the most radical feature of the Section 111(d) Rule is its sheer breadth. Rather than following the well-established practice of imposing an emission rule on a certain source category, to make that source category's operations more environmentally friendly, the Section 111(d) Rule seeks to require States to replace coal-fired energy with other sources of energy and even generally reduce consumer *demand* for energy. Make no mistake, the Section 111(d) Rule is not merely a regulation of power plant emissions, it is a mandate that the States fundamentally reorder their entire electricity sectors and pick winners and losers between sectors. As Allison D. Wood, a well-respected attorney observed in a hearing before the House Committee on Energy and Commerce, EPA's claim here is analogous to the agency asserting that its authority to regulate automobile emissions gives it the power to order citizens to take the bus to work and to buy more electric cars, on the theory that such measures would reduce car emissions.[9]

Section 111(d) simply does not authorize EPA to assert such broad power. In fact, EPA's Section 111(d) authority extends only to performance standards for *individual sources*. That

[8] EPA, Air Emissions from Municipal Solid Waste Landfills—Background Information for Final Standards and Guidelines, Pub. No. EPA-453/R-94-021, 1-6 (1995).

[9] http://docs.house.gov/meetings/IF/IF03/20150317/103073/HHRG-114-IF03-Transcript-20150317.pdf.

Section expressly limits EPA to setting guidelines for States, who then set "standards of performance for [] *existing source[s]*," in certain limited circumstances.[10] Furthermore, any EPA rules under Section 111(d) must "permit the State in applying a standard of performance *to any particular source* under a plan submitted under this paragraph to take into consideration, among other factors, the remaining useful life of the *existing source* to which such standard applies."[11] The language could not be more clear: EPA's authority is limited to the existing source only.

EPA's assertion of such unprecedented authority—including the power to lower consumer demand for energy—is all the more illegal because it is based upon such a rarely used statutory provision. As the Supreme Court admonished EPA just last Term: "[w]hen an agency claims to discover in a long-extant statute an unheralded power to regulate a significant portion of the American economy, we typically greet its announcement with a measure of skepticism."[12] This principle applies directly to the Section 111(d) Rule, where EPA is attempting to impose the single-most meaningful, far-reaching regulation in the agency's history, based upon an obscure, decidedly narrow provision of the Clean Air Act.

(3) The Section 111(d) Rule Illegally Commandeers The States

Harvard Law Professor Laurence H. Tribe, a celebrated liberal icon and noted environmental lawyer, has forcefully explained that the Section 111(d) Rule raises a number of serious constitutional concerns, including that it seeks to unlawfully commandeer the States, in violation of the States' Tenth Amendment rights.[13] As Congress designed Section 111(d), that Section is intended to permit EPA merely to establish a "procedure" under which States set "standards of performance" for a limited category of sources. Only if the States fail to submit a state plan that complies with EPA's "procedure" can EPA substitute its own plan to regulate emissions from that source category.[14]

The Section 111(d) Rule does not accord with this congressional regime of cooperative federalism. Instead, it creates a punitive system that seeks to coerce the States, in violation of their Tenth Amendment rights. Specifically, EPA has threatened that if States do not submit state plans that fundamentally reorder their energy economies in the way EPA dictates, EPA will impose upon the States some yet-unannounced federal plan, which may well take the form of EPA taking over the States' entire electricity sector. The Supreme Court has held that the Federal Government simply has no legal authority to coerce and threaten the States with such drastic consequences, simply for failing to do the Federal Government's bidding. *See NFIB v. Sebelius*, 132 S. Ct. 2566, 2602 (2012).

* * *

[10] 42 U.S.C. § 7411(d)(1).

[11] *Id.*

[12] *Util. Air Regulatory Grp. v. EPA*, 134 S. Ct. 2427 (2014) (citation and quotation omitted).

[13] http://docs.house.gov/meetings/IF/IF03/20150317/103073/HHRG-114-IF03-Wstate-TribeL-20150317-U1.pdf

[14] 42 U.S.C. § 7411(d)(1), (d)(2).

Regardless of your position on the underlying merits of severely limiting the use of coal, it is critical for this body to exercise oversight over a federal agency that is radically seeking to reinvent American energy policy in an unlawful manner. The repudiation of greenhouse gases should not be advanced by executive fiat on the basis of a clerical error. I urge this Committee to ensure that, when and if EPA acts, it does so after express authority has been delegated to it by Congress.

RESPONSE TO A QUESTION FOR THE RECORD—HON. PATRICK MORRISEY

Senator Whitehouse:

Question. Please describe any communications you have had with any element of the fossil fuel industry regarding the substance of your testimony before the EPW Committee for this hearing.

Response. I worked exclusively with my staff in preparing my testimony to the Committee, drawing upon my Office's extensive familiarity with the so-called Clean Power Plan. Although we did not discuss the remarks with any outside group, we have worked on these issues with a broad, bipartisan coalition of stakeholders, including labor unions, coal operators, businesses, and consumer groups. Notably, stakeholders across the political spectrum in West Virginia—from coal miners to energy companies to elected officials from both parties—are united in opposition to EPA's illegal Plan, which will have devastating impacts upon our State. Opposing this illegal Plan remains one of the top priorities for my Office, and that will continue to be the case.

Senator CAPITO. Thank you.

Now, I have just been informed that the vote has been called, so hold on here, let me see what we prefer to do.

[Pause.]

Senator CAPITO. OK, we are going to go vote, so we will stand and recess and return. We should be here shortly. Thank you for your patience.

[Recess.]

Senator CAPITO. That was pretty quick, I think, and we will resume the hearing.

I would like to welcome Hon. Scott Pruitt, who is the Attorney General from the State of Oklahoma. Welcome.

STATEMENT OF HON. SCOTT PRUITT, ATTORNEY GENERAL, STATE OF OKLAHOMA

Mr. PRUITT. Good morning, Chairwoman Capito, Ranking Member Carper, Chairman Inhofe, and members of the subcommittee. It is a joy to be with you this morning. It is good to be with my dear colleague and friend from West Virginia. I appreciate the invitation to discuss the legal ramifications of the EPA's proposed Clean Power Plan.

This is an issue of major importance to States across the Country like Oklahoma.

Quite simply, Madam Chairwoman, the EPA does not possess the authority under the Clean Air Act to do what it is seeking to accomplish in the so-called Clean Power Plan.

The EPA, under this Administration, treats States like a vessel of Federal will. The EPA believes States exist to implement the policies the Administration sees fit, regardless of whether laws like the Clean Air Act permit such action.

In their wisdom, Congress gave States a primary role in emissions regulation, noting in the statement of policy of the Clean Air Act that "air pollution control at its source is the primary responsibility of States and local governments."

That statement respects the constitutional limits on Federal regulation of air quality and the reality that States are best suited to develop and implement such policies.

States are able to engage in a cost-benefit analysis to strike the necessary balance between protecting and preserving the environment, while still creating a regulatory framework that does not stifle job growth and economic activity. The States are partners with

the Federal Government, as the chairwoman noted in her comments, with the Federal Government regulating such matters.

Therefore, the Clean Air Act hinges on cooperative federalism by giving States the primary responsibility and role for regulation while providing a Federal backstop if the States should fail to act.

When the EPA respects the role of the States, the cooperative relationship works well. When the EPA exceeds the constraints placed upon the Agency by Congress, the relationship is thrown out of balance and the rule of law and State sovereignty is affected adversely.

The Clean Power Plan proposal throws the cooperative relationship between the States and the Federal Government off balance.

The EPA claims the proposal gives States flexibility to develop their own plans to meet the national goals of reducing carbon dioxide emissions. In reality, the Clean Power Plan is nothing more than an attempt by the EPA to expand Federal agency power at the expense of States energy power generation.

The Plan requires each State to submit a plan to cut carbon dioxide emissions by a nationwide average, the attorney general indicated earlier, by 30 percent by the year 2030.

In Oklahoma, 40.5 percent of our energy production comes from coal-fired generation and 38 percent comes from natural gas. Oklahoma, notably, ranks fourth in the Country in generating electricity through wind.

This begs the question: How does the EPA expect States like Oklahoma, and the top four in the Country in generating electricity through renewables, to meet the goals of the Clean Power Plan? There are only so many ways Oklahoma can achieve a 30 percent reduction demanded by the EPA. The Plan, therefore, must be viewed as an attempt by the EPA to force States into shuttering coal generation and eventually other sources of fossil fuel generated electricity.

Additionally, the proposed Rule, through its building block four, would require States to use demand-side energy efficiency measures that would reduce the amount of generation required. However, States are limited to emission standards that actually can be achieved by existing industrial sources through source-level, inside-the-fence measures.

The proposal's attempt to force States to regulate energy consumption and generation throughout their jurisdictions, in the guise of reducing emissions from fossil fuel-fired plants, violates Section 111(d)'s plain text requirement that the performance standards established for existing sources by the States must be limited to measures that apply at existing power plants themselves, inside the fence.

EPA's approach converts the obscure, little-used Section 111(d) into a general enabling act, giving EPA power over the entire grid from generation to light switch. By going beyond source-level, inside-the-fence-line measures, EPA's proposal would expand 111(d), and specifically the underlying statutory term "best system of emission reduction" into a whole new regime of regulation, one that regulates not only pollutant emission by sources, but the State's entire resource and energy grid.

To meet the objectives of the EPA's proposed rule, States would be forced to rework their energy generation market. To account for the loss of coal-fired generation, States will be forced into changing their energy mix in favor of renewables. States will be also forced to alter existing regulatory framework which would threaten energy affordability and reliability for consumers, industry, and energy producers.

Finally, there is a substantial concern that the EPA, before the Clean Power Plan is even finalized, will issue a uniform Federal implementation plan that will be forced upon those States that don't acquiesce to the unlawful Clean Power Plan.

Such a move by the EPA would be the proverbial gun to the head of the States, demanding the States to act as the EPA sees fit or face punitive financial situations for their States.

Madam Chairwoman, I can say with great confidence that if the EPA does in fact move forward with the uniform FIP, the EPA will be challenged in court by Oklahoma and other like-minded States.

I am not one who believes the EPA has no role. The Agency has played a very important role historically in addressing water and air quality issues that traverse State lines. However, with this rule, the Agency is now being used to pick winners and losers in the energy market by elevating renewable power at the expense of fossil fuel generation.

No State should comply with the Clean Power Plan if it means surrendering decisionmaking authority to the EPA, a power that has not been granted to it by this Congress. States should be left to make decisions on the fuel diversity that best meets their generation needs.

States like Oklahoma care about these issues because we breathe the air, drink the water, and want to preserve the land for future generations, and we have developed a robust regulatory regime that has successfully struck a balance between maintaining and preserving air and water quality, while still considering the economic impact of such regulations.

Madam Chairwoman, States like Oklahoma are simply opposed to the Clean Power Plan because it is outside the authority granted to the EPA by the law. We only ask that the State authority under the Clean Air Act be respected and preserved, and the decisions on power generation and how to achieve emissions reductions be made at the local level rather than at the Federal level.

I again appreciate the opportunity to speak with you today and discuss these important matters. Thank you.

[The prepared statement of Mr. Pruitt follows:]

Testimony before the Senate Environmental and Public Works Subcommittee

on Clean Air and Nuclear Safety

"Legal Implications of the Clean Power Plan"

May 5, 2015

E. Scott Pruitt

Attorney General

State of Oklahoma

Chairwoman Capito, Ranking Member Carper, Chairman Inhofe, and Members of the Subcommittee,

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States are able to engage in a cost-benefit analysis to strike the necessary balance between protecting and preserving the environment, while still creating a regulatory framework that does not stifle job growth and economic activity. The states are partners with the federal government in regulating such matters.

Therefore, the Clean Air Act hinges on "cooperative federalism" by giving states the primary responsibility and role for regulation while providing a federal backstop if the states should fail to act.

When the EPA respects the role of the states, the cooperative relationship works well. When the EPA exceeds the constraints placed upon the agency by Congress, the relationship is thrown out of balance and the rule of law and state sovereignty both suffer.

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The plan requires each state to submit a plan to cut carbon-dioxide emissions by a nationwide average of 30 percent by 2030.

In Oklahoma, 40.5 percent of energy generation comes from coal-fired power plants while 38.1 percent comes from natural gas. Oklahoma ranks fourth in the nation with 15 percent of power generation coming from wind.

This begs the question, how does the EPA expect states like Oklahoma to meet the goals of the Clean Power Plan? There are only so many ways Oklahoma can achieve the 30 percent reduction demanded by the EPA. The plan, therefore, must be viewed as an attempt by the EPA to force states into shuttering coal-fired power plants and eventually other sources of fossil-fuel-generated electricity.

Additionally, the proposed rule, through its building block four, would require states to use demand-side energy efficiency measures that would reduce the amount of generation required. However, states are limited to emission standards that can actually be achieved by existing industrial sources through source-level, "inside-the-fence-line" measures.

The proposal's attempt to force states to regulate energy consumption and generation throughout their jurisdictions, in the guise of reducing emissions from fossil fuel-fired power plants, violates Section 111(d)'s plain-text requirement that the performance standards established for existing sources by the states must be limited to measures that apply at existing power plants themselves.

EPA's approach converts the obscure, little-used Section 111(d) into a general enabling act, giving EPA power over the entire grid from generation to light switch. By going beyond source-level, "inside-the-fence-line" measures, EPA's proposal would expand 111(d), and specifically the underlying statutory term "best system of emission reduction," into "a whole new regime of regulation": one that regulates not only pollutant emission by sources, but a state's entire resource and energy sectors.

To meet the objectives of the EPA's proposed rule, states will be forced to rework their energy generation market. To account for the loss of coal-fired generation, states will be forced into changing their energy mix in favor of renewables. States would also be forced to alter existing regulatory framework which would threaten energy affordability and reliability for consumers, industry and energy producers.

Finally, there is substantial concern that the EPA – before the Clean Power Plan rule is even finalized – will issue a uniform federal implementation plan that will be forced upon those states that don't acquiesce to the unlawful Clean Power Plan.

Such a move by the EPA would be the proverbial "gun to the head" of the states, demanding the states to act as the EPA sees fit or face punitive financial sanctions.

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However, with this rule, the agency is now being used to pick winners and losers in the energy context, by elevating renewable power generation at the expense of fossil-fuel fired generation.

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Madam Chairwoman, states like Oklahoma are simply opposed to the Clean Power Plan because it is outside the authority granted to the EPA by the law. We only ask that state authority under the Clean Air Act be respected and preserved and that decisions on power generation and how to achieve emissions reductions be made at the local level rather than at the federal level.

I again appreciate the opportunity to discuss these issues with you.

Sincerely,

E. SCOTT PRUITT

ATTORNEY GENERAL OF OKLAHOMA

RESPONSE TO A QUESTION FOR THE RECORD—HON. E. SCOTT PRUITT

Senator Whitehouse:

Question. Please describe any communications you have had with any element of the fossil fuel industry regarding the substance of your testimony before the EPW Committee for this hearing.

Response. My office did not have any contact with any outside groups regarding the substance of my testimony to this Committee and its honorable members.

Senator CAPITO. Thank you.

Our next witness is Mr. Roger Martella. He is a Partner at Sidley Austin and he was formally the General Counsel at the USEPA. Welcome.

STATEMENT OF ROGER MARTELLA, JR., PARTNER, SIDLEY AUSTIN, LLP

Mr. MARTELLA. Thank you, Madam Chair, Ranking Member Carper, Chairman Inhofe. Thank you for the opportunity to appear before this committee once again. It is a great honor.

EPA has yet to finalize the Existing Source Performance Standard, but that hasn't stopped the lawyers from submitting thousands of pages of legal arguments to the Agency, both in passionate support of the rulemaking and in vehement opposition of it. I have added to that mix a little bit today with some written testimony that I shared with you, but what I thought I would do is digest those scores of arguments into what I think are going to be the two overarching issues that the court is going to consider when it ultimately reviews the final rule.

The first is picking up on a point from Senator Carper in his introduction, that if we look at how the courts have responded to climate change issues since 2007, since Massachusetts v. EPA, we have had a lot of direction in the last few years from the Supreme Court, the D.C. Circuit, the Ninth Circuit; and what the courts have told us is that they take climate change extremely seriously. Regardless of what I might think about it, what anyone here might think about it, the courts have expressed that they view climate change as a paramount policy concern and they have been highly deferential not only to EPA, but to the States, when they have engaged in creative mechanisms to use old and outdated tools to address the modern challenge of climate change. So I agree with that proposition. The courts have been recognizing that and they won't look at this in a political vacuum or a policy vacuum; the courts will consider that when they review the rule and the goal of what the EPA is trying to do here.

Now, having said that, the other countervailing consideration from the other side will be the unprecedented nature of what EPA is trying to do with its existing authority under the Clean Air Act, and what I am talking about specifically, of the many legal issues, the one that I think is going to get the most attention from the court is something you have probably heard about several times by now, EPA's approach to regulate sources beyond the fence line of those sources, and it basically works like this: if my pen here is my coal-fired power plant, for the 45 years in the history of the Clean Air Act, the EPA has always set a standard for this coal-fired power plant based on the technology that could be achieved at this source, on what this coal-fired power plant could do.

But now EPA is saying in order to address climate change, that is going to limit us. We can only get so many emissions from the coal-fired power plant, so we have to look beyond the fence line; we have to look at natural gas facilities, we have to look at renewable energy, nuclear energy, the energy efficiency of buildings like this. And that will enable us, for the first time, to achieve greater reductions in greenhouse gases than what we can get from this coal-fired power plant.

Now, back to my first point. The court may think that is a noble goal, but at the same time it is going to be thinking also about the legal precedent of this beyond-the-fence-line approach for the first time in 45 years of the Clean Air Act; and it has really three precedential ramifications. The first is the practical ramification. As the two generals have spoken today, is the enormous expansion of authority to make EPA not only a regulator of the environment, but really the most significant regulator of energy at the national level. In order to get those greenhouse reductions, it has to include in its regulatory authority nuclear facilities, renewable energy facilities, energy efficiency in countless buildings. So it is expanding its authority to the entire energy market in a way that really Congress should be speaking to and Congress should be authorizing, as opposed to looking at inherent authority.

The second ramification is a legal one, and the courts are going to be concerned about the legal precedent here, that this is a departure from the Clean Air Act's historic approach focusing on sources, on the case law that has been consistent in EPA's past application. Never before in 45 years has EPA gone beyond a source and gone beyond the fence line. In the case law and the couple times it has tried to do so has shut that down.

And then the third concern for the courts is going to be the precedential nature of this on other sectors. If EPA is affirmed with this approach, this beyond-the-fence-line approach here, as it starts to regulate greenhouse gases from other sectors down the road, there is really going to be almost no limit to how it can look beyond an individual source to bring in other sources and, by the way, also hold other sources that are not currently subject to Clean Air Act regulation, like a nuclear facility, like this building and energy efficiency, bring them into EPA's regulatory regime.

While I have said the Supreme Court has endorsed EPA's climate change rules, there is an asterisk there. Less than a year ago, the Supreme Court did say, in partially affirming EPA, but partially reversing EPA, that EPA cannot look to the Clean Air Act to engage in sector-wide economic regulation; and that came out just 4 days after this Rule that the Supreme Court said we will not allow EPA to use the Clean Air Act to regulate lots of small sources and engage in sector-wide regulation of the economy. It is unfathomable how the justices that were concerned in that instance with EPA regulation wouldn't be concerned with this regulation.

The last thing I just wanted to mention briefly is the harm that we are going to see in the interim, during judicial review. It takes about 4 years for courts to review cases like this if it goes to the Supreme Court, and, again, the generals have spoken to some of the harms going to the State. I do want to point out, any single

rule, everybody is always going to allege harm. But this is fundamentally distinctive because of the ways I think Attorney General Pruitt and Morrisey have talked about, the ways States have to fundamentally restructure and reorganize their entire system of regulating energy, creating energy infrastructure, and also developing laws, enacting laws that promote renewable portfolio standards, energy efficiency programs, and so on. So this is fundamentally distinct in terms of the harm that is going to be realized in the short-term from other environmental rulemakings.

Thank you again for this opportunity.

[The prepared statement of Mr. Martella follows:]

The Legal Implications of the Environmental Protection Agency's Greenhouse Gas Existing Source Performance Standard for Utilities: *Whether*, *How* and *When* the Courts Will Undo It

Roger R. Martella, Jr.
Sidley Austin LLP[1]

Chairman Capito, Ranking Member Carper, and Members of the Subcommittee:

Thank you for providing me the opportunity and the honor to appear before you today.

The subject of today's hearing addresses the legal implications of what is likely the most important and precedent-setting environmental regulation of a generation. President Obama instructed the Environmental Protection Agency to develop the Greenhouse Gas Existing Source Performance Standard for Electric Generating Units ("ESPS") to address today's pressing environmental challenge: global climate change. In pursuit of a target of reducing greenhouse gases ("GHGs") from power plants by 2030, EPA proposes for the first time in the nearly 45 year history of the Clean Air Act ("CAA") to implement new legal interpretations that would massively expand its authority to set standards for existing sources of air pollutants far beyond what is technically achievable, feasible, or legally permissible at those sources. If implemented as proposed, the ESPS would become the federal government's most comprehensive regulation of energy itself, and forever elevate EPA's role to be the nation's most powerful regulator of energy at both the federal and state levels.

No matter how noble the goal may be set by the President and being implemented by EPA, there can be no debate at the outset that the Executive Branch first must act within the bounds and limits set by Congress. While it is settled now that EPA can regulate GHGs under the CAA, the unprecedented approach it proposes to take in the ESPS squarely conflicts with the CAA, 45 years of legal precedent, and a recent decision by the Supreme Court.

Although EPA has yet to finalize the ESPS, Administrator McCarthy has indicated that the final rule—due this summer—is unlikely to change materially from the proposal. For instance, McCarthy explained in an interview that "we are quite certain

[1] The views expressed here are that of the author are not intended to represent the views of Sidley Austin LLP or its clients.

that [the] obligations [in the proposed rule] will be required."[2] Given the certainty of its finalization, and the immediate irreparable harm that will flow from it, the time is thus now ripe for this Subcommittee to consider the legality of the final rule, the impact on states and the regulated community, and the legal precedent for future regulation of other sectors.

In my testimony below, I seek to answer three key questions: (1) *whether* the reviewing courts are likely to undo the ESPS; (2) *how* courts might address the precedent setting legal concerns the rule raises; and (3) *when* courts might take action. In summary, I, like many other legal commenters, conclude that the ESPS ultimately is unlikely to survive judicial review in its full form, but, importantly, in the interim states and the regulated community will confront significant irreparable harm while judicial review proceeds over the next several years. Indeed, as described below, the most important factor regarding the ultimate impact and harms of the ESPS may be the timing of judicial review.

Background

By way of background, I am both a lifelong environmentalist and a career environmental lawyer. I am very proud to have spent the majority of my career in public service, as a trial attorney in the Justice Department's Environment Division, as the General Counsel of the United States Environmental Protection Agency (a position to which I was unanimously confirmed by this Committee and the full Senate), and as a judicial law clerk on the Tenth Circuit Court of Appeals. Last week, Who's Who Legal named me the leading environmental attorney globally based on peer recommendations.

Both in the government and in private practice, I have served as counsel in almost every case addressing climate change and greenhouse gases. Last year, the Supreme Court in *UARG v. EPA* specifically adopted a position advanced by my clients that both affirmed in part and rejected in part the EPA's GHG regulation under the Prevention of Significant Deterioration ("PSD") permitting program. In my current capacity as a private practitioner, I am privileged to work with a number of stakeholders, including private companies and trade associations, environmental organizations, and the government, to develop regulatory solutions that advance environmental protection and address climate change while also enabling the United States to retain economic competitiveness in a trade sensitive, global environment

[2] Interview by Kate Sheppard with Gina McCarthy, EPA Administrator, *available at* http://www.huffingtonpost.com/2015/04/21/mccarthy-epa-climate-change_n_7102410.html.

where very few economies provide even the faintest glimmer of our own environmental controls.

Finally, in both my government and private careers, I am very proud of the opportunities I have had to participate in and advance international rule of law initiatives, working to help develop the enactment of environmental and public participation laws in growing economies. Recently, I served as one of two vice-chairs in the United States of the International Bar Association's Climate Change Justice and Human Rights Task Force, which released a landmark report regarding international legal mechanisms to address climate change. I am also honored to serve on the American Bar Association's President's Sustainable Development Task Force, Rule of Law Initiative, and as a delegate to the United Nations at the Rio+20 sustainable development conference in Brazil and the World Justice Forum at the Hague.

Setting the Stage for Judicial Review:
The Importance of Climate Change in the Courts
v.
The Precedent Setting Legal Nature of the ESPS

Before addressing the specific questions surrounding the merits, remedy, and timing of judicial review of the ESPS, it is important first to set the stage by which the D.C. Circuit and the Supreme Court will review the final rule.

First, like most significant policy issues, the courts will not review the legal issues in a jurisprudential vacuum detached and ignorant from the environmental goals being sought. This is a factor that greatly weighs in EPA's and the President's favor. In the eight years since the Supreme Court first held in *Massachusetts v. EPA* that EPA could regulate GHGs under the existing CAA, the question of EPA's general authority to address climate change is settled in the courts. But even more importantly for EPA, during these eight years the courts repeatedly have signaled that they view climate change as an important policy goal and have endorsed many of the efforts by the government to address GHGs.

The most active courts on climate change issues since 2007's *Massachusetts v. EPA* decision have been the United States Supreme Court, the D.C. Circuit Court of Appeals, and the Ninth Circuit Court of Appeals. (And here the Supreme Court and D.C. Circuit will play the key review roles in the ESPS.) Each court has issued decisions largely affirming federal and state authority to address GHGs and, specifically, regulatory agencies' ability to tailor old laws to address the new challenge of climate change. The Supreme Court has addressed EPA's authority now on three occasions, *Massachusetts v. EPA, AEP v. Connecticut,* and *UARG v. EPA*, and with the

exception of a partial vacatur in the *UARG* decision, has endorsed EPA's efforts to use the CAA to regulate GHGs. The Ninth Circuit perhaps has been the most explicit in discussing the court's view on providing leeway to regulatory agencies to address climate change. In addressing a Constitutional challenge to a purported California change regulation, the Ninth Circuit declared the Commerce Clause an "archaic formalism" and opined that "California should be encouraged to continue to expand its efforts to find a workable solution to lower carbon emissions, or to slow their rise" and held that the court "will not . . . block" California from such initiatives."[3] While the D.C. Circuit has not gone so far with explicit language, its decisions to date largely have affirmed EPA's GHG regulations to the extent allowed by the Supreme Court.

Thus, in 2015, it would be naïve for anyone to underestimate the importance on which courts consider climate change to be an important, if not paramount, policy goal for regulators to pursue and the likely discretion and leeway courts will be inclined to give to measures to address GHGs, even if they entail some creative and novel interpretations of legal authority. This factor may become particularly significant for the courts that review the ESPS given the perception of a pressing need by the United States to take action to reduce GHGs, the unlikelihood of Congressional action on the issue, and the uncertainty associated with the unknown policies of the next Administration. For these reasons, EPA unlikely will be defending its rulemaking on a level playing field, but instead before courts that are likely to be pragmatic in understanding what the Agency is trying to do with its handicapped middle aged legal authority in pursuit of the modern goal of addressing climate change.

At the same time, though, however noble the goal is perceived by the courts, they also will have to balance the unprecedented nature of EPA's legal approach, and the extraordinary consequences that endorsing such an approach would have for future regulation under the Clean Air Act generally.

As described below, the ESPS presents numerous significant precedent-setting and legal issues of first impression in the CAA's 45-year history that, if affirmed, will forever shape if not fundamentally reinvent the scope of EPA's regulatory reach moving forward. Indeed, this may be the first rule in EPA's history where the agency's lawyers felt compelled to include a separate legal justification document in the record to provide the opening argument in favor of its various pushing-the-envelope positions. There are far more novel issues of first impression presented in the rulemaking than there are settled ones.

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[3] *Rocky Mountain Farmers Union v. Corey*, 730 F.3d 1070, 1107 (9th Cir. 2013).

Most significantly, these issues, described below, will have expansive precedent beyond the specific rulemaking; even more importantly, if affirmed, they will fundamentally redefine and reshape EPA's regulatory reach for the next generation of rulemakings in a way typically reserved for legislative amendments. In essence, the proposed ESPS would be the nation's broadest and most extensive regulation of energy itself and establish EPA's authority effectively to reorganize the entire energy generation sector. By way of analogy, the impact of the ESPS here on the energy industry is akin to the impact of recent healthcare legislation on the medical services industry with one key distinction: unlike with healthcare, Congress has not specifically acted to authorize EPA to engage in the effective restructuring of the impacted sector here.

Along the way, the ESPS also would forever redefine the system of cooperative federalism upon which the nation's environmental laws are built and challenge Constitutional limits on the federal government's ability to commandeer states to pursue federal policies

Given the two important overarching considerations of addressing climate change and the precedent of the ESPS, the litigation of the ESPS is likely to be as extraordinary as the rule itself. Ultimately, despite the prominent significance and importance to the courts of the goal of addressing climate change, for the reasons described below the legal precedent presented by EPA's approach in the ESPS is likely to tip the scales in the favor of the Rule's challengers. Thus, the key questions at this time go beyond merely *whether* the courts will undo the ESPS, but *how* they will do so and *when* such a decision will be realized. I now take each of those questions in turn.

Whether
The Courts Will Undo the ESPS

Ultimately, I believe there are five key arguments that will be considered by the courts in deciding the legality of the ESPS.

1. The effect of CAA Section 112 on Section 111(d).

The question of whether Section 112 forecloses EPA's regulation of existing power plants under Section 111(d) has received an unprecedented amount of attention for a proposed rule as it already has been presented to the D.C. Circuit in three distinct challenges to the proposed rule. Assuming the D.C .Circuit does not resolve the issue now, it certainly will confront it again when the ESPS is finalized.

In short, the argument goes like this: the plain language of the codified version of Section 111(d) does not apply to air pollutants that are emitted from source categories subject to Section 112 (which governs hazardous air pollutants ("HAPs")). Fossil fuel-fired power plants, in turn, are subject to the Section 112 hazardous air pollutant standards under EPA's Mercury and Air Toxics Standards rule. Thus, even EPA has agreed that that "a literal reading" of this provision "would mean that EPA cannot regulate HAP or non-HAP emitted from a source category regulated under Section 112."[4] The Supreme Court has similarly found the language of section 111(d) to be clear. After describing generally EPA's authority to regulate existing sources under Section 111(d), the Court in *AEP* noted that "[t]here is an exception: EPA may not employ Section [111(d)] if existing stationary sources of the pollutant in question are regulated under the national ambient air quality standard program, Subsection [108-110], or the 'hazardous air pollutants' program, Section [112]. See Section [111(d)(1)]."[5]

Of course, everyone now knows that this argument is not so straightforward. Specifically, the analysis is complicated here by the peculiar fact that Congress enacted competing revisions to the same provision, one originating in the House of Representatives and one in the Senate. The Senate version reads slightly differently, but different enough, and would preempt from regulation under Section 111(d) only those pollutants that are actually regulated under Section 112.

There is little doubt that decades from now law professors will be teaching how the courts ultimately resolve this unique issue in administrative law classes. But today the challengers have the better of the arguments. Although it may seem instinctual to simply invoke standard *Chevron* deference here, as EPA attempts to do in choosing to give full weight to the Senate version while virtually disregarding the House version, in this instance, however, citing *Chevron* may be too simplistic a solution to save the agency's interpretation. Foremost, EPA itself has recognized that the Senate version was a "drafting error,"[6] and it is hard to see why that version should be given any weight at all, let alone greater weight than the House version. In fact, EPA has previously recognized that the House amendment is "the correct amendment," and

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[4] *See* Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units From the Section 112(c) List, 70 Fed. Reg. 15994, 16032 (Mar. 29, 2005).

[5] *AEP v. Connecticut*, 131 S. Ct. 2527, 2537 n.7, 41 ELR 20210 (2011).

[6] *See* 70 Fed. Reg. at 16031.

that it means just what the States say it does.[7] Further, when faced with conflicting provisions, EPA is required "to give effect to both if possible."[8] Indeed, EPA reached this same conclusion in a 2005 final rule, explaining that it "must attempt to give effect to both the House and the Senate [versions.]"[9] Here, as stated above, any attempt to give effect to the House version that has been codified in Section 111(d) is fatal to the ESPS because, as EPA has recognized, the literal language of that provision "mean[s] that EPA cannot regulate HAP or non-HAP emitted from a source category regulated under Section 112."

2. Reconciling EPA's Section 111(b) and (d) Rules

Although it is well-established doctrine that courts are inclined to defer to regulatory agencies on technical and scientific issues, there also are well-established exceptions to the rule. Courts offer no deference when an agency takes inconsistent positions across related regulations; instead, courts require that "identical words used in different parts of the same act are intended to have the same meaning."[10]

The CAA contains two provisions governing performance standards. Section 111(b) governs new sources, and Section 111(d) governs existing sources. There is no debate that Section 111(b) and (d) are related, if not symbiotic, provisions.

However, EPA's approaches to setting performance standards based on the Best System of Emission Reduction ("BSER") adequately demonstrated in the two proposals are entirely independent, distinct, and ignorant of each other, if not flatly inconsistent. For example, in the Section 111(b) proposal, EPA's BSER analysis focuses specifically on emission reduction opportunities for individual facilities within the fenceline of those facilities, and sets separate standards for coal- and natural gas-fired EGUs. By contrast, in the Section 111(d) proposal, EPA adopts an entirely distinct approach to BSER that looks far beyond the fenceline of any given facility, and merges not only coal and gas together, but also GHG reductions associated with renewable energy, nuclear energy, and demand-side energy efficiency—energy sectors that are not subject to the Section 111(b) proposal in the first place, and arguably not

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[7] EPA, *Air Emissions from Municipal Solid Waste Landfills—Background Information for Final Standards and Guidelines*, Pub. No. EPA-453/R-94-021, 1-5 ~ 1-6 (1995).

[8] *United States v. Borden Co.*, 308 U.S. 188, 189 (1939).

[9] 70 FR 15994, 16031.

[10] *Gustafson v. Alloyd Co.*, 513 U.S. 561, 570 (1995).

even subject to the CAA.

As a result of these disparate approaches, the Section 111(d) ESPS proposal turns Section 111 on its head by setting standards for existing facilities that are *more stringent* than those for new facilities in 30 states. If the ESPS survives the first argument above, and a court concludes that there is no generic preemption of Section 111(d) for Section 112 sources, this inconsistency between the Section 111(b) and (d) approaches may be grounds for the court to remand EPA's specific approach back to the drawing board for a rule that draws a stronger nexus between new and existing source regulation.

3. Regulating "Beyond the Fenceline"

The most novel, important and precedent setting legal issue presented in the ESPS is the proposal's approach to setting performance standards for EGUs based on emission reduction goals that can only be realized beyond the fenceline of those facilities. For the first time in the history of the CAA, EPA is interpreting its authority to set standards for regulated facilities—here, coal and natural gas power plants—based on emissions reductions that can only be achieved outside those facilities and from facilities such as nuclear and renewable facilities that are not even subject to CAA regulation. In so doing, EPA has assumed regulatory authority over energy generation, dispatch, and retail demand that has always been predominantly (if not exclusively) subject to state regulation.

EPA's policy rationale for adopting this approach is apparent. The agency concludes that, under the best of circumstances, existing coal-fired EGUs can realize at most 6 percent reductions in their GHG emissions by 2030 (a number that most coal-fired EGUs would contest as unrealistic and too aggressive). Thus, to realize the goal of 30 percent reductions by 2030, as outlined in the proposed rule, EPA had to look elsewhere to make up the difference. The core premise of the ESPS, therefore, is that fossil fuel-fired EGUs can be held accountable for the actions of third parties in other sectors that can reduce overall GHG emissions by displacing coal. And the other side of the coin is EPA's authorization to states to also hold non-EGUs—who are not otherwise subject to CAA regulation—liable under the CAA as a means of enforcing those reductions.

Putting aside the policy goals, the legality of this approach is untested and beyond the bounds of EPA's past regulation under the CAA. EPA hinges almost the entirety of its position on the fact that the Section 111 standard here—the best *system* of emission reduction—enables EPA to regulate a "system" of reductions. But this is a heavy lift for a single word read out of context. The arguments surrounding the legislative

history, case law, and past practice have been thoroughly fleshed out in the public comments, with challengers pointing to the approach's inconsistencies with everything that has come before it during the generations of CAA implementation to date.

But beyond the pure legality of the issue, the fundamental question for judges will focus on the precedent-setting nature of the decision. Ultimately, putting the specific arguments aside, supporting EPA's interpretation would require a court to endorse an approach that can hold individual facilities responsible and liable for the actions of third parties in entirely distinct sectors that are not regulated by the same rule or perhaps by the CAA at all. EPA's "portfolio" approach of compliance also, in turn, would hold unrelated third parties liable for a rule under a provision of the CAA that was never intended to apply to them. Even a court sympathetic to EPA's policy goals should pause on the precedential nature of such a decision, not only for this and future GHG rulemakings, but also for the potentially dramatic expansion of the CAA in other contexts into the future.

The legal questions here also extend beyond the CAA. When viewing the ESPS's beyond-the-fenceline approach through the lens of being fundamentally a regulation of energy in the states, states have advanced arguments about how the ESPS upsets the delicate balance between state and federal regulation of the energy sector expressed in the Federal Power Act, state regulations, and regional energy agreements. To implement EPA's ESPS, many states would have to enact new laws and regulations to enforce the new policies set by EPA, even though EPA itself would lack the authority to implement them directly under the CAA. All of this raises questions about the ESPS unraveling cooperative federalism, in potential violation of the Tenth Amendment and other laws.

4. The Challenges with EPA's Energy Sector Technical Assumptions

In the ordinary course, EPA should feel most confident and challengers most insecure when the legal debate before a court turns to challenging EPA's technical assumptions. As the D.C. Circuit recently reminded litigators who challenge EPA rules, "[w]e do not determine the convincing force of evidence, nor the conclusion it should support, but only whether the conclusion reached by EPA is supported by substantial evidence when considered on the record as a whole." Thus, seasoned EPA litigators devote precious little real estate in briefs to challenging technical issues and factual conclusions.

The ESPS, however, may present an exception to this general practice rule for challengers. Throughout the rule, EPA relies on several overarching uniform

assumptions regarding heat rate improvements at coal-fired EGUs, the ability to seamlessly switch dispatch from coal to natural gas combined cycle facilities, states' abilities to enact renewable portfolio standards and preserve at-risk nuclear energy, and efforts to improve demand-side energy efficiency on an annual basis.

It would not be surprising to see the courts take a deeper dive than they ordinarily are inclined to with both the lack of a record basis for EPA's assumptions and a litany of examples where the real world in individual states is at sharp and distinct odds with EPA's across-the-board assumptions. Although EPA surely will cite a mountain of case law in support of its position that neither other parties nor the courts should second-guess its judgment on its factual conclusions, the assumptions that will be challenged are not highly technical environmental and scientific issues where deference is most warranted for EPA, but rather involve assumptions about energy issues outside EPA's expertise. Indeed, just a few days ago, in *Delaware Department of Natural Resources and Environmental Control v. EPA*, the D.C. Circuit vacated portions of a rule governing emergency backup generators in part on the ground that EPA is not the federal agency tasked with regulating the power grid. Further, given the black-and-white nature of rebuttal facts that already have been presented by states and industry in the filed comments, courts are likely to be more willing to truly assess whether EPA's conclusions are arbitrary and capricious.

5. In the Shadow of the Supreme Court

Just five days after the proposed rule was published in the *Federal Register*, the Supreme Court issued its decision in *UARG v. EPA*, a challenge to EPA's inclusion of GHGs in the Prevention of Significant Deterioration ("PSD") permitting program. While the Supreme Court upheld aspects of the regulatory regime EPA proposed, it struck down EPA's attempts to extend the regulatory scheme of the CAA in a novel fashion, stating that:

> When an agency claims to discover in a long-extant statute an unheralded power to regulate "a significant portion of the American economy," *Brown & Williamson*, 529 U. S., at 159, 120 S. Ct. 1291, we typically greet its announcement with a measure of skepticism. We expect Congress to speak clearly if it wishes to assign to an agency decisions of vast "economic and political significance."[11]

[11] *UARG v. EPA*, 134 S. Ct. 2427, 2444.

Beyond that broader direction, however, also came the Court's comment that EPA cannot "regulate millions of small sources" including commercial, residential, and public buildings, a holding that appears to speak directly to EPA's proposal to regulate demand-side energy efficiency.

Although it is too early to know how lower courts, not to mention EPA, will implement this direction across a wide range of rulemaking challenges, *UARG* seems highly relevant here. In the ordinary course, there is probably little doubt that an agency, in the wake of such a relevant Supreme Court decision, would take the time to revisit its regulatory approach to reconcile it with the Court's direction. But very little about the ESPS is ordinary, and the administration has committed to an approach and time line that does not offer the flexibility required to fix the fundamental issues identified by the Court.

Thus, of the various arguments likely to be considered by the courts, the most inescapable one may be the shadow of the Supreme Court's *UARG* decision. While EPA certainly will work to distinguish it in the record, the D.C. Circuit is unlikely to give the Supreme Court's holding short shrift. As for the Supreme Court itself, it is admittedly difficult to fathom how five Justices who were sufficiently concerned about the EPA's assertion of expansive permitting authority would not share as significant a concern with a rule that is exponentially broader in reach.

How
The Courts Will Undo the ESPS

For many legal observers in this area, the key question is not whether the courts will strike down the ESPS, but instead how they will do so. In essence, there are two potential paths for the courts to rectify legal flaws and concerns with the ESPS: a full relief option and a partial relief option.

Several of the arguments above would likely warrant the court vacating the ESPS. Specifically, this scenario likely would arise if the court found that Section 112 preempts Section 111(d), if the court found the Section 111(b) and 111(d) approaches inconsistent, or if the court found the *UARG* decision as precluding such a sector wide regulation entirely. Under a "full relief scenario," EPA may have limited options left to address existing power plants under Section 111(d) of the Clean Air Act, and would look to other programs such as the PSD permitting program to realize GHG reductions from plant modifications that are triggered by the emissions of conventional air pollutants and, potentially, Section 111(b)'s coverage of modified and reconstructed existing sources. In addition, states would continue to have the ability

to pursue organic authority to address GHG emissions under state programs and legislation such as California's AB32 and the northeast RGGI coalition.

Other legal arguments might lead to a partial vacatur. For example, successful challenges to EPA's beyond the fenceline approach and/or its technical assumptions might lead to the court drawing lines in EPA's Blocks 1-2-3-4 approach. Under such a result, the court might find that EPA has some legal authority to regulate under the ESPS program, but contain it to one or more of the four building blocks. Indeed, anticipating the likelihood of this scenario, EPA is rumored to be inserting a "severability provision" into the final ESPS in an effort to salvage part of the rule making—a signal that the Agency itself is bracing for the possibility of a remand on at least one of the building blocks.

When
The Courts Will Undo the ESPS

Finally, for states and regulated parties adversely impacted by the ESPS, no question is becoming more important than the timing of judicial review and a final decision by the courts. Although EPA sets what at first blush appears to be a seemingly far off deadline of 2030 for full compliance with the ESPS, given the broad and unprecedented scope of the ESPS, historically there have been few environmental regulations whose extraordinary impacts will irreparably harm states and regulated parties so soon.

At the outset, the harm to the states will be extraordinary and irreparable. The ESPS is unique in that it places the primary implementation burdens on the states themselves. EPA has set aggressive deadlines requiring states to submit plans on how they will comply with the ESPS within one year after the rule is finalized, although EPA may grant limited extensions if States can show sufficient progress toward developing a final plan. As described by Attorney Generals Morrissey and Pruitt, this will put states squarely in the proverbial catch-22 position of expending significant state resources and creating regulatory uncertainty at home to develop plans that many states believe violate not only the Clean Air Act, but the Constitutional division of powers between states and the federal government. In addition, much of what EPA would require will warrant new state legislation. EPA presumes that the politically accountable legislative bodies of various states will comply with EPA's asserted goals regarding fossil fuels, renewable energy, and energy efficiency in the time established by EPA. If states do not submit adequate plans, EPA has made it clear that it will pursue the reductions in the states itself, which raises significant questions about EPA's own ability to dispatch energy among sources in a state, run a renewable portfolio standard mandate, maintain nuclear energy set for retirement, and operate an energy efficiency program.

In addition to state environmental agencies, the ESPS will pose significant challenges for public utility commissions and other organizations charged with operating and maintaining the electricity grid. To comply with EPA's aggressive emission reduction goals, PUCs, Regional Transmission Organizations ("RTOs") and Independent System Operators ("ISOs") will be forced to change from least cost dispatching to environmental dispatching. This fundamental transformation could pose significant untested questions for grid reliability and PUCs, RTOs, and ISOs will be required to invest significant resources to ensure the reliable delivery of electricity. Further, because the geographic scope of RTOs and ISOs differ from those of the states, these organizations will have to operate in a manner that ensures compliance with multiple and perhaps conflicting state plans. Recognizing the significant risks that the ESPS poses for these entities and for electricity consumers, FERC has urged EPA to include a reliability mechanism in the final rule to ensure that EPA's environmental regulations do not threaten the reliability of electricity sector. Several other regional bodies including the North American Reliability Corporation, Southwest Power Pool, the Electric Reliability Council of Texas, and the Midcontinent Independent System Operator have all questioned whether electricity can be reliably provided under the emission reduction requirements that EPA would impose.

Finally, the ESPS, once final, will have an immediate impact on the regulated community. In the proposed rule, EPA has set interim compliance deadlines that must be realized as soon as 2020. On average, these interim 2020 compliance deadlines are approximately two thirds as stringent as the final 2030 compliance requirements. This means that the bulk of the reductions must be realized far in advance of 2030, with the most significant and dramatic burden occurring between now and 2020. This so-called "cliff" between now and 2020 may lead to decisions to shut down coal plants in advance of 2020 while leaving inadequate time to develop the generation capacity and infrastructure for new facilities given the timing necessary for planning, permitting, construction, and startup of new facilities and infrastructure. EPA has hinted that it recognizes this concern and plans to soften the interim deadlines in the final rule. However, it is unlikely to change the ultimate targets to an extent that would avoid the immediate impact and harm to the regulated community once it finalizes the rule.

Unfortunately, under the best of circumstances, judicial review in the D.C. Circuit and the United Supreme Court likely will outlive the near term deadlines in the ESPS. On average, the D.C. Circuit issues decisions 19 months after the commencement of an administrative appeal. The Supreme Court issues decisions on average 9 months after the granting of a petition for certiorari. Importantly, these time frames do not include the time for petitions for rehearing and the time for the filing of and review of a

petition for certiorari. Indeed, recent history has shown that it took more than four years from the filing of litigation challenging EPA's recent greenhouse gas standards for the PSD program to a final decision by the Supreme Court—and the case remains active in the D.C. Circuit to this day. In the meantime, both the states and the regulated industry will be irreparably harmed awaiting a court decision as they decide during the pendency of review whether to proceed in reliance of the possibility of the rule being affirmed and implemented or risk the potential for severe sanctions for noncompliance.

The common rebuttal to these concerns is that almost all environmental rules lead to some immediate harm to both industry and state regulators. That may be true as a general point, but the ESPS is unique and distinct in unprecedented ways. For example, under the well established NAAQS state and federal implementation program regimes, Congress first specifically authorized EPA to implement a NAAQS applying to the states and second, in turn, authorized EPA to delegate EPA's authority to states. Here, however, EPA can point to no authorization by Congress enabling EPA to implement blocks 2, 3 and 4 of the ESPS; indeed, several states have commented that the Constitution's Tenth Amendment forbids Congress from doing so. Thus, EPA cannot require the states to do what Congress has not authorized EPA to do in the first place, and what the Constitution arguably forbids. Furthermore, the ESPS reaches not only specific facilities, but virtually the entire energy grid, and would warrant changes to not only energy production but infrastructure and states laws and compacts.

Thus, the timing issues associated with implementation of the ESPS, the requirements of state plans, and judicial review take on an unprecedented importance here. States will be pressed to decide whether to waive their asserted Constitutional rights or risk enforcement by EPA while they engage in judicial review of the ESPS in the courts.

Similarly, the harm to industry during judicial review is distinct from other rulemakings. In conventional environmental rulemakings, the regulated community typically will be required to make economic investments in new technologies at existing facilities between the time of a final rule and the completion of judicial review. While these investments can be significant and costly, these harms are distinct from the decisions the ESPS requires. Because there is no existing add on technology to reduce GHGs of the magnitude required by EPA, complying with the ESPS could force decisions to shut down coal facilities in favor of natural gas, renewable, and nuclear facilities for which any one generator may have no control. Thus, energy providers in many states will need to make irreparable decisions regarding not only power generation, but also transmission and infrastructure, that will entail more than just economic harm due to investments at existing facilities, but also fundamental

decisions about the viability of existing and new facilities and the need for new infrastructure. Such consequences are far beyond the impact of conventional environmental rulemakings.

For these reasons, the actual fate of the impact of the ESPS will be decided as much by the timing of a final decision as it will the ultimate outcome by the courts. Given the unlikelihood that the ESPS will survive judicial review fully in its anticipated final form, the timing of relief obtained by the courts ultimately is likely to be the key factor in assessing the magnitude of harm caused to states and the cost and reliability of electricity not only during the pendency of judicial review, but on a going forward basis after a final court decision.

Thank you for the opportunity to share my views on this important topic. I would be happy to answer any questions.

Senator CAPITO. Thank you very much.

Our next witness is Ms. Kelly Speakes-Backman. She is a member of the Maryland Public Service Commission and she is also the Co-Chair of the Regional Greenhouse Gas Initiative. Welcome.

STATEMENT OF KELLY SPEAKES-BACKMAN, MARYLAND PUBLIC SERVICE COMMISSIONER, CHAIR, BOARD OF DIRECTORS, RGGI

Ms. SPEAKES-BACKMAN. Thank you. Good morning. Thank you for inviting me to speak today. It is truly an honor.

Since the issuance of the Clean Power Plan, proponents and opponents alike have been engaged in many discussions about what the next steps are. Reiterating a sentiment expressed by one of my dear fellow panelists, one of the most significant questions for States right now is how do I comply.

I respectfully submit to you, from the perspective of a State that already has boots on the ground on this issue, not only can States comply with the Clean Power Plan, but we can do so in a way that generates economic benefits and supports grid reliability.

Furthermore, I ask in return can we, as States, afford not to comply with the Plan?

Rather than looking at this in the contexts of a Federal implementation plan and what that would mean look like, I encourage the legal experts and legislators to view this situation from a State regulator's perspective.

As noted in the recently released Quadrennial Energy Review, severe weather is the leading cause of power disruptions, costing the U.S. economy from $18 billion to $33 billion a year. And as a rate utility regulator, I have the statutory obligation to ensure reliable and affordable electricity. In a restructured market I need more tools at my disposal than what is available to me from within the fence line of a power plant in order to meet those requirements.

Modernizing the electricity grid is critical and it requires multistate collaboration to implement cost-effective infrastructure improvements. The proposed Plan is an impetus for us States to access our grid and to face the reality of an already shifting fuel mix. Adding carbon pollution reductions is a metric for States to consider.

The RGGI States have continued for 7 years now, and coming up on 28 auctions, to successfully implement the Nation's first fully operational carbon market. The RGGI program, initiated by a bipartisan group of Governors and developed collaboratively by economic and environmental regulatory bodies, caps emissions by first determining a regional budget of carbon dioxide allowances and then distributing a majority of those allowances through the regional auctions at market prices, and finally capturing that value for reinvestment into strategic energy programs.

Although we have collaborated for the better part of a decade, the region remains surprisingly diverse. We comprise three different separate electricity regions, different political and economic landscapes, and dissimilar generation profiles. Maryland, for example, is 44 percent coal.

It is a little bit surprising for those who look into the RGGI region and think of us all as northeastern States. But we have

learned to balance that and we have learned to diversify our fuel mix. We have gone, from 2005 to 2013, from 56 to 44 percent coal, demonstrating that it is actually possible for a State with a significant coal generation profile to reduce our carbon dioxide emissions. The carbon intensity of the whole RGGI region's power sector has decreased at twice the rate of the rest of the Country.

So you will find more statistics in my written testimony that attest to the economic and environmental benefits for our region and for my State. The benefits informed our perspective of the RGGI States as we voiced support for the framework of the Clean Power Plan and recommended revisions to ensure that early action is recognized and that State targets are verifiable, transparent, equitable, and enforceable.

Regional mass-based programs like RGGI are advantageous in part because they closely align with the nature of the grid already and they allow for transparent and verifiable tracking and compliance systems. Recent analysis even from our own regional transmission organization, PJM, calculated higher compliance costs for States that go it alone, underscoring the cost-effectiveness of regional plans. States that work together can implement a regional emission budget across a larger geographic boundary and they can find the least cost solutions across a larger selection of options.

To add some perspective on the timing, just a really quick one on that. The power sector has already responded effectively in the RGGI region to environmental regulations in less time than the EPA provides the rest of the Country as part of the Clean Power Plan. In fact, measures supported by RGGI investments have advanced reliability goals in the region in just 7 years. In contrast, States have 15 years to meet the final compliance goals. We have reduced our carbon dioxide emissions from power plants by 40 percent, while our region's economy grew by 8 percent over that same timeframe.

Finally, we have accumulated some pretty good lessons as a participant in RGGI that we hope will be instructive to other States. No. 1, we formed intra- and interagency relationships through cooperative effort, which allows us to do a lot more for a lot less. The regional mechanism has stimulated quite some good stakeholder engagements as many of the compliance entities span multiple jurisdictions and appreciate the regional consistency. The third is that consistency doesn't mean that we have to have identical programs. Each State has its own programs based on its own policy and needs.

And, last, I think the most important lesson is that participation in a mass-based regional compliance effort will likely provide our States the most flexibility moving forward. Using this mass-based construct, the cap is the only enforceable mechanism, and that cap is enforced by our individual State regulators. So States retain jurisdiction over their individual energy efficiency and renewable energy programs; they are not subject to the Federal implementation. And we can continue to offer these initiatives to mitigate the cost of compliance for ratepayers.

So thank you. We look forward to working with you and answering questions.

[The prepared statement of Ms. Speakes-Backman follows:]

United States Senate Committee on Environment and Public Works

Subcommittee on Clean Air and Nuclear Safety

Testimony on "Legal Implications of the Clean Power Plan"

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Summary of Remarks:

- The Regional Greenhouse Gas Initiative (RGGI) states have demonstrated that it is possible to achieve cost-effective pollution reductions while maintaining grid reliability, and while having a positive impact on ratepayers and our overall economies.
- Carbon pollution in the RGGI region has decreased by over 40 percent, while the regional economy has grown by 8 percent.
- The basic structure of EPA's proposed rule is sound, although the RGGI states recommend that EPA adopt certain revisions to ensure that early action is recognized, and that the state targets are verifiable, transparent, equitable, and enforceable.
- Maryland's experience and recent independent grid operator analysis indicate that a regional path to compliance with the Clean Power Plan is the most efficient and cost-effective path forward.
- Independent analysis concluded that the impact of RGGI's first three years is $1.6 billion net economic gain to the region; changes in 2014 are projected to provide an additional $8 billion in gross regional product and add more than 130,000 job-years.
- Through 2013, Maryland invested $277 million in RGGI proceeds, directing 90 percent of the State auction proceeds toward energy efficiency initiatives, renewable energy projects, and direct bill assistance.
- Using a regional, mass-based construct, the regional emission cap is the only enforceable mechanism included in a compliance plan; states retain jurisdiction over their individual energy efficiency and renewable energy programs, and can continue to offer these initiatives as complementary measures that help mitigate the cost of compliance for their ratepayers.

Thank you Chairman Capito, Ranking Member Carper, and other members of the subcommittee for inviting me to testify this morning. As a Commissioner of the Maryland Public Service Commission, and as the Chair of the RGGI, Inc. Board of Directors, I am grateful for the opportunity to provide testimony on this crucial and timely subject. I particularly appreciate the opportunity to comment on the practicality of the EPA's proposed Clean Power Plan from the perspective of a state economic regulator.

Since the issuance of the proposed Clean Power Plan, proponents and opponents alike have been engaged in lengthy discussions regarding next steps. Reiterating a sentiment expressed by one of my fellow panelists, one of the most significant questions for states right now who are looking at the Clean Power Plan is: how do they comply? While I note that the panelist I am referencing expressed this sentiment as a reason to oppose the EPA's proposal, I respectfully submit to you, from the perspective of a state that already has boots on the ground on this issue: not only *can* states comply with the Clean Power Plan, but we can do so in a way that reduces harmful pollution, while also generating economic benefits and supporting grid reliability.

Furthermore, I take this opportunity to highlight a question I would ask in return of opponents to the EPA's proposal: can we as states afford *not* to comply with the Clean Power Plan? Rather than considering this question in the context of what a Federal Implementation Plan would look like, I encourage legal experts and legislators alike to view the situation from a state regulator's perspective. As noted in the recently-released Quadrennial Energy Review, severe weather is the leading cause of power disruptions, costing the U.S. economy from $18 billion to $33 billion a year. As a state commissioner, I have the statutory obligation to ensure reliable and affordable utility service, and especially acting as a regulator in a competitive and restructured market, I need more tools at my disposal than what is available to me within the

fenceline of a power plant to meet my obligation. Modernizing the electricity grid is critical and requires multi-state collaboration and planning to efficiently and cost-effectively implement key infrastructure improvements. The proposed Clean Power Plan is an impetus for states to assess our interconnected electric grid and to approach the reality of an already shifting fuel mix through a shared lens adding carbon pollution reductions as a mandatory metric for states to consider.

As an economic regulator first and foremost, my primary objective is to ensure that the policy goals of my State that effect the electric sector are realized in the most cost-effective way possible while maintaining grid reliability. To this end, I am pleased that the EPA has allowed states to work within the current construct of our electric grid markets and by encouraging a regional approach to compliance. As one of the nine states participating in the Regional Greenhouse Gas Initiative (RGGI), the experience of my State, as well as recent analysis completed by several independent grid operators, indicates that a regional path to compliance is the most efficient and cost-effective path forward.

Maryland, along with Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont, continue for the seventh year to successfully implement the nation's first fully-operational carbon market. The RGGI program, initiated by a bipartisan group of governors and developed collaboratively by economic and environmental regulatory bodies, caps emissions by first determining a regional budget of CO_2 allowances, and then distributing a majority of the CO_2 allowances through regional auctions at market prices so that the states may capture the allowance value for reinvestment in strategic energy programs.

Collectively, the nine RGGI states represent 16 percent of the U.S. economy and generate a total gross domestic product of 2.4 trillion U.S. dollars. Inclusive of California's similar program, 28 percent of the U.S. economies are operating under the market-based carbon

programs of RGGI or AB32. The states work together within the current electricity markets to create a unified system for auctioning and trading carbon allowances so that environmental goals are achieved through least-cost, market-based solutions. Although the nine states have collaborated effectively for the better part of a decade, the RGGI region remains diverse in many aspects. The RGGI states comprise three separate electricity regions, different political and economic landscapes, and dissimilar generation profiles.

For example, Maryland's in-State generation remains predominately coal [See Graph 1 in Appendix]. As a part of RGGI and coupled with other state energy initiatives, however, Maryland has diversified its fuel mix and reduced its carbon footprint. Since 2005, in-State generation from renewables, nuclear energy, and natural gas as a percentage of total generation mix has increased from 36 percent to 55 percent, while in-State generation from coal has decreased from 56 percent to 44 percent.

Over the entire RGGI region, power sector carbon pollution has decreased by over 40 percent, while the regional economy has grown by 8 percent (2005 to 2013) [See Graph 2 in Appendix]. Non-hydro renewable generation has increased by 47 percent, while regional dependency on coal and oil has decreased. The carbon intensity of the RGGI states' power sectors (in tons per MWh) has decreased at twice the rate of the rest of the country.

Market forces and complementary state policies and programs, such as RGGI, are driving these cost-effective pollution reductions while simultaneously supporting local economies. State energy efficiency, demand response, and renewable energy initiatives, as well as policies to encourage fuel-switching to less carbon-intensive fuels, all work in tandem to reduce pollution and to establish long-term solutions for a reliable energy infrastructure. Many of these complementary state strategic energy initiatives are funded using proceeds from the regional

RGGI allowance auctions – creating a virtuous cycle of benefits that also serves to minimize ratepayer impact.

Through 2013, across the region the RGGI states reinvested over $1 billion of auction proceeds in energy efficiency, clean and renewable energy, and other strategic energy programs. Maryland accounted for more than $277 million of this regional investment, with 90 percent of the State auction proceeds directed toward energy efficiency initiatives, renewable energy projects, and direct bill assistance. The reinvestment of auction proceeds in consumer benefit programs has helped more than 215,800 low-income Maryland families pay their energy bills, supported energy efficiency upgrades at 11,880 low- to moderate-income households, and helped 5,206 families and 201 businesses in Maryland install solar, wind, and geothermal systems.

An independent analysis by the Analysis Group on the economic impacts of RGGI conclude that RGGI's first three years alone are adding $1.6 billion net economic value to the region, and that benefits are likely to have increased further since then [See Note 1 in Appendix]. Changes to the RGGI program in 2014 (including a 45 percent reduction to the cap) are projected to provide an additional $8 billion in gross regional product and add more than 130,000 job-years for our citizens.

These benefits – both economic and environmental – informed the perspective of the RGGI states as we voiced support for the general framework of the Clean Power Plan. Through two sets of comments in which we expressed our support, we also recommended revisions to the Plan to ensure that early action to reduce carbon emissions from the power sector is recognized, and that the state targets are verifiable, transparent, equitable, and enforceable [See Notes 2 and 3 in Appendix].

The RGGI states commend the EPA for recognizing multi-state, mass-based programs like RGGI as an acceptable means by which to demonstrate compliance with the Clean Power

Plan. Regional mass-based programs are advantageous in part because they closely align with the regional nature of the electricity grid, and allow for a simple, transparent, and verifiable tracking and compliance system. Recent analysis from PJM calculated higher compliance costs for states that "go it alone," underscoring the cost-effectiveness of regional plans. Groups of states can implement a regional emission budget that reduces overall emissions across a region using the most cost-effective measures available to a larger geographical boundary, while allowing for potential emission increases in some specific locations where more efficient energy resources are available. This structure allows the market to determine the most cost-effective solutions, helping to maximize emission reductions at the lowest possible cost – a concept demonstrated by the RGGI states' own experience.

Furthermore, reliance on a regional, market-based construct to accomplish environmental goals prevents the superimposition of any additional function on our markets beyond the roles already required of our existing electricity market players. Reliable dispatch of the least-cost resources remains with our grid operators; the North American Electric Reliability Corporation retains its responsibility to assure the reliability of the bulk power system; the Federal Energy Regulatory Commission retains its responsibility to design and enforce wholesale market structures; and our utilities retain responsibility for distribution-level reliability. Maryland recognizes that reliability is of utmost importance to the success of any power sector initiative, including RGGI and the Clean Power Plan. In both cases, a properly designed plan allows grid reliability and pollution reduction programs are fully compatible.

In the RGGI states' experience, our power sector has been able to respond effectively to environmental regulations in less time than the EPA provides the rest of the country as part of the Clean Power Plan. In fact, measures supported by RGGI investments in peak demand reduction and energy efficiency programs have advanced reliability goals in the region.

Maryland has achieved a 14.6 percent reduction in peak electricity demand from a 2007 baseline, equivalent to avoiding the need for 1,743 MW from 2008-2014. In contrast, the interim compliance goal notwithstanding, states have 15 years to meet the final compliance goal. This allows adequate time for grid reliability to be fully upheld through ordinary planning and resource development.

Several independent studies of reliability under the proposed Clean Power Plan confirm the experience of the RGGI states. Researchers including the Analysis Group have noted that utilities' goals of ensuring reliability and reducing carbon pollution are fully compatible [See Note 4 in Appendix]. Others have noted that many of the grid changes encouraged by the Clean Power Plan are already underway due to existing economic forces and environmental regulations already in effect. Likewise, while the ISO/RTO comments suggest that more reliability assessments should be undertaken, the comments conclude that well-designed plans will ultimately be able to ensure reliability [See Note 5 in Appendix].While RGGI is one path forward, it is only one of many proposed regional compliance mechanisms being discussed among industry stakeholders. Through our participation in RGGI, Maryland has accumulated invaluable lessons that may be instructive to other states as they investigate their options for compliance with the Clean Power Plan. One such lesson stems from the formation of intra- and inter-state agency relationships as part of the regional cooperative effort; relationships and resources that spill over into other initiatives such as distributed generation, electric vehicles, and compliance with other EPA regulations. The pooling of staff resources and state budgets through participation in a regional mechanism allows states to achieve a lot more, for a lot less. These administrative efficiencies translate into funding and resources for the completion of necessary regional electric sector modeling in a timely fashion, with built-in peer review. It is also the experience of the RGGI states that a regional mechanism stimulates active and

productive stakeholder engagement, as many potential compliance entities span multiple jurisdictions and appreciate the desire for regional consistency. Which leads into another lesson learned: regional consistency does not require states to implement identical programs. RGGI states do in fact deviate in program implementation and administration; for example, beyond a minimum commitment to re-invest 25% of auction proceeds in consumer benefit initiatives, RGGI states may distribute the remainder of auction proceeds as dictates by individual state policy and needs.

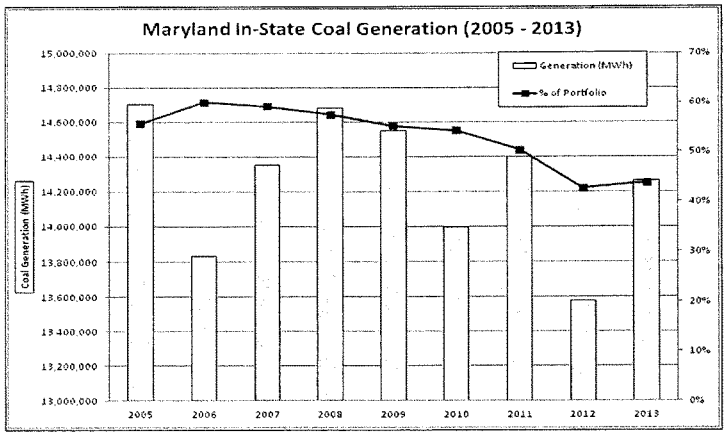
Lastly, I would like to greatly emphasize the most important lesson learned by the RGGI states to-date – a lesson that we intend to rely on as we move toward compliance with the proposed EPA rule. Participation in a regional compliance effort will likely provide your state the *most* flexibility moving forward. Initial hurdles surrounding the structure of the mechanism are not in fact insurmountable, as the real-world example of the RGGI states demonstrates. Using a regional, mass-based construct, the regional emission cap is the only enforceable mechanism included in a compliance plan; states retain jurisdiction over their individual energy efficiency and renewable energy programs, and can continue to offer these initiatives as complementary measures that help mitigate the cost of compliance for their ratepayers.

Maryland looks forward to working with FERC, EPA, and our fellow states to navigate compliance options as the implementation of the Clean Power Plan moves forward. Our experience has demonstrated that flexible carbon emission reduction programs, coupled with other state policies, can work within the construct of establish markets to reduce harmful pollution while also generating economic benefits and supporting grid reliability.

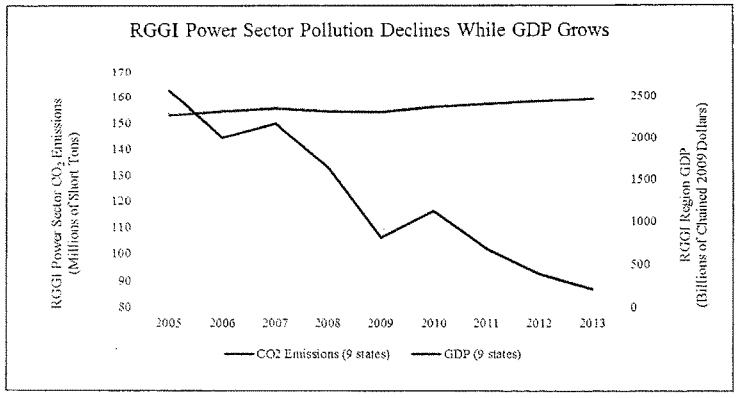
Appendix

1. *EPA's Clean Power Plan: States' Tools for Reducing Costs and Increasing Benefits to Consumers*. The Analysis Group, 2014.
2. *RGGI States' Comments on Proposed Carbon Pollution Guidelines for Existing Stationary Sources: Electricity Generating Units*. Nov. 5, 2014.
3. *RGGI States Supplemental Comments on Proposed Clean Power Plan*. Dec. 1, 2014.
4. *Electric System Reliability and EPA's Clean Power Plan: Tools and Practices*. The Analysis Group, Feb. 2015.
5. *Comments of the ISO/RTO Council on Carbon Pollution Guidelines for Existing Stationary Sources: Electricity Utility Generating Units*. Dec. 1, 2014.

Graph 1:



Graph 2:



Senator CAPITO. Thank you.

And our final witness is Ms. Lisa Heinzerling, who is a Professor at Georgetown University. Welcome.

STATEMENT OF LISA HEINZERLING, PROFESSOR, GEORGETOWN UNIVERSITY

Ms. HEINZERLING. Thank you and thank you for inviting me to appear before you today to discuss the legal implications of EPA's carbon dioxide rule.

Many dramatic legal arguments have been raised against EPA's proposal. Opponents of EPA's proposal have claimed that the proposal is unconstitutional under any one of a number of novel theories. They have also argued that the whole proposal, or significant aspects of it, are unlawful under the Clean Air Act. We have heard several such arguments already this morning.

In my view, the constitutional and statutory arguments that have been raised against EPA's proposed rule collapse upon close inspection.

For example, constitutional principles of federalism are not violated by EPA's proposal. Under EPA's proposal, States have a choice. They may devise their own plans to meet the State-specific targets EPA will set or they may let EPA devise a plan for them. This is the very same choice States have had for 45 years under the Air Quality Standards Program of the Clean Air Act. It is not an unconstitutional choice.

Nor does EPA's proposal violate the doctrine forbidding delegations of legislative authority to the Executive. EPA is interpreting statutory provisions of less than ideal clarity, using its best judgment to offer an interpretation that gives some force to the provisions enacted by Congress. The opponents of EPA's rule argue that if EPA interprets the statute the right way, the way they favor, it raises no non-delegation issue. But, they say, if EPA interprets the statute the wrong way, the way they don't like, this violates the non-delegation doctrine.

In 2001, in a case called Whitman v. American Trucking Association, Justice Scalia, writing for a unanimous Supreme Court, rejected this exact theory, the theory that an agency can cure or create a non-delegation problem by adopting a particular interpretation of a statute.

If the Clean Air Act presents EPA with an unconstitutional choice between apparently conflicting provisions, which it does not, the remedy would be to strike those provisions down, not to require the adoption of the interpretation that opponents of this rule prefer.

EPA's proposal also does not violate the Clean Air Act. Much has been made of the two different 1990 amendments to Section 111(d), both passed by Congress and both signed into law by President George H.W. Bush. EPA has long offered an interpretation of Section 111(d) that aims to take something from each of these amendments.

Under EPA's construction of the amendments, EPA may not, under Section 111, regulate the same hazardous air pollutants from the same sources under both that section, Section 111, and Section 112. This interpretation makes perfect sense and respects

the larger structure of the Clean Air Act, which pervasively leaves room for regulation in the event new threats from air pollution come to the fore.

EPA's proposed consideration of a wide range of emissions reduction measures and setting State targets, including renewable portfolio standards and demand-side energy efficiency, is also consistent with the broad authority given to it by Section 111(d). In contrast to what we have heard this morning already, this kind of approach is not unprecedented. EPA has long, for conventional air pollutants, allowed compliance via renewable energy standards and energy efficiency programs.

And here it is worth thinking about what the claim is. The claim is that, in essence, there is too much flexibility afforded by the Plan. It is worth noting here the Office of Management and Budget of the White House, in 2003, noted that the Clean Air Act had the largest quantified health benefits of any Federal regulatory program. The latest EPA study of costs and benefits of the Clean Air Act found in a central estimate that the Clean Air produces $30 worth of benefits for every dollar-worth of costs. The ratio is 30 to 1 under a central estimate. Under a high estimate of benefits, it is 90 to 1.

This doesn't happen by accident. This kind of program, this kind of statutory implementation happens as a result of firm, but sensible interpretation of broad statutory provisions. It is mystifying to me that opponents of the Clean Power Plan are criticizing EPA for exhibiting the same good sense and flexibility that has served the Clean Air Act and this Country so well for 45 years.

[The prepared statement of Ms. Heinzerling follows:]

TESTIMONY
OF
LISA HEINZERLING

JUSTICE WILLIAM J. BRENNAN, JR., PROFESSOR OF LAW,
GEORGETOWN UNIVERSITY LAW CENTER

BEFORE THE SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY OF THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
UNITED STATES SENATE

HEARING ON
LEGAL IMPLICATIONS OF THE CLEAN POWER PLAN

MAY 5, 2015

Lisa Heinzerling
Justice William J. Brennan, Jr., Professor of Law
Georgetown University Law Center
Testimony before the Subcommittee on Clean Air and Nuclear Safety of the
Committee on Environment and Public Works
United States Senate
May 5, 2015

Thank you for giving me the opportunity to testify before you today on the legal implications of the Environmental Protection Agency's proposed rule to regulate carbon dioxide from power plants, known as the "Clean Power Plan."

I am the Justice William J. Brennan, Jr., Professor of Law at the Georgetown University Law Center. My primary expertise is in environmental law and administrative law. My work in these areas includes four books and dozens of law review articles and book chapters. I was the lead author of the briefs for the petitioners in *Massachusetts v. EPA*, 549 U.S. 497 (2007), in which the Supreme Court held that the Clean Air Act authorizes the Environmental Protection Agency to regulate greenhouse gases and that EPA had erred in refusing to regulate these pollutants for policy reasons unconnected to the statute. I was counsel of record for petitioners Massachusetts and New Jersey in *Whitman v. American Trucking Associations*, 531 U.S. 457 (2001), in which the Court upheld a central program of the Clean Air Act against a constitutional challenge based on the nondelegation doctrine. From January 2009 to December 2010, I took a leave of absence from Georgetown to serve first as Senior Climate Policy Counsel and then as head of the Office of Policy at the U.S. EPA.

In this testimony, I will discuss three sets of legal claims that critics of EPA's proposed Clean Power Plan have asserted against it and explain why they lack merit.

These claims are that the Clean Power Plan violates the Constitution by taking property without just compensation and without due process, usurping States' authority, and disrespecting constraints on the delegation of authority from Congress to the executive; violates the Clean Air Act by regulating, under section 111(d) of the Act, sources that are regulated under section 112 of the Act; and violates the Clean Air Act by considering carbon-reducing measures "beyond the fence line" of individual power plants. As I will explain, the constitutional claims have no basis in current doctrine, and the statutory claims misunderstand the Clean Air Act and EPA's authority under it.

I. The Clear Constitutionality of the Clean Power Plan

Critics of the Clean Power Plan – most notably, renowned constitutional law scholar Laurence Tribe of Harvard Law School – have asserted that the rule violates several constitutional doctrines: doctrines on takings and due process, federalism, and nondelegation. These claims are fundamentally inconsistent with current law.

Much of the argumentation on these constitutional theories proceeds from two deeply misguided premises. The first is that, once the government has favored a particular industry, over a period of time, with financial subsidies and regulatory forbearance, it may not – even in response to new information about the harms caused by that industry – cease lavishing favorable treatment on the industry without paying for its decision. The second is that the harm caused by carbon dioxide is not the kind of harm that counts for constitutional purposes. Nowhere is

this mode of argumentation more prominent than in the critics' theory that the Clean Power Plan violates the takings and due process clauses because it upsets the "reasonable investment-backed expectations" of the coal industry and targets a subset of polluting sources.

This theory is long on rhetoric but short on law. It is not true that *any* interference with "reasonable investment-backed expectations" violates the takings clause. In order to run afoul of the takings clause, a regulation must deprive a property owner of all or substantially of the value of her property.[1] The Clean Power Plan does not do this. Moreover, the plan does not even interfere with *reasonable* investment-backed expectations. The federal government has never promised the coal industry that its gargantuan carbon load will be allowed to continue indefinitely. The coal industry, like all other property owners, has no constitutional right to immunity from new regulations designed to protect the public from harm. As Justice Antonin Scalia affirmed in *Lucas v. South Carolina Coastal Council*, a "property owner necessarily expects the uses of his property to be restricted, from time to time, by various measures newly enacted by the State in legitimate exercise of its police power."[2]

Professor Tribe has conceded that the government may, without violating the takings or due process clause, "phas[e] out intrinsically harmful activity that injures

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[1] Lingle v. Chevron USA Inc., 544 U.S. 528, 539 (2005) (regulatory restrictions rise to the level of a taking only if their economic impacts are so severe that they are "functionally equivalent" to a direct appropriation or physical occupation of private property).
[2] 505 U.S. 1003, 1027 (1992).

identifiable individuals or businesses."[3] With the novel criteria of intrinsicality and identifiability in hand, Professor Tribe aims to distinguish carbon dioxide from other air pollutants that, he tacitly admits, may be regulated without compensation. Carbon dioxide, he posits, "simply is not a pollutant in the conventional sense"; rather, "it is a benign gas essential for life."[4] "No cause-and-effect relationship" exists, Tribe continues, "between the actions of any individual and any specific harm."[5]

The trouble with this argument is that parroting the Competitive Enterprise Institute's "they call it pollution; we call it life" television advertising campaign is not a constitutional theory.[6] There is no constitutional doctrine that embraces Professor Tribe's eccentric view of "intrinsic" harm, which ignores both the lethal potential of carbon dioxide in high concentrations and the catastrophic potential of carbon dioxide for the world's climate. And there is no constitutional doctrine that adopts Professor Tribe's novel condition that victims of harm be individually identifiable before the government may regulate the harmful activity without compensating those doing the harm. If this condition held, much of the Clean Air Act would be unconstitutional in the absence of a massive compensation scheme for the industries regulated by it. We do not know exactly who dies when concentrations of particulate matter reach a deadly level, who suffers neurological damage when mercury concentrations are too high, or who gets skin cancer as a consequence of

[3] Testimony of Laurence H. Tribe, Before the Subcommittee on Energy and Power of the Committee on Energy and Commerce, U.S. House of Representatives, at 28 (March 17, 2015) ("Tribe Testimony").
[4] Id., at 28-29.
[5] Id., at 29.
[6] The ad is available here: https://www.youtube.com/watch?v=7sGKvDNdJNA.

the thinning of the ozone layer. Laws like the Clean Air Act reflect a conscious rejection of the notion that injury must take a particular, pre-twentieth-century-common-law-type form before it may be addressed by law. Professor Tribe's theory would do radical damage to such laws.

Equally strange is Professor Tribe's claim that the government must pay compensation when it aims regulation at a subset of harm-producing activity – "a fraction of emitters," in Professor Tribe's formulation – that affects that public as a whole.[7] Taken to its extreme – and nothing in this already extreme argument counsels against such an extension – this argument would require compensation whenever the government moves one step at a time. The government could not target, say, the sulfur dioxide emissions from oil refineries without triggering the obligation to pay compensation, because oil refineries represent "a fraction of emitters" of sulfur dioxide. However, beyond quoting a general passage from the Supreme Court on "fairness and justice," Professor Tribe offers no precedent for the idea that the government must pay compensation when it regulates incrementally rather than across the board.

The application of this novel principle to coal-fired power plants is especially bizarre, and would set back rather than promote the cause of fairness and justice. In 2014, coal-fired power plants were responsible for 76 percent of the carbon dioxide emissions of the country's electric power sector and for some 38 percent of our total energy-related carbon dioxide emissions.[8] Professor Tribe can include the coal

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[7] Tribe Testimony, at 29.

[8] These figures come from the U.S. Energy Information Administration. They are available at http://www.eia.gov/tools/faqs/faq.cfm?id=77&t=11.

industry in the "unlucky few,"[9] eligible for compensation from the broadly injured general public, only because the harm the industry inflicts is so vast compared to the number of facilities it operates. Professor Tribe's novel theory for protecting the "unlucky few" would trigger the obligation of compensation most readily when an industry manages a dubious efficiency, imposing harm across a whole population with only a "fraction" of actors.

Critics of the Clean Power Plan magnify their constitutional errors by arguing that the plan violates principles of federalism embodied in the Tenth Amendment. Specifically, Professor Tribe claims, the plan "commandeers" State governments by setting pollution reduction goals for the States, offering a menu of options for meeting those goals, and setting a timeline within which the States must act.[10]

Thus described, the Clean Power Plan is materially indistinguishable from the Clean Air Act's longstanding National Ambient Air Quality Standards (NAAQS) program. That program, too, sets air pollution goals for the States, provides a menu of options for meeting those goals, and sets a timeline for State action. If the Clean Power Plan is unconstitutional, so, too, is the 45-year-old NAAQS program – despite the fact that in its many trips to the Supreme Court on various issues, this program has never been questioned on the grounds raised by Professor Tribe. Furthermore, if Professor Tribe is correct, the constitutional error of the "cooperative federalism" framework of the Clean Air Act lies precisely in its "cooperative" aspect; he nowhere suggests that EPA's carbon rule would be constitutionally suspect, on federalism grounds, if the federal government acted alone in regulating pollution. Professor

[9] Tribe Testimony, at 28.
[10] Id., at 16.

Tribe supports this "no good deed goes unpunished" theory of constitutional law by arguing that a framework of cooperative federalism blurs accountability by splitting authority between the federal and state governments.[11] This argument, too, would apply equally to the decades-old NAAQS program.

Happily, however, neither the Clean Power Plan nor the NAAQS program usurps constitutionally protected State prerogatives. Both programs give States a choice: develop plans to meet the air pollution reduction goals set by the federal government, or let the federal government develop those plans itself. To the extent the Clean Power Plan guides the States in developing their own plans, it is a study in flexibility, offering States not only a broad menu of specific options in developing their plans but also accepting that they may want to strike out in a different direction. Moreover, on the question of accountability, especially given the unprecedentedly high profile of the Clean Power Plan, it is not realistic to fear that citizens will be unable to tell who is responsible for its contours in their States.

Nothing in the Supreme Court's jurisprudence on federalism suggests that the Clean Power Plan unlawfully interferes with State prerogatives. Two decisions from the 1990s, *New York v. United States*[12] and *Printz v. United States*,[13] concluded that federal statutes that required certain actions from the States' "legislative or administrative apparatus"[14] – in the form of either taking title to nuclear waste or imposing certain waste regulations, in *New York*, or performing background checks on handgun purchasers, in *Printz* – "commandeered" State governments in violation

[11] Id., at 22.
[12] 505 U.S. 144 (1992).
[13] 521 U.S. 898 (1997).
[14] NFIB v. Sebelius, 132 S.Ct. 2566 (2012).

of the Tenth Amendment. The Clean Power Plan, in contrast, does not require the States to do anything. It merely gives them the opportunity to develop their own plans for reducing carbon dioxide. Giving States the option of finding their own way to solve a problem does not offend constitutional principles of federalism; it respects them.

Giving the States this choice, moreover, does not run afoul of the "coercion" principle applied in *National Federation of Independent Business v. Sebelius.*[15] The Clean Power Plan is nothing like the Affordable Care Act's charge to States that they either expand their Medicaid programs or lose all of their federal funding for Medicaid – amounting to an average of over 10 percent of their overall budgets.[16] The Court in *Sebelius* agreed with the States that "the Medicaid expansion is far from the typical case." "In the typical case," the Court said,

> we look to the States to defend their prerogatives by adopting 'the simple expedient of not yielding' to federal blandishments when they do not want to embrace the federal policies as their own. The States are separate and independent sovereigns. Sometimes they have to act like it.[17]

Nothing in the Clean Power Plan prevents States from acting like the separate and independent sovereigns they are.

The final constitutional objection that critics have made against the Clean Power Plan is that it violates the constraint on delegations of the legislative power from Congress to the executive. Even more than the claims based on principles of takings, due process, and federalism – principles that have inspired at least some successful litigation in recent years – the argument based on the nondelegation

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[15] 132 S.Ct. 2566, 2602 (2012).
[16] Id., at 2605.
[17] Id., at 2603 (quoting Massachusetts v. Mellon, 262 U.S. 447, 482 (1923)).

doctrine is strikingly out of touch. As Professor Cass Sunstein, also of Harvard Law School, put it some years ago, the nondelegation doctrine has had "one good year": that was 1935, the year in which the Supreme Court struck down two statutes on nondelegation grounds and the last time the Supreme Court did so.[18] After noting this history, Justice Scalia lamented in 1989: "What legislated standard, one must wonder, can possibly be too vague to survive judicial scrutiny, when we have repeatedly upheld, in various contexts, a 'public interest' standard?"[19] Notably, it was Justice Scalia himself who went on to write the unanimous opinion in *Whitman v. American Trucking Associations*, upholding the NAAQS provisions of the Clean Air Act against a challenge based on the nondelegation doctrine.

Given this jurisprudential arc, the critics of EPA's Clean Power Plan admit, as they must, that they cannot rest their argument on the settled understanding of the nondelegation doctrine. As Professor Tribe puts it, the "constitutional objection ... is not to a congressional decision to leave excessive authority to the agency (in violation of a non-delegation constraint)."[20] Such an argument would be a sure loser, given current law. Instead, Professor Tribe and his colleagues at Peabody Energy have developed the novel theory that the nondelegation doctrine is violated when an agency resolves the tension between two apparently incompatible statutory provisions by trying to give both provisions some legal significance. This argument boggles the legal mind.

Administrative agencies interpret ambiguous and even inconsistent statutory

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[18] Cass R. Sunstein, *Is the Clean Air Act Unconstitutional?*, 98 MICH. L. REV. 303, 330, 332 (1999).
[19] Mistretta v. United States, 488 U.S. 361, 416 (1989) (Scalia, J., dissenting).
[20] Tribe Testimony, at 49.

provisions every day in this country. They do so not only with the longstanding approval of the Supreme Court but also within the sanctuary of the Court's longstanding posture of deference to their interpretations.[21] To say that an agency oversteps constitutional bounds when it tries to reconcile confusing statutory language would be to upend much of modern administrative law.

Professor Tribe tries to mask the audacious and disruptive nature of this argument by pretending that the Clean Power Plan presents an interpretive dilemma never before encountered by an administrative agency. He claims that in interpreting the 1990 amendments to section 111(d) of the Clean Air Act, EPA is "choos[ing] for itself which statute Congress in fact enacted and which, therefore, the agency will enforce."[22] This is not a fair characterization of what EPA is doing. The fact of the matter is that Congress in 1990 passed, and President George H.W. Bush signed, two provisions amending section 111(d) of the Clean Air Act. One, the amendment offered by the Senate, appears to look to the kinds of pollutants to be regulated under section 111(d); the other, offered by the House, appears to look to the kinds of sources to be regulated under this provision. The correct way to describe EPA's task in applying these provisions is not that EPA is "choos[ing] for itself which statute Congress in fact enacted"; the agency is acutely aware that Congress enacted both of these amendments. Instead, the correct way to describe EPA's task is as an effort to reconcile two provisions that appear at first glance to

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[21] The standard contemporary citation is to Chevron v. NRDC, 467 U.S. 837 (1984), but the Court's deferential stance to agencies' interpretations of the statutes they implement actually preceded *Chevron* by many years. See, e.g., Gray v. Powell, 314 U.S. 402, 411 (1941).

[22] Tribe Testimony, at 49.

point in different directions. This interpretive task is part of the quotidian work of an administrative agency in the modern era.

Professor Tribe's new theory of the nondelegation doctrine not only immeasurably enlarges the scope of that doctrine, but it also flouts the Supreme Court's teaching in its one case examining the Clean Air Act in light of the nondelegation doctrine. In *Whitman v. American Trucking Associations*,[23] the Supreme Court unanimously reversed the D.C. Circuit's ruling that EPA had, in setting revised NAAQS for particulate matter and ozone, construed the NAAQS provisions of the Clean Air Act "so loosely as to render them unconstitutional delegations of power."[24] The D.C. Circuit had concluded that EPA had unconstitutionally erred by not giving these provisions a narrowing interpretation that would cabin the agency's own authority, and had remanded the case to EPA with the instruction to come up with a "determinate standard" for setting the NAAQS.[25] The D.C. Circuit's deployment of the nondelegation doctrine in this way was utterly novel; never before had a court held that an agency's failure to interpret a statute in a particular way violated the nondelegation doctrine.

In *Whitman v. American Trucking Associations*, the Supreme Court, with Justice Scalia writing for a unanimous bench, easily dispatched the D.C. Circuit's new nondelegation doctrine. The Court wrote:

> We have never suggested that an agency can cure an unlawful delegation of legislative power by adopting in its discretion a limiting construction of the statute.... The idea that an agency can cure an unconstitutionally standardless

[23] 531 U.S. 457 (2001).
[24] American Trucking Associations v. EPA, 175 F.3d 1027, 1034 (D.C. Cir. 1999) (per curiam).
[25] Id., at 1038.

> delegation of power by declining to exercise some of that power seems to us internally contradictory. The very choice of which portion of the power to exercise – that is to say, the prescription of the standard that Congress had omitted – would *itself* be an exercise of the forbidden legislative authority. Whether the statute delegates legislative power is a question for the courts, and an agency's voluntary self-denial has no bearing upon the answer.[26]

An unconstitutional delegation, in other words, cannot be fixed by the agency receiving the delegation; that would exacerbate, not solve, the nondelegation problem.

Yet having EPA "fix" the supposed nondelegation problem in the Clean Power Plan, by interpreting the Clean Air Act in a particular way, is exactly what Professor Tribe's theory demands. Granting for purposes of this argument that Congress did indeed pass two amendments on the scope of section 111(d), Professor Tribe and Peabody Energy claim that EPA may not "pick and choose which version it want[s] to enforce."[27] They believe, however, that EPA can avoid this problem altogether by picking the *correct* version of section 111(d) – that is, their preferred version. This is just the kind of novel understanding of the nondelegation doctrine that the Supreme Court rejected in *Whitman v. American Trucking Associations*. As that case teaches, an agency may not correct a statute's nondelegation problem by "choosing which portion of the power to exercise."[28] If interpreting two arguably inconsistent provisions of a statute poses an unconstitutional choice, it is a choice inherent in the statute that contains the provisions. If the theory offered by Professor Tribe and Peabody Energy is correct, the remedy is not for EPA to choose the interpretation

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[26] 531 U.S. 457, 472-73 (2001).
[27] Comments of Laurence H. Tribe and Peabody Energy Corporation on EPA's Clean Power Plan, at 27 (Dec. 1, 2014), available at http://www.masseygail.com/pdf/Tribe-Peabody_111(d)_Comments_(filed).pdf.
[28] 531 U.S. at 473.

they prefer; it is to strike the two statutory amendments that create the conflict they see. That would mean, of course, that section 111(d) would no longer contain the provision at the center of their legal argument against the Clean Power Plan. No wonder Professor Tribe and his colleagues at Peabody Energy do not ask for this remedy.

The constitutional arguments raised by critics of the Clean Power Plan all come to grief because they have no basis in today's constitutional law. The Clean Power Plan is not unconstitutional. Nor does it even raise the kind of "serious constitutional problems" that sometimes persuade a court to adopting a narrow interpretation of a statute in order to avoid the constitutional issues.[29] The "constitutional avoidance" doctrine – which Judge Richard Posner has rightly criticized for its creation of "a judge-made constitutional 'penumbra'"[30] – would grow grotesquely powerful if flimsy constitutional arguments were enough to justify its invocation.

II. The Legality of Regulating Power Plants Under Section 111(d)

Once the distracting constitutional rhetoric of the critics of the Clean Power Plan is swept aside, as it should be, the critics' primary remaining legal argument is statutory: section 111(d) of the Clean Air Act does not, they claim, allow EPA to regulate carbon dioxide from power plants, because power plants are regulated

[29] Edward J. DeBartolo Corp. v. Fla. Gulf Coast Bldg. & Constr. Trades Council, 485 U.S. 568, 575 (1988).
[30] Richard A. Posner, *Statutory Interpretation – In the Classroom and in the Courtroom*, 50 U. CHI. L. REV. 800, 816 (1983).

under section 112 of the Act. They base this argument on the House-originated version of amendments to section 111(d) enacted in 1990, which directed EPA to set standards of performance for existing sources of an air pollutant "which is not ... emitted from a source category which is regulated under section [112] of this title."[31] In the course of their argument, the critics mostly ignore the Senate-originated version of the amended section 111(d), which directed EPA to set standards of performance for existing sources of an air pollutant so long as that pollutant was not listed as a hazardous air pollutant under section 112.[32] Both of these amendments were passed by Congress and signed into law by President George H.W. Bush. Although the Office of Law Revision Counsel included only the House-originated amendment in the U.S. Code, the Statutes at Large contain both amendments. Where Congress has not adopted the relevant provisions of the U.S. Code as legislation, the Statutes at Large prevail over the U.S. Code.[33]

While the history of these two arguably inconsistent amendments to section 111(d) may be unusual, the task these provisions present to EPA is not. EPA's task is to try to reconcile the provisions as best it can, using its best judgment as to how to do this. EPA has proposed this kind of reconciliation in the Clean Power Plan, aiming to give force to both amendments by interpreting them, together, to allow, under section 111(d), the regulation of air pollutants from sources also regulated under section 112, so long as those very air pollutants are not regulated under section 112.

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[31] Pub. L. No. 101-549, § 108(g), 104 Stat. 2399, 2467.
[32] Pub. L. No. 101-549, § 302(a), 104 Stat. at 2574.
[33] See, e.g., Stephan v. United States, 319 U.S. 423, 426 (1943) ("[T]he Code cannot prevail over the Statutes at Large when the two are inconsistent"); Darby v. Cisneros, 509 U.S. 137, 139 n. 1 (1993) (same).

The agency has undertaken a painstaking, word-by-word analysis of the language of the House-originated amendment, demonstrating that the superficial clarity of this provision recedes upon close inspection.[34] I am not aware of a situation in which an administrative agency has explained its proposed interpretation of challenging statutory language more thoroughly or more forthrightly than EPA has done here. Based on the text of section 111(d) alone, EPA has persuasively defended its proposed view that the statute is ambiguous and that its interpretation is reasonable. These are the criteria for *Chevron* deference, and EPA has met them.

Beyond the specific text of section 111(d), EPA's interpretive judgment also makes sense in light of the larger structure of the Clean Air Act. Throughout the Act, Congress preserved EPA's ability to respond to new threats from air pollution without having to obtain new legislative authority. The provisions on the NAAQS, for example, are open-ended insofar as they allow EPA to add pollutants to the current list of pollutants covered by the NAAQS if EPA finds these pollutants meet certain conditions.[35] Likewise, section 112 on hazardous air pollutants, while adopting a provisional list of pollutants to be regulated under this section, also gives EPA the authority to add pollutants to the list when they meet certain conditions.[36] The provisions of the Act applying to specific polluting sources, such as automobiles, also have this open-ended character; they are triggered by EPA's finding that pollutants

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[34] See, e.g., Final Brief for Respondents, Murray Energy Corp. v. EPA, 33-54 (March 9, 2015), available at http://www.eenews.net/assets/2015/03/09/document_ew_02.pdf.
[35] 42 U.S.C. § 7408(a)(1).
[36] 42 U.S.C. § 7412(b)(1), (2).

emitted by them endanger public health or welfare.[37] Indeed, this was, of course, how greenhouse gases first came into the Clean Air Act's regulatory fold.[38] In all of these ways, the Clean Air Act is pervasively structured to allow, and even require, EPA to respond to new scientific evidence of injury from air pollution by addressing it through the Act's regulatory provisions. In arguing that the amendments to section 111(d) enacted in 1990 left EPA unable to address greenhouse gas emissions from power plants once it had regulated *other* emissions from power plants, the critics of EPA's Clean Power Plan bust the mold set throughout the rest of the Clean Air Act. Nothing in section 111(d) or the rest of the Act suggests that this was Congress's intention.

III. The Legality of Moving "Beyond the Fence Line" under Section 111(d)

The critics of EPA's Clean Power Plan have raised another broad legal argument against the plan. They believe that EPA's proposed consideration of "beyond-the-fence-line" measures in the plan plainly violates the Clean Air Act. This claim, too, misses the mark.

EPA has proposed to include "beyond-the-fence-line" carbon-reducing measures in the Clean Power Plan in two ways. First, it has proposed to include such measures in calculating the carbon emissions targets for States. Second, it has proposed to include these measures in the "building blocks" it offers to States as examples of how to meet their emissions targets. In offering these measures as part

[37] 42 U.S.C. § 7521(a)(1).
[38] Massachusetts v. EPA, 549 U.S. 497 (2007).

of the building blocks for reducing carbon emissions, EPA has not required any State to adopt such measures.

EPA's sensible proposal to take into account a broad range of opportunities for emissions reduction, and not to limit its range of vision to technological fixes at individual sources, reflects a reasonable interpretation of section 111(d). The central legal concept of section 111(d) is that of a "standard of performance,"[39] defined as "the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirement) the Administrator determines has been adequately demonstrated."[40] This definition is notably broad, leaving EPA generous room to consider regulatory strategies that take advantage of the best mix of options available to address a particular pollution problem. Although several other features of section 111 might suggest that Congress had traditional, source-specific regulation in mind,[41] Congress did, in 1990, amend section 111 to remove an explicit reference to technology-based requirements for fossil-fuel-fired stationary sources.[42] Especially given that the beyond-the-fence-line measures that EPA has

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[39] 42 U.S.C. § 7411(d)(1).
[40] 42 U.S.C. § 7411(a)(1).
[41] Lisa Heinzerling and Rena I. Steinzor, *A Perfect Storm: Mercury and the Bush Administration*, 34 ENVTL. L. REP. 10297, 10309 (2004).
[42] The 1977 amendments to the Clean Air Act had revised section 111(a)(1) to define "standard of performance," as applied to fossil-fuel-fired stationary sources, to require a "percentage reduction" in emissions, from the emissions which would have resulted from fuels not treated before combustion. Clean Air Act Amendments of 1977, Pub. L. No. 95-95, § 109(c)(1)(A), 91 Stat. 685, 700. The 1990 amendments repealed the "percent reduction" condition. Clean Air Act Amendments of 1990, Pub. L. No. 101-549, § 403(a), 104 Stat. 2399, 2631.

proposed to consider – such as renewable portfolio standards and demand-side energy efficiency programs – are already being used in a number of States,[43] inclusion of such measures in determining the States' emissions reduction targets and in the menu of possible regulatory strategies for the States to adopt in meeting those targets is a reasonable way to balance the multifarious factors that go into developing regulatory programs under section 111(d).

[43] EPA, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule, 79 Fed. Reg. 34830, 34832-35 (June 18, 2014).

Senator CAPITO. Thank you.

Appreciate everybody's testimony, and I will begin with questions.

Attorney General Morrisey, let me ask you a question. We obviously have a difference of opinion here. The Supreme Court recently said that it is skeptical "when an agency claims to discover in a long extant statute an unheralded power to regulate a significant portion of the American economy."

I guess my question is how long has 111(d) existed and has it ever been used outside the fence line to overhaul an entire sector?

Mr. MORRISEY. Ms. Chairman, this actually is literally an unprecedented effort on the part of the EPA to regulate, and we have looked very closely and we have never seen a proposal quite like this both in terms of its scope and its willingness to regulate outside the fence, but also the legal theory that is being advanced here by the Administration. If you go back to 1970 and then you go up all the way to modern day, to today, you are looking at nothing that has ever occurred quite like this. Now, there have been some select efforts to rely on 111(d) in very limited circumstances, but nothing ever approaching this magnitude.

And the other critical point is that from 1990 no Federal agency, no one has ever questioned that if you were to regulate under 112, that the literal text would ultimately preclude the State-by-State emission targets that are being set under 111(d). So we think that this is really an unprecedented approach.

And we would also add that what the Administration is trying to do here is rely on a typo, a conforming error, if you will, in order to breathe life into one of the most sweeping regulations in our Country's history. If you look to advance something that has this great an impact on the American economy, at a minimum, there should be clear authority and not a reliance on this typo.

Senator CAPITO. Mr. Martella, you mentioned in your statement, I believe, that EPA had never gone that far in terms of this fence line issue. Could you respond to that question as well?

Mr. MARTELLA. Thank you, Madam Chair. That is correct. There have been a number of occasions where EPA, in the past, has looked at something called a bubble concept, and that sounds like exactly what it is, that you can sometimes bring in the notion that something is more than just a stack, and you bring in other sources of that bubble. There are two cases that address that, and both rejected the bubble concept, and those weren't even in the Section 111(d) context. So the little bit we have seen of this in the courts has been negative and pessimistic on that.

In terms of your question on Section 111(d), EPA has engaged in five Section 111(d) rulemakings since 1990. In each single case it has always stayed strictly within the fence line, the analogous fence line, it has never gone outside of it. So there is a lack of precedent from the Agency and a consistent source of case law that would suggest that everything has to be within the fence, and, frankly, that is the clear reading of the statute as well.

Senator CAPITO. Thank you.

Attorney General Pruitt, the proposed rule is clearly on shaky grounds, and I believe Mr. Martella said 4 years before we would actually maybe get a firm legal interpretation of it being finalized.

So what happens if States start implementing the final rule, only to have the courts strike the rule down? What do they do? Are people going to start signing contracts and breaking ground? What kind of scenario does that present in your mind?

Mr. PRUITT. Madam Chairwoman, I think it is a great question, because what has not been discussed this morning is the short time line that the EPA is likely going to propose when they finalize the rule next month. It is our understanding that it is going to be a 1-year compliance period for States to submit a State implementation plan, and by any estimation that is a very ambitious time line. As such, I think what is happening across the Country is respective Departments of Environmental Quality at the State level feel as though they are being pressured, intimidated to comply with a rule that perhaps is not consistent with the statutory construction, which is the purpose of our discussion here today. I am very concerned about the time line.

And I would add, to Roger's comment earlier, you know, we have to keep in mind, in fact, one of my fellow panelists is a public utility corporation; she regulates this at the State level. The regulation of energy generation is a police power of the States that has historically been recognized as such through court cases, and for there to be any intervention into that police power, there is a rule of statutory construction that Congress speak explicitly, clearly, unambiguously to the authority of the Agency to invade that police power that has been recognized under the law. And I think by virtue of the discussion here today even among the panelists there is disagreement about whether this statute clearly provides that type of authority.

Senator CAPITO. Another quick question. And I think your Governor has said that she will not be doing a State implementation plan, is that correct?

Mr. PRUITT. There was an executive order recently issued by the Governor indicating that the DEQ is not empowered to submit an invalid plan to the EPA.

Senator CAPITO. And I believe in West Virginia, Mr. Attorney General, that the State legislature weighed in on this. Could you talk about that just for a minute?

Mr. MORRISEY. Yes. Just recently, a couple months ago, the State legislature changed the law so that for the State of West Virginia to submit a State implementation plan the legislation would have to ratify it. That is different from the previous law, which would leave all that authority to the Governor.

Senator CAPITO. All right. Thank you.

Senator Carper.

Senator CARPER. Thank you, Madam Chair.

Senator Inhofe may recall me telling this story before, but it bears, I think, repeating. Ten or so years ago I was involved in an effort with Senator George Voinovich and others to try to find agreement on multi-pollutant legislations dealing with sulfur dioxide and mercury and CO_2, and as part of that process I remember meeting with a bunch of utility CEOs from all the Country and we spent about an hour or so together talking about how we might proceed. And at the end of the conversation this one old fellow who was with a utility from someplace down South, I don't remember

just where, but he said to me these words, he said, look, Senator, here is what you need to do. You need to tell us what the rules are going to be. You need to give us some flexibility and a reasonable amount of time and get out of the way. That is what he said. Tell us what the rules are going to be, give us some flexibility, a reasonable amount of time, and get out of the way.

And I would just say, if I could, for Ms. Heinzerling, think about that conversation and what that fellow said to me that day. How does it relate to what we are looking at here that the EPA is trying to accomplish?

Ms. HEINZERLING. I think it fits it exactly, Senator; that is, this Plan sets out what States are to do, gives them targets to meet, gives them the flexibility to choose the way they want to meet those targets. In this respect, it is strange and surprising to me that States are already saying that they would prefer to have the Federal Government set their plans. But it gives them that kind of flexibility to set their own plans to meet the targets, and then it gives them the times to do it. The time lines in this rule are notably long. We are looking out to 2030 for a final compliance with the structure of this Plan. So I think your story fits this rule perfectly.

Senator CARPER. Good.

Ms. Backman, I think you were saying that Maryland has had a fairly heavy reliance on coal in the generation of electricity, and I think what you said was that you reduced over, I don't know, over the last 7 or 8 years, your two emissions by roughly 40 percent?

Ms. SPEAKES-BACKMAN. Yes, sir.

Senator CARPER. And you are part of this regional coalition with Delaware and a bunch of other States. In my last job that I had as Governor, I loved the idea of having flexibility. If the Feds wanted me to do something, I would say give me a menu of options that I would have. I understand there are, like, at least four options here that States can use, and this term of beyond-the-fence-line is an option that is sort of unprecedented. As I recall working on multi-pollutant legislation a number of years ago, we were anxious to see what kind of options that were outside the fence line.

How could we help it with respect to CO_2? How could we help by going to no-till? How could we help with respect to encouraging folks to plan switch class and other crops like that, so the idea of going out of the fence line, it just seems to me, as my dad would say, that just seems like common sense.

Ms. Backman, talk to us about this flexibility, the idea of actually more flexibility not just by going out of the fence line, but actually by doing these regional solutions. How is having a regional solution helped Maryland? And we have Oklahoma, a producer of wind. God bless you. We are doing that. But if they were in a regional compact of some kind, could they actually get some help, as I am sure Maryland and Delaware have?

Ms. SPEAKES-BACKMAN. Absolutely. And thank you for the question. I will step back just a second and say that EPA has made unprecedented outreach to the utility regulators of the Nation through the National Association of Regulatory Utility Commissioners, and three things that we asked for across the board and

three things we could all agree on, even if the NARU commissioners don't agree on everything. My good friend, Chairman McKinney, at the time, these were the things that we agreed on: that we wanted flexibility, that we wanted affordability, and that we wanted reliability. And I think the EPA's Clean Power Plan gives us all of those.

Now, we have chosen to use all four of these building blocks in reducing carbon emissions from our RGGI region, but it is not necessarily necessary to do all four of those building blocks. And you are not limited to those four building blocks. The EPA has clearly set out a plan in setting up the goal, very separately from what the compliance plans will be, that you may use outside-the-fence-line solutions, and that includes energy efficiency and demand response that has actually helped us with reliability. It includes changing fuel sources from 56 percent coal to a much wider mix of fuel availability for our generation, which actually helps with reliability. So we have been able to meet multiple policy goals for our States that include reliability, affordability, and reducing carbon by reaching outside the fence.

Now, that said, we still only regulate State-by-State we regulate in our RGGI construct at the power plant line. We are not going in and regulating through RGGI the energy efficiency programs of each State. Each State regulates their own. I, as a utility regulator, actually help to make those decisions.

Senator CARPER. Thank you.

Ms. SPEAKES-BACKMAN. Thank you.

Senator CARPER. My time has expired.

Madam Chair, we have a simultaneous meeting going on in Finance on tax reform. I need to slip over there for a while. I will be back, though. This is a great hearing. Thank you.

Senator CAPITO. Thank you.

Senator CARPER. Thank you all.

Senator CAPITO. Senator Inhofe.

Senator INHOFE. Thank you, Madam Chair.

I listened to different people here and I get different ideas, and since I am a rare thing, I am not an attorney—most of the members of the Senate are—it seems to me that the practical application of EPA's proposal would require the States to pass new laws to revise existing regulatory systems, and I think of this and I think what is wrong with this picture. Should it be the role of an administrative agency to be forcing States to take this kind of action?

And then, second, General Pruitt, is this consistent with the Clean Air Act, or how does that factor into it?

Mr. PRUITT. Well, thank you, Mr. Chairman. I think, as we have discussed today, there is a question that keeps coming up in my mind. If this is such a flexible arrangement that is offered the States, if this is really within the bounds of cooperative federalism, why is it that the EPA presently is in the process of developing a uniform Federal implementation plan that they are going to put on the shelf to then say to the States unless you act a particular way, unless you act a particular way, unless you act consistent with the Rule, this is what you are going to get.

That, to me, does not sound like cooperation. That does not sound like partnership. That sounds like the proverbial gun to the head of making States act a particular way, and it is consistent with the comments, Mr. Chairman, that I offered in my opening statement.

This EPA looks at State implementation plans and says you can introduce and adopt a State plan so long as it embodies Federal will, so long as it embodies that which we want to happen on a State-by-State basis. And when States disagree, that is when these Federal implementation plans are forced upon the States. I don't think there is much discretion to the State of Oklahoma. As I indicated in my comments, we are already in the top four States in the Country in generating electricity through renewables and wind. But yet this EPA is expecting the State of Oklahoma to reduce their CO_2 footprint by over 30 percent. The question is how, but for shuttering coal generation in the State of Oklahoma. That is a concern practically and it is a concern legally.

Senator INHOFE. Well, looking at it as a non-attorney, you look at the Tenth Amendment, which refers to reserving power to the States. Do you think this is consistent with the Tenth Amendment?

Mr. PRUITT. Well, I think this case, and I would add this to the comments earlier from the fellow panelists. I don't think it is terribly novel for us to have a dispute or a case about statutory construction. I indicated that it is a traditional police power to regulate power generation. And for the Federal Government to intervene or to invade that, the statute has to be explicit and clear and unambiguous; and I think by virtue of our discussion today it is demonstrative that that is not the case.

So, Senator, I think it is less about the Tenth Amendment, less about States' rights under the Tenth Amendment, and more about statutory construction and whether the EPA possesses the authority that you gave it to regulate in this area.

Senator INHOFE. Mr. Martella, do you have any comments about that?

Mr. MARTELLA. I would agree with that. If I could mention this theme of flexibility that has come up during our discussion, I don't think there is anybody who would dispute flexibility is a good thing. We all want flexibility. But I think there is a little bit of an apples to oranges situation going on. I apologize, but I have to go back to my pen.

So if this is my coal-fired power plant, and if you are staying inside the fence line, EPA may say for coal-fired power plant you are currently emitting 2100 tons of CO_2 per megawatt hour. We are going to reduce you to 2,000 tons. That is inside the fence line. What EPA is saying, though, is we are going to look at nuclear and renewable and energy efficiency and these other things, and because we are looking outside the fence line, we are going to bring you down to 1200 pounds of CO_2 per megawatt hour, to the point this coal-fired power plant has to shut down.

What we are saying or what I am saying is EPA has to set the standard. Set the standard inside the fence line. If there is flexibility on how you meet that standard, that is fine, but you can't look outside the fence in setting the standard. So we don't dispute, I don't dispute that flexibility is a good thing, but the distinction

is the flexibility doesn't come in in setting the standard, it comes in on the compliance side.

Senator INHOFE. OK, that is a good comment.

General Morrisey, we will probably have another round of questions and I might get to that building block 3 question that I want to pose to you, but I know people in West Virginia and I know what is happening there right now. Even though this Rule has not gone into effect, what has happened to some of your coal plants, some of your utilities in your State already as a result of the threat?

Mr. MORRISEY. Well, Mr. Chairman, it is clear in West Virginia that the harm is already occurring. In fact, as we were preparing for the lawsuit that we filed last year against the EPA, one of the principal arguments that we made is that, unlike many of the other traditional rules that are subject to notice and comment, this proposed rule is actually causing real tangible harm in the States and also it is affecting power plant operations currently. If you go and look at our litigation, we have at least eight declarations from very experienced environmental regulators who talk about the cost of trying to comply with this rule.

The other point that I would raise is that the timeframes associated with this proposal are hyperaggressive. You had a proposed rule that was issued June 2014, a final rule scheduled to be issued sometime this summer, and then while the regulators are suggesting that they may need many years in order to try to even come up with a plan, they have been given 1 year. That is a very real problem.

But there are real costs being expended by the States and also I believe that this Administration is not particularly interested in whether the rule is finalized so long as the marketplace actually moves away for them. If coal-fired power plants have to be retired much quicker than baseline, then they are going to accomplish their goal even if this regulation never is upheld in the courts.

Senator INHOFE. Thank you, General Morrisey. I do want to follow up on this. I will wait until the second round.

Senator CAPITO. Senator Markey.

Senator MARKEY. Thank you, Madam Chair. Madam Chair, I would ask that two articles by Jody Friedman and Richard Lazarus be included in the record. They provide a very clear and thorough explanation of the constitutionality of the EPA's Clean Power Rule.

Senator CAPITO. Without objection.

Senator MARKEY. Thank you so much.

[The referenced documents follow:]

HARVARD LAW Today

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Is the President's Climate Plan Unconstitutional?

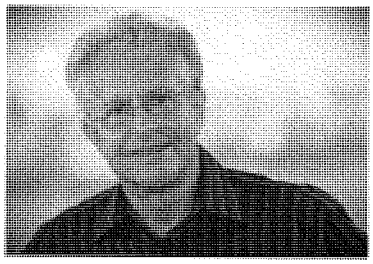
March 18, 2015

Theme: Faculty Scholarship

Experts debate the constitutionality of the president's climate change plan

Noted constitutional law professor ***Laurence Tribe '66***[1] *has made headlines with his Congressional testimony that the Environmental Protection Agency's Clean Power Plan is unconstitutional. Testifying before the* ***Energy and Power subcommittee***[2] *of the House Energy and Commerce Committee on the EPA's proposed rule for existing power plants, Tribe said, "In my considered view, EPA is off on a constitutionally reckless mission." His written testimony is available* ***here***[3] *and a video of his testimony is* ***here.***[4]

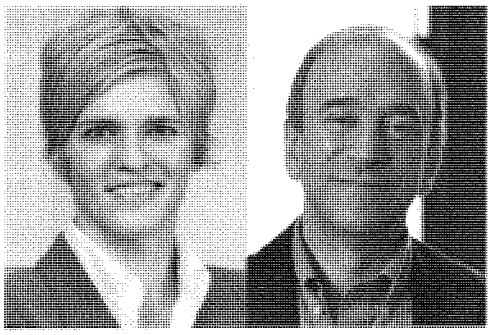
Two leading Harvard Law professors with expertise in environmental law, administrative law, and Supreme Court environmental litigation, take an opposing view. ***Jody Freeman***[5]*, Archibald Cox Professor of Law and director of the Environmental Law Program, and* ***Richard Lazarus 79***[6]*,*



Professor Laurence H. Tribe '66

Howard and Katherine Aibel Professor of Law, have written a response to his view, which is published in full below.

Is the President's Climate Plan Unconstitutional?



Professors Jody Freeman LL.M. '91 S.J.D. '95 and Richard Lazarus '79

The Environmental Protection Agency's proposal to limit carbon pollution from the electricity sector is the centerpiece of the President's plan to address climate change, and the foundation for U.S. leadership on an international climate agreement. In an effort to kill the rule, the coal industry has shrewdly hired Larry Tribe, our Harvard Law School faculty colleague and perhaps the nation's most famous constitutional law professor, who is arguing on their behalf that the rule is unconstitutional. Like most proposed rules, the Administration's climate rule is far from perfect, but sweeping assertions of unconstitutionality are baseless. Were Professor Tribe's name not attached to them, no one would take them seriously.

EPA's power plant rule sets carbon intensity targets for each state, which they can achieve using whatever measures they prefer, including by substituting natural gas for coal, using more renewable energy, and investing in energy efficiency. The targets vary in stringency because cutting carbon pollution is harder for some states than others, which EPA took into account by considering each state's current energy mix. Generally, states that depend heavily on coal have lower targets than states with a cleaner energy supply. Coal-fired plants are the single biggest source of carbon

emissions in the economy. They are, on average, 42 years old, and pollute more than newer plants because they are highly inefficient.

Tribe testified in Congress this week, declaring that EPA's proposal violates the Constitution by taking industry's private property, trampling on states' rights and usurping Congress' power. He will make the same arguments as the coal industry's counsel in federal court next month. In Tribe's telling, EPA's proposal to cut carbon pollution from old power plants by up to 30% by 2030 is an assault on the separation of powers equivalent to President Truman's seizure of the steel mills during the Korean War and President Lincoln's suspension of *habeas corpus* during the Civil War.

This is ridiculous. First, nothing in EPA's proposal requires states to retire coal plants or dictates their energy mix. In fact, states remain in full command of their energy supply, just as before. Nor does anything in the proposal encroach upon the powers of any other agency, like the Federal Energy Regulatory Commission, which oversees the reliability of the electricity system. Claims to the contrary are simply untrue.

Second, the constitutional arguments are wholly without merit. Tribe argues that EPA's rule is an unconstitutional "taking" of industry's private property under the Fifth Amendment because government regulation of power plant pollution has not covered greenhouse gas emissions until now. The clear implication of Tribe's novel view of the Constitution is that the coal industry, and the power plants that burn their coal, possess an absolute constitutional property right to continue to emit greenhouse gases in perpetuity. No Supreme Court opinion has ever announced such a preposterously extreme proposition of constitutional law. Nor has even one single Justice in more than two centuries of cases endorsed such a reading of the Fifth Amendment.

If Tribe were right, government could never regulate newly discovered air or water pollution, or other new harms, from existing industrial facilities, no matter how dangerous to public health and welfare, as long as the impacts are incremental and

cumulative. The harm EPA seeks to address with its power plant rule not only affects future generations, but also current ones already managing the impacts and risks of climate change. Indeed, after an unprecedented and exhaustive scientific review, EPA in 2009 made a formal finding that greenhouse gases already endanger public health and welfare. The D.C. Circuit upheld this finding, and, given a chance to review it, the Supreme Court declined. This is important because it makes it all the more astonishing that Professor Tribe has himself determined that greenhouse gases do not pose the kind of risk that government is entitled to address, unless it is willing to compeusate industry for its losses. It is hard to imagine a more industry-friendly and socially destructive principle than this.

Thankfully, this principle has no basis in constitutional law. The Supreme Court has repeatedly made clear that the Fifth Amendment's Takings Clause does not shield business investments from future regulation, even when that regulation cuts sharply into their profits. The Constitution protects only "reasonable investment backed expectations," and there is simply no reasonable expectation to profit forever from activities that are proven to harm public health and welfare. Certainly the coal industry uniquely enjoys no special exemption from this fundamental constitutional rule.

Tribe further argues that EPA's proposal violates federalism principles by encroaching on the states' traditional powers under the Tenth Amendment. This claim also lacks credibility. The courts have consistently upheld as perfectly constitutional the scheme of "cooperative federalism" in the nation's pollution laws. This approach requires EPA to set regulatory goals while allowing states to achieve those goals using whichever tools make the most sense for them. States always have the choice to say "no" to this deal, leaving the federal government to regulate without any state input or assistance. Indeed, Senator Mitch McConnell, from the coal state of Kentucky, recently advised States to do just that, acknowledging that states have a choice. EPA has given states maximum flexibility to devise plans to suit their own economic, political and energy needs, and has offered states multiple extensions of deadlines if they need more time. And EPA has announced no plans to punish states using the draconian measures that

Tribe claims. Contrary to his colorful suggestion that states face a "gun to the head," nothing in the proposed climate rule "commandeers" state institutions for federal purposes, which is what the Constitution forbids. If the States choose not to act, then the responsibility falls on the federal government to regulate industry itself.

Finally, Professor Tribe argues that EPA has "flagrantly" violated the Constitution by ignoring clear statutory language, which, on his reading, bars EPA from regulating carbon emissions from power plants. But it is Tribe's reading that ignores legal text. His argument shrugs off a truly hard legal question, which is what to do when two versions of a law, both passed by the Congress and signed by the President, appear to conflict. In what seems to be a clerical error, made in haste when Congress was amending the air toxics program in 1990, Congress passed two different versions of the provision at issue here, one of which clearly authorizes EPA's proposal, and one of which may not. Which governs? A close reading of text, legislative history, and context, shows that Congress was trying to prevent duplicative regulation of particular pollutants. It was not seeking to exempt entire categories of industry, like power plants, from regulation under separate Clean Air Act programs, as Tribe claims. The latter approach makes no sense—just because a power plant is regulated for toxic pollution should not exempt it from regulation for other, different pollution. EPA's proposal does not regulate any pollutant twice and is most consistent with legislative intent, based on the historical record. Professor Tribe's assertion that EPA has wildly overreached in its reading is convenient for the coal industry, but it is implausible if one understands the Clean Air Act.

So here is the truth, stripped of the exaggerated rhetoric of the coal industry and its counsel. The President' s proposed climate plan neither unconstitutionally ignores statutory language nor unconstitutionally takes anyone's property. And certainly not that of the coal industry and coal-fired power plants, which will continue to supply approximately 30% of our electricity even after the rule is fully implemented. Nor is State sovereignty unconstitutionally threatened by the proposed rule. The real threat to State sovereignty is Tribe's radical reading of the Takings Clause, which would prevent States and the federal government from regulating pollution, like greenhouse

gases, that scientists agree pose serious risks to the nation's public health and welfare.

Does this mean that the President's climate plan is a legal slam-dunk? Of course not. EPA is interpreting the Clean Air Act in a new way for the first time, and new interpretations always pose risks. But well-established legal precedent says that agencies must have a chance to interpret the statutes lawfully delegated to them by Congress. Whether the agency is right about its authority is normally settled by using the Chevron principle, established by the Supreme Court three decades ago, which asks simply whether the agency's view of an ambiguous statute is "reasonable."

We believe EPA has a strong legal basis for its power plant rule, and a good chance of winning the argument in court. Still, we freely acknowledge there are some credible arguments to the contrary. But is the rule unconstitutional? Not even close.

Jody Freeman, a Harvard law professor, served as White House Counselor for Energy and Climate Change in 2009-10. Richard J. Lazarus, a Harvard Law professor, has represented clients in more than 40 Supreme Court cases, including many raising constitutional claims against environmental laws.

* * *

Links

1. http://hls.harvard.edu/faculty/directory/10899/Tribe
2. http://energycommerce.house.gov/hearing/epa%E2%80%99s-proposed-111d-rule-existing-power-plants-legal-and-cost-issues
3. http://docs.house.gov/meetings/IF/IF03/20150317/103073/HHRG-114-IF03-Wstate-TribeL-20150317-U1.pdf
4. https://youtu.be/f36QoMm50HI

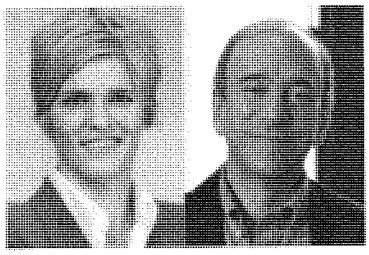
HARVARD LAW Today

today.harvard.edu

Freeman and Lazarus: A rebuttal to Tribe's reply

March 21, 2015

Theme: Faculty Scholarship



Professors Jody Freeman LL.M. '91 S.J.D. '95 and Richard Lazarus '79

Our colleague Larry Tribe's response to our initial posting serves as a reminder of why he is widely celebrated as one of the nation's most effective advocates. On the merits, though, we are no more persuaded. We will keep our rebuttal short.

The Right to Say No and the Tenth Amendment

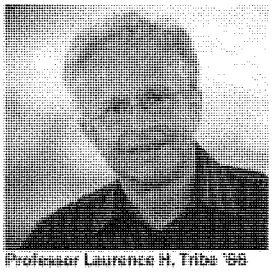
To review briefly, our colleague is wrong that the Clean Power Plan "commandeers" the states in violation of the Tenth Amendment. The reason is simple: the States retain the fundamental right to say no. We know that this is a genuine right of refusal and not something illusory because States have exercised this option in the past. When States have failed to file State plans in other contexts, EPA has simply filed its own plan and borne the brunt of regulating the sources directly. The same will happen here.

There is no plausible basis for the claim that EPA is pointing a "gun to the head" of States. There is no gun. There is not even the legal equivalent of a stick because under the Clean Power Plan EPA has *no* legal power to punish the states for not submitting a plan. Not by denying States highway funds. Nor by imposing any of the other sanctions that Professor Tribe says would force states to "knuckle under" – the linchpin of his claim of unconstitutionality. His argument confuses the proposed rule here with a different statutory program dealing with a very different kind of State plan, which contemplates the possibility of some sanctions. There is no viable Tenth Amendment claim against the Clean Power Plan. None.

But should states still opt in, and write their own plans, rather than "just say no" to EPA? Of course they should. States have always understood that it is in their best interests and that of their citizens to file plans and design their own pollution reduction programs themselves—for the straightforward reason that nobody knows a State's own political and economic priorities better than they do. And even a well-intended federal government may not possess the plenary authority necessary to make the precise tradeoffs the States would make if they were in charge.

There are clear advantages to being in control,

Why EPA's Climate Plan is Unconstitutional

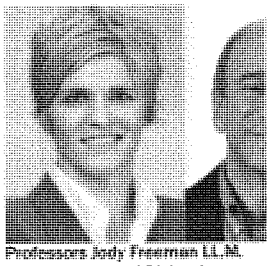


Professor Laurence H. Tribe '66

When my friends Jody Freeman and Richard Lazarus defend the legality of the EPA's power plant rule by saying that no one would take the constitutional arguments against the rule seriously were my "name not attached to them," they no doubt mean to be complimentary. But I take my arguments very seriously indeed and hope, by bringing them into the public forum, that I will be able to help others understand why – despite my lifelong devotion to environmental causes, my deep concern about climate change, my agreement with the need to address it urgently, and my admiration for the president whose plan to address that vital problem is at stake and for those (including Jody and Richard) who are defending that signature initiative –

as States well know, and these I regretfully feel obliged to oppose their views. **Read more.** [1]

Is the President's Climate Plan Unconstitutional?



Professors Jody Freeman LL.M. '91 S.J.D. '95 and Richard Lazarus '79

The Environmental Protection Agency's proposal to limit carbon pollution from the electricity sector is the centerpiece of the President's plan to address climate change, and the foundation for U.S. leadership on an international climate agreement. In an effort to kill the rule, the coal industry has shrewdly hired Larry Tribe, our Harvard Law School faculty colleague and perhaps the nation's most famous constitutional law professor, who is arguing on their behalf that the rule is unconstitutional. Like most proposed rules, the Administration's climate rule is far from perfect, but sweeping assertions of unconstitutionality are baseless. Were Professor

> Tribe's name not attached to them,
> no one would take them seriously.
> **Read more.**[2]

advantages are lost whenever States decide they would rather abdicate their policy and lawmaking expertise in favor of the federal government stepping in. This is the very reason why EPA crafted its proposal to let States develop their own plans for meeting the carbon reduction targets using whatever mix of measures they think best.

Tribe claims that under the Clean Power Plan, "States are left with no control over their regulatory programs" and with only the "trivial ability (at most) to fine-tune a few details." But this is just not true. States that do file plans are committing to meet EPA's performance standard—that's all. How to do so is up to them. If they are rich in natural gas (now cheaper than coal; many States are switching already), they can bring more natural gas on-line; if they have great potential for renewable power, they can build some; if they wish to invest in the cheapest compliance option of all, energy efficiency, they can do that too.

Many States are already well on their way to meeting the proposed targets because of steps they have already taken, for economic or other state-driven policy reasons that have nothing to do with EPA's proposal here. And although Professor Tribe has repeatedly asserted that EPA has given states a mere "13 months" to comply, this is also inaccurate. States have up to 2018 if they ask for more time; the compliance period does not even begin until 2020; and the rule would not phase in fully until 2030. All of our colleague's arguments are meant to present EPA as radical, extreme and out of control. But the actual proposal shows very clearly otherwise.

Still, the Constitution does give States the right to opt out. Tribe has testified that this will lead EPA to implement a "total overhaul of each state's way of life." It is true that if States choose not to file plans, EPA will do so instead, but by law, they must do so reasonably. What will this look like? Everyone, including EPA, agrees on the need for flexible approaches to compliance to prompt creativity and keep costs down. So EPA

will file plans for each State that give power plants the flexibility to reduce their carbon emissions through a variety of cost-effective measures (for example, by relying on market mechanisms, like carbon trading, and by approving banking, averaging and borrowing), and to phase in the pollution cuts over fifteen years. In other words, they will implement classic pollution control. There is nothing remotely radical or extreme about it.

What is extreme is the coal industry claim, which our colleague uncritically embraces, that the proposed rule threatens the reliability of the nation's electricity system. That claim is flatly contradicted by numerous independent studies. By express statutory command, EPA can impose restrictions based only on emission reduction measures that have been "adequately demonstrated." Setting limits on carbon dioxide from power plants, based on measures that have already been demonstrated to work, will not make the lights go out.

The threat of blackouts is an effective tactic, but it borders on the disingenuous. Even if you do not trust EPA, or believe any of the independent studies showing that there is ample flexibility to implement pollution control while ensuring reliability—as grid managers have done for decades—the Federal Energy Regulatory Commission is legally required to ensure the reliability of the system. FERC will do its job. The nation's electricity grids are not going to fail as a result of the proposed Clean Power Plan.

The Non-Taking Issue

We were pleased to see in our colleague's response a quiet, yet unmistakable retreat from his earlier pronouncements that the Clean Power Plan is an unconstitutional taking of private property in violation of the Fifth Amendment. All that could be mustered, presumably upon further reflection, is that EPA's proposal "would run right up against the Fifth Amendment and would thereby require any reviewing court to resolve yet another tough constitutional question." We are unsure what "run up against" means since the issue isn't tough at all. Greenhouse gas emissions have been

found to endanger public health and welfare – a scientific determination supported by an overwhelming consensus of scientists worldwide. And, whatever the "vagaries of Fifth Amendment analysis," governmental restrictions on such harmful emissions do not amount to takings of private property requiring the government to pay industry to stop polluting. There is no plausible taking here.

No "Serious" Constitutional Question After All

Perhaps the most baffling aspect of Professor Tribe's argument is his continued insistence that EPA's reading of Clean Air Act raises serious questions of constitutional law. It does not. The question whether a federal agency has misread a federal law, which Congress has delegated to them to implement, does not present a constitutional crisis. When President Truman seized steel mills, he did not base his assertion of power on his reading of a statute conferring such authority on the President. Nor did President Lincoln in suspending *habeas corpus* during the Civil War rely on a reading of congressionally conferred authority. Those were true constitutional crises. But EPA's Clean Power Plan? To equate them is quite amazing.

As we have freely acknowledged, EPA's proposal does raise legal questions of a more ordinary sort. The hard legal question is whether EPA's approach to setting a "performance standard" is reasonable. The Act defines performance standard here as the "best system of emission reduction." EPA has set the state targets for carbon emissions based on what the entire grid, not just the coal-fired units on-site, can do to cut emissions (e.g., by using more natural gas and investing in energy efficiency). Are all of these considerations reasonably considered part of the "best system" of controlling carbon emissions? Does their availability count toward stringency? Certainly, they are all proven ways to reduce emissions, and they are interchangeable and invisible to electricity customers because they are part of an interconnected electricity system.

This is the kind of typical bread-and-butter question of administrative law that courts handle on a daily basis: whether an agency's interpretation of statutory language is a

reasonable interpretation entitled to judicial deference. We think EPA has a strong argument to support its interpretation, and certainly an entirely plausible case for deference, though we have always said there are credible arguments to the contrary.

But whatever one thinks about this question, there is no constitutional crisis. Professor Tribe says judges should refuse to even consider deferring to EPA because doing so would lead them to confront the multiple potential constitutional violations he has invoked. But there is simply no constitutional issue here, let alone a "serious" one that might justify refusing to defer to an agency's interpretation. Waving the Constitution, no matter how ardently, is not enough to trigger the constitutional avoidance canon.

The Dueling Amendments Issue over EPA's Authority

On the question whether Congress passed only one amendment to the Clean Air Act in 1990, as our colleague contends, rather than two simultaneous amendments to the same statutory provision, as we suggest, there can be only one answer: two. Professor Tribe ultimately acknowledges the single most important fact: both amendments "were included in the bill enacted by Congress after Conference and signed by the President on November 15, 1990, and both appear in the Statutes at Large." As the Supreme Court has repeatedly made clear, the only official record of what Congress has enacted and the President has signed into law is found in the official "Statutes at Large." And if one opens the Statutes at Large, both amendments are there for all to see.

It is completely irrelevant that for decades the United States Code has failed to include the language of both amendments. The Court has said clearly that where there is a conflict between the U.S. Code and the Statutes at Large because the former mistakenly eliminates language from the latter, it is the Statutes at Large that controls. No employee of the Office of Law Revision Counsel can change that bottom line. Nor can a congressional staffer writing either a "legislative manual" or a legislative "report" undo language passed by both legislative chambers, signed by the President

and therefore properly appearing in the Statutes of Large. It makes no difference which chamber passed which amendment.

And contrary to our colleague's claim, both amendments are substantive, and neither can be dismissed. It does not matter that Congress labeled one of the amendments "conforming" – which Tribe dubs "clerical" – because a label cannot render an amendment non-substantive. The Supreme Court long ago squarely rejected that very claim. Conforming amendments may be substantive in effect. And the term "clerical" has no legal meaning or relevance. It appears neither in the Clean Air Act nor in any of the Supreme Court's applicable precedent.

The presence of simultaneous amendments to the same statutory provision is certainly unusual, which is why we readily agree that their interpretation presents a novel and, even hard legal issue. But it is clear that EPA is entitled to interpret this language, and to deference as long as it does so reasonably. The Supreme Court has repeatedly held that the executive branch agency charged by Congress with the administration of the statute is entitled to judicial deference so long as its statutory interpretation is reasonable. And this rule applies, the Court said as recently as two years ago, even when agencies are interpreting the scope of their own authority.

EPA's interpretation strikes us as eminently reasonable. It would ensure against duplicative regulation of the same pollutant under two distinct provisions of the Clean Air Act that have different purposes. This view is consistent with the plain meaning of the Senate Amendment and with EPA's longstanding practice for two decades prior to the 1990 amendments, which was to avoid regulating under other programs any hazardous pollutant regulated under the toxics program. By contrast, Tribe's proposed interpretation would exempt an entire category of sources from regulation, regardless of how harmful their emissions. There is no credible reason why Congress would grant coal-fired power plants such an extraordinary exemption. For this reason, although we do not doubt that the House amendment is susceptible to such a reading, we do not believe it is the better one, let alone the only reasonable interpretation of the Act in light of the simultaneous passage of the Senate amendment.

The Importance of Legal Discussion and Debate

We do not question the sincerity of Professor Tribe's claim that his legal arguments represent his own independent views, although he represents the coal industry. And we take his arguments seriously precisely because he is making them and states that he is not merely representing the views of his client, as lawyers do all the time. We just believe he is wrong. For most law professors, it matters little if they are wrong—we often toil away in anonymity. But Professor Tribe is arguably the most public law professor in America. His arguments have an outsize impact because they are backed by his enormous credibility and reputation. (As just one indication that we are not exaggerating, the Senate Majority Leader has relied on our colleague's claims in a letter to the nation's governors asking them not to cooperate in any way with EPA.) This kind of influence requires a higher level of diligence and responsibility simply because it is so powerful. Which is why we feel it so important to call his arguments to account when, as here, they threaten the nation's first meaningful effort to address the compelling issue of climate change in a comprehensive and responsible manner.

* * *

Links

1. http://today.law.harvard.edu/why-epa-climate-plan-is-unconstitutional/

2. http://today.law.harvard.edu/is-the-presidents-climate-plan-unconstitutional/

3. https://www.facebook.com/sharer/sharer.php?s=100&p[title]=Freeman+and+Lazarus%3A+A+rebuttal+to+Tribe%26%238217%3Bs+reply&p[url]=http%3A%2F%2Ftoday.law.harvard.edu%2Fa_rebuttal_to_tribe_reply%2F&p[images][0]=http://today.law.harvard.edu/wp-content/uploads/2015/03/Freeman-Lazarus.jpg&p[summary]=Our+colleague+Larry+Tribe%E2%80%99s+response+to+our+initial+posting+serves+as+a+reminder+of+why+he+is+widely+celebrated+as+one+of+the+nation%E2%80%99s+most+effective+advocates.+On+the+merits%2C+though%2C+we+are+no+more+persuaded.+We+will+keep+our+rebuttal+short.+%26amp%3Bnbsp%3B+%26amp%3Bnbsp%3B+The+Right+to+Say+No+and+the+Tenth+Amendment+%C2%A0To+review+briefly%2C+our+colleague+is+wrong+that+the+Clean+Power+Plan+%E2%80%9Ccommandeers%E2%80%9D%C2%A0the+states+in+violation+of+the+Tenth+Amendment.+The+reason+is+simple%3A+the+States+retain+the+fundamental+right+to+say+no.+We+know+that+this+is+a+genuine+right+of+refusal+and+not+something+illusory+because+States+have+exercised+this+option+in+the+past.+When+States+have+failed+to+file+State+plans+in+other+contexts%2C+EPA+has+simply+filed+its+own+plan+and+borne+the+brunt+of+regulating+the+sources+directly.+The+same+will+happen...

Senator MARKEY. We are in a big moment. Pope Francis is about to issue an encyclical on climate change. The College of Cardinals did a very dangerous thing, they named a Jesuit who taught chemistry as the Pope. So Pope Francis believes, actually, that science is the answer to our prayers and we have to look at the smartest ways that we can deal with this to reduce the danger that growing greenhouse gases is going to pose to God's creation, the planet. And I think it is important for us, then, to find ways to accomplish that goal.

So back in 1990 we worked on the Clean Air Act. I was on the committee to draft it and put that law on the books, and I added, actually, an energy efficiency section to the Clean Air Act to give more flexibility to the administrator at the EPA, George Bush's EPA administrator. And there were ways that utilities could comply with their acid rain requirements by undertaking activities beyond what was occurring at their power plants, and I can assure you that my intent and that of my congressional colleagues was to encourage utilities to look at the energy system in total to find ways of reducing sulfur pollution in the air.

So Ms. Heinzerling, one objection that has been raised about the Clean Power Plan is that utilities might have to go beyond the fence of their power plants to achieve their emission targets. In addition to the acid rain program that I just mentioned, are there other examples of using energy efficiency renewables or other beyond-the-fence activities under the Clean Air Act?

Ms. HEINZERLING. Yes. Very early on, something like 35 years ago, EPA issued a rule that included washing of coal before it was burned as a compliance mechanism for dealing with the Clean Air Act. It was something that wasn't within the source, it wasn't a typical end-of-the-pipe kind of measure. In regulating interstate pollution or interstate conventional air pollutant under the Clean Air Act, EPA has for many years included renewables in energy efficiency as potential compliance mechanisms.

If I may just extend this example just a bit further afield, but I think it illustrates that you are talking about, if you look at the program under the Clean Air Act, under Section 202 to regulate mobile sources, you might, if you looked at that quickly, you might think that is the classic end-of-the-pipe measure. And yet if you look at EPA's most recent rules on greenhouse gas emissions for mobile sources, EPA has, in the terms used today, gone beyond the fence line. They included flexibilities in their rules that made the rule, I think, a marvel of modern regulation. They included consideration of the footprint of the vehicle and the air conditioning refrigerants used in the vehicle, and flex fuel vehicles. So if you look not just at the pollution regulation that we have been talking about, of stationary sources, but beyond that under the Clean Air Act, it has, I think, become standard to look for flexibilities.

Senator MARKEY. I agree with you, and that was the intent of the 1990 Act, it was to give more flexibility, it was to use a different model; and I think that is what this proposed Rule is going to do as well, it is going to say to each State, move in a way that accomplishes the goal, but we are going to be very flexible.

Let me ask you this question. The constitutionality of EPA's approach to setting public health standards has been challenged be-

fore. The Supreme Court upheld EPA's approach in a 9-to-nothing opinion in Whitman v. American Trucking in 2001. In 2011, the Supreme Court ruled that EPA has the authority to set standards for carbon pollution under Section 111(d) in an 8-to-nothing opinion in American Electric Power v. Connecticut. And during the oral arguments in that case the counsel argued, on behalf of AEP, said to the Court we believe that the EPA can consider, as it is undertaking to do, regulating existing, non-modified sources under Section 111 of the Clean Air Act.

Ms. Heinzerling, is there really any constitutional question about EPA's approach or their legal authority to regulate carbon pollution under Section 111 of the Clean Air Act?

Ms. HEINZERLING. No, I don't think so. I think the constitutional issues have been a distraction. I think they have been used to make people worry that maybe there is lurking a real constitutional issue, so we better interpret this statute narrowly. But the constitutional arguments, I think, are flimsy. And the statutory authority under the Clean Air Act, as I have said, I think is clear.

Senator MARKEY. Beautiful. Thank you.

Thank you, Madam Chair.

Senator CAPITO. Thank you.

Senator Barrasso.

Senator BARRASSO. Thank you very much, Madam Chairman.

Attorney General Pruitt, good to see you again. Oklahoma is a fossil fuel producing energy State. Attorney General Morrisey, the State of West Virginia, like the State of Wyoming, is a coal State. All of our States are particularly hit by the slew of proposed EPA rules aimed squarely at the fossil fuel industry and the folks that work in that industry.

I would like to highlight a letter from the Governor of my home State of Wyoming, Governor Matt Mead, to EPA Administrator Gina McCarthy on April 28th of this year, and I ask that the Governor's letter be entered into the record, Madam Chairman.

Senator CAPITO. Without objection.

Senator BARRASSO. Thank you.

[The referenced document follows:]

MATTHEW H. MEAD
GOVERNOR

THE STATE OF WYOMING

STATE CAPITOL
CHEYENNE, WY 82002

Office of the Governor

April 28, 2015

The Honorable Gina McCarthy
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Docket ID No. EPA-HQ-OAR-2013-0602. Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units

Dear Administrator McCarthy,

On June 2, 2014, the Environmental Protection Agency (EPA) proposed emission guidelines for existing electric utility generating units. These emission guidelines are far-reaching and extend EPA's regulatory authority beyond its statutory authority. On December 1, 2014, I submitted a comment letter detailing my concerns.

I write now to ask that you consider a recent study by the Center for Energy Economics and Public Policy at the University of Wyoming. The study, titled "The Impact of the Coal Economy on Wyoming," was published in February of 2015. The study addresses the influence of the coal industry on Wyoming's economy and analyzes impacts to the industry and Wyoming's economy.

The study determined the single largest threat to Wyoming's coal industry is EPA's Clean Power Plan (this proposed rule and related 111(b) proposed rulemaking). You have the discretion to consider additional information when a rule is not yet final. I formally request this study be a part of the record and consideration in making your final decisions regarding this proposed rulemaking.

Sincerely,

Matthew H. Mead
Governor

MHM:mdm

cc: The Honorable Mike Enzi, U.S. Senate
The Honorable John Barrasso, U.S. Senate
The Honorable Cynthia Lummis, U.S. House of Representatives

PHONE: (307) 777-7434

FAX: (307) 632-3909

Senator BARRASSO. In this letter, the Governor highlights a recent study by the Center for Energy Economics and Public Policy at the University of Wyoming entitled, The Impact of the Coal Economy on Wyoming. It was published in February of this year.

I would ask also that this study be entered into the record.

Senator CAPITO. Without objection.

Senator BARRASSO. Thank you.

[The referenced document follows:]

Center for Energy Economics
and Public Policy

The Impact of the Coal Economy on Wyoming

Prepared for:
Wyoming Infrastructure Authority

February 2015

Robert Godby
Roger Coupal
David Taylor
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Contents:

EXECUTIVE SUMMARY

Coal production has been a cornerstone of the modern Wyoming economy since the 1970's, and has served as Wyoming's most stable source of tax revenues over the past four decades. In the current market environment, the coal industry in Wyoming is facing significant pressure. D espite its critical role in Wyoming, few studies have quantified the coal industry's impact on the statewide economy, and those that have are significantly out of date. This study addresses this information gap by describing the importance of the coal sector to Wyoming's economy today. It documents the risks and challenges facing the coal industry in the future due to market conditions and regulatory threats, and using the most recent data available, conducts an impact analysis to determine how these risks could affect the Wyoming economy and state revenues through 2030. The potential impacts of proposed carbon regulations introduced by the Environmental Protection Agency's (EPA) Clean Power Plan are also estimated, as are the potential impacts that large-scale international coal exports could have on Wyoming's economy. This report concludes with analysis of the policy choices Wyoming faces in response to these market challenges.

The Importance of Coal to the Wyoming Economy Today

Since 2008, coal production in Wyoming has fallen by 17%, and coal markets remain depressed. Assessment of market forces that may have caused this decline suggests that the three most important contributors to the decline have been:

- Falling natural gas prices, causing some coal to be displaced as a generation fuel nationally
- Slow national economic growth, which has reduced electricity demand and the need for Wyoming coal
- Growth of renewable energy production, which has displaced some coal-fired generation

Figure ES-1 summarizes the outlook from five well-known energy market forecasters regarding coal production over the next 25 years. Four of the five forecasts suggest zero or negative growth in the near term relative to the current national output of

WYOMING COAL ECONOMY QUICK FACTS

	Coal economy	*Coal mining only*
Share of gross state product (GSP):	**14.0 %**	**11.3 %**
Share of total labor income:	**9.3 %**	**4.7 %**
Share of total employment:	**5.9 %**	**1.8 %**
State revenue directly from coal mining, not including other activities:	**$1.3 billion, or 11.2% of all government revenues collected in the state**	

The "coal economy" includes all activity caused by the presence of coal mining, rail-shipping and coal-fired electricity generation in Wyoming.
All figures used are for fiscal year 2012.

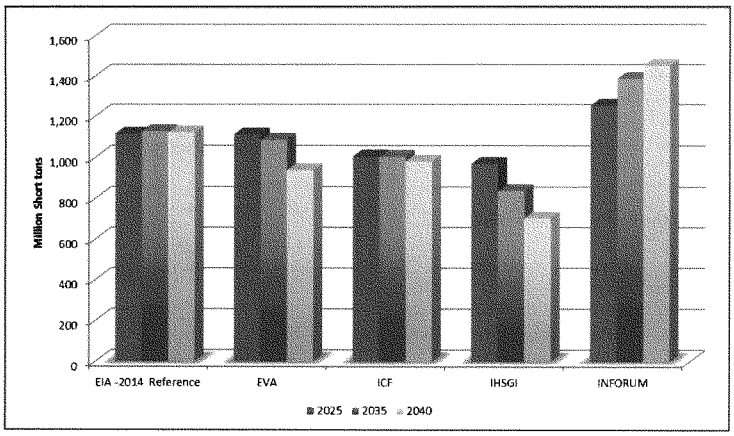

Figure ES-1. Forecasts of U.S. coal production.

approximately 1 billion tons annually. Through 2040, the outlook for coal production gets considerably weaker in several cases, particulary those that assume more stringent carbon regulations occur.

The Potential of Expanded International Coal Exports from Wyoming

Coal exports to international markets provide one possible means of protecting and expanding future coal production in Wyoming. The primary challenge facing a major expansion of Wyoming coal exports to foreign destinations is a lack of port capacity that would allow expansion of export shipments at competitive cost. Development of such ports has proven difficult, and has often been opposed outside Wyoming on environmental grounds. Concerns associated with port development - primarily in Oregon and Washington - range from local traffic congestion problems, dust and air qnality concerns, and the implication that such exports could contribute significantly to global climate change.

In addition to environmental concerns, however, the greatest challenge in achieving such port expansion may be the perceived weakness of the coal market and domestic coal producers themselves. For example, Arch Coal, Inc., a financial backer of one of two proposed large west coast port expansions (Millennium Bulk Terminal in Longview, Washington) has experienced a sharp decline in its capital value. Arch Coal holds a 38% investment in the project. In November 2014, Ambre Energy, Ltd., the majority backer of the Millennium Bulk Terminal project, announced in a regulatory filing that it was divesting its North American coal export assets, selling them to a Denver-based private-equity firm. Further, Peabody Energy Corporation, owner of half of the proposed Gateway Pacific Terminal in Bellingbam, Washington is also in weak financial condition. Cloud Peak Energy, Inc., with an interest at both planned terminals recently reported losses on coal exports and divested of export mine interests. Weakness in U.S. coal markets has left domestic firms with limited ability to finance large-scale investments. The general market willingness to support such projects is also uncertain.

If opposition to proposed new terminals could be overcome and the projects financed, the impact on the Wyoming economy could be substantial, especially if all of the proposed terminal capacity were accessible. Most of these potential economic benefits would accrue to the Powder River Basin; however, the secondary effects would be felt throughout the state.

Threats to the Domestic Coal Market

In addition to international export scenarios, this report analyzed the potential impact of existing domestic market challenges. Using the U.S. Energy Information Agency's (EIA) Annual Energy Outlook 2014 (AEO2014) projections, authors assembled several Wyoming coal production scenarios. These scenarios considered the following influences on coal production:

1. *Fundamental market effects driving coal market demand and production costs:*
   - Continued weak demand due to low natural gas prices caused by recent increases in domestic natural gas production
   - Continued weak demand due to slower national economic growth leading to slower electricity load growth
   - Decreases in productivity growth in the coal mining sector, resulting in increased coal production costs

2. *Regulatory changes affecting Wyoming energy markets:*
   - U.S. EPA proposed Clean Power Plan for new and existing electricity-generating power plants[1]

ESTIMATED BENEFITS OF 100 MILLION TON ANNUAL COAL EXPORTS EXPANSION

Increase in Gross State Product:
$1.2 billion annually

Increase in jobs:
4,000+ new jobs

Increase in labor income:
$345 million annually

Analysis of EIA coal production projections using an impact model constructed specifically for this study suggests that of the fundamental factors that may decrease Wyoming coal production, rising coal costs pose the greatest threat. For example, using the EIA's scenarios and assumptions, in a worst-case scenario assuming an economy at full employment and growing normally, coal production in Wyoming could fall by 20% from 2012 levels by 2030. The decrease could occur due to lower productivity growth at mines and higher wage and capital cost growth than recent historic norms. Based on these assumptions, employment losses in the state would total nearly 4,800 jobs by 2030, relative to 2012 employment levels.

Assuming no changes to the regulatory landscape of 2012, EIA projections suggest low natural gas prices and slowing economic growth present a much smaller threat to future Wyoming coal production than rising coal production costs. In both low gas price and slow growth scenarios considered, coal output levels would be between 4% and 8% greater by 2030. While adverse market effects could result in less output than these estimates, especially if multiple market effects occurred simultaneously, the analysis suggests that fundamental market factors pose a less serious threat to Wyoming coal production than those presented by potential carbon regulations.

1 The EPA Clean Power Plan is also referred to as "111(d)" - the section number of the Clean Air Act that the rule falls under.

Potential Impacts of the EPA's Clean Power Plan Proposal

The EPA's Clean Power Plan targets carbon dioxide emissions reductions of 30% of 2005 levels, but places the burden of reduction unevenly among states. In Wyoming, the proposed rules would require a reduction in the state's CO_2 emissions rate by 19% from 2012 levels.

The EPA's proposed 111(d) rules allow states to determine the means of meeting mandated emissions reductions goals. These may include energy efficiency as a reduction mechanism, and states may choose to design regional compliance programs, cooperating with other states. Given the range and uncertainty of the policy combinations states may choose, projections of the potential impact of the proposed regulation were performed as four separate scenarios. Scenarios considered include allowing energy efficiency (EE) to be used as a compliance strategy, and the degree of state cooperation (nationwide or regional). Scenario 1 considers national scale cooperation with energy efficiency; Scenario 2 considers national scale cooperation without energy efficiency. Similarly, Scenario 3 considers regional level cooperation with energy efficiency and Scenario 4 considers regional level cooperation without energy efficiency.

To define the potential impacts of the EPA 111(d) proposals, authors enlisted the help of Rhodium Group, a New York-based consultancy that shared a set of proprietary simulations developed to estimate the impact of the EPA's proposed greenhouse gas (GHG) regulations on the national economy. A comparison of the Rhodium Group modeled scenarios corresponding ro those scenarios considered in this study for Wyoming coal production is presented in Figure ES-2.

Regardless of how policy is implemented, imposition of proposed 111(d) rules results in a significant decline in projected Wyoming coal output in all scenarios. By 2030, these declines range from approximarely 20% ro 45% decreases from 2012 production levels, depending on the scenario.

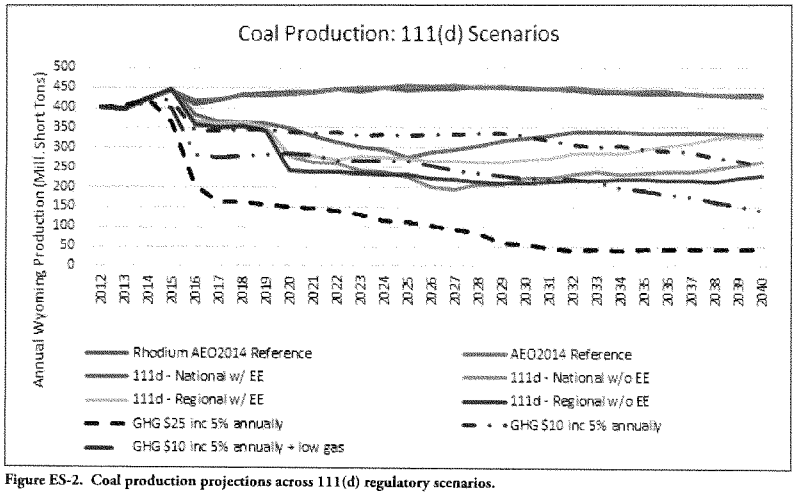

Figure ES-2. Coal production projections across 111(d) regulatory scenarios.

For comparison, authors show how forecasts for various carbon taxes, a commonly considered policy option, compare to the EPA's 111(d) rules using the EIA AEO2014 carbon tax scenarios. The impact of a greenhouse gas tax of $25/ton results in the most detrimental hypothetical outcome for coal production, and other scenarios with a $10/ton tax level have an impact similar to the various 111(d) scenarios modeled.

The ways in which other states choose to implement 111(d) compliance measures have an impact on Wyoming. In order of production outcome from best (greatest production) to worst (least production), the policy scenarios considered rank as follows:

1. National cooperation with energy efficiency
2. Regional cooperation with energy efficiency
3. National cooperation without energy efficiency
4. Regional cooperation without energy efficiency

Including energy efficiency, regardless of the scale of cooperation with other states, results in greater coal production than scenarios that do not include energy efficiency. Energy efficiency measures reduce electricity demand and effectively result in carbon reductions across the wider economy.

The 111(d) climate regulation has the potential to drastically decrease Wyoming coal production. Projected coal output under the most favorable production circumstances decreases by 32% of 2012 production by 2025. Using the production outcomes described in Figure ES-2, even in the best case, impact modeling of the 111(d) scenario suggests a loss of over 7,000 jobs across the state by 2025, relative to 2012 employment. Other scenarios analyzed exhibit continuous and greater losses. Effects of the regulations would impact the Powder River Basin region of Wyoming most severely, where one in ten jobs would be eliminated.

Complicating the analysis of the economic impact of the EPA's 111(d) rule on the Wyoming economy is the potential to use fuel-switching between coal and natural gas as a means for the state to comply with the regulation. Since Wyoming produces a significant amount of natural gas, authors accounted for potentially mitigating effects of the natural gas sector to determine the overall impact of the EPA's proposed Clean Power Plan regulations on the state.

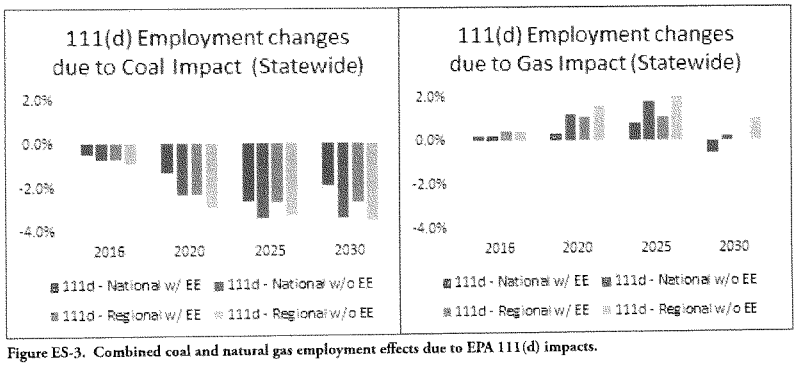

Figure ES-3. Combined coal and natural gas employment effects due to EPA 111(d) impacts.

This analysis indicates that despite the 111(d) rules stimulating Wyoming's natural gas sector, employment losses in the state's coal industry are not offset by the additional natural gas production prompted by carbon regulation. The negative impact to employment in Wyoming from reduced coal production is approximately two to four times larger than the posirive employment effects from natural gas production. Across all scenarios analyzed, the total impact on statewide employment ranges from a 0.3% decline in 2016 to a 3.2% decline in 2030, relative to 2012 employment levels. The impact of the regulations would be expected to lead to a contraction in statewide economic activity and employment regardless of any other offsetting economic growth in Wyoming.

State Revenues

Authors analyzed both the effect of changes in coal production from fundamenral market risks (shown in Figure ES-4 - adverse production cost changes, slow economic growth, and continued low natural gas prices) and potential 111(d) impacts on state revenues. Of rhe fundamental market risk scenarios, state revenues were highest in rhe case of higher coal production costs, the worst outcome for the wider Wyoming economy in terms of employment and production. Conversely, state revenues were lowest in the low coal production costs scenario, the best outcome for the sratewide economy. Other scenarios had little impact on state revenues.

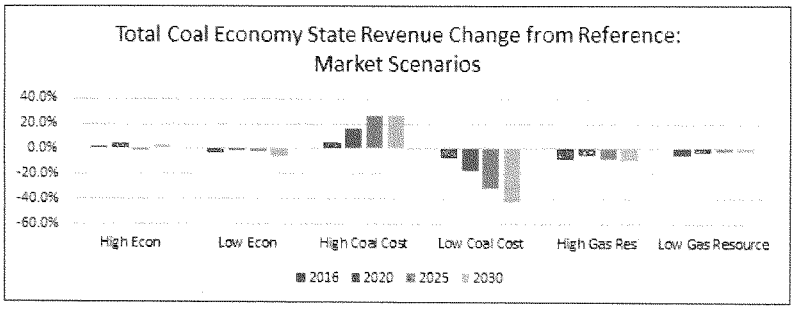

Figure ES-4. Total coal economy tax revenue change.

The scenario in which coal production is highest results in the lowest tax revenues to Wyoming.

The potential impacts of proposed carbon regulations on state revennes are severe. The most favorable outcomes for state revenues are those in which energy efficiency is used as a compliance strategy, as shown in Figure ES-5.

Because EPA's 111(d) is anticipated to increase demand for natural gas in electricity generation, authors also considered the potentially offsetting effects this could have on state revenues. Combined coal and gas effects on state revenues are shown in Figure ES-6. Tax revenues continue ro decline in all policy implementation scenarios, suggesting that positive natural gas effects do not offset the

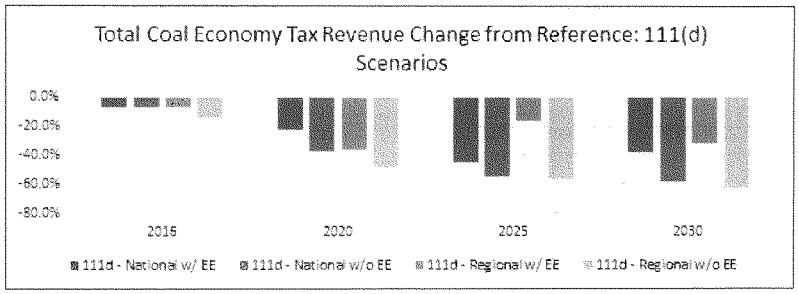

Figure ES-5. Total economy tax revenue change: 111(d) scenarios.

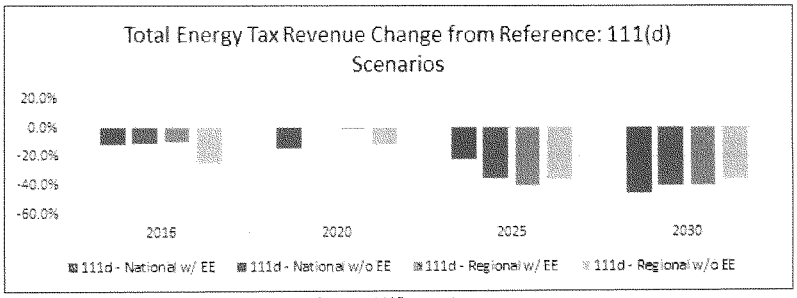

Figure ES-6. Total energy economy tax revenue change: 111(d) scenarios.

losses in state revenue due to lower coal production caused by 111(d). Authors also found that state revenue is highest in the scenario worst for coal production. Overall, proposed carbon regulations result in a predicted decline in the state's combined coal and natural gas revenues of between 36% and 46% by 2030, as shown in Figure ES-6.

Conclusions

The greatest risks Wyoming's coal industry faces, and by extension the greatest risks to state revenues derived from coal production, are posed by proposed carbon regulations. Significant expansion of internarional coal exports on the order of 100 million tons annually may be possible with the opening of proposed new export terminals, which would have significant economic benefit to Wyoming.

Wyoming may have to choose whether to prioritize production and employment or its own revenues in implementing its carbon mitigation strategies.

By 2030, the terminals would not, however, entirely offset the potential coal production losses resulting from carbon regulations in any of the policy scenarios considered in this study.

The ways in which policymakers in Wyoming and across the nation implement strategies to meet new carbon regulations is critical to the economic impacts the state will experience. Greater use of energy efficiency measures coupled with wider cooperation among states at a national scale are critical to minimizing the impact of the regulation on Wyoming's economy.

The ways in which Wyoming implements policies to meet carbon regulations will also have an impact on state revenues. Policies rhat result in the highest state revenues have the worst impacts on the coal industry and by extension statewide production and employment. This suggests that the state may have to choose whether to prioritize state production and employment or its own revenues in implementing its carbon mitigation straregies. More important will be whether Wyoming can influence other states to implement carbon control strategies least detrimental to its coal industry.

ACKNOWLEDGEMENTS

This report would not have been possible without assistance from a number of people. Thank you to Mahdi Chahkandi, Gabrielle Horvath and Jenna Cantrell, the dedicated graduate students who helped with the data collection and analysis necessary to prepare this report. We are also indebted to Trevor Houser and Rhodium Group for allowing us the use of their EPA 111(d) rule simulations describing the potential effects of these proposed rules on Wyoming coal and natural gas output. Their willingness to share is gteatly appreciated.

Others served as resources, offered patient help and guidance in the preparation of various sections in this report and deserve mention. Ian Andrews at Rocky Mountain Power read several versions of early chapters, offering corrections and comments. Help and insight was also offered by the Wyoming Infrastructure Authority (WIA) Study Technical Support Group, including Jonathan Downing (Wyoming Mining Association), Matt Jones (Burlington Northern Santa Fe), Everett King (Ambre Energy), Bill Mai (University of Wyoming), Colin McKee (Wyoming Governor's Office), Rita Meyer (Rocky Mountain Power), Dan Noble (Wyoming Department of Revenue), Joe Ritzman (SSA Marine), Greg Schaefer (Arch Coal), Deck Sloan (Arch Coal), John Lowell (Arch Coal), and Nathan Nicholas (Wyoming Governor's Office). WIA board members Mike Easley (Chairman); Kyle White (Vice Chairman); Don Collins (Treasurer); David Sparks (member); and J.M. Shafer (member) also contributed to this effort, as did former WIA board member Bryce Freeman (Wyoming's Office of Consumer Advocate).

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As usual, all errors remaining are strictly the authors', and are not the responsibility of those who have helped us along the way. Thank you everyone, and a heartfelt thanks and our apologies to those we have forgotten to mention as well.

1. WYOMING'S COAL INDUSTRY: ITS HISTORY AND IMPORTANCE IN TODAY'S ECONOMY

CHAPTER SUMMARY

Coal production has been an important part of the Wyoming economy since the arrival of the railroad. Coal production, peaked in this era at approximately 1.6% of national coal output in 1945. With the decline of steam technology in transportation, Wyoming coal production began to wane, hitting a low in 1958 at 0.4% of national output. The growth of large coal-fired electricity generation facilities in the state, beginning in 1959, however, caused coal production to gradually expand in the years following. By 1969, coal production had almost tripled its low eleven years earlier and Wyoming's share of national production had doubled to 0.8%.

The 1970s saw coal production begin to increase toward the level the modern Wyoming economy now enjoys. The opening of the Powder River Basin (PRB) from the 1970s onward, was driven by the economies of scale offered by deposits there, falling transport costs, and environmental regulations favoring PRB coal's low sulfur content. Each contributed to a massive expansion in Wyoming coal output. By 2008, output was 66 times that in 1970, totaling 468 million tons and 40% of the nation's coal production.

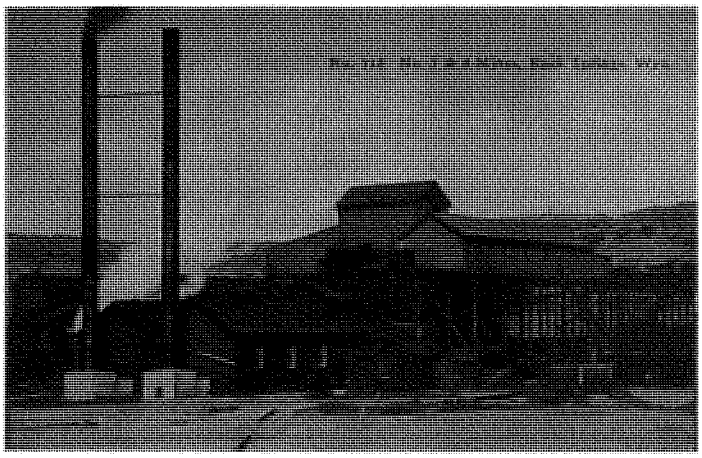
This growth has not been without recent challenges. Worker productivity has fallen from 81,000 tons per worker in 2004 to 60,000 in 2013. Over this same period real prices of Wyoming Powder River Basin coal have been rising. Since the 2008 peak, coal production in the state has declined by almost 17%, but still contributes significantly to the Wyoming economy.

Few studies have documented the impact of coal on the Wyoming economy, and those that have are over a decade old or more. New estimates are presented here to document coal's importance to the Wyoming economy today. Results indicate that in 2012, at a production value of over $5 billion, coal production alone accounted for 11.3% of gross state product, 4.7% of total labor income and 1.8% of in total state employment. Coal mining alone also accounted for almost 6,900 jobs. Consideration of the wider "coal economy" in the state, the railroad operations used to ship coal, and coal-fired generation utilizing the state's coal, as well as the indirect and induced expenditures these activities create, results in the coal sector accounting for 14% of gross state product, 9.3% of labor income and 5.3% of state employment and over 23,000 jobs. In the coal-producing regions of the state, particularly counties in the PRB, coal production and related activity alone accounts for over 7% of jobs, and the overall coal economy accounts for one job in five.

Coal production also accounts for a significant portion of government revenues in Wyoming. In 2012, direct taxation on coal production alone accounted for 11.2% of total government revenues, or almost $1.3 billion in total revenues to the state, cities, counties, and towns. In contrast, taxation on the activity coal stimulates added only $48.6 million to state revenues, demonstrating how dependent revenues derived directly from coal production are to the state.

Historic Coal Production in Wyoming: The Rail Era 1868-1958

Coal production in Wyoming has occurred since before statehood and even before the Wyoming Territory was created. Foulke et al (2013) notes that historians have documented coal being identified in what is now Wyoming as early as 1835. Jim Bridger used native coal to power a forge in 1843 and coal deposits in the state were documented by the Fremont expedition, but it was not until the coming of the transcontinental railroad in 1868 that coal was actually exploited commercially, when the town of Carbon was founded. The Union Pacific railway needed fuel for its locomotives and the treeless plains of Wyoming provided little timber to generate steam. To provide the railroad a local source of fuel, railroad-owned land was leased to the Wyoming Coal and Mining Company to allow the exploitation of resources near the town of Carbon (now a ghost town) and further west in Rock Springs, with underground operations beginning in 1868. Demand for Wyoming coal would be closely tied to the railroad for the next ninety years.



Union Pacific Coal mines Nos. 7 and 9, Rock Springs, Wyo., no date. Wyoming Tales and Trails.

With the coming of the railroad, local Wyoming coal resources were exploited primarily for use as steam locomotive fuel and also used to support local economic development, providing heat and energy in the mines' respective regions. Mining operations were underground, and occurred throughout the state, including in the southeast near the towns of Carbon and later Hanna, in the southwest beginning near Rock Springs in what was to become Sweetwater County, at Almy near Evanston, and Diamondville in what would later become Uinta and southern Lincoln Counties.

Elsewhere in the state, coal mining began with the arrival of the Chicago, Burlington and Quincy Railroad (CB&Q) in the Sheridan area, and at Cambria, near present-day Newcastle. The building of rail lines by the Chicago and Northwestern Railroad and CB&Q into the central part of Wyoming also helped develop mines near Hudson and Thermopolis. Most mines throughout the

state exploited local higher quality bituminous coal sources wherever possible, as lower quality sub-bituminous coal closer to the surface was deemed less attractive by the railways and other energy users. Coal mining helped regional development in each of the areas as mines opened, however, the boom and bust cycle that has become familiar to the state was also perpetuated by these activities as many of the settlements developed around these mines were company towns, and their success or failure depended entirely on the state of the coal industry.

During the late nineteenth century and early twentieth century Wyoming's coal production steadily increased, following national trends. Wyoming's share of total national coal output increased from under 1.0% through the 1880s and peaked in 1901 at 1.7% as annual output in the state achieved a 4.4 million ton total. For the first two decades of the 1900s Wyoming's national share of total coal output remained approximately 1.5% while the industry in the state grew, with annual production peaking in 1920 at over 9.6 million tons. Due to a confluence of factors, including the conversion of the Navy to petroleum-powered ships, the beginning of the diesel era in railroading, and greater use of heating oil in homes, national coal production plateaued by the 1920s, and declined in the 1930s due to the economic conditions of the Great Depression, before experiencing a brief resurgence during World War II.

Employment in coal-mining was similarly affected, peaking at more than 8,000 in the early 1920s before declining to levels nearer 4,000 until the end of WWII. During the Second World War, Wyoming coal production briefly spiked, achieving a (then) record of over 9.8 million tons of output in 1945, but after the war, coal production in the state declined again quickly, and in 1954 Wyoming's share of national output fell below 1% and annual production fell below 3 million tons for the first time since 1899. In that same year employment in Wyoming coal mining fell below 2,000 workers.

This decline closely tracked the conversion of national railroad operations to diesel power. In 1958 Wyoming coal production hit its twentieth century low, with annual output of 1.6 million tons mined, lower than any year since 1889. By the end of the 1950s the Rail Era of Wyoming coal production had ended.

The Transition Era: 1959-1969

Employment in the coal mining sector continued to decline, falling from 587 workers in 1958 to an historical low of 327 workers in 1965. During this period of decline, mining in many of Wyoming's traditional regions ended; however, a new demand for coal in the state was to emerge in the form of electricity generation.

In 1959, the first modern, large coal-fired generation plant opened in Wyoming; the 114 MW Dave Johnston Generation Station near Glenrock. Originally supplied by coal from an adjacent mine-site, coal production in Wyoming from this date onward became dependent on the growing demand for electricity. Transportation demand had ended and the use for coal to provide heating in homes and industry would suffer the same fate; however, the growing demand for electricity would more than offset any losses. In 1961, the Dave Johnston plant's generation capacity was doubled. By the end of 1964 it had doubled again.

In 1963 the 163 MW Naughton plant opened near Kemmerer, exploiting locally produced coal. This plant was expanded by a further 218 MW in 1968. As electricity generation in the state produced by coal expanded, so too did coal production, expanding from 2 million tons per year in 1960 to over 3.8 million in 1968. Employment in coal-mining also began to increase by the end of the 1960s, and in 1969 stood at 448 jobs. As Wyoming's coal resources began to be appreciated for their potential to power the electricity sector, the second major era of Wyoming coal production began, the Energy Era.

Wyoming Coal Production since 1970: The Energy Era

Wyoming coal production saw a resurgence in the late 1960s for several reasons. The most important was the growth of coal-fired electricity generation within the state. Throughout the 1960s coal-fired generation in Wyoming was fueled by new mine-mouth operations. The growth of Wyoming coal production since the 1970s reflects three additional underlying forces, and these factors are responsible for Wyoming becoming the nation's largest coal-producing. The **first** was the closure of traditional underground coal mining operations and the growth of lower-cost surface mining, a process that began decades earlier. This greatly reduced production costs and opened economies of scale to Wyoming mining, allowing mines to grow to an entirely new scale in the Powder River Basin. The **second** major change occurred in 1980 with the Staggers Rail Act, which eliminated railroad freight rate regulation and greatly reduced transport costs between states. The **third** major market force that stimulated production increases in Wyoming was the advent of more stringent Federal regulation on sulfur dioxide (SO_2) emissions. Together these three forces; continually declining mining costs; falling transport rates; and increasing environmental regulations stimulated demand and were responsible for the eventual extent of the Wyoming coal industry today, especially in the PRB.

State demand for coal to fuel generation continued unabated in the 1970s. In 1971, Naughton Unit 3 was commissioned, adding 326 MW of generation capacity and greatly increasing local coal demand. In 1972, Dave Johnston Unit 4 opened, adding 360 MW of additional generation. The largest plant to be built in Wyoming, the Jim Bridger Station, opened in stages and by 1979 had added an additional 2,300 MW of generation to the capacity in the state. Wyodak Station, opening in 1978, and at 362 MW, was the first large plant to utilize PRB coal for fuel.

The same production cost characteristics that made Wyoming coal attractive within the state also began to create interest outside the state during these years. This interest would eventually dominate the demand for Wyoming coal and by the 1970s more coal would be produced in Wyoming for export out of the state than for use within it. Sub-bituminous deposits close to the surface in the PRB with seams 50 to 70 feet thick offered very low production costs and economies of scale, allowing larger and larger surface mines to develop with lower and lower production costs. A common joke in the PRB referred to the idea that all you needed to mine coal in the area was a 3-iron golf club. In 1972, the Belle Ayr Mine opened near Gillette, the first surface mine not associated with a local power plant, and Wyoming coal exports, shipped by rail from the PRB began in earnest to power plants in Midwestern states.

The following year the Arab Oil Embargo resulted in the first energy crisis in the United States, and led to a new focus on non-oil based fuel sources. Wyoming's abundant and low cost PRB coal provided a practical answer to this need. During the 1970s, Wyoming coal production increased tenfold, from 7.2 million tons per in 1970 to 72 million tons, accounting for over 9% of national coal output, by 1979. In that same year the nuclear accident at Three Mile Island in Pennsylvania led to the end of expansion in the nuclear power industry and an even greater focus on inexpensive Wyoming coal as the solution to generating electricity cheaply and dependably.

Inexpensive to mine, the potential extent of Wyoming PRB coal exports was initially challenged because it's lower energy (BTU value) and higher moisture content. These characteristics and the distance of Wyoming mines from major markets offset some of the cost advantages attributed to PRB coal and resulted in limited exports to other states. As the 1980s went on; however, continuing productivity improvements and deregulation of railroad rates began to drive increases in demand for Wyoming coal in more distant states, encouraging additional production growth. It would be the Federal government; however, that would confer the final advantage needed for PRB coal use to become widespread and allow the region to become the largest producer of coal in the United States.

The Clean Air Act of 1970 initially led to the first restrictions of sulfur dioxide (SO_2), a by-product of coal combustion, on newly built generation facilities. Initial attempts to reduce SO_2 emissions around the country involved the deployment of taller smokestacks – meant to disperse sulfur dioxide in lower concentrations over larger areas. In some locales, plants also sought to substitute lower sulfur-content coals in their fuel mix to reduce emissions. PRB coal, despite its lower energy content and higher moisture, also has a very low sulfur content. The new regulations and PRB coal's falling price due to continuing cost improvements resulted in additional demand.

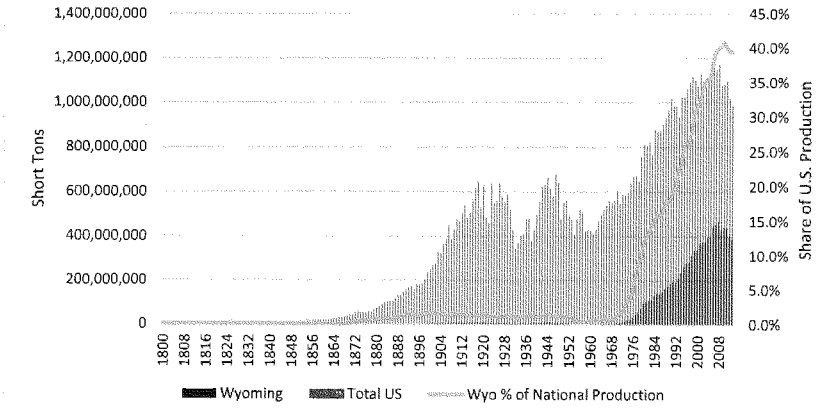
Title IV of the Clean Air Act amendments of 1990 greatly expanded SO_2 control in the United States by regulating such emissions from most plants across the country, not just new ones or those deemed to create local emissions problems. Creating a national cap and trade market in SO_2, plants in the United States would collectively have to reduce sulfur-based emissions, eventually to half of the levels emitted in 1980. Compliance would require plants to install expensive emissions control equipment, burn lower sulfur-content coal, or pay other plants to do both. The net result was a significant increase in demand for the low-sulfur coal produced in the PRB.

As shown in Figures 1 and 1a, the combination of the opening of low-production cost, surface-mined coal deposits in the PRB; falling railroad shipping rates; the increase in coal generation demand; and greater regulation regarding power plant sulfur emissions, led to a substantial increase in the production of Wyoming-mined coal, and in Wyoming's share of national coal production.[1] By the end of the 1980s, coal output in Wyoming had reached 172 million tons per year, and supplied almost 18% of the nation's total coal output. By the end of the 1990s this production had effectively doubled, rising to 338 million tons and almost a 31% national production share. The price effects alone driving this growth are described in Figure 2. Peak prices

[1] Ellerman et al (2000) and Gerking and Hamilton (2008) results suggest that coal costs and other factors such as deregulation had a greater effect on the expansion of coal production in the Powder River Basin than did environmental regulation, but that all were important.

occurred in the 1970s during the oil-crisis years. Since then, factoring in inflation rates, real prices of coal produced in the state dropped by over four times between 1980 and 1999, a direct reflection of the productivity gains in the state. During that same period, production also more than tripled. Production continued to increase into the second decade of the 2000s with Wyoming's share of coal production exceeding 40% nationally by 2012.

Figure 1: Historic Wyoming and National Coal Production

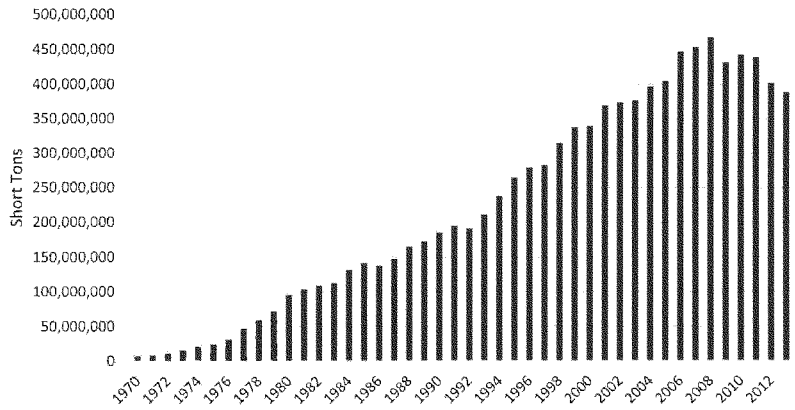


Source: United States Geological Survey (USGS) data.

The effect of the emergence of PRB coal production on Wyoming's economy proved transformational. It allowed the state to weather a severe bust in oil prices that began in the mid-1980s by providing a major new economic sector in the state, expanded employment, high paying jobs and a significant new source of state revenues. These benefits have continued to the present day.

In the future, cost increases and carbon regulation could threaten Wyoming's coal output, and Wyoming's coal economy. Presented later in this report are estimates of the potential effects such changes could have on Wyoming's coal industry and the potential impact plans like the EPA's recently announced Clean Power Plan could have on the state economy.

Figure 1a: Wyoming Coal Production: 1970 - 2013



Source: United States Geological Survey (USGS) data.

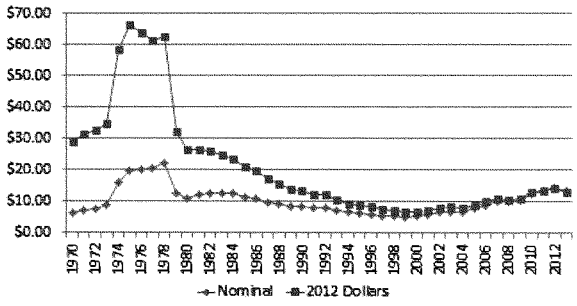
Performance of Wyoming's Present-Day Coal Industry:

Wyoming coal production peaked at more than 466 million tons in 2008. This level of production was more than 66 times the state's coal production in 1970 (7 million tons). Between 1970 and 2008, Wyoming coal production increased at an average rate of more than 12% per year due to the competitive advantages of PRB coal. In 2012, 97% of Wyoming's coal production occurred in the PRB in the northeastern corner of the state while 3% occurred in the Uinta Basin in the southwest corner of the state.

Since 2008, however, Wyoming coal production has declined by 78 million tons (as of the end of 2012). This represents a 17% decline in production over the last five years. Much of this decrease was due to a combination of relatively low natural gas prices, reduced electricity demand due to the recession, problems with rail transportation, and concerns with increased government regulations. Between 2008 and 2012 average rail freight rates paid for shipped coal also increased in real (inflation adjusted) terms by over 30%.[2] For 2014, the Energy Information Administration estimates that January through July coal production for Wyoming decreased by 1.1 million tons (-0.5%) from 2013 levels.

[2] Data comes from the EIA Coal Transportation Rates to the Electric Power Sector (2014). http://www.eia.gov/coal/transportationrates/

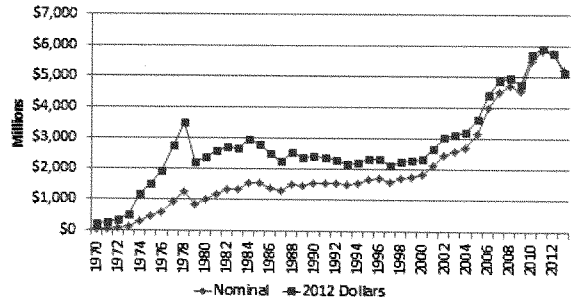
Figure 2. Wyoming Coal Price Per Ton: 1970-2013



Source: Wyoming Department of Revenue

Since 1999, Wyoming has experienced a steady increase in coal prices, peaking at $14.34 per ton in 2012. This represents a doubling of coal prices in real terms in 13 years. Following the recent peak in 2012, Wyoming coal prices have declined by 8% in real terms averaging $13.21 through September of 2013.

Figure 3. Value of Production for Wyoming Coal: 1970-2013



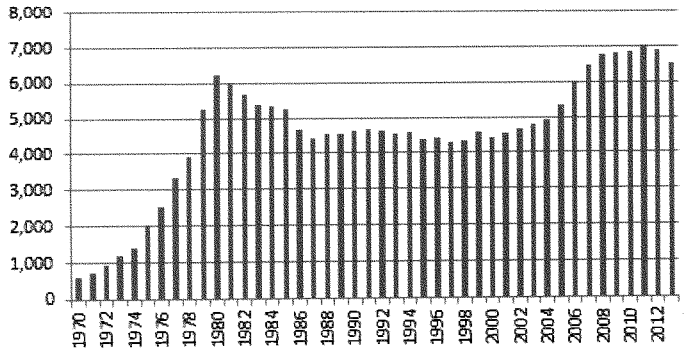
Source: State Inspector of Mines of Wyoming and Wyoming Department of Revenue

Multiplying the coal production data shown in Figure 1a and the coal price data shown in Figure 2 indicates the total value of production for Wyoming coal shown in Figure 3. After approximately 20 years of relatively constant value of production in real terms using 2012 dollars, ranging from approximately $2 to $3 billion, from 2002 through 2011 the value of Wyoming coal production nearly doubled, rising from $3.1 billion in 2002 to $5.9 billion in 2011. Since 2011, the total value of production for Wyoming coal has fallen by $796.8 million (-13%) due to the combination of declining production and price in recent years.

Impacts of coal production on the Wyoming Economy

Between 1970 and 1980 Wyoming coal employment increased from 621 jobs to more than 6,000 jobs, peaking at 5.3% of total employment in the state, as shown in Figure 4. Coal employment then declined to between 4,000 and 5,000 jobs from 1986 through 2000, falling to 1.7% of total state employment by the end of the 1990s despite the fact that Wyoming coal production during this period increased by 256%. Since 2000, Wyoming coal employment has increased from less than 4,500 jobs in 2000 to over 7,000 jobs in 2011, and now accounts for almost 2.5% of total state employment. Much of this growth in employment was due to increased production as shown in Figures 1 and 1a. Some of this growth, however, was also due to declining efficiency as tons of coal produced per worker declined from 81,000 tons per job in 2004 to 60,000 tons per job in 2013, requiring more labor to produce the same amount of coal.

Figure 4: Wyoming Coal Employment: 1970-2013

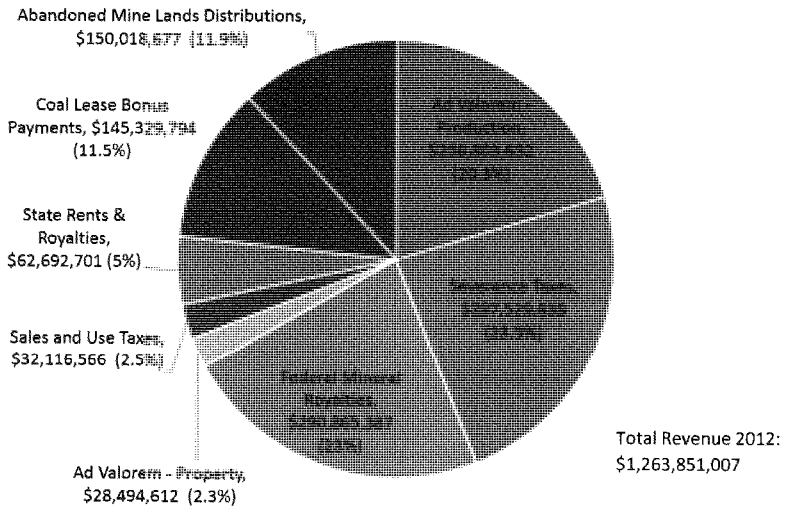


Source: State Inspector of Mines of Wyoming

This period of declining productivity also corresponds to the period when real prices of Wyoming coal began to rise. Both observations suggest greater costs associated with increased overburden experienced in mining PRB coal as operations reached deeper into the ground and began to exploit lower quality deposits. Still, Wyoming coal mines remain very competitive. As noted by Considine (2013), PRB coal mines averaged 40.0 tons of coal per employee per hour while other producers in the U.S. averaged 4.4 tons per employee per hour. After peaking in 2010, coal employment declined by 488 jobs (-7%) as production fell. Even with this decrease, the Bureau of Labor Statistics estimates that total wages and salaries for Wyoming coal mining employment in 2013 were $550 million (excluding benefits). This represents average annual earnings per job for coal mining of $82,654 which is nearly twice the state average ($44,977).

State and Local Government Revenue Impact

Figure 5: State Revenues from Coal-Production (2012)

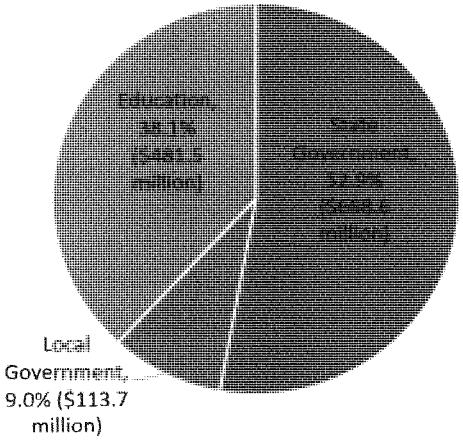


Source: Wyoming Department of Revenue

Coal production is an important source of government revenue for Wyoming and in 2012 it is estimated that coal production generated nearly $1.3 billion in revenue for state and local governments. The largest sources of revenue were Severance Taxes (23.5%), Federal Mineral Royalties (23.0%), and Ad Valorem Taxes on Production (20.3%). Combined, these three revenue

sources represented two-thirds of total state and local tax revenue from coal. Following these three revenue sources, Abandoned Mine Lands (AML) distributions and Coal Lease Bonus Payments each accounted for more than 11 % of total coal revenue. The remainder of the $1.3 billion represented State Rents & Royalties from coal production on state lands (5.0%), Sales & Use Taxes associated with coal production (2.5%), and Ad Valorem Taxes on Property associated with coal mine facilities (2.3%). Overall, the $1.26 billion in revenues collected from coal production represented 11.2% of the state's total revenues collected in 2012.

Figure 6: Distribution of Wyoming Government Revenues from Coal (2012)



Source: Various State Agency Reports

Figure 6 summarizes the distribution of Wyoming State & Local Government revenue from coal for 2012. More than one-half of the total revenue went to fund various aspects of state government. Coal revenues to state government flow to numerous accounts and agencies including: General Fund, Budget Reserve Account, Permanent Mineral Trust Fund, Water Development, Highway Fund, LUST, Legislative Royalty Impact Assistance Account, DEQ, State Engineer, and Wyoming Wildlife and Natural Resource Trust Fund. The largest sources of coal revenue for state government in 2012 were Severance Taxes, Federal Mineral Royalties, and Abandoned Mine Lands Distributions.

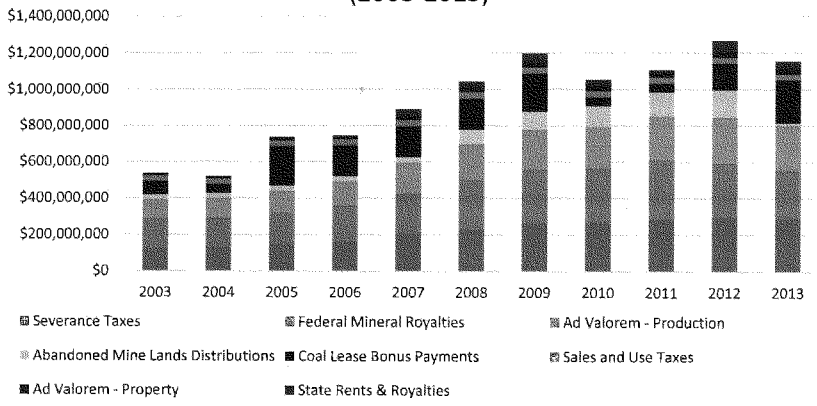
A significant share of coal revenues is also used to support education in the State. Education received about one-third of coal revenues with the remaining 9% going to local government. Coal revenues were used to fund all aspects of education in Wyoming including K-12, Community

Colleges, and the University of Wyoming, supporting both operations and capital construction. The largest sources of coal revenue for education were Ad Valorem Taxes on Production, Coal Lease Bonus Payments, and Federal Mineral Royalties.

The remainder of coal revenues supports all aspects of local government in Wyoming. Cities, towns, county governments and special districts all received funds from coal revenues for both operations and capital construction. The largest sources of coal revenue for local governments were Ad Valorem Taxes on Production and Sales and Use Tax revenues.

Trends in State and Local Government Revenue

Figure 7: Wyoming Government revenues from Coal (2003-2013)



Source: Wyoming Concise Guide to Wyoming Coal

The trend in Wyoming State and local government revenue from coal followed total coal revenues shown in Figure 3, trending upward from 2003 to 2009, increasing from $534 million in 2003 to nearly $1.2 billion in 2009.[3] Since then coal revenue has fluctuated between $1.0 billion and $1.2 billion; exceeding $1.2 billion in 2012. Much of this variability is due to fluctuations in Abandoned Mine Lands Distributions and Coal Lease Bonus Revenues. Beginning in 2008, the AML funds to Wyoming included "Prior Balance Replacement Funds". These were past revenues collected under the AML program that were supposed to be returned to the states but were not. In 2006 an agreement was reached in Congress to return these payments to the states in seven installments between 2008 and 2014. As a result Wyoming's AML payments increased from by

[3] Most Wyoming government revenues are based on the previous year production level thus revenue trends lag production revenue trends by approximately one year.

$82.5 million per year from 2008 through 2012. However, in 2012 Congress capped AML payments per state at $15 million per year which reduced the 2013 AML payment for Wyoming to $14.2 million after sequestration.

Federal coal lease bonuses have also fluctuated over time ranging from a low of $47 million in 2004, 2010, and 2011 to a high of $237 million in 2013. The large increase in 2013 coal revenues was the result of annual coal lease bonus payments from contracts for 1.3 billion tons of mineable coal sold by the BLM in 2012, in addition to coal lease bonus payments from previous contract sales. Coal lease bonus payments last for five years after the sale of the lease thus high lease payments are expected through 2017. A lack of sales in 2013 and 2014; however, coupled with a low inventory in Federal lands available for lease in the future suggests that these funds will decline for the rest of the decade, especially if current weak conditions in coal markets persist. Detailed production and state revenue data used in Figures 1a through Figure 7 is found in Appendix 2.

Estimating the Importance of Coal production on Wyoming's Economy

Despite the fact that the coal industry is critical to Wyoming, few studies have been attempted to quantify the impact on the statewide economy of the industry, and those that have are significantly out of date. Given the lack of current knowledge regarding the quantitative importance of the coal industry to the modern Wyoming economy, this study addresses this information gap by estimating the importance of the coal sector to Wyoming's economy today. This is accomplished by first reviewing the few previous studies available, then presenting estimates that quantify the current relationships between the coal industry and wider economic outcomes in Wyoming.

The earliest analysis of this set of economic relationships was conducted by Borden, Fletcher, and Taylor (1994), who estimated the economic impact of coal mining on the economy of Wyoming in 1991 using an economic impact model created at the University of Wyoming. The analysis collected primary data from mines across the state building a 12 sector input-output model. Based upon 1991 production of 194 million tons of coal, the authors estimated that coal mining generated almost $462 million in personal income directly and indirectly. The industry also generated approximately 18,600 jobs. These contributions represented approximately 5% and 7% of personal income and employment respectively. The authors also estimated that coal mining produced over $262 million in taxes and federal mineral royalties to the state. In this analysis tax revenues were only those direct revenues accrued to the State of Wyoming and did not include tax revenues generated from indirect impacts from coal mining thus actual tax revenues generated from coal mining were higher than those listed in the report.

Two more recent studies of the regional social and economic effects of coal mining in the Powder River Basin have been undertaken for the Bureau of Land Management (BLM) in support of coal lease and other BLM management activities on federal lands. These reports assess the economic and social effects of coal mining in the PRB region alone, however, and do not estimate the impact of the industry statewide. The first, conducted in 2005 by ENSR Corporation and Sammons/Dutton LLC (2005), catalogued an inventory of effects and trends in the counties located in the PRB during the expansion of coal mining activities since the 1970s. The 2005 report was

updated in 2013 by AECOM (2013), who conducted a technical study assessing existing conditions and projected future cumulative impacts associated with energy-related reasonably foreseeable development (RFD) in the Wyoming PRB and, for specific resources, the Montana PRB.

The AECOM analysis was based on two RFD scenarios. From a production level of 428 million tons per year (mmty) in 2010 within the Wyoming portion of the PRB, output was projected to increase to 473 mmty by 2030 under the lower production scenario, and to 630 mmty under the higher production scenario. The authors used an updated REMI™ model for their analysis, calibrated to be representative of two economic regions: the first consisting of Campbell County alone, and the second composed of the Wyoming counties that border Campbell County and that are economically linked to it (Converse, Crook, Johnson, Sheridan, and Weston). Outcome estimates suggested that under the low production scenario increased coal production would create over 3,500 jobs in Campbell County alone and over 10,000 in total in the region between 2010 and 2030, while under the high production outcome estimates rose to over 5,700 and 12,700 jobs respectively. Estimated employment impacts included direct mining; indirect mining service and support; and induced jobs due to the increased economic activity in the area. Other studies of the coal industry and related impacts not directly relevant to this report are found in Appendix A2 accompanying this report.

Wyoming Coal Economy Quick Facts

The Value of the Wyoming Coal Economy to the State in 2012:

	Coal Economy	*Coal Mining only*
Share of Gross State Product:	*14.0%*	*11.3%*
Share of Total Labor income:	*9.3%*	*4.7%*
Share of Total Employment:	*5.9%*	*1.8%*

Revenue directly from coal mining, not including other activities: $1.3 billion, or 11.2% of all government revenues collected in the state for fiscal year 2012.

Current Impact Estimates of the Coal Economy on Wyoming

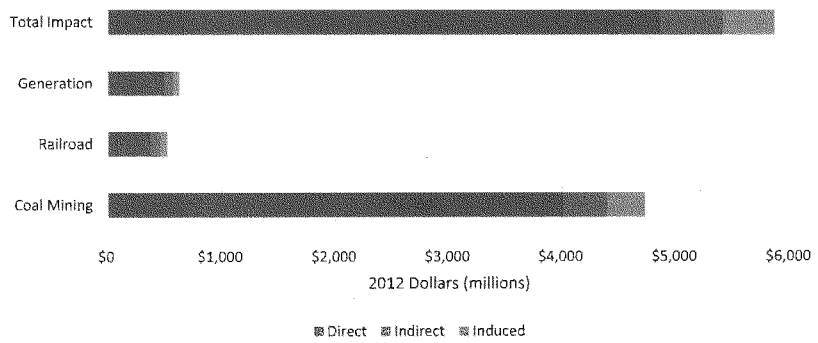
Identifying the importance of coal on the Wyoming economy, including revenue at the state level, and regional impacts is a difficult task. The following describes new estimates computed for this report that define the impact of the coal sector, and the wider "coal economy", which includes the impact of the coal-fired electricity generation sector, the railroad sector involved in coal-hauling as well as coal mining for our reference year (2012). Impacts are described for the state as a whole and then with respect to its two coal producing regions encompassing the PRB in the northeast, and the western Wyoming coal-basins in the southwest.

Impact modeling used a modified version of IMPLAN™, a commercially available regional modeling software, specifically customized by the authors using state-specific data to more accurately reflect conditions in Wyoming.[4] We first define the economic impact of coal

[4] IMPLAN is an input-output economic model that uses data to determine the relationships between sectors, both the economic activity in sectors indirectly related to the sector in question, and the associated activity induced in sectors not directly related to the activity in that sector. Indirect activities support production in a sector, for example

production, that is, the *direct* activity of mining, and also associated *indirect* activity created by mining firm expenditures in the state, as well as the *induced* economic activity caused by the household expenditures in the state related directly and indirectly to the mining activity. We then define the impact to the state of the "coal economy" – the total direct, indirect and induced effects from mining, railroad and coal-fired generation activity.

Figure 8: Coal Economy Addition to Gross State Product (2012)



Our estimates of the impact the coal economy has to the wider state economy are presented in Figures 8 and 9 for output and employment. They are also summarized in more detailed impact tables in the Appendix. Overall, Wyoming's gross state product, that is, the total value of production or economic activity produced in Wyoming, was $41.8 billion in 2012. Of this, the *direct* contribution of coal mining to state product was $4.0 billion in 2012, or 9.6% of the state's entire value of production. Including all computed indirect and induced production created by coal-mining activity only increases the impact of coal mining to 11.3% or $4.7 billion of the state's gross state product.

Computation of the total impact of the coal economy on gross state product requires adding to the impact of coal mined and shipped to locations outside the state, the impacts of coal related railroad and generation sectors. Including the value added in Wyoming of railroad activity and it's induced and induced activity increases, the share of total state product rises to 12.5% ($5.2 billion). Including the impact created by coal-fired generation, the total share of gross state product due to the coal economy rises to 14%, or $5.9 billion. These contributions are shown in the Figure 8.

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supply and maintenance activities related to a production sector and are related to firm expenditures. Induced economic activity is not directly related to production and instead describes household expenditures its payroll may induce, for example the food consumption by firm employees in a sector at nearby restaurants or their grocery purchases. This activity is purchased and produced within the state with the revenue from the production sector considered.

Figure 9: Coal-related Employment (2012)

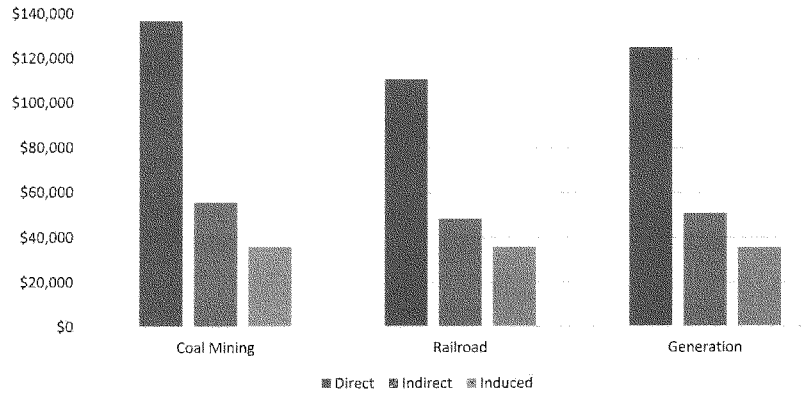
With respect to employment, the effects of the coal economy are smaller on the state than output, in part because of the very high productivity in coal mining and associated activities, but still very significant. Of the 393,348 jobs in Wyoming in 2012, there were 6,902 direct jobs (1.8%) created from coal mining operations.[5] Mining created an additional 9,138 indirect and induced jobs. Overall, the total impact of coal mining in the state was to create 16,040 jobs or 4.1% of total state employment. Including the associated rail and electricity generation sectors related to coal, the total direct, indirect and induced jobs estimated to be created by the total coal economy rises to 23,145 jobs or 5.9% of total state employment. The contributions to employment in Wyoming for the coal mining, railroad and generation sectors are shown in Figure 9.

The coal economy not only adds significantly to the state's total employment, it also creates high-paying jobs. The estimated total share of labor income in the state created just by coal mining was 7.0% or $1.4 billion. Including labor incomes from rail transport, electricity generation and the indirect and induced employment these sectors are estimated to create, the share of total state labor income associated with coal activity in the state rises to 9.5%. The average income in coal mining, railroading, or generation paid over $100,000 including benefits, and was $80,617 across all jobs

[5] Note that employment in this type of modeling refers to the total number of jobs created in a sector or an economy over a year, regardless of their length. It also includes farm jobs that may not be included in more traditional census estimates of employment. Census estimates of employment (for example, 290,857 for Wyoming in December 2012) are computed on the basis of how many people are working at a point in time, not the number of jobs in total created in an economy over a year. The methodology used here results in higher numbers than those used in the census as it includes farm jobs, allows for people to hold multiple jobs simultaneously and allows jobs to last less than a year. For example, if four jobs lasting less than a year were created and one person worked all of them throughout the year, a census estimate would compute this as one person employed, whereas the methodology here would consider that four jobs created.

created in the wider coal economy. The average wage per job in the State in 2012 was $45,243 (BEA 2014). The relative average incomes (including benefits) created by coal mining, railroading and generation are shown in Figure 10.

Figure 10: Coal Economy Average 2012 Earnings Per Job (including benefits)



Overall, the impact of the coal economy on the state in 2012, the total impacts from coal mining, industries closely associated with coal mining (rail transport a coal-fired electricity generation) and the indirect and induced production caused by these activities accounted for a significant portion of the state's total economic activity. The coal economy generated approximately one seventh of total output, almost one tenth of total labor income in the state, and one seventeenth of total Wyoming employment.

Regionally, the coal economy is even more important to local economies. In the PRB, including Campbell, Sheridan, Johnson, Converse, Weston, Crook, Niobrara and Platte counties, coal mining alone produced 388. million tons of coal, accounted for 5,989 jobs (7.1% of regional employment), generated $4.3 billion in gross state product and was responsible for generating $820 million in

The Importance of the Coal in Wyoming's Producing Regions

	Powder River Basin Region		*Uinta Basin Region*	
Coal Production	388.4 million tons		13.1 Million tons	
	Coal Mining Only	*Coal Economy*	*Coal Mining Only*	*Coal Economy*
*Contribution to Gross State Product**	$4.3 billion	$5.1 billion	$256 million	$506 million
*Employment**	12,340	17,252	1,617	2,739
*Total State Labor Income**	$1.1 billion	$1.5 billion	$155 million	$242 million

* Includes direct, indirect and induced effects

- *Powder River Basin Region includes Campbell, Sheridan, Johnson, Weston, Niobrara, Crooke, Converse and Platte Counties.*
- *Uinta Basin Region includes Uinta, Carbon, Sweetwater and Lincoln Counties.*

labor income. Collectively, the wider coal economy including direct, indirect and induced activity in the PRB region contributed $5.1 billion to Wyoming's gross state product, created $1.5 billion in labor income and resulted in 17,252 jobs or more than one job in five in the region in 2012.

In southwest Wyoming where coal mining occurs in the Uinta Basin in Sweetwater, Uinta, Carbon and Lincoln counties, while the coal economy is much smaller than that in the PRB, it is still significant. For the 13.1 million tons of coal mined in the region, the coal mining sector alone contributed $256 million to gross state product, created $124 million in labor income and was responsible for 909 jobs (1.4% of the region's total jobs in 2012). The coal economy in the area is responsible for $506 million in value added, $243 million in labor income and creates 2,739 jobs, or 4.3% of the total jobs in the region. The regional impacts are summarized in the table above and described in greater detail in the Appendix.

Impact of the Wider Coal Economy on State Revenues

Consideration of the wider coal economy also affects the estimated state revenues caused by the coal sector in the state; however, the impact is not nearly as large as the overall economic impact consideration of generation and railroad hauling in addition to coal mining causes. As shown above, consideration of the wider coal economy statewide increased the value of coal activity from 11.3% of gross state product to 14% of gross state product, an increase of 19% beyond that of coal production alone.

While direct coal production alone generates almost $1.3 billion in state revenues across eight revenue categories as shown previously in Figure 5, the wider coal economy adds relatively little to the state's revenues in comparison. Of the eight categories direct coal production activity contributes to in Figure 5, wider economic activity in the state contributes to just two: sales and use taxes and Ad Valorem Property taxes, which contribute relatively more to local government revenues and relatively less to overall state revenues.

Using the impact model results developed here, and a state revenue model developed to estimate impact effects on total state revenues for this study, the estimated additional revenue created by the wider coal economy above and beyond that derived from only direct coal production is $48.6 million. This implies that including the wider coal economy increases state revenues only 3.8% beyond that due to coal production effects alone.

To those unfamiliar with Wyoming's tax system, this may seem surprising. The wider coal economy, while increasing the total economic value of the coal sector of Wyoming by over 19%, increases total tax revenues by much less. Wyoming's tax system is very dependent on energy extraction for the majority of its revenues. Those revenues derived from other economic activity are comparatively small. With respect to state revenues, the most important impacts occur when energy production revenues change. If, for example, a general decline in the state's economic aetivity were to occur due to a decline in coal production, the Wyoming tax system makes it possible that tax revenues could still increase. This is because state tax revenues derived from energy activity are determined by the total value of energy production, not the wider economic activity such production creates.

This effect, which we term "tax revenue elasticity" could occur if for example, an increase in price caused a proportional decrease in coal output that was less than the price change. This would result in an increase in total production revenues from coal despite the reduced economic activity in the coal sector. If demand for Wyoming coal exhibits this inelasticity of demand, coal production revenues will increase for price increases even if coal production falls due to the higher prices. By extension, since coal tax revenues are derived from taxable coal production revenues, state revenues will increase also despite the fact that economic activity in the state could decline. This fact will be important for future results presented in this report and can create a situation in which what is in the interest of the state from a revenue perspective is actually not in the wider general economy's interest.

2. UNDERSTANDING THE WYOMING COAL MARKET

CHAPTER SUMMARY

Wyoming coal producers face significant challenges today. These include eroded cost-competitiveness in domestic markets as natural gas prices remain low and weak electricity demand has existed since the recession of 2008-09. Increases in production costs have also occurred as mined PRB deposits become deeper, requiring greater over-burden to be removed. More recently, rail congestion issues caused by increased oil shipments from the Bakken Formation in North Dakota has undermined the ability of Wyoming coal to get to market, reducing coal production and delivery.

The competitive advantage Wyoming coal has enjoyed in the past with respect to sulfur control is also being eroded by new regulations. These new control standards threaten to undermine PRB coal's historic low-sulfur benefits. Further, potential new carbon standards have led to uncertainty in the generation industry with respect to the construction of new coal-fired power plants, and have potentially accelerated the retirement of existing facilities. Additionally, greater renewable generation capacity has also undermined the demand for Wyoming coal, driven by state-imposed renewable portfolio standards; by carbon emissions targets favoring renewables; and by renewables' improving cost competitiveness.

International exports present a potential means for Wyoming to expand its markets, however, the building of new port access necessary to take advantage of these potential opportunities is uncertain due to environmental and local concerns, concerns regarding potential carbon emission regulations being implemented in overseas markets; and the poor financial condition of the domestic coal industry today. Should export growth occur; however, the impact on the state would be significant. For a 100 million ton per year increase in coal exports from Wyoming (the approximate amount of new port capacity being considered in Washington and Canada), analysis performed for this report indicate that almost 5,000 new jobs would be created statewide, and gross state product would increase by $1.3 billion, or 2.9%. Within the PRB region alone, employment would be estimated to increase by over 4,000 jobs and add over $345 million to regional labor incomes.

Given these challenges, future projections of Wyoming coal production vary by forecaster, but they appear to converge on common themes. Most optimistic projections suggest coal production will remain flat with only a minority of forecasters suggesting significant market production increases in the coming two decades. Downside risks suggest that in extreme circumstances, coal production could decline by as much as 50 percent or more. In addition to potential new regulations and limited access to foreign markets, domestic coal market outcomes will be determined by the extent to which coal production and electricity generation can remain cost-competitive, and this will depend on future natural gas prices; electricity demand growth; and on production costs of Wyoming coal remaining low. How the industry rises to these challenges and how the potential for new technology like carbon capture improvements might affect the future, remains unknown.

Introduction

Wyoming coal producers currently face some rather formidable domestic and international challenges. How coal companies weather these challenges will in large measure determine the course of future Wyoming production and the impacts on local economies.

The first challenge involves competing with abundant and relatively inexpensive supplies of natural gas from many shale gas plays in North America. From fears of growing shortages and rising imports in 2007, the United States is now the world's largest producer of natural gas and will likely begin exporting liquefied natural gas in the years ahead. Moreover, many large firms have announced plans to invest billions of dollars in new industrial capacity to use this natural gas to produce petrochemicals and even liquid petroleum fuels. How shale gas producers respond to these rising industrial uses for natural gas will largely determine the future course of natural gas prices and, in turn, coal production and prices.

Another significant challenge in the decades ahead involves the development of new technologies to further reduce emissions from coal-fired power generation. While coal-fired electric power generators have dramatically reduced their emissions of criteria air pollutants, such as (SO_2) and nitrous oxides (NO_X) over the past 20 years, even more stringent emissions standards are being implemented over the next few years for these pollutants. New standards have been implemented for emissions containing toxic materials such as mercury and other acid gases, and there are standards proposed to limit emissions of carbon dioxide (CO_2) from fossil-fuel based electric power generators. As a result, a large number of coal-fired power plants will be retired in the years ahead, perhaps at an accelerated pace depending upon the final scope and stringency of these policies.

Adding to the pressure regulations have created is new competition in the coal market. Highly efficient longwall mining has dramatically cut production costs in the Illinois Basin. In addition, new Mercury and Air Toxics Standards (MATS) have required significant improvements in emission reduction equipment to be installed at many plants and these new installations have undermined the need to burn PRB coal to take advantage of its low-sulfur content. Competitors such as Illinois Basin coals have higher heat and lower moisture contents relative to PRB coal and the combination of lower production costs; better fuel characteristics; reduced shipping costs; and the reduced need for low-sulfur fuels has allowed these challengers to gain advantages in some Midwestern, Mid-Atlantic and Southeastern markets.

These difficulties in domestic markets have motivated U.S. coal companies to seek markets abroad. While total U.S. exports rose from 2009 through 2012, they remain a small share of world coal export trade and, in fact, have declined over the past year. Moreover, exports of coal from Wyoming to foreign markets are down more than 50% from 2007.[6] Current installed export capacity in the U.S. and Canada is estimated at 125 million tons per year and the bulk of such

[6] Declining exports to Canadian markets have also undermined Wyoming coal exports in the past five years. For example, the closure of the largest coal-fired generating station in North America, the 3,964MW Nanticoke Station in southern Ontario has reduced Wyoming PRB exports by as much as 8 million tons per year.

capacity is currently contracted and being utilized. In order for substantial increases in coal exports to occur, new capacity must be built by expanding existing facilities or new greenfield sites. Efforts to expand port capacity on the West Coast have been hampered by environmental opposition and concerns regarding rail congestion. There are a number of potential sites for new export capacity along the west coast of North America and the Gulf Coast region. In order for such capacity to be built, political and environmental hurdles will have to be overcome and there is a question as to the economic viability of exports given the competition for market demand.

The objective of this section is to assess the factors affecting these domestic and international markets for coal and to evaluate how these forces would affect future Wyoming coal shipments. The discussion will begin with a high level analysis of the factors affecting electricity demand, the nature of competition between primary sources of energy in electric power generation, and recent trends in coal export markets. The section ends with an analysis of forecasts of coal shipments and prices produced by the U.S. Energy Information Administration and private consulting companies.

Electricity Demand

Wyoming coal is used to produce electricity across the United States; hence, the demand for electricity is a key factor determining Wyoming coal shipments. While competition from natural gas and environmental regulations are contributing to lower Wyoming coal shipments, lower electricity consumption is also partially responsible. Indeed, as the analysis below illustrates, electricity consumption in recent years seems to have hit an inflection point with prospects of either stagnant or very slow future growth in electricity use much more likely than would have been thought even a few years ago.

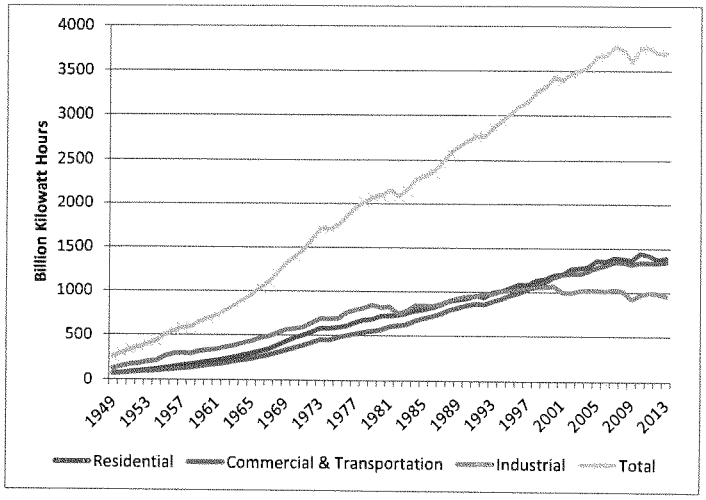


Figure 1: U.S. Electricity Consumption, 1949-2013

A time series plot of electricity consumption is presented in Figure 1. Total final consumption of electricity has declined over 72 billion kilowatt hours (kWh) from 2007 to 2013. Residential use declined by 1.1 billion Kwh while commercial use increased 1.2 billion kWh. Industrial consumption declined 73.1 billion Kwh over this period. Indeed, as Figure 1 illustrates, industrial electricity use has been declining since the late 1990s. The closure of many large industrial plants during the early years of this century contributed to this decline, along with significant improvements in energy efficiency. Higher electricity prices and lower economic growth, however, are also at work.

While rising electricity prices from the late 1990s through 2008 may have contributed to the lackluster electricity demand growth, real electricity prices in most areas of the U.S. have actually been declining over most of the period (see Figure 2).

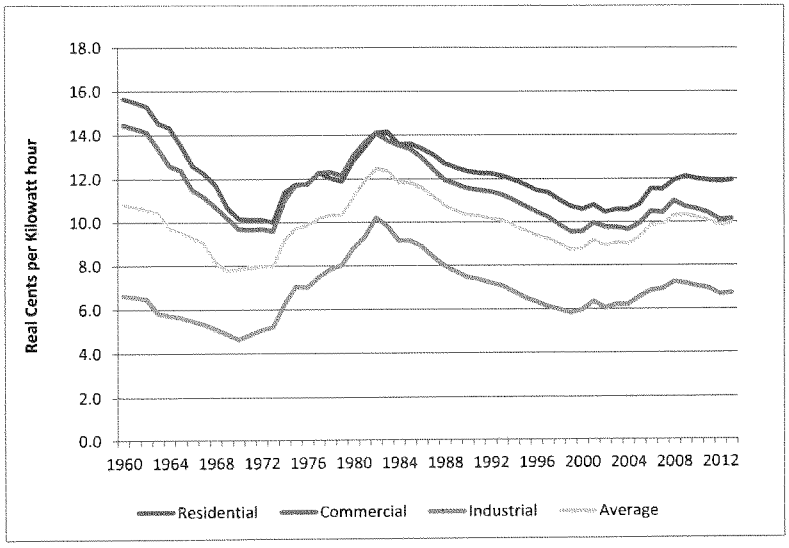


Figure 2: Real Electricity Prices, 1960-2013

Another contributing factor to falling electricity use is slower economic growth. The correlation coefficient between the percentage changes in real gross domestic product and electricity consumption is 0.68, indicating a rather strong relationship so slower economic growth translates to lower electricity demand growth, as shown in Figure 3. Additionally, electricity growth that at one time outpaced economic growth, now lags it.

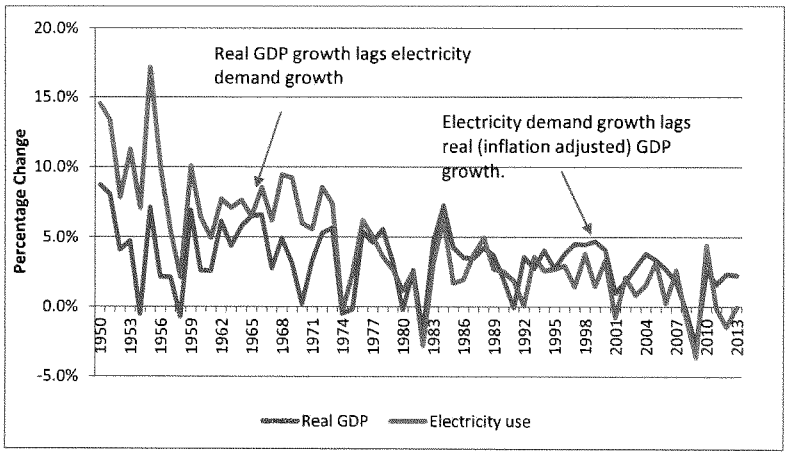


Figure 3: Changes in Economic Growth and Electricity Use, 1950-2013

Another factor contributing to slower electricity demand growth is technological change that results in greater energy efficiency, which was identified above as a factor affecting the industrial use of electricity. One summary measure of these improvements is the electricity intensity of use, defined as the quantity of electricity used to produce a dollar of real gross domestic product. The electricity intensity of use was increasing from 1949 until the early 1970s and has been declining ever since, with an acceleration of the decline since 2008 (see Figure 4).

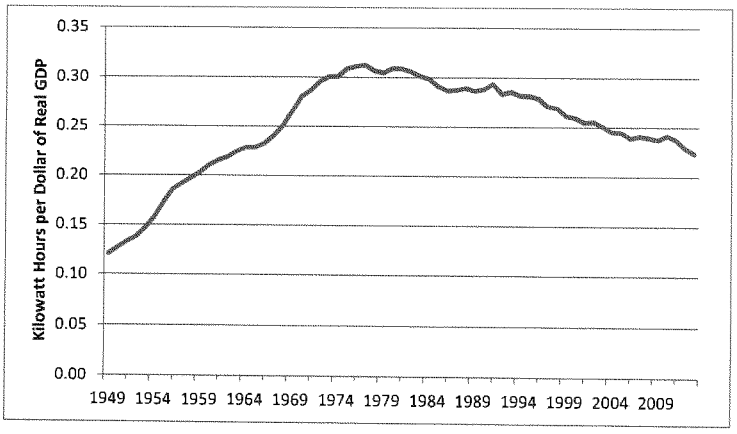


Figure 4: Electricity Intensity of Use, 1960-2013

Overall, the demand for electricity has been declining in recent years primarily due to slower economic growth and improvements in energy efficiency. Even if all other factors affecting coal demand were held constant, such as the price of natural gas and environmental regulations, Wyoming coal shipments would still be lower due to the reduced consumption of electricity.

The Demand for Coal in Electric Power Generation

The electric power sector has gone through transitions during which major changes in the sources of generation have occurred. It appears that another shift may be underway. Trends in the net generation of electricity by source from all sectors, including privately held utilities, public utilities, and independent power producers are displayed in Figure 5. During the 1970s, petroleum was the second largest source of electric power generation in the U.S. only to be eclipsed by nuclear and hydroelectric power from the 1970s into the 1980s. After declining throughout much of the 1970s due to federal law prohibiting the construction of new gas-fired power plants, natural gas use recovered sharply during the early 1990s after this legislation was repealed. Natural gas is now the second leading source of electric power in the United States. Coal has been and remains the largest source of primary energy for electric power generation since 1949.

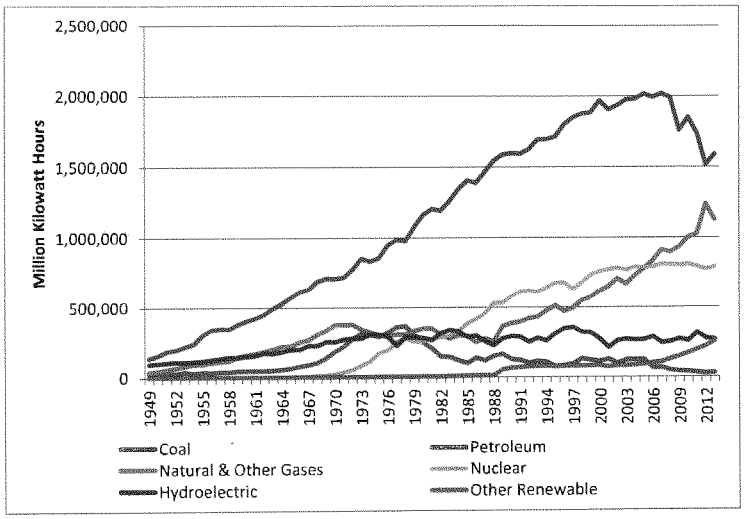


Figure 5: Net Electricity Generation by Source for All Sectors, 1949-2013

Electric power output from coal, however, peaked in 2007 at slightly over 2,000 million megawatt hours (MWh). From 2007 to 2013 though, net electricity generation from coal is down 430 million MWh. Over the same period, net electricity generation from natural gas increased 216 million

MWh, slightly more than half of the decline in coal generation, while wind and solar net generation increased by 148 million megawatt hours (Figure 6).

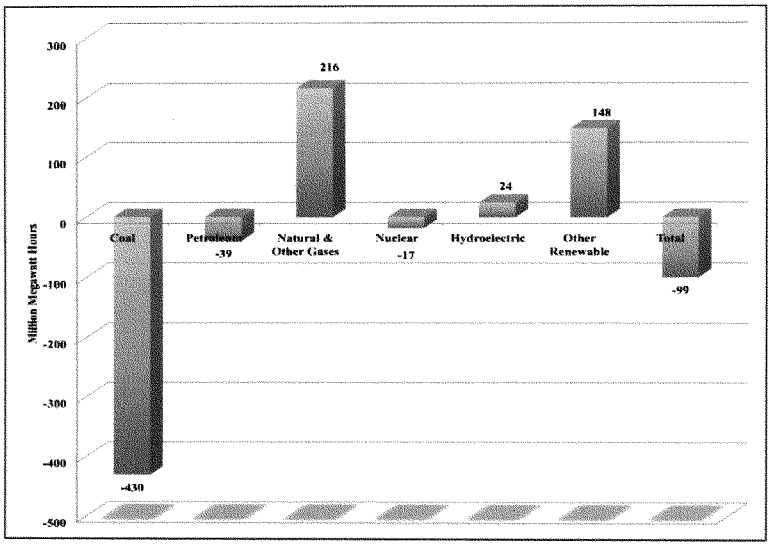


Figure 6: Changes Net Electricity Generation, 2013-2007

Much of this switch from coal to natural gas seems to be associated with falling prices for natural gas relative to coal. In Figure 7, the shares of coal and natural gas in total net generation of electricity are displayed alongside the ratio of natural gas to coal prices from January 2007 through May 2014.

Natural gas prices were more than five times higher than the coal prices on a heat equivalent basis during 2008 but reached near parity with coal prices during the spring of 2012. As a result, the coal and natural gas shares of total net generation almost converged in April 2012 with coal at 33%, down from 50% during late 2007, and natural gas use at 32% from less than 20% early in the sample period. The simple correlation coefficients between the natural gas to coal cost ratio and the coal and natural gas generation shares are 0.79 and -0.67 respectively. Even though natural gas prices spiked during early 2014, they have since declined and, as a result, so has the coal generation share (see Figure 6).

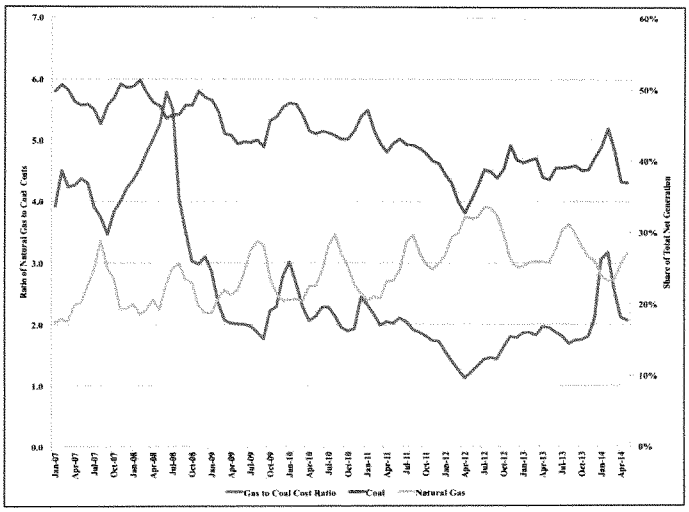


Figure 7: Changes Net Electricity Generation, 2013-2007

Since the nadir of natural gas prices during early 2012, coal has won back market share but remains substantially below levels of 2007-2008. Despite a doubling of relative natural gas costs since April 2012, coal's generation share has rebounded to 39%, but remains substantially below the peak of 48% average market share during 2007 and 2008. This suggests that the coal share of total net electricity generation may not return to previous levels.

Domestic Coal Markets

The above trends in electricity demand and generation have had major impacts on U.S. coal markets, leading to reduced coal consumption and production. Roughly 92% of total U.S. coal consumption is used to produce electricity. Industrial consumption for combined heat and power and other uses constitutes about 5%. Metallurgical coal used to produce coke for steel production constitutes another 2% of total consumption. The remaining fraction occurs in the residential and commercial sector.

From 2008 to 2013, consumption of coal for power generation declined 17.5%; coke coal use fell 2.7%; industrial coal use dropped 20.3%; and residential and commercial coal use dropped 44.4%. Overall, coal consumption in the U.S. fell 82.3 million short tons from 1.13 billion ton in 2008 to 925.1 tons in 2013 (see Figure 8). Domestic coal consumption has not declined for such a sustained period since the 1950s.

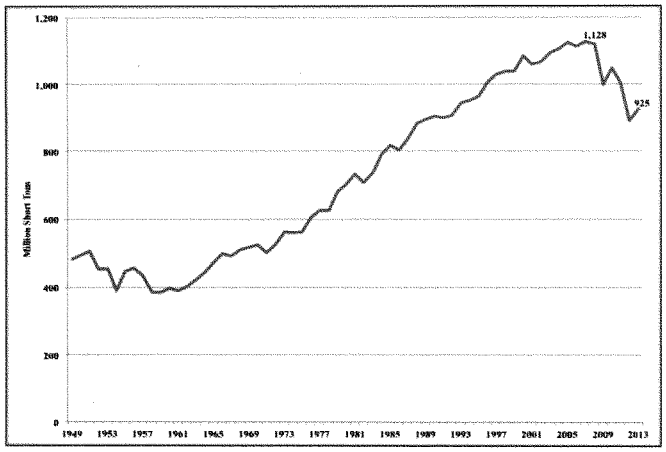


Figure 8: U.S. Coal Consumption, 2013-2007

U.S. coal production has dropped in line with consumption, although the magnitude of production cuts have been tempered by rising net exports of coal, which are discussed below. Coal production peaked at 1.172 billion tons in 2008 and averaged 984 million tons during 2013 (see Figure 9). Even though coal consumption increased 4% during 2013, production declined 3.2% because coal users were drawing down coal inventories. Production appears to have stabilized during 2014 showing no change from the first six months of 2014 compared with the same period in 2013.

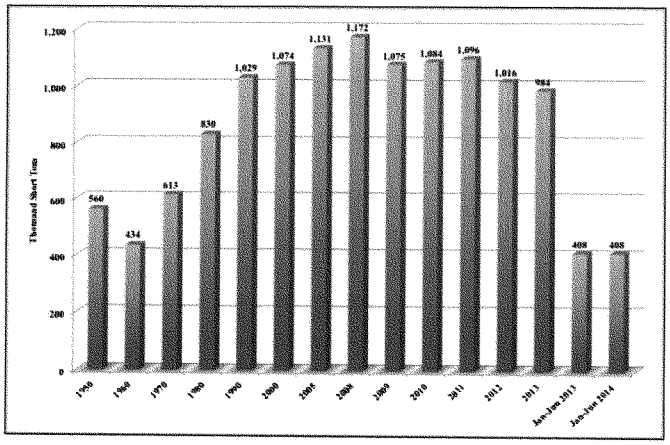
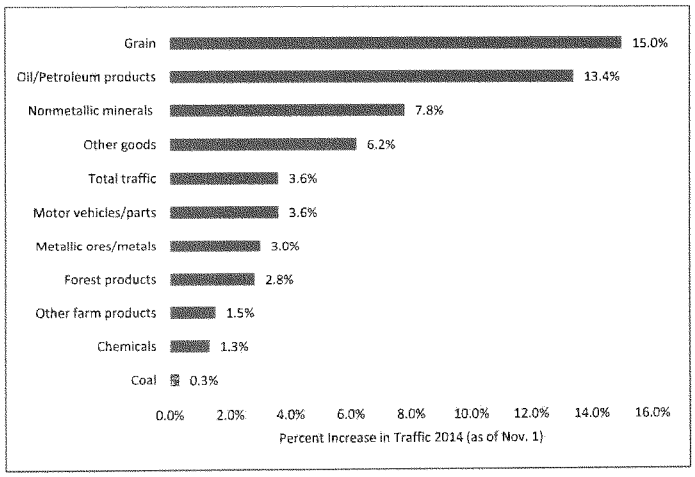


Figure 9: U.S. Coal Production, 1950-2014

Prior to 2011, Wyoming coal production generally fared better than production from the rest of the U.S. During 2011, however, Wyoming coal production declined 0.9% while production in the rest of the U.S. increased 2.4%. Moreover, during 2012 Wyoming coal production sank 8.5% while production outside the state declined 6.4%. The fact that Wyoming coal is declining faster than coal production outside the state suggests the competitive challenge Wyoming coal faces by shipping relatively lower heat content coal and competing with the oil and gas industry for limited railroad capacity.

Over the past two years rail congestion has been a significant problem as coal capacity in the mid-west has competed with oil-traffic from Bakken originating oil in and near North Dakota, seasonal grain traffic, greater goods shipments as the US economic recovery after the recession of 2008-09 has quickened, and weather related delays, especially in the winter of 2013-14. Traffic congestion in 2013-14 was reported as the worst since 2002 (WSJ, Nov 14, 2014), affecting not only coal shipments but also threatening agricultural profits as elevator prices plummeted due to congestion. Figure 11 shows, that in 2014, though traffic volume has increased in other commodities, coal shipments have remained flat. While this is in part due to a flat demand for coal, it is also apparently due to congestion problems on some railways.



Source: Wall Street Journal

Figure 11: US Rail Traffic Increases in 2014

More recently, problems with the ability to ship coal by rail to Midwestern markets have resulted in operating issues at some U.S. utilities. In September 2014, Minnesota Power temporarily shut

down two coal-fired power plants to conserve coal supply at other plants as inventories dwindled. They also reported that shortages of power due to these delivery difficulties had cost the company $24 million since December 2013 (WSJ, November 23, 2014). Other utilities have indicated that low coal inventories could result in operating problems in the coming winter, especially if the weather is especially harsh. Problems have appeared to be greatest on the Burlington Northern Santa Fe Railway (BNSF). Xcel Energy has noted that plants served by that railroad have less than 30 days of coal inventory on hand while those served by the Union Pacific Railroad have adequate supplies. Peabody Energy, the largest operator of coal mines in the Powder River Basin blamed rail capacity for a decline in shipments of 2% in the third quarter of 2014 (WSJ, November 23, 2014). Problems on the railroads with respect to coal shipments have become so difficult, especially on the BNSF, that coal companies, power plant operators, and other shippers requested the Surface Transportation Board impose orders on the railroad to improve service in October 2014.

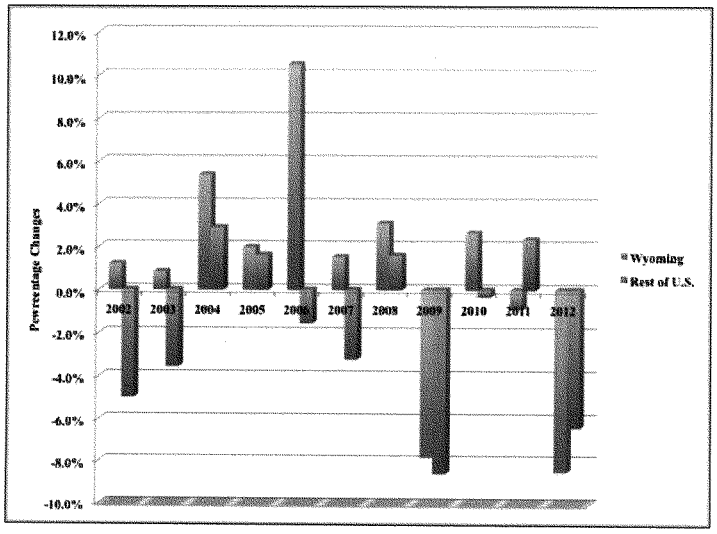


Figure 10: Changes in Wyoming and U.S. Coal Production, 2012-2012

Competitiveness of Wyoming Coal

Despite challenges with respect to the electricity generation industry and more recently transport problems, Wyoming enjoys several comparative advantages in coal production arising from economies of scale in production and transportation. The very thick coal seams of the PRB coalfield that produces virtually all of Wyoming's coal, combined with the application of advanced

mining technology, results in very large scale mines that enjoy significant economies of scale in which unit production costs fall with higher output.

Another important factor is economies of scale in the transportation of coal. Roughly half of the delivered cost of coal to electricity producers is transportation. Historically, deregulation of railroads and investments in rail cars and tracks played a key role in reducing transportation costs for delivering PRB coal. Another important factor contributing to higher coal output in Wyoming involves environmental regulations. The Clean Air Act Amendments of 1990 mandated significant reductions in emissions of SO_2 from energy consuming facilities, such as electric power plants. Considine and Larson (2006) show how electricity providers achieved these emission control standards by substituting low-sulfur PRB coal for higher sulfur fuels, such as eastern coal and residual fuel oil.

The economies of scale in Wyoming coal production result in significantly higher labor productivity compared with other producing regions. Figure 12 plots the labor productivity of coal producers in Wyoming, in the PRB, and outside the region. Labor productivity among PRB producers is on average nine times greater than other U.S. coal producers. PRB mines averaged 40 tons of coal mined per employee per hour while other producers averaged 4.4 tons per hour.

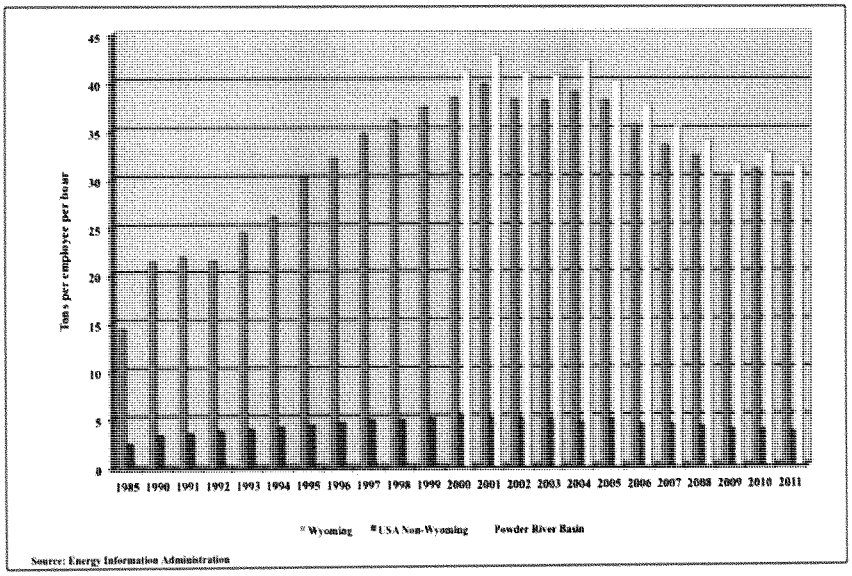
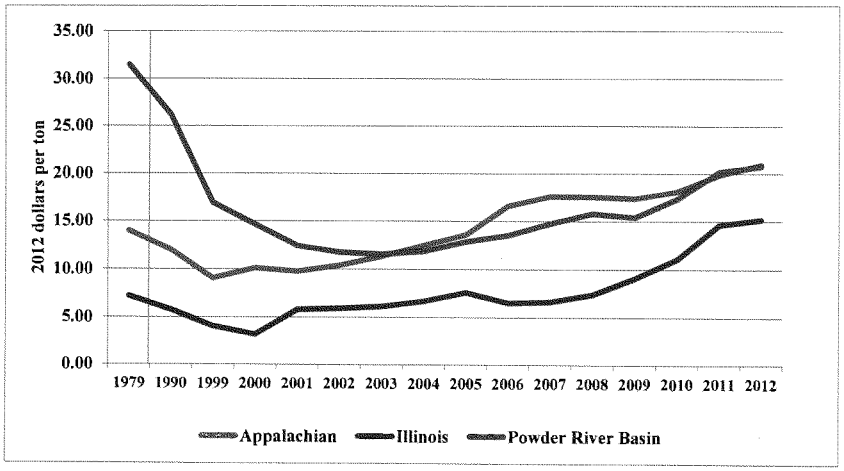


Figure 12: Labor Productivity of Various Coal Producers, 1985-2011

The average annual growth in labor productivity in Wyoming between 1985 and 2007 was 3.9% per annum, while the same measure in other regions was 1.9% per year. Although both productivity

growth rates are impressive, the higher growth rate in Wyoming may reflect differences in labor incentive structures, workplace rules, and technology adoption.

Another key factor contributing to PRB coal competitiveness is an efficient rail transportation network. In 1980, the U.S. Congress passed the Staggers Rail Act that deregulated the railroad industry. Prior to passage, rail rates were linked to tariffs regulated by the Interstate Commerce Commission. After passage, railroads could charge their own tariffs and began to compete for business by setting competitive rates. After the early to mid-1980s, average rates for coal transportation declined steadily. In Figure 13 regional coal transportation rates are reported from 1979 to 2010 for coal shipped from Appalachia, Illinois, and the PRB. Coal transportation rates for PRB coal declined 45% from 1979 to 2010 while rates increased 30% and 54% respectively for coal shipped from Appalachia and Illinois (see Figure 13). Recent increases in PRB freight rates; however, have undermined PRB cost-competitiveness.



Source: Energy Information Administration

Figure 13: Coal Transportation Rail Rates by Region, 1979-2012

Higher productivity and lower transportation costs contributed to a trend of declining real prices for coal in the U.S. from the late 1970s through the first few years of this century, see Considine (2013). Prices for bituminous and sub-bituminous coal are plotted in Figure 14 from 1979 to 2011. Wyoming coal is primarily sub-bituminous coal so prices for this grade reflects trends in PRB coal prices. The first notable feature of this time series plot is the wide differential between prices for bituminous and sub-bituminous coal. These price differentials are consistent with a competitive market in which prices reflect productivity and cost differences between regions. Early in the sample, sub-bituminous coal prices were about 40% of prices for bituminous grades. Towards the end of the period, prices for sub-bituminous grades were only 27% of bituminous prices. This price

discount for PRB coal also reflects to some extent, the lower heat value of this coal. These trends are also consistent with the productivity trends discussed above in which the PRB region became relatively more productive over time.

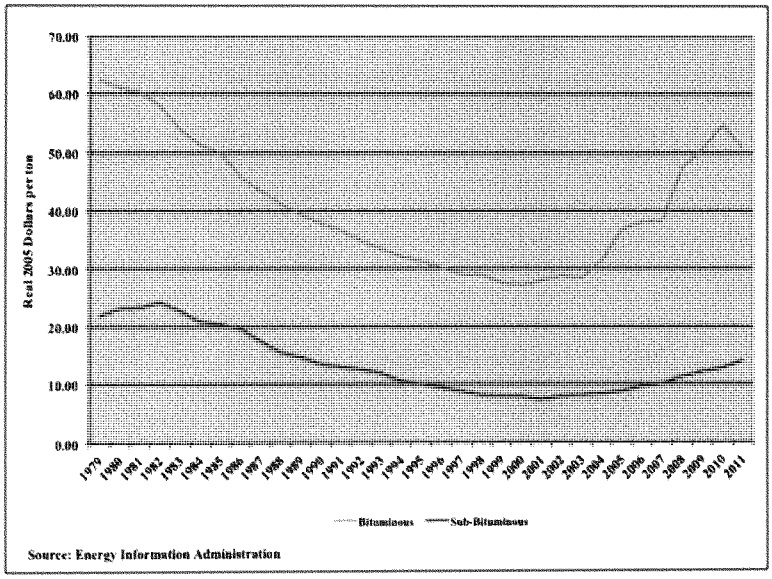


Figure 14: Real Prices for Coal by Grade, 1979-2011

These differences in prices between coal grades affected the relative composition of shipments over time. As Figure 15 illustrates, bituminous coal shipments were substantially higher than sub-bituminous coal shipments until 2001. By 2006, sub-bituminous shipments were just 4 tons less than bituminous coal deliveries and by 2010 they exceeded bituminous shipments. These adjustments in part reflected fuel use decisions by electricity producers in response to delivered cost and environmental regulations.

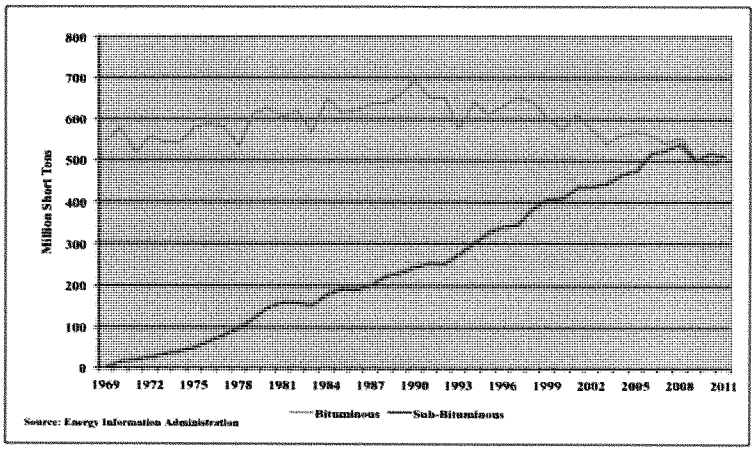


Figure 15: Coal Shipments by Grade, 1969-2011

Sub-bituminous coal from Wyoming has substantially lower sulfur content with about 0.4% sulfur by weight as opposed to 1.5% for bituminous coals. The rising share of PRB coal played an important role in reducing U.S. emissions of SO_2 from 1995 to 2010. From their peak of 13.5 million tons in 1997, SO_2 emissions dropped to 5.4 million tons in 2010 (see Figure 15). Emissions per unit of electricity generated from fossil fuels also declined, which reflects in part switching to PRB coal and natural gas.

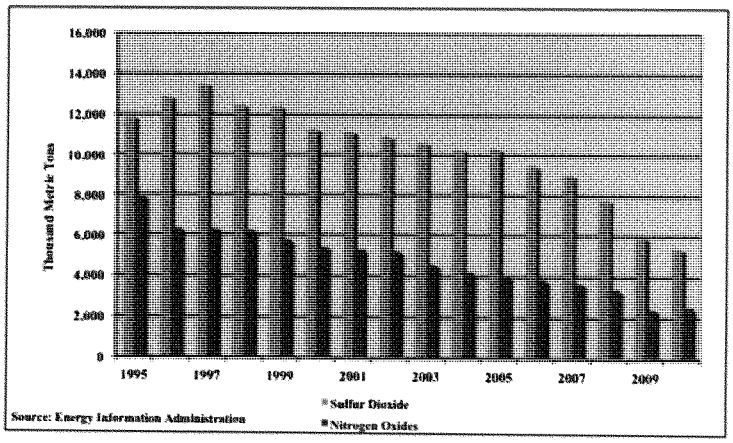


Figure 16: Sulfur Dioxide and Nitrogen Oxide Emissions from Power Plants

As of 2012, the cumulative advantages enjoyed by PRB coal mined in Wyoming have resulted in the fuel being used in 34 states. Figure 17 describes the relative shipments of Wyoming coal by state. Use by state reflects the importance of production and transport costs, with nearby Midwestern states consuming the greatest shares of coal shipments from Wyoming. Overall, the outcomes shown in the figure are possible because the combined cost of production and shipping still allows PRB coal to be a competitive choice for utility operators despite the distance of Wyoming from many markets. This broad utilization also reflects the importance of pollution control costs and the advantages Wyoming coal provides in this regard, as states in the upper Midwest, which are prone to prevailing winds affecting acid rail deposition in the northeast, are also significant users of PRB coal.

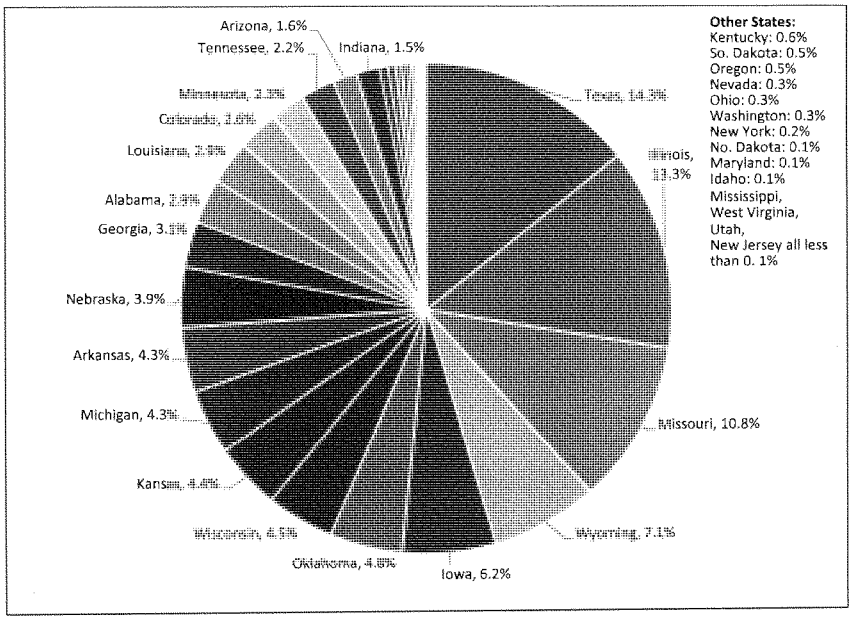


Figure 17: Composition of Wyoming Coal Shipments, 2012

Coal Export Markets

With the prospects of inexpensive and abundant supplies of natural gas and more stringent environmental regulations, several U.S. coal companies are looking abroad for new markets. Globally, coal provided the largest contribution of incremental energy consumption in the world

over the past decade (see Figure 18), supplying the world with more than 1.4 billion tons of additional oil equivalent energy compared with 742 million tons of oil equivalent from natural gas. The third largest contributor was oil with 544 million tons. New hydroelectric supplies were the fourth largest source of growth followed by renewable power sources, such as wind and solar, with 218 million tons of oil equivalent. Nuclear power's contribution actually decreased during from 2003 to 2013 (see Figure 18).

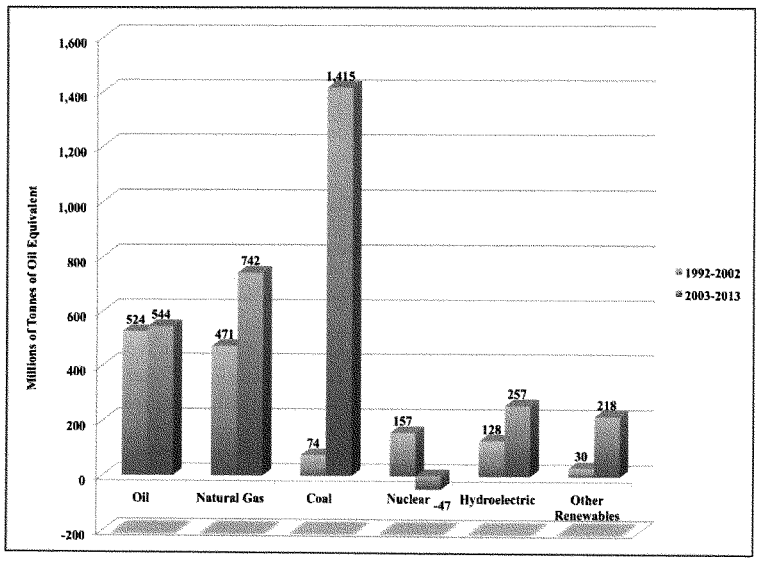


Figure 18: Average Incremental Changes in World Energy Consumption

From 2003 to 2013, total world energy consumption increased 28% or 2,786 million tons of oil equivalent, which equates to nearly 56 million barrels of oil per day. During 2013, the world consumed slightly over 84 million barrels of oil per day, so the growth in total world energy consumption over the past ten years would have required a two-thirds increase in the world oil industry if all of that new energy demand were met by oil, which is clearly not possible.

What filled the gap? Coal. Globally, coal provided 45% of the growth in world energy consumption since 2003 (see Figure 19). With oil and natural gas, fossil fuels supplied 86% of world energy demand growth. Other renewable energy supplied 7% of demand growth over the past decade, while hydroelectric power supplied the remainder. Nuclear power actually declined 2% over the period.

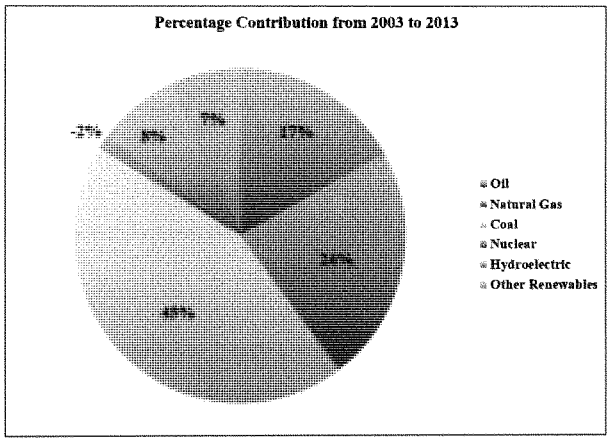


Figure 19: Sources of World Energy Consumption Growth

Growth in coal consumption was in part supplied with an expansion in world coal trade. Total world coal exports rose 69% from 835.1 million tons in 2003 to 1.41 billion tons in 2013. The top ten coal exporters, displayed in Figure 20, accounted for 97.6% of total world coal exports in 2012. Indonesia and Australia are the dominant coal exporters with 422 and 332 million tons respectively, which together account for 58% of world coal exports. The United States is in third place with 116 million tons of exports. Russia, Columbia, and South Africa are also significant exporters. Most of these exports are shipped to Europe and Asia.

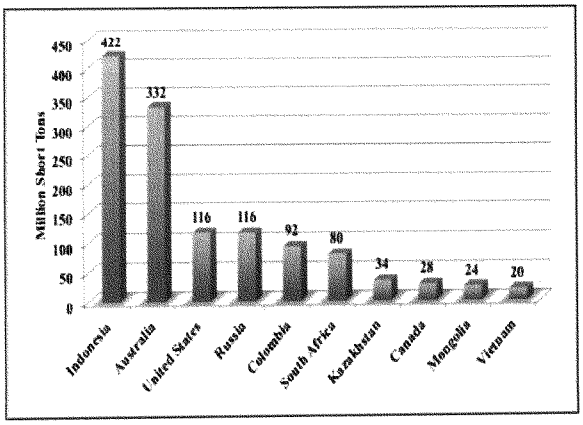


Figure 20: Top Ten Coal Exporting Nations

Most U.S. exports are metallurgical grade coal also known as coking coal used to make coke for iron-making in the steel industry. The U.S. exported 70 million tons of metallurgical grade coal during 2011 and 2012, up considerably from 37 million tons during 2009 (see Figure 21). The world steel industry has consumed over 700 million tons of coking coal in recent years.

Wyoming does not produce metallurgical grade coal. U.S. exports of steam coal used in electric power generation increased from 22 million tons in 2009 to 56 million tons in 2012 but then dropped to 52 million tons during 2013 due to lower export demand and lower coal export prices (see Figure 20). Also included in Figure 19 are exports of petroleum coke, which is produced by petroleum refineries and used primarily as a fuel in electric power and cement production. Prior to 2011 petroleum coke exports from the U.S. often exceeded steam coal exports. Coal exports declined during 2013 in part due to lower coal export prices (see Figure 22).

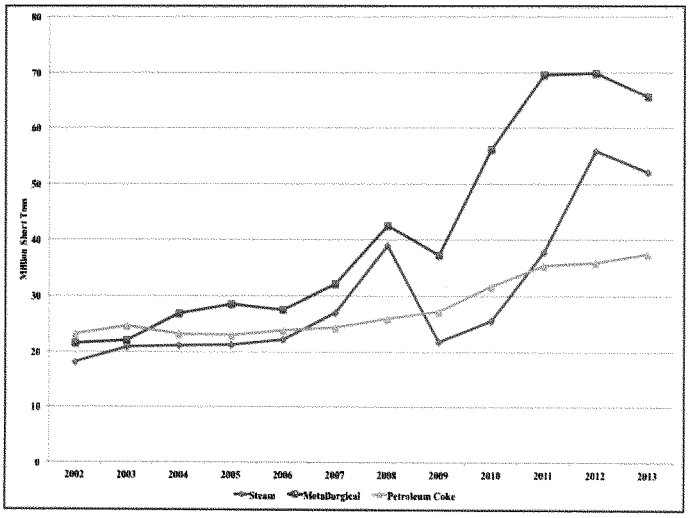


Figure 21: U.S. Coal and Petroleum Coke Exports, 2002-2012

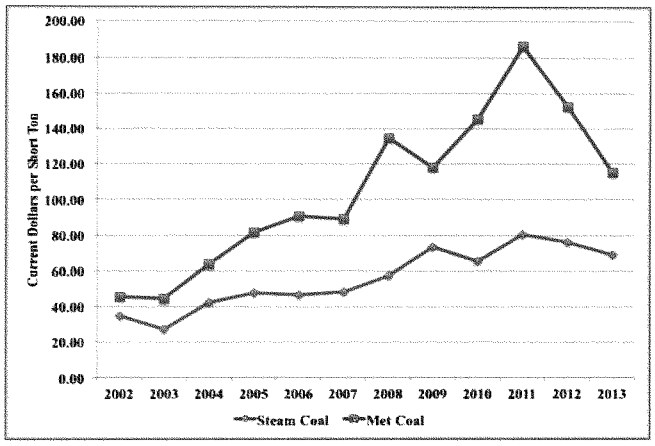


Figure 22: U.S. Coal Export Prices, 2002-2012

Most of the growth in steam coal exports from the U.S. has come from an increase in demand from Europe and to a lesser extent Asia (see Figure 23). U.S. exports of steam coal to Europe were over 32 million tons, comprising 58 percent of total U.S. steam coal exports during 2012 (see Figure 24). The Asia Pacific region bought 12.4 million tons or 18 percent of total U.S. steam coal exports during 2012. Much of this was from the PRB, however, it is estimated that only approximately 3 million tons originated in Wyoming.

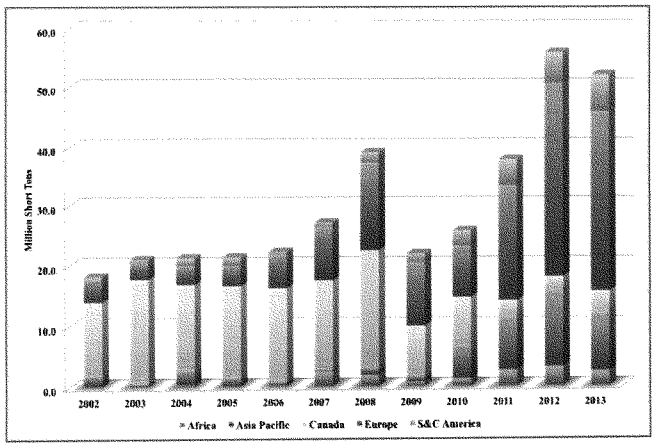


Figure 23: U.S. Coal Exports by region, 2002-2012

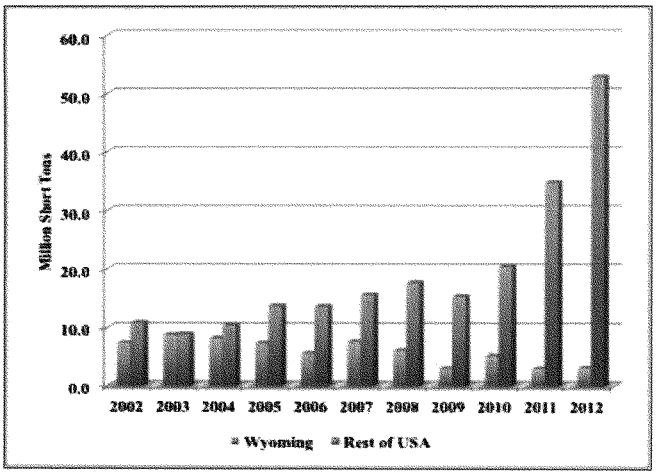


Figure 24: Steam Coal Exports from Wyoming & Rest of USA, 2002-2012

Given the size of the international coal market and the highly competitive costs of PRB coal production, Wyoming has the potential to export significantly greater amounts of PRB coal. Despite this promise, however, Wyoming coal producers have yet to achieve significant access to world markets. Moreover, over the past ten years, exports of coal from Wyoming to international destinations have declined while coal exports from other regions of the United States surged. These divergent trends reflect the absence of metallurgical coal production in Wyoming and the relatively high costs of getting Wyoming coal to ports for shipment overseas. Wyoming lacks clear pathways to ship coal to export markets. In particular, there is a lack of incremental export capacity, and rail access to new locations would require new rail infrastructure should such facilities be built. Typically, the Wyoming coal that is exported is currently shipped to Canada by rail, where it is then shipped via Canadian ports to Asia.

One of the key obstacles in making higher coal exports from Wyoming a reality is environmental opposition to port expansions in the Pacific Northwest. Currently there are two large port facilities proposed to ship approximately 100 million tons of Wyoming coal annually, one located in Longview and the other at Cherry Point in the state of Washington. The Longview site proposed by Millennium Bulk Terminals would eventually have capacity to ship 44 million tons per year by 2018 barring delays. The Gateway Pacific Terminal proposal at Cherry Point would have an annual coal shipping capacity of 48 million tons and could also be open by the end of the decade. Several smaller expansions have also been proposed in Oregon and Canada to allow additional access to Asian markets for Wyoming coal. Even if half of this proposed west-coast capacity were to be built, and with additional export capacity in the Gulf Coast region and in Canada, coal exports could help offset potential declines in domestic coal shipments to Wyoming's traditional markets.

Opposition to the two large proposed west-coast port facilities falls across three broad areas of complaint. The **first** is the local disruption and congestion the coal trains could create, since it is estimated that as many as 20 slow-moving trains over a mile long would be required to serve each site per day. Such rail traffic could drastically affect street traffic in affected communities along rail routes as they caused delays at level crossings. The **second** category of complaint comes from residents along the rail routes that would be used to serve the ports regarding potential coal-dust problems coming from the trains in transit and during the unloading process. The **third** thrust of opposition comes from concerns regarding climate change effects the burning of exported coal could create. Controversially, the State of Washington has required the potential impact of greenhouse gas emissions caused by shipping operations and end-use consumption of exported coal be documented in the state environmental impact studies necessary to support the proposed port expansions. The effect all these concerns will have on the final decision to permit additional port facilities in the northwest is still unknown.[7] The uncertainty of future port expansions and permitting decisions was further emphasized in August 2014 when the State of Oregon declined a permit for an expansion at the Port of Morrow where a 12 million ton per year coal to barge trans-shipment site was proposed to ship Wyoming coal to Asian markets. Developers of the proposal and the State of Wyoming have appealed this decision.

Outlook for Wyoming Coal

As the above discussion suggests, there are a number of market and regulatory forces that have been acting to reduce shipments of coal from Wyoming. The price of natural gas appears to be a very important factor to consider in forming expectations of future Wyoming coal production. Perhaps even more important are environmental regulations.

Potential Regulatory Impacts

There are several regulations under various stages of implementation that, if implemented, will significantly raise the cost of using coal to generate electricity in the United States, see Maunder (2012). These complex and overlapping regulations are summarized in Table 1. For instance, the Cross-State Air Pollution Rule (CSAPR) targets reductions in SO_2 & NO_X and the Utility Maximum Achievable Control Technology standards, while targeting hazardous air pollutants, require reductions in SO_2 even greater than the targets under CSAPR according to Glaser (2012). The regional haze regulations for western states have a similar problem. Regulations on coal ash, cooling water, and other coal combustion residuals have also been proposed.

The EPA's Clean Power Plant CO_2 emissions proposals under sections 111(b) and 111(d), discussed elsewhere in this report, would require significant reductions in CO_2 output through either reduced use of coal or the installation of CO_2 capture technology. New coal-fired power plants would have to meet an output-based standard of 1,100 lbs. CO_2 per megawatt hour of electricity generated under the 111(b) proposed rules. Utilizing current operating technology, the

[7] The uncertainty of port expansion and permitting decisions was underlined in August 2014 when the State of Oregon declined a permit for an expansion at the Port of Morrow where a 12 million ton per year coal to barge transshipment site proposed, allowing Wyoming coal access to Asian markets. Developers of the proposal and the State of Wyoming have appealed this decision.

most advanced coal plants emit roughly 70-80% more than this standard while older plants exceed 100% of this level. If new-plant rules are implemented, this standard alone would prohibit the construction of new coal-fired coal generation capacity in the United States without carbon capture utilization and storage (CCUS) technology, and at current costs this would make the construction of such plants extremely cost-prohibitive. The 111(d) portion of the plan would also require emissions from existing plants to be sharply curtailed, as they call for nationwide existing plant emissions to be cut by 30 percent from 2005 levels. State limits, however, would depend on how states choose to implement the proposed 111(d) rules. Overall, these proposed rules could result in a significant reduction in the use of coal in generation across the country by the early 2020s.

Table 1: Proposed and Pending Environmental Regulations Affecting Coal Use

Regulation	Pollutant	Status
Cross-State Air Pollution Rule (CSAPR) for Eastern USA	SO_2 & NO_X	Rules adopted. Overturned on appeal. Petitions for rehearing pending.
Regional Haze for Western USA	SO_2 & NO_X	Rules adopted, but on hold pending final judicial action and litigation.
Ambient air quality standards	SO_2 & NO_X	Affirmed on appeal. PM2.5 proposed, not yet final. Ozone not yet proposed.
Utility Maximum Achievable Control Technology (UMACT) also referred to as MATS	Hazardous air pollutants	Rules adopted. Rules come into effect in 2015-2016.
Solid Waste	Coal Ash	Rules proposed December 2014.
316(b) cooling water intake structures	Thermal Emissions	Rules proposed
GHG endangerment finding	CO_2	Rules adopted. Affirmed on appeal. Petitions for rehearing pending.
111(b) and 111(d): GHG new source performance standards (NSPS) for power plants and existing/modified source limits	CO_2	Rule proposed but not yet final for new, modified and existing (not modified) power plants.

Pending regulations on blasting at coalmines and emissions during coal mining could also significantly raise costs of coal production as noted by Witham (2012). Such a change in production costs, especially combined with other regulatory changes could seriously undermine the cost-competitiveness of Wyoming PRB coal and therefore its demand. Table 1 summarizes the some of the proposed regulations that could affect coal-fired generation in the future. Furthermore, already adopted MATS (also referred to as UMACT) standards to reduce mercury and other hazardous pollutant output from plants requires the installation of additional scrubbing facilities often used for SO_2 and NOx, eliminating the advantages of using Wyoming PRB coal. The rule is already anticipated to cause a significant retirement in coal-fired power plants, which may or may not reduce depending on the analysis considered.[8]

The broad reach of these regulations is creating a great deal of uncertainty and a reluctance by electric power producers to operate coal power plants, much less invest in new ones. For example, the compliance deadline created under MATS could result in investments being made to comply before CO_2 proposals can be finalized, potentially creating stranded assets when new and existing source performance standards for greenhouse gas emissions are defined.[9] Avoiding the possibility of investment in plants that later have to be shut down due to other rules appears to have resulted in announced plus expected coal-fired power plant retirements increasing in excess of the levels estimated when MATS was originally being proposed. Projected reductions in coal-fired capacity due to MATS and proposed EPA CO_2 rules range from 50 to 75 gigawatts (GW), with some estimates as high as 100 GW.[10]

In a shifting policy environment, forecasting future coal production is very difficult. Nonetheless, several organizations have produced forecasts of U.S. coal production that are summarized in Figure 25. The U.S. Energy Information Administration forecasts are widely followed. The EIA 2014 reference case forecast shows essentially stable production out to the year 2040. This reference case, however, assumes current laws and regulations remain in effect over the forecast horizon.

While three of the other forecasts project reductions in future U.S. coal production, INFORUM forecasts production rising from 1.016 billion tons in 2012 to over 1.2 billion tons by 2025 and eventually past 1.4 million tons by 2040. In contrast, the three other forecasts foresee falling coal production and in two cases very substantial reductions. IHSGI assumes a cap-and-trade program

[8] MATS standards are largely expected to affect the oldest plants in the country, many that have previously been exempt from many air quality rules due to their age. These plants often do not use PRB coal thus some analysts have suggested these rules could create a surge in demand for PRB coal due to the higher capacity utilization of PRB-coal burning plants these retirements will induce.

[9] Major plant modification to improve plant heat-rates for example, could result in new source reviews of existing plants.

[10] Estimates of retirements caused by future and pending regulation are numerous. The Government Accountability Office (GAO) estimated in 2012 that a combination of new regulations and market forces could reduce coal-fired generation capacity from 2 to 12%. In September 2014 these estimates were updated to 13% by 2025. These new estimates include the effect of the proposed CO_2 regulations announced in 2014, which were not defined in 2012. Others have estimated potentially larger impacts, including the EPA (for example, see SSEB (2014) who report EPA simulations suggest 88 GW of retired capacity due to MATS and CO_2 regulations).

for the electricity sector beginning in 2021 and a CO_2 allowance price that increases to $20 per ton. The forecasts produced by EVA and ICF include a carbon pollution standard for new plants.

All forecasts were created prior to the new EPA CO_2 regulations being announced in 2014, but as noted they do consider plans that would result in similar greenhouse gas outcomes necessary to meet previously announced goals. All three forecasting firms assume the implementation of new regulations for cooling water and coal combustion residuals, unlike the EIA Reference Case (which can only consider regulations already finalized and being implemented). The most pessimistic forecast is clearly IHSGI with production falling to 970, 837, and 703 million short tons in 2025, 2035, and 2040 respectively. These forecasts demonstrate that projections of coal production are heavily influenced by assumptions of future environmental regulations.

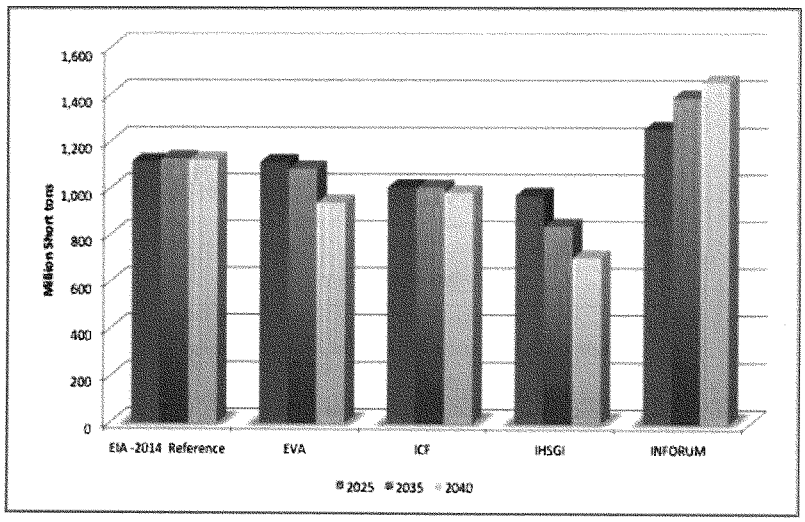


Figure 25: Forecasts of U.S. Coal Production

Coal Exports

A comparison of coal export projections is provided in Figure 25. In its Reference case scenario, EIA projects U.S. net exports of coal to rise from 118 million short tons in 2012 to 135, 158, and 160 million short tons respectively in 2025, 2035, and 2040. IHSGI and INFORUM envision very similar export growth. On the other hand, ICF projects U.S. net exports of coal to double over the 16 years (see Figure 26).

In light of growing world demand for electricity and relatively higher costs for electric power generation from other sources compared to coal, an expansion of U.S. coal exports seems reasonable and is indeed the consensus among forecasters. For Wyoming, however, the challenge

is to gain access to ports and, most importantly in a cost effective manner to keep shipping costs relatively low to offset the competitive disadvantage of the relatively lower heat content of its coal. In fact, while the projections cited suggest an increase in total coal exports, they do not anticipate large increases in Wyoming or PRB exports. For example, the EIA projection only anticipates Wyoming exports to increase from the approximately 3 million tons in 2012 to just over 34 million tons by 2040 (AEO2014).

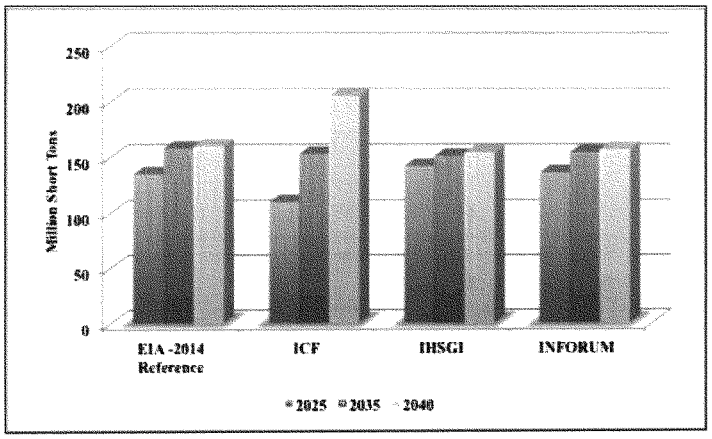
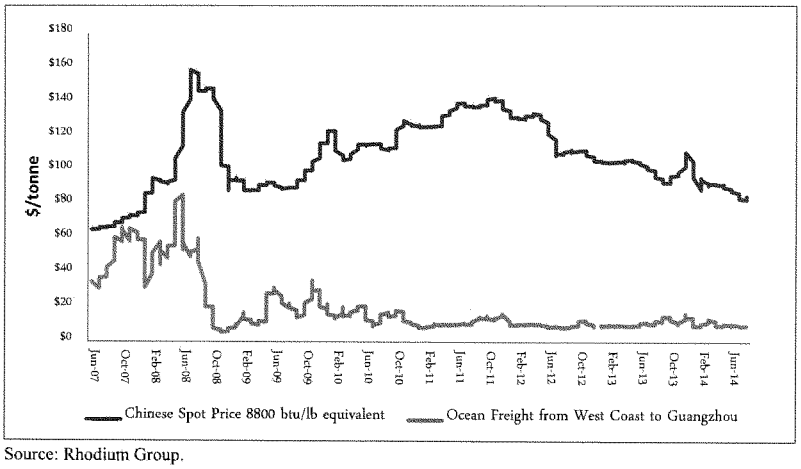


Figure 26: Forecasts of U.S. Net Exports of Coal

Forecasts of potential coal exports from the United States also vary considerably from other forecasters. Wood Mackenzie (2014) projections suggest that Asian steam coal demand from the United States could increase from the current level of approximately 12 million tons annually to over 100 million by the mid-2020s. The primary source of demand is assumed to be China, with Indian demand also a primary driver. Chinese demand may not, however, materialize for various reasons. The Wood Mackenzie projection suggests that there is enough demand to be met with supply from proposed west-coast port facilities. In contrast, ETA (2014) projects Chinese demand for coal to peak as early as 2016 and certainly by the middle of the decade (Wood Mackenzie projects no peak), and while Indian demand continues to grow through the 2030s it does not increase enough to offset this demand decrease in China. Elsewhere in Asia, ETA projects an increase in Korean demand for steam coal is largely offset by a decline in Japanese demand and overall they see US exports to Asia growing to only 35 million tons, largely from the PRB by 2035. Sanzillo (2014) suggests that such an increase in exports could be handled by existing ports in the Pacific Northwest, implying the conditions to build additional facilities are weak.

Fundamentally, the differences in projections regarding worldwide coal demand potential hinge on two assumptions: whether current weak prices are a short-term symptom of over-supply or are instead structural and permanent, and related to this, whether global efforts to combat climate

change will result in reduced coal use. The attractiveness of coal exports may have peaked in summer 2011 when Chinese spot prices for coal approached $135/tonne (see Figure 27). Given shipping prices this led to a significant potential margin for shipments that could be made to China (see Figure 28). Since this time, however, prices have declined and by the end of 2014 approached a level half that seen two years ago. This has resulted in a significantly lower margin for coal exported from the PRB as defined by the computed "net-back" price. This decline in price reflects a significant over-supply in the market compared to two years ago, in part due to a significant reduction in Chinese coal demand, and a lack of growth elsewhere. As shown, at current prices the potential margin between export revenues and domestic revenues is significantly lower return than at the market peak, and as of summer 2014 was below $10/short ton.[11]



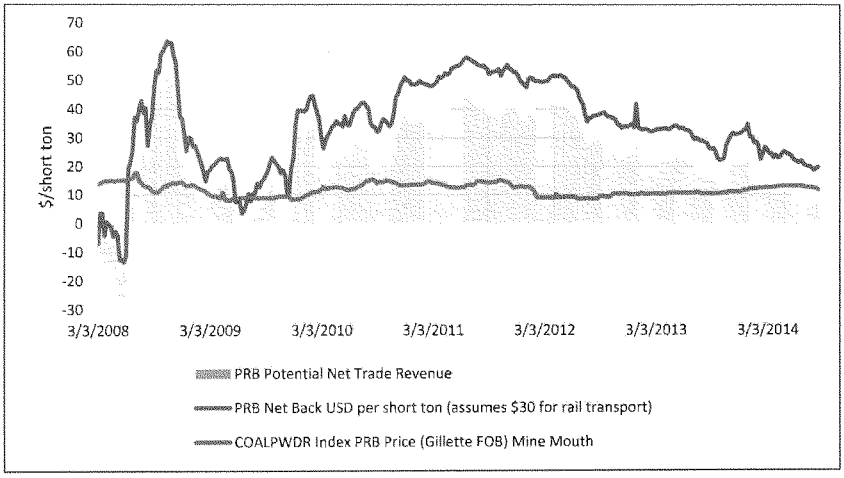
Source: Rhodium Group.

Figure 27: Chinese Spot Price and Shipping Costs

Whether current prices for landed coal in China and in the southern Pacific remain weak will depend on several conditions. Chinese demand for imported coal has fallen as domestic electricity production on the coast has been curtailed due to local pollution concerns. Further, an economic slowdown in China has also reduced the demand for electricity. Market analysts are also split on whether electricity demand will continue to grow at reduced rates as the economy in China continues to develop. Economic development could lead to a much less energy intensive economy and a more service-oriented, consumer driven economy, which would temper future electricity growth rates (Houser, 2014). Coupled with policies meant to reduce air pollution along the eastern coast, including new imported coal taxes recently introduced, these changes could result in permanently lower Chinese demand for imported coal. Given that China is much closer to

[11] This value requires many assumptions and some industry sources suggest Wyoming net-back was negative in summer 2014.

Indonesia and Australia, the two primary coal exporters in the region, both of whom will be able to exploit lower transport costs and recent free trade agreements with China, the result could be export conditions much closer to low projections predicted by some forecasters. This would be particularly true if the price competitiveness of US coal exports erodes and/or the lucrative margins that attracted potential coal exports disappears. Changes in how federal mineral royalties are assessed on exported coal shipments could also undermine their potential returns.[12]



Source: Rhodium Group

Figure 28: Chinese Export Net-Back Computation for PRB Exports

The market for potential exports to Asia is also challenged by potential climate change actions. China recently concluded an agreement with the United States in November 2014 to reach peak emissions in CO2 before 2030. Achieving this goal will likely require coal-use peaking no later than the mid-2020s, and Chinese officials have suggested a willingness for the country to meet their new CO2 obligations before 2030.[13] Similar climate change actions have been announced elsewhere. In Europe, leaders in the EU agreed to a more stringent policy reducing CO_2 emissions by 40% from 1990 levels by 2030 across the union. In Korea, a carbon trading system is scheduled to begin in 2015, and new taxes have been imposed on imported coal. While no new

[12] The Department of Interior announced new proposed rules regarding how federal mineral royalties are assessed on coal mined on federal lands in December 2014. Companies had been able to sell coal to domestic partners, with assessment of mineral royalties based on the domestic sale price. Affiliated trade partners would then sell the coal at much higher international prices, avoiding any royalty that might be payable on the higher revenue. The intent of the new rules is to close this loophole, which would increase the tax rate paid on exported coal in proportion to the price it is sold for. See http://www.doi.gov/news/pressreleases/interior-department-announces-initial-steps-to-strengthen-federal-energy-valuation-rules-expand-guidance-on-federal-coal-program.cfm.

[13] Chinese officials have recently suggested they may attempt to curb coal use, with coal use peaking as early as 2019.

announcements have been made at the time of this writing, it is possible that Japan may also follow the world lead in actively reducing CO_2 emissions in an effort to curb potential climate change. Overall, the International Energy Agency recently indicated this is the largest source of uncertainty in projections regarding the future use of coal as such climate policies could radically change the market fundamentals with respect to coal use in the world.[14]

Finally the development of large-scale new port facilities in the United States may be affected by the weak financial condition of its primary backers – large coal companies. For example, Arch Coal, backing 38% of the proposed Millennium Bulk Terminal port expansion has experienced a sharp decline in its capital value, with market capitalization of less than $500 million while carrying $5.1 billion in long-term debt (Sanzillo, 2014). In late November 2014, Ambre Energy, the majority backer of the Millennium Bulk Terminal project, announced in a regulatory filing that it was divesting of its North American coal export assets, selling them to a Denver-based private-equity firm.[15] Further, Peabody Energy, owner of half of the proposed Gateway Pacific Terminal capacity is in weak financial condition, and Cloud Peak, with an interest in capacity at both terminals has recently admitted recent losses on coal exports, while divesting of export mine interests.[16] Weakness in US coal markets has left US firms in diminished financial positions, and their ability to finance large-scale investments that such facilities would require is uncertain, as is the general market willingness to back such projects.[17]

Other Market Factors

Recognizing the limitations of the assumptions required for the Reference case scenario, the U.S. Energy Information Administration runs 29 alternative model simulations under a range of different assumptions for oil and gas resource availability, coal production and electric power production costs, environmental regulations, world oil prices, and several other factors not of direct relevance to coal.

A summary of these forecasts is presented in Figure 29 for Wyoming coal production in 2040. The distribution of these forecasts is skewed, with a large number of forecasts projecting production at what are essentially current levels of 400 million tons per year. Many of these scenarios entail only minor variations from the reference case assumptions. The high end scenarios with production

[14] See IEA Coal Medium Term Market Report, 2014 press release December 15, 2014 http://www.iea.org/newsroomandevents/pressreleases/2014/december/global-coal-demand-to-reach-9-billion-tonnes-per-year-by-2019.html.

[15] See http://www.oregonlive.com/environment/index.ssf/2014/11/ambre_energy_selling_oregon_wa.html and its filing at http://media.oregonlive.com/environment_impact/other/Ambre%20filing.pdf.

[16] Cloud Peak and Ambre Energy announced the sale of Cloud Peak's interest in their Decker Montana mine in September 2014. Ambre afterward has apparently divested these interests as previously noted. http://investor.cloudpeakenergy.com/press-release/business-development/cloud-peak-energy-and-ambre-energy-announce-signing-deal-ambre-en. With respect to losses on recent coal exports, see Gillette News Record, December 14, 2014, http://www.gillettenewsrecord.com/news/local/article_6c83df44-3a6b-5bdd-8274-a1dacd800d02.html. For additional comment, see Sanzillo 2014.

[17] See Sanzillo (2014b) for a critical investor newsletter regarding the financial condition of major Powder River Basin operators.

around 450 million short tons occur under assumptions that natural gas reserves are smaller and prices are higher, coal production and emissions costs are low, and oil prices are low.

In light of the proposed greenhouse gas emission regulations recently proposed by EPA and discussed separately in other sections of this report, the scenarios that result in very low Wyoming coal production deserve consideration. For example, under the GHG10 scenario carbon emission fees are imposed at $10 in 2020 rising at 5% in real terms per year. As a result, Wyoming coal production falls to 252 million tons per year in 2040. If the price of carbon emissions was $25 in 2020 increasing at the same 5% real rate, production drops to 44 million tons in 2040. This clearly is the worst case scenario for Wyoming coal producers. Accelerated coal plant retirements due to higher fuel and operating costs than anticipated could also reduce production to 200 million tons in 2040.

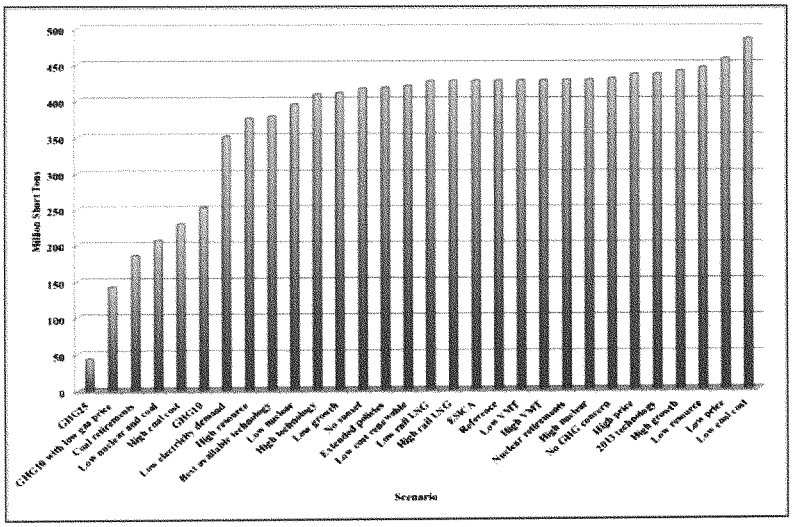


Figure 29: Possible Scenarios for Wyoming Coal Production in 2040

Under high natural gas resource availability and low natural gas prices, Wyoming coal production slips to 376 million short tons in 2040. With low gas prices and a $10 carbon fee, production could drop to 142 million short tons. These last two scenarios suggest that natural gas prices alone are not the main driver to lower Wyoming coal production. If low natural gas prices occur with a carbon permit fee (or regulatory standards that achieve the same emission reductions) a very sharp reduction in Wyoming coal production is possible. Similarly, higher coal costs than under the reference case, or higher coal-fired plant retirements than assumed could also result in dramatic reductions in coal output.

Alternatively, as shown in Figure 29, favorable policy outcomes and a combination of factors that improve coal competitiveness are forecast to have similar effects on coal output to the reference case, suggesting that the output in the PRB may not be greatly sensitive to positive conditions and that output in the 425 million ton range annually may be likely across a wide variety of scenarios.

Estimating the Potential Economic Impact to Wyoming of Expanded Coal Exports

From the impact analysis in the previous chapter describing the economic impact of coal production on the Wyoming economy, the same impact model allows an estimate of the potential impact for an expansion of export sales from the PRB. These estimates assume industry relationships present in 2012 are maintained when export expansion occurs. Three levels of Wyoming exports are considered: (i) an additional 100 million tons per year, which is approximately the increase in port capacity that would be available to PRB producers if both currently proposed west-coast coal terminals are built (Millennium Bulk Terminal and Gateway Terminal in Washington State), (ii) a 50 million ton scenario equal to the approximate capacity that would be added if one of the two proposed terminals were opened, and (iii) 25 million tons per year, the approximate increase in exports possible if only the first stage proposed in either terminal project is built, or if incremental export expansion occurs at other existing ports.[18] Impacts are computed across both the mining and rail-hauling industries in the state.

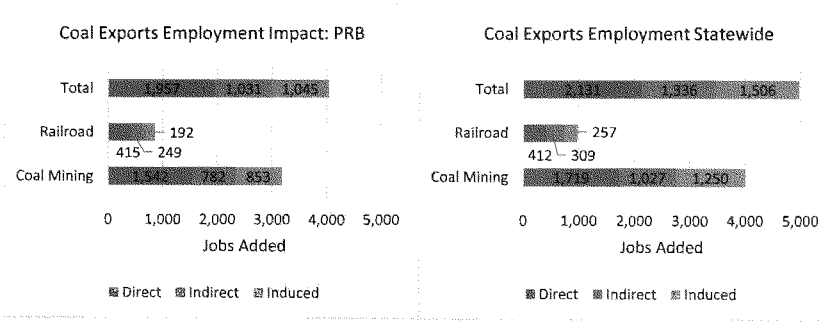


Figure 30: Estimated Coal Exports Employment Impacts (100 Million tpa)

For an increase of 100 million tons exported annually (tpa) from the PRB, representing an increase of just more than 25% over 2012 PRB production levels, the impact on the PRB regional and overall statewide economy would be substantial. These impacts are shown in Figure 30. With respect to employment, such an increase would result in 1,957 new mining and railway jobs in the PRB alone, while an additional 174 jobs in these two sectors would be created elsewhere in the

[18] We ignore the fact that of the 12 million tons of PRB exports in 2012, the majority came from Montana (approx. 9 million). The impacts shown assume an expansion of exports from Wyoming thus the actual increase in total exports from the PRB assumed here would likely be larger if Montana also increased export production.

state.[19] This new direct economic activity due to additional exports would also cause an increase in upstream activity or indirect activity with respect to suppliers and service industries, creating 1,031 jobs in the PRB and an additional 305 elsewhere in Wyoming. The induced jobs caused by the additional household expenditures these new indirect and direct jobs would create total 1,045 in the PRB, and a further 461 elsewhere in Wyoming. Overall, for 100 million tons of additional exports annually, an estimated 4,033 new jobs would be added to the PRB region, increasing the total number of jobs there by 4.8%. In total, the added exports of coal would create 4,974 new jobs in Wyoming annually, increasing employment by 1.3%.

Considering exports of 50 million tons per year or 25 tons per year results in half or a quarter of this growth (no economies or diseconomies of scale are assumed with respect to additional production and shipping). The impacts overall with respect to statewide employment for the three levels of exports considered are shown in Figure 31.

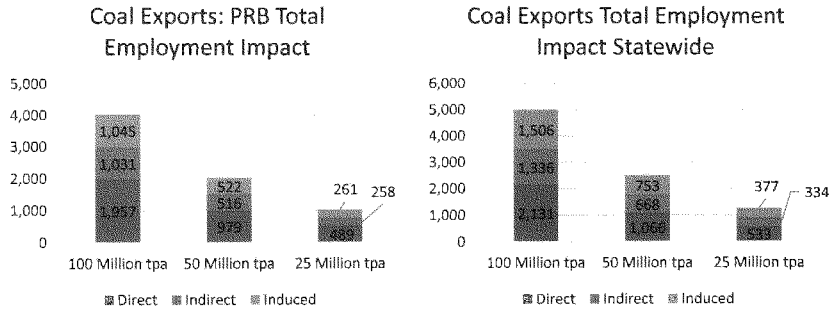


Figure 31: Estimated Employment Impacts for each Export Scenario Considered

Because coal mining and railroad employment are better paying than average positions in the state, 100 million tons of new exports would increase total labor income in the PRB by 8.0% relative to current levels, (4% or 2% for each of the two lower export scenarios considered). Statewide, a 2% increase in total labor incomes earned would be estimated to occur for an additional 100 million tons in coal exports, adding almost $407 million to labor earnings in the state.

The impact of such increases on the value of gross state product would also be significant. An annual 100 million ton increase in coal exports originating from the PRB would be estimated to increase total output generated in the region by $1.2 billion annually, with direct activity alone accounting for $1.0 billion of this total, and indirect and induced activity accounting for the remainder as described in Figure 32. Statewide, the addition to gross state product created by an additional 100 million tons of coal exports is estimated to be over $1.3 billion when including

[19] Note in Figure 30 that the PRB estimate of new railroad jobs is 415, while statewide it is 412. This discrepancy is due to slight differences in the model used for the PRB and statewide estimates. The results indicate however, that virtually all new railroad jobs created would occur within the PRB region.

direct, indirect and induced activity created, increasing GSP by over 2.9%. As indicated by the figure, most the new export activity would occur in the PRB regional economy. Export levels of 25 or 50 million tons per year reduce these estimates proportionately. The 50 million ton scenario results in an increase in gross state product of almost 1.5%, and a 25 million increase results in an increase of just under three quarters of one percent in gross state product. Greater detail with respect to the data estimates for increases in coal exports from Wyoming is found in the Appendix.

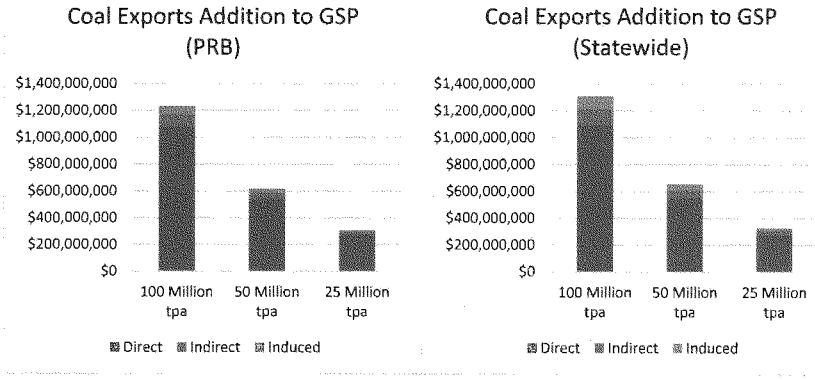


Figure 32: Estimated Employment Impacts for each Export Scenario Considered

Estimated benefits to the state if Wyoming were to expand coal exports by 100 million tons annually:		
	PRB Region:	***Statewide:***
Increase in Gross State Product:	*$1.2 billion annually.*	*$1.3 billion annually.*
Increase in State Jobs:	*Over 4,000 new jobs.*	*Almost 5,000 new jobs.*
Increase in State Labor Income:	*Over $345 million annually.*	*Over $406 million annually.*

3. THE POTENTIAL IMPACT OF MARKET RISKS TO THE WYOMING COAL ECONOMY

CHAPTER SUMMARY

This chapter identifies the factors that are likely to be most important in the future in affecting Wyoming coal production, and by extension the wider Wyoming economy. These are identified as:

- "Fundamental" market effects driving the domestic thermal coal market, specifically factors affecting demand and production costs. The three most important in the future are likely to be:
  - national economic growth (causing changes to electricity load growth);
  - natural gas prices; and
  - coal-mining production costs.
- Regulatory changes, particularly with respect to new national and international carbon-control policies.

The potential impact of fundamental market effects are considered in this chapter. Estimated regulatory impacts are the subject of Chapter 4. Using the publicly available EIA projections as a forecast for Wyoming coal output, the impact model used previously in Chapters 1 and 2 was used to estimate the potential effect on the State economy for each of the fundamental market changes identified. With respect to coal production and the Wyoming economy, the greatest risk is posed by rising production costs in the mining sector, especially if they were to rise faster than they have historically. For the assumptions used in the coal production forecasts (declining labor productivity rate of 4% per year, and higher wage, mine equipment and supply, and transport costs), increases in coal costs could decrease state coal production by about 20% from 2012 levels by 2030, at a cost of over 4,000 jobs. Slower than historically observed economic growth and lower natural gas prices were found to reduce but not eliminate future growth in Wyoming coal output relative to 2012 levels through the same time period.

A state revenue model was used to estimate how coal production changes would affect Wyoming tax revenues. These results indicate that, due to the properties of Wyoming coal demand, though rising coal costs have the worst impact on the Wyoming economy for the market changes considered, they result in the highest state revenue (because they result in higher taxable production revenues). Economic growth changes and fluctuations in natural gas prices do not have the same effect on revenues, and these unfavorable changes in coal markets also lead to unfavorable state revenue changes. Findings here suggest that if unfavorable market conditions were to occur that undermined the State's coal industry, changes in state tax policy could do little to offset these effects, at least for the market assumptions considered.

Introduction

The findings of the previous chapter can be summarized as follows: three influences could affect Wyoming coal production and by extension, the Wyoming coal economy in the future:

- "Fundamental" market effects driving the domestic thermal coal market, specifically factors affecting demand and production costs. The three most important in the future are likely to be:
  - national economic growth (causing changes to electricity load growth);
  - natural gas prices; and
  - coal-mining production costs.
- Regulatory changes affecting Wyoming's energy markets, especially the implementation of carbon regulations like the EPA's proposed Clean Power Plan (Section 111(d)) for new and existing electricity-generating power plants.
- Disruptive changes, which are often difficult to predict. Two types could have significant impact on Wyoming:
  - Changes in export market conditions: These include changes in foreign demand conditions, or significant changes in the export infrastructure serving the state, which are described in Chapter 2. Both types of changes could affect the ability of Wyoming to export its coal internationally and could have significant impact on Wyoming.
  - Technological changes: such changes could occur with respect to:
    i. Other fuel sources in the economy, for example unanticipated improvements in renewable generation costs and storage; further changes in natural gas production costs beyond those experienced in recent years; or improvements in the production costs of competing coals nationally.
    ii. Improvements in emission technologies, in particular carbon capture methods and operations costs, which could be spurred by new regulations.

We focus on fundamental changes in this chapter. Specifically, it describes the estimated potential impact that changes in load growth due to weak national economic growth as experienced over the past several years could have on Wyoming coal production. Continued low natural gas prices, which have undermined coal's competitiveness in generation, and the potential for Wyoming coal production cost changes to affect Wyoming markets are also considered. The relative effects in terms of the impact each risk might pose on the state are also evaluated, as are the potential opportunities that positive changes in these factors could have on Wyoming. Impacts are evaluated with respect to their estimated effects on the state economy and the two coal-producing regions of the state. The estimated effects these changes could cause on state revenues are also described.

The potential for regulatory changes, in particular the risk posed by the EPA's proposed Section 111(d) rules is described in the following chapter. The estimated impacts this could have on the statewide, as well as regional coal-producing economies of Wyoming are described using the same

methodology as used to estimate fundamental market effects in this chapter. Estimated state revenue impacts are also described.

Disruptive effects are difficult to evaluate due to their uncertain and unpredictable nature. By definition, disruptive effects are unanticipated yet they cause considerable change to markets. Projections used to evaluate the impact of fundamental or regulatory effects do not assume significant changes to export markets; competing fuel costs; or to emissions technologies that could significantly impact coal demand, although each type of change could happen. In particular, there are significant efforts being deployed to develop new technologies. Some description of possible factors affecting export markets was presented in Chapter 2. Changes to natural gas prices beyond those trends already experienced since 2008 are potentially possible (for example, due to lower than anticipated oil prices or additional technological improvements in gas extraction), as are significant improvements in competing coal technologies. An example of the latter can be found with respect to longwall mining improvements over the past decade that have allowed Illinois Basin coals to better compete with PRB coal. Finally, improvements in carbon capture, utilization and storage (CCUS) and its implementation could significantly improve the Wyoming coal market, particularly if a national commitment is made to expand such research and development. Again, such developments and scientific breakthroughs are impossible to predict, and therefore speculation regarding how they could affect the Wyoming coal economy is outside the scope of this document.

The following outlines the methodology used to estimate the potential impact fundamental market factors could have on Wyoming coal output, and the estimated impacts such changes could have on the Wyoming economy and state revenues.

Methodology

To identify projections of potential future Wyoming coal market outcomes for changes in the fundamental market conditions described above, this report used a series of well-known market projections derived from the US Energy Information Agency (EIA) 2014 Annual Energy Outlook (AEO2014). These forecasts derived from a complex and highly integrated model of the US energy economy called the National Energy Modeling System (NEMS).[20] These projections identify national and regional energy market outcomes including coal price and production outcomes in Wyoming under "reference" conditions, previously described briefly in Chapter 2, and then under a series of side cases reflecting variety of market and regulatory assumptions.[21] The "reference

[20] NEMS was originally developed by the US Department of Energy to understand the inter-relationship of energy markets and to analyze the effects of potential policy changes on these outcomes. They have since continued to be used by policy-makers, along with academic organizations, industry and national laboratories for business forecasting, policy-work and energy-market research. See http://www.eia.gov/oiaf/aeo/overview/ for an overview of the NEMS system.

[21] The AEO2014 projections derived from the most recent version of the NEMS model consider a series of thirty-one different economic and regulatory cases to define thirty-one separate series of price, production, consumption and

case" provides projections utilizing current macroeconomic data, market conditions, and statutes regarding energy use and emissions. These projections do not include any proposed legislation or assume any new regulation thus they are often referred to as the "business as usual" outcome. The conditions under which the reference case is computed are updated over time, resulting in changes in the resulting forecast. Figure 1 presents the reference case forecasts for total Wyoming coal production from 2010 through 2014.

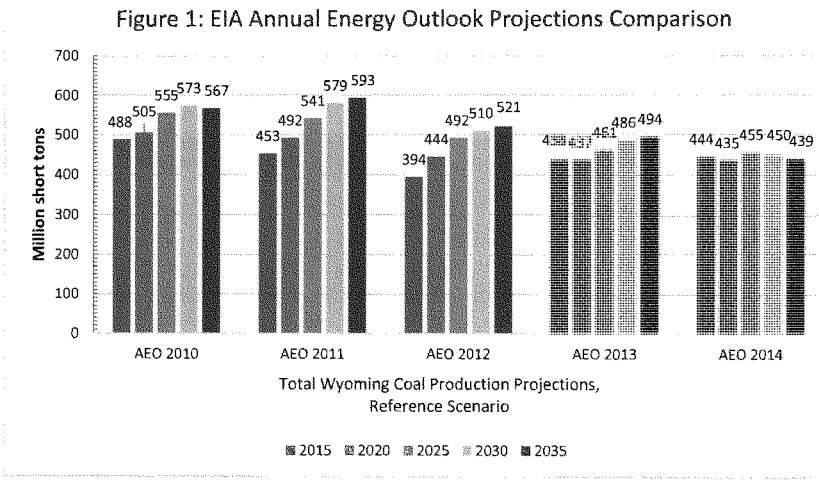


Figure 1: EIA Annual Energy Outlook Projections Comparison over Time

As noted in Chapter 2, conditions in the US domestic coal market have become more difficult in the last few years, and are projected to continue to be difficult.[22] Forecasts have typically predicted growth over time in Wyoming coal output; however, this growth rate has been declining, and the most recent forecast indicates little growth in state production. Reasons for the projected decline in production over time include the increasing importance of several fundamental market factors including the declining rate of load growth due in part to slower economic growth forecasts; natural gas prices lower than anticipated in earlier forecasts; and declines in productivity affecting coal production costs in the PRB experienced over the past decade. EIA's more recent AEO2014 forecast is not radically different from the forecasts from some other major forecasters (as

emissions projections from 2012 through the year 2040, each corresponding to the different market and regulatory assumptions used (this study only uses the projections through 2030).

[22] Totals in Figure 1 combine PRB output forecasts with Uinta Basin projections. PRB coal on average accounts for between 97% to 98% of total coal output from Wyoming, depending on the forecast and year.

previously shown in Chapter 2) and somewhat more optimistic than several forecasts.[23] Unlike other forecasts, the EIA reference forecast only includes current regulations and current market conditions and trends, including export levels.[24] This allows comparison of each of the side-cases EIA prepares along with the reference forecast to identify how changed assumptions affect relative market outcomes. This feature of the EIA forecasts makes them especially useful for this study.

To determine the potential impact on the Wyoming economy of changes in natural gas prices and coal costs, the corresponding side-case projections were utilized from the AEO2014 report. Using the annual coal production and price outcomes forecast in each case, we estimated the change in coal production in 2020, 2025 and 2030 relative to the reference year 2012.[25] The economic impacts of these changes were then estimated for the statewide economy, the PRB, and Uinta Basin regional economies in each of the three impact years using the impact model presented in Chapters 1 and 2. Using these economic impacts, the estimated effect on state revenues was then computed for each scenario using a Wyoming state revenue model developed for this study.

Prediction of potential future coal production outcomes, including the impact these outcomes could have on the statewide economy, coal-producing regional economies and on state revenues are strongly dependent on initial assumptions. Given the long timeframes of these projections, they cannot necessarily be considered absolute forecasts of market outcomes since they depend on current information and conditions, which are bound to change over time, and are developed around only one market change at a time. The market projections are therefore presented as comparisons meant to illustrate how changes in economic conditions could affect coal output in a comparative sense holding other assumptions constant. In reality, any forecast of future outcomes will include changes in more than one market or regulatory assumption, unlike the projection scenarios shown. The projections; therefore, should be used for comparison relative to the reference case or actual 2012 outcomes and are illustrative examples of the potential effects future

[23] EIA forecasts are not out of line with major market forecasts, though they often predict outcomes that are slightly higher than other forecasts do. A summary of how EIA projections from the AEO2014 model compare to other professional forecasts can be found in the document "Annual Energy Outlook 2014: Comparison to other projections," pp. CP-2 to CP-16 http://www.eia.gov/forecasts/aeo/section_comparison.cfm (accessed November 16, 2014).

[24] EIA projections do not indicate significant increases in the level of international coal exports thus the scenarios presented in Chapter 2 are assumed not to occur in the projections presented in this chapter. In each of the cases described including the reference case, total western coal exports to Asia are assumed to approximately double between 2012 and 2030. Given that export levels from the Wyoming PRB in 2012 were estimated to be equal to less than three million tons annually (the remainder originated in the Montana portion of the PRB) the export increases modeled represent potential increases of between 3 million and 13 million tons in total annual Wyoming international coal exports.

[25] The year 2012 is used as the reference as this was the last year in which full data was available at the time the study computations were performed (Summer/Fall 2014). 2013 conditions were not significantly different from 2012, and estimates of 2014 coal production outcomes appear to be similar to 2012 conditions with respect to coal employment and output in the state. For example, Wyoming coal output in 2012 was 401 million tons, in 2013 was 390 million tons, and in 2014 it is estimated to have been 396 million tons. Total coal mine employment in Wyoming in 2012 was 6,873, in 2013 was 6,484, and 2014 it was 6,669 (data courtesy Wyoming State Geological Survey (WSGS)).

changes in market fundamentals could have on the coal market. These comparisons then allow identification of those changes that may have the largest or most significant effects on the state.

Market Projections and Scenarios

Given the previous overview of the relationship between coal markets and Wyoming coal production, EIA projections from the publicly available AEO2014 report were used to derive Wyoming coal, natural gas and crude oil production and revenue estimates under six AEO2014 scenarios and the reference case.[26] Specifically, these included projections describing the potential impacts of high and low economic growth on energy markets relative to reference case assumptions, the impacts of higher and lower coal costs relative to the reference case, and the impact of higher and lower natural gas production conditions (lower and higher natural-gas prices respectively) than those found in the reference case.[27] These correspond to the three fundamental coal-market concerns previously described. A summary of the assumptions used in each scenario is provided in the Appendix.

Conditions in each scenario are identical except for the following conditions:

- **Annual economic growth rate:** The reference scenario, and those scenarios not related to economic growth presume an annual national economic growth rate of 2.4%. This is approximately the average rate of growth observed in the national economy since 2011. Low economic growth scenarios show the evolution of outcomes assuming the long term economic growth rate falls to an average of 1.9%, while high growth economic scenarios increase this growth rate to 2.8%, the average rate of growth in the national economy observed since 1984. As described previously, different economic growth scenarios could significantly impact electricity demand growth in the future (even if the relationship has become less sensitive over time), and therefore derived coal demand outcomes would be expected to vary with changes in economic growth.

- **Wyoming coal mining costs:** Coal cost scenarios alter the reference (and non-coal cost case) assumptions by allowing mine productivity to increase at a rate 2.3% higher or lower

[26] All AEO2014 projections summaries along with the results of previous years' economic outlooks and studies prepared to consider specific federal energy programs are available this interactive website: http://www.eia.gov/oiaf/aeo/tablebrowser/,.

[27] In addition to the scenarios based on the market factors determined to be most important to Wyoming's coal market, a low oil price case was also considered to examine how the very low oil prices like those present in late 2014 might affect coal production. Because natural gas is often a co-product in oil plays, lower oil prices may reduce gas production and therefore might affect coal production in the state through its impact on natural gas production and price. The EIA AEO2014 side-case scenarios from which this study draws its forecasts also includes a case in which oil prices are low. The reference case assumes Brent crude oil, the world reference price, rises from $112/barrel to $141/barrel in 2040 (in 2012 dollars), while OPEC countries maintain their market share of between 39% and 44% of world production. The low oil price scenario assumes that oil prices fall to $70/barrel in 2016, and remains at that price through 2023, staying below $75/barrel through 2040 (all measured in 2012 dollars). OPEC market shares are assumed to be maintained as in the reference case. In almost all years through 2030 the outcome in this case was very similar to the high natural gas price case thus it was not presented.

than the reference case (reference case assumes a 1% decline in annual labor productivity). Additionally, wages paid to miners, equipment and transport costs are all altered to grow at faster or slower rates than those in the reference case, resulting in either relatively cheaper or more expensive coal production costs relative to the business as usual (reference) projection. Higher costs would cause greater coal prices, which would reduce quantity of Wyoming coal demanded.

- **Natural gas prices:** Natural gas scenarios alter gas recovery in shale gas, tight gas and tight oil to be 50% higher (lower gas prices) or lower (higher natural gas prices) than the rates assumed in the reference and non-gas resource cases. Falling or rising natural gas prices relative to reference alters the degree of fuel switching in the production of electricity between the two fuels over time. Lower natural gas prices (higher available gas resource) would be expected to cause coal use to decline relative to the reference case, while in the higher gas price case the opposite would be expected to occur.

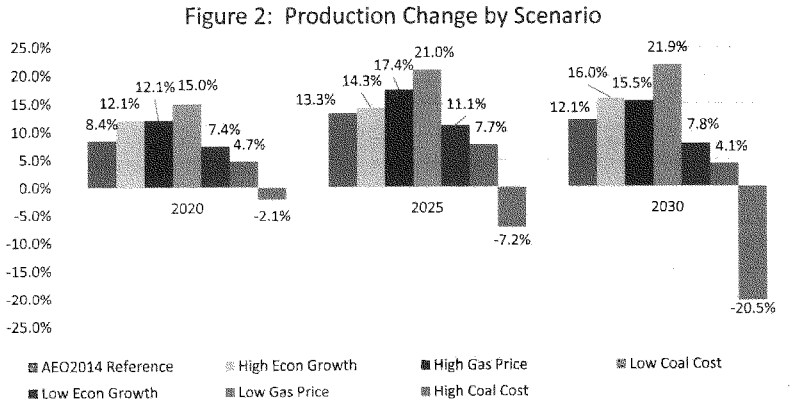


Figure 2: Coal Production Comparison by Scenario Relative to 2012 Output Level

A comparison of projected coal production changes relative to the actual level in 2012 (401 million tons) is shown in Figure 2. As is clear from the chart, under the assumptions used, the only case projected to cause a decline in coal production relative to 2012 levels is the high coal cost case. By 2030 in this scenario, coal production in Wyoming is forecast to decline by 20.5% (to 319 million tons of production annually) relative to 2012 output. The low coal costs case has the opposite effect, increasing forecast output to 489 million tons annually by the end of the forecast period. All other cases show far less sensitivity for the assumptions used.

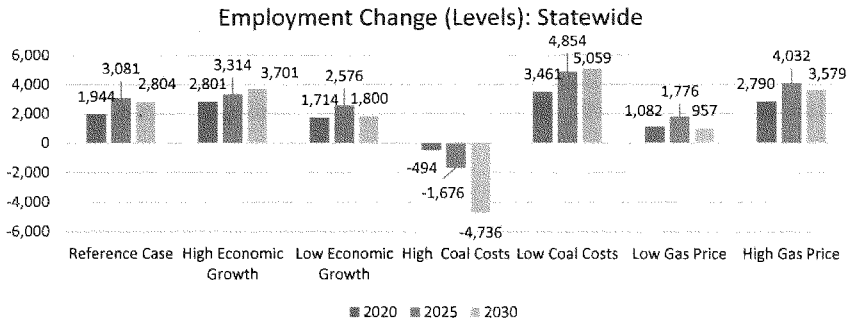


Figure 3: Coal Economy Total Employment Change: Statewide relative to 2012

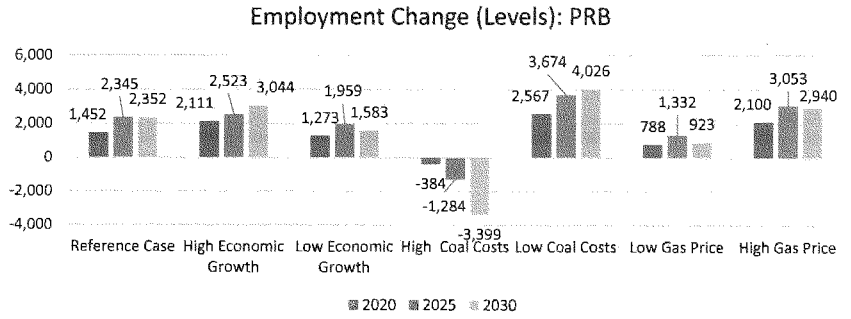


Figure 4: Coal Economy Total Employment Change: PRB relative to 2012

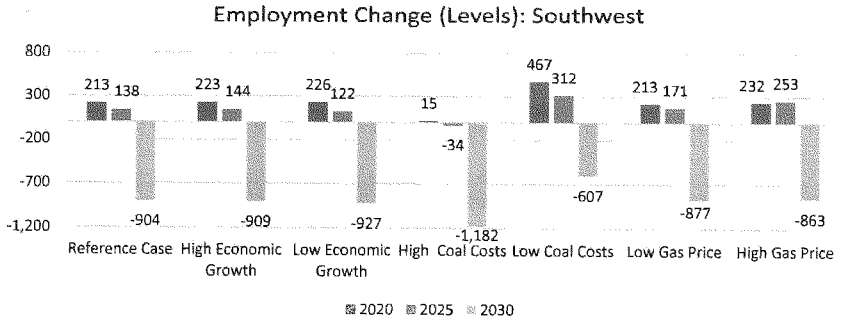


Figure 5: Coal Economy Total Employment Change: Uinta Basin relative to 2012

Estimated employment impacts to the Wyoming coal economy for the market scenarios considered are summarized in Figures 3 to 5. These describe the implied employment changes in mining, railroad and electricity generation in each case, along with the indirect and induced employment changes in the statewide coal economy, and in each of the state's two coal regions. The majority of statewide impacts occur in the PRB due to the majority of mining and rail hauling that occurs in this area.[28]

Statewide, coal economy employment outcomes follow the production outcomes described in Figure 2. Direct, indirect and induced employment rises across all cases except the high coal cost scenario until 2025, then in four of the scenarios that previously showed growth relative to 2012, coal employment falls in the last five year period. This is in part explained by the decline in coal output in the Uinta Basin region between 2025 and 2030 caused by the projected retirement of two Wyoming power plants in the model (Dave Johnston is scheduled to retire in 2027 and Naughton in 2029). This results in a decrease in coal production in the southwest, and a slight statewide production and coal economy employment decline overall. In the high coal cost scenario, employment falls throughout the projection period as production falls across the state, especially in the PRB. Plant retirements after 2025 only exacerbate these impacts. In all but the high coal cost scenario though, production and employment in the coal economy is higher than it was in 2012.

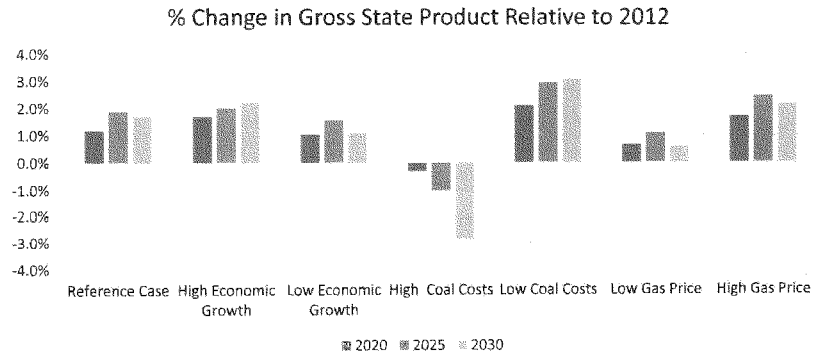


Figure 6: Gross State Product Change by Scenario for Projected Coal Production

Figure 6 describes the impact on Wyoming GSP due to the forecast production changes in Figure 2. In the most extreme cases (the coal costs scenarios) for the assumptions used, state GSP could rise or fall by almost 3% relative to 2012 levels due to changes in fundamental market changes. These results, and the employment outcomes, suggest that of the fundamental market factors considered, impacts to Wyoming production are largest when the price of coal relative other forms

[28] It is important to keep in mind that in this analysis a loss of jobs does not assume re-employment in other sectors. In reality, workers may be re-employed elsewhere.

of energy is changed. The second most sensitive condition occurs in the natural gas price cases, which again affect the relative price of coal to natural gas as a fuel source. Coal output outcomes are relatively unaffected by changes in the economic growth assumptions that leave the relative prices of energy (coal versus natural gas for example) unaffected. The difference between these two cases and the reference case is less than a 1% change in state GSP.

It should also be noted that none of these forecasts include the potential impact of a major expansion in exports. Using the values in Chapter 2, an expansion of 100 million tons of international exports annually could result in a 2.9% increase in gross state product relative to output in 2012, and if this were combined with, for example the low coal cost scenario, the coal economy would contribute an additional 6% to gross state product by 2030, and would double the employment impact of the low coal cost scenario alone. While the impact of an export expansion of 100 million tons of output annually and the low coal cost scenario are approximately the same by 2030, how they would impact the state is very different. The low coal costs gradually affect the state, adding just over a tenth of a percent to the state gross state product annually through 2030, while an export expansion could occur over a period as short as a few years or less. In the former case, potentially only state statisticians would notice the gradual impact on the PRB, while the latter could provide a significant boost to the local and statewide economy over a relatively short period of time (as little as a half-decade). Overall, however; significant expansion in coal exports could offset even the worst effects of any of the fundamental market changes considered, and reinforce any positive market impacts.[29]

Impact of Fundamental Market Change Scenarios on State Revenues

To determine the revenue impact of changes in the coal economy based on the EIA projections, a model of Wyoming state revenues was created specifically for this project. Using this model, the revenue impacts of the various EIA projection scenarios were analyzed with respect to changes created in Federal mineral royalties, Wyoming state severance taxes, and energy-generated portions of sales and use taxes and ad valorem taxes. These were further analyzed as separate State and local funding streams, though in what follows we combine the two revenue streams to define a total Wyoming "state" revenue outcome – that is the total revenue accruing to all state of Wyoming government entities.[30] Coal lease bonus payments and Abandoned Mine Lands (AML)

[29] Note that it is unclear that coal exports would be profitable under the high coal production costs scenario as it is possible such increases in costs could gradually undermine the profitability of coal exports. In such circumstances where major coal exports were occurring, for example at the 100 million ton per year level, the negative impact to the state economy of high coal costs would be double that shown in the figures presented here. This underlines the importance to the state economy of keeping coal productivity high and therefore coal production costs as low as possible.

[30] While ad valorem revenue generates mostly local government revenues, the education portion of property taxes, both local school and State School Foundation revenues were combined with state funding streams in our analysis. Detailed results are available upon request.

revenues were not included in this revenue analysis due to recent changes in AML payments and the fact that future coal lease bonus payments are not predictable.[31]

Tax revenue changes are presented in a manner slightly different from the state impacts presented previously. Instead of presenting changes in revenues relative to 2012 output level, we compare the tax revenue implications due to changes in production caused by changes in market assumptions. We therefore present how tax revenues change when market conditions change in each projection forecast relative to the reference case forecast. For example, the 2020 tax revenue impact of the high economic growth case compares the effect of increasing the economic growth rate assumptions on tax revenues relative to the EIA reference case tax revenue projection.

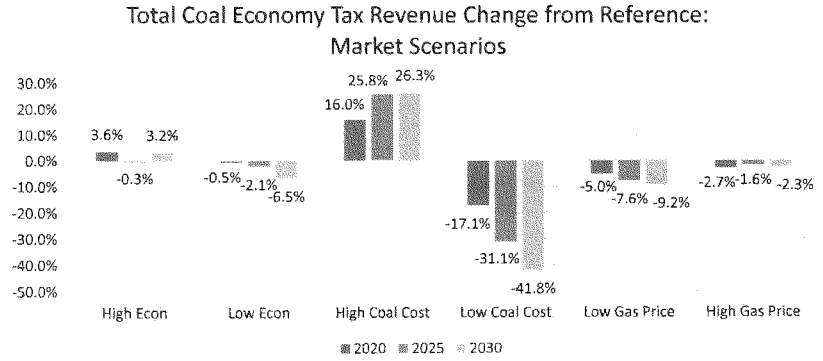


Figure 7: Total Coal Economy Tax Revenue Change from Reference

The effects of changes in fundamental market conditions on estimated tax revenues relative to the reference case (baseline projections) are presented in Figure 7. These values describe the effect the scenario conditions considered have on tax revenues relative to the reference case in the years shown. As discussed previously, coal production and total coal economy economic impacts such as employment and gross state product are much less sensitive to changes in economic growth and natural gas prices than coal costs. Tax revenues are similarly insensitive to changes in these market assumptions as shown in Figure 7. For example, not considering the coal cost scenarios, the worst

[31] As previously noted in Chapter 1, coal lease bonus payments reflect an expectation of future values of coal, which cannot be forecast in each scenario. Further, they also involve the definition of potentially available Federal land leases, an activity that is outside the control of the State and uncertain for a variety of reasons, including environmental assessment and institutional decision-making. Any attempt to model such activity would be very difficult and outside the scope of this work. With respect to AML funds, they are now capped at $15 million by Federal law and there is no reason to anticipate these revenues changing unless Federal legislation regarding them does over the projection periods considered. Given AML funds are now a very small portion of total coal revenues relative to the total state revenues coal generates they can be ignored without serious consequence in the results that follow.

outcome for total state tax revenues occurs under the low natural gas price scenario where by 2030, tax revenues are 9.2% lower than they would be under reference case (business as usual) assumptions. In the worst outcome these are not significantly different from the reference case revenues.

Coal-activity induced tax revenues realize the greatest change when coal cost assumptions are altered. Somewhat unexpectedly, however, the case in which state revenues improve most occurs in the case that was shown to be worst for the Wyoming economy in terms of jobs and production levels, based on the fundamental market change cases considered. The explanation for this is found in Figure 8.

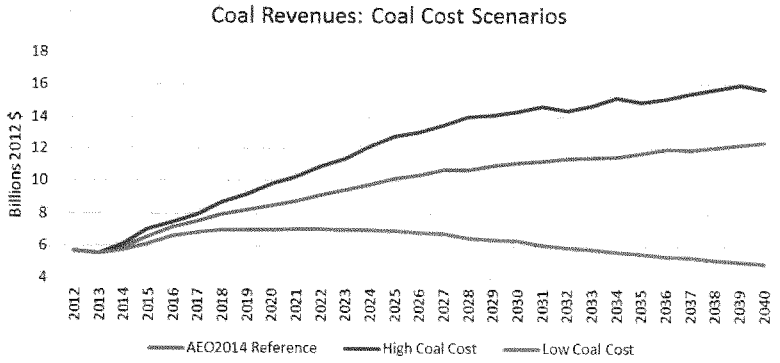


Figure 8: Coal Revenue Projections 2012-2040 under Coal Cost Assumptions

State tax revenues, as previously explained in Chapter 1 are most affected by production revenues from coal sales, not the direct, indirect and induced economic activity such production creates. Total projected Wyoming coal production revenues for the two coal cost cases are shown in Figure 8. From this figure, while the low coal cost assumptions increase total coal production, as shown previously in Figure 2, they actually result in reduced total coal revenues. Similarly while high coal cost assumptions resulted in a decrease in coal production over time in Figure 2, they result in a coal revenue increase. While these results may seem surprising, they illustrate how state tax revenues and economic activity can move in opposite directions.

The reason that production declines can result in greater production revenue (and therefore greater tax revenues) when higher coal costs occur is due to the following: higher coal production costs will result in higher sales prices assuming margins are held constant. These higher prices result in production declines as quantity demanded of coal falls, as shown in Figure 2. If, however, the price

effect causes total revenues (price x production quantity sold) to increase despite the production decline, then state tax revenues, which are assessed on the value of total revenue, will also rise.[32] The result therefore, is that in the presence of higher coal costs, state revenues increase despite the fact that as shown previously, this results in the greatest loss in state employment and gross state product.

Similarly, in the opposite scenario, the low coal cost case, state tax revenues are reduced the most of any case despite the fact that, as shown in Figures 2 through 6, this results in the greatest positive impact to state economic output and employment. Note that this effect does not occur for the other scenarios considered. Higher gas prices result in better state tax revenue outcomes than lower gas prices than in the reference case, while lower economic growth results in lower state tax revenues than the high economic growth case.

Conclusions:

This chapter has presented a comparative analysis of the effects that economic growth, natural gas prices and changes in coal production costs could have on Wyoming coal production, the wider Wyoming economy, and on Wyoming government revenues. The purpose of the analysis was to determine which type of fundamental market changes could pose the greatest threat to Wyoming coal production, the wider Wyoming economy and to state tax revenues. Overall, it was found that, using EIA projections and assumptions from the Annual Energy Outlook 2014 (AEO2014) the greatest potential impact to the state economy and state tax revenues could come from changes in coal production costs. With respect to coal production and the Wyoming economy, the greatest risk is posed by rising production costs in the mining sector, especially if they were to rise faster than they have historically. For state revenues; however, the greatest risk is posed by lower coal costs (and therefore lower coal prices) than might be expected from historic trends. Lower natural gas prices and slower economic growth pose much less of a threat to state revenues, coal production, employment and state economic output.

Were any of these market risks to be realized, it is unclear the state could do anything to alter their impacts. Growth rates experienced in the national economy are outside the State's control, as are national natural gas prices, both of which could alter the demand for Wyoming-produced coal in electricity generation. Similarly coal production costs – the number of miners needed to produce coal, their wages, the equipment costs and the transport costs to get coal to market are also outside policy-makers' control.

The relationship between state revenues and coal production effects in the high coal costs scenario

[32] In economics when total revenues rise in the presence of higher prices the demand for such a good is termed "demand inelastic", as a price increase of 1% for example, induces a reduction in quantity demanded of less than 1% and therefore causes total revenues (price x quantity) to rise.

may suggest that the state has the potential to offset some of the adverse effects rising production costs could have on the economy. In particular, the revenue result may at first glance suggest that the effect of production cost increases could be offset by production tax reductions on mining firms. A tax decrease, however, could not mitigate the effects of declining productivity in Wyoming coal mines on the Wyoming coal economy, and at best would only slow them briefly. This is the case for two reasons. First, a tax reduction is a one-time reduction in incurred costs faced by mining firms and the effects shown in the high coal costs case are the result of ongoing relative price increases that continue over time, with compounding effects. Even if all taxes were removed from coal, the effects shown in this scenario would only be delayed, not avoided, for the assumptions used.

Secondly, the scale of tax reduction necessary to affect the economy substantially would be large.[33] Since the coal economy is very important to state revenues, any reduction in coal taxes necessary to have significant impact on coal market outcomes would reduce total state revenues so greatly that Wyoming would almost certainly have to make the lost revenue up with new revenues collected elsewhere in the economy, negatively impacting economic activity elsewhere. Further, the political costs of such a dramatic change in taxation in order to favor one sector of the economy could be severe. Furthermore, such a reduction could have no effect on delivered coal costs (and therefore no effect on coal production in the wider Wyoming economy) if railroads merely raise delivered freight rates by an offsetting amount. In that case the tax effort would merely result in a transfer to railroads and provide no benefit to Wyoming's coal economy. Previous research has shown this may occur (see Gerking *et. al.*, 2000).

Overall, the state would have little ability to affect any of the market scenarios considered in this chapter. At best, the results suggest that the state should be vigilant in its observation of coal market conditions, particularly with respect to production costs, as adverse developments could very well portend significant economic impacts to the state economy in the years following such a trend being identified.

[33] In the projections shown, by 2030 the price of coal has risen to $44.90 (inflation adjusted 2012 dollars), a level double the price of any other scenario in that year. Even if all Wyoming tax revenues derived from the entire coal economy (direct production taxes and revenues and all induced sales and use and local property taxes) were forgiven, at an estimated $2.56 billion in 2030, this would still only amount to a rebate of $8.04 per ton of coal mined. If the tax rebate were passed on to market customers in the form of lower coal prices, the projected results suggest this would only reduce the production impact in Wyoming in 2030 to levels similar to those in 2025. In other words, using the employment results in Figure 3, this might save as many as 3,060 jobs. At a cost of $2.56 billion, however, the cost of each job saved would be approximately $840,000. This cursory analysis therefore suggests that while tax rebates may be possible to help offset some of the negative effects of increased production costs by adverse cost conditions; to mitigate a meaningful share of the effect would be prohibitively expensive.

4. REGULATORY CHANGE: THE POTENTIAL IMPACT OF THE EPA's 111(d) PROPOSAL ON WYOMING

CHAPTER SUMMARY

Potential carbon regulations pose a significant risk to the Wyoming economy due to the fact that carbon regulation could significantly reduce the demand for Wyoming coal in the rest of the country. The EPA's proposed Clean Power Plan, announced in June 2014, attempts to reduce national CO_2 emissions rates by 30% from 2005 levels. The plan also allows states flexibility regarding how they would implement necessary carbon emission reductions.

Key policy choices that states face are whether or not to use energy efficiency programs, and regional cooperation programs that allow carbon reductions to occur outside state boundaries, potentially reducing the cost of such actions. Both options could potentially reduce the potential adverse impact on Wyoming coal production the proposed EPA rules are otherwise projected to have by allowing carbon reductions to occur more cost-effectively and across a wider set of sectors in the national economy. Complicating the analysis with respect to Wyoming is the fact that reductions in coal-fired generation caused by the regulations will require increases in generation from natural gas across the nation. Since Wyoming is also a large natural gas producer, benefits from increased natural gas demand and the corresponding increase in prices could partially or entirely offset losses in the coal sector.

Identifying four scenarios based on these two policy choices, the potential impact the EPA's Clean Power Plan could have on Wyoming is evaluated, first with respect to coal production outcomes, and then with respect to combined coal and natural gas outcomes. Coal production declines due to the proposed regulations range from 30% to 50% relative to 2012 production levels. The estimated impacts with respect to coal economy employment range from a 2% to 3.5% decline depending on the scenario considered. Natural gas production increases mitigate some of these losses in some scenarios, but employment losses are still between 2.5% and 3.2% across scenarios. Overall, regardless of whether coal only, or combined coal and natural gas effects are considered, the impacts of the proposed carbon regulations would be strongly recessionary. Wider use of energy efficiency and regional cooperation nationally could mitigate some of these effects. The proposed regulatory impacts on state revenues are not as clear cut. In some cases, those policy scenarios that result in the least adverse impact on the coal economy often result in the largest state revenue losses, and often the opposite is also true.

Overall, results suggest that the state may have to decide whether to prioritize state production and employment, or its own revenues in deciding how to implement its carbon mitigation strategy. Further, what the state chooses to do in Wyoming is not ultimately as important as its ability to influence how other states' approach carbon mitigation actions, as their choices could significantly impact Wyoming coal production outcomes.

This chapter considers only the potential impact of future carbon emissions reductions policy on Wyoming coal production, and specifically the potential effect of the U.S. Environmental Protection Agency's (EPA) proposed Clean Power Plan rules on the Wyoming economy and State revenues. The methodologies used to determine the potential impacts on the State are the same as that presented in Chapter 3.

The EPA's Clean Power Plan

In 2007, a Supreme Court ruling obligated the EPA to regulate greenhouse gas (GHG) emissions if they were found to endanger public health.[34] In 2010, the EPA issued its "endangerment finding" and began the process to regulate CO_2 emissions from mobile and stationary sources. In 2012, the EPA first issued proposed plans to regulate power plant GHG emissions for new (to be built) plants under Section 111(b) of the Clean Air Act (CAA).[35] In June 2013, the Obama Administration announced the Climate Action Plan to address climate change, and as power plants are the largest single source of U.S. GHG emissions, action in this sector was central to the proposal.[36] Following this announcement, a subsequent memo directed the EPA to issue rules to regulate all power plant CO_2 emissions under Section 111 of the CAA.[37] The memo also included a directive for the EPA to rescind its original proposal for new sources (referred to as new source performance standards or NSPS) in response to the over 2.5 million comments it had received on the proposal, and to issue new rules no later than September 20, 2013.[38] The memo also directed the EPA to propose new rules regulating CO_2 emissions from modified and reconstructed plants under Section 111(b) of the CAA, and for existing plants under Section 111(d) no later than June 1, 2014. On September

[34] Massachusetts v. Environmental Protection Agency, 549 U.S. 497 (2007).

[35] The Clean Air Act of 1970 (and amended in 1977 and 1990) defines the set of rules that define how air pollution is regulated in the United States, and requires that the EPA regulate emissions that are determined to endanger public health and welfare. For stationary sources, the principal authority to regulate comes from Section 111 of the CAA (42 U.S.C § 7411). Under this section, section 111(b) requires the EPA to define standards for new and modified stationary sources. Referred to as New Source Performance Standards (NSPS), these rules defined by the EPA are then enforced by permitting authorities (most often the states). If a category of new stationary sources is regulated for a specific pollutant, then so too must existing sources in the category as stipulated under Section 111(d). The exception is when the pollutant is already regulated under another section of the CAA such as Sections 110 or 112. Since CO_2 from power plants is not regulated under other provisions of the CAA, regulating CO_2 from new power plants requires regulation of existing plants as well under the EPA's interpretation of the rules. This would occur under section 111(d) and the rules announced on June 2, 2014 define the proposed regulations.

[36] See Executive Office of the President, *The President's Climate Action Plan*, June 2013 http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf. Also central to the plan were promoting the use of renewable energy generation, promoting clean energy development technologies; reducing emissions in the transportation sector, including increased fuel economy standards; improvements in building lighting, heating and cooling energy efficiency; and reducing other types of GHG emissions beyond CO_2.

[37] Section 111 is not often used as most pollutants are regulated under other sections of the CAA. An interpretation of the 1990 CAA amendments suggests that if a category of sources is regulated under Section 112 of the CAA, then the category is excluded from regulation under 111(d) even if the pollutant is unregulated elsewhere in the Act. Since power plants are regulated under Section 112, this interpretation would exempt them from Section 111(d). The appropriate interpretation of the law is likely to be an area of litigation regarding the newly proposed rules that followed this directive.

[38] See Presidential Memorandum -- Power Sector Carbon Pollution Standards, June 25, 2013. http://www.whitehouse.gov/the-press-office/2013/06/25/presidential-memorandum-power-sector-carbon-pollution-standards.

20, 2013 the EPA announced its revised proposal for rules governing new plants, with a deadline to finalize these rules no later than January 7, 2015. On June 2, 2014 the EPA announced its power plant CO_2 emissions rules for existing as well as modified and reconstructed fossil-fueled plants as part of the Agency's "Clean Power Plan" (CPP).

Fossil-fueled generators in the United States are responsible for about 70% of electricity production and approximately 32% of the nation's total greenhouse-gas emissions.[39] Of these generators, 75% of carbon emissions come from existing coal-fired plants, which emit approximately 2,200-2,300 pounds of CO_2 per megawatt hour (lbs. CO_2/MWh) and produce about 40% of total electricity. The remainder of the nation's fossil-fuel generated electricity comes mainly from natural gas-fired plants (producing approximately 30% of electricity) with emissions rates of about 1,000 to 1,100 lbs. CO_2/MWh. Given the emissions differences between technologies, the proposed new rules impact coal-fired sources most greatly.

Published in the Federal Register on June 18, 2014, the new rules for modified, reconstructed and existing plants were open for comment for a 120 day period. The comment period was later extended to December 1, 2014. During this time approximately 2 million comments were received. To ensure all comments received on its proposed NSPS rules (issued in September 2013) as well as the CPP rules (announced in June 2014) could be considered jointly, on January 7, 2015 the EPA announced that final rules under both proposals would be released in mid-summer 2015.

CPP Proposed Timeline as of January 2015:

Design Period:

- December 2014: comment period ends
- Mid-summer 2015 (Originally June 2015): EPA finalizes NSPS and CPP rules.

Implementation Period:

- June 2016: Initial deadline for State Implementation Plans (SIPs).
- June 2017: extended deadline for SIPs at state's request.
- June 2018: Extended deadline if state choose to submit multistate cooperative plans.

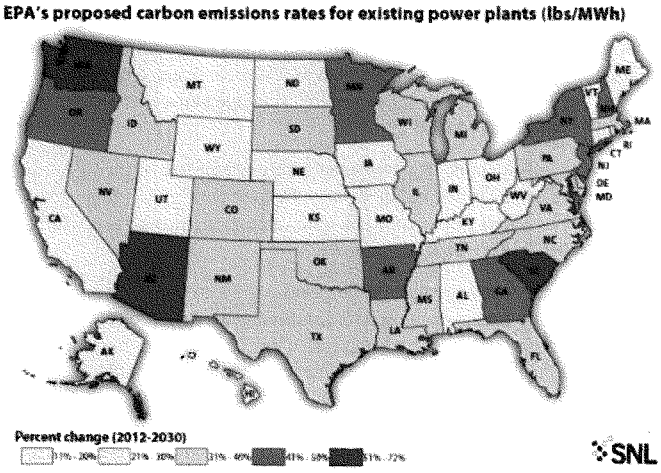
Compliance Period:

- January 2020-December 2029: States must meet interim CPP goals on average.
- January 2030: states must comply with final CPP emissions targets.

Under the rules as proposed in September 2013 for new fossil-fueled plants, CO_2 emissions rates are limited to no more than 1,100 lbs. CO_2/MWh averaged over a single year (or 1,000-1,050 lbs. CO_2/MWh over seven years). Natural-gas fired plants would have to meet a standard of 1,000 lbs. CO_2/MWh (with small plants having to meet a standard of 1,100 lbs. CO_2/MWh). Given the current state of generation technology, if new plants are to meet these limits, it is likely that all new fossil-fueled generation plants will have to be built using efficient natural-gas technology. Alternatively, partial carbon capture utilization and storage (CCUS) technology could be used for coal-fired plants, but currently this technology is

[39] See http://www.epa.gov/climatechange/ghgemissions/sources/electricity.html.

prohibitively expensive thus the proposed new rules have the potential to greatly reduce the construction of coal-fired power plants in the future.[40]



Source: SNL Financial

Figure 1: EPA Clean Power Plan State Emission Rate Targets

In contrast to the proposed NSPS rules, proposed rules for existing plants announced in June 2014 impose emissions rate targets at the statewide instead of plant level. These rules set as a target a national 30% reduction in power plant emissions by 2030 relative to levels that occurred in 2005. Given the magnitude of GHG reduction the rules intend to achieve, the potential impact on coal-fired generation use in the country could be very significant. Factoring in improvements in carbon emissions due to changes on the grid since 2005, CO_2 emissions have already fallen by 13% since

[40] The EPA argument for proposing that CCUS technology was currently both effective and commercially feasible for coal-fueled plants was based on demonstrations of new "clean-coal" plants in service or under construction in Canada and the U.S. Such a facility opened by SaskPower in Canada in October 2014. The coal-fired 110 MW Boundary Dam Unit 3 is capturing 90% of CO_2 emissions near Estevan, Saskatchewan. The plant utilizes existing steam-turbine technology with capture equipment retrofitted. Capture utilizes a post-combustion amine-based process and CO_2 captured is currently used in an enhanced oil recovery (EOR) flood 65 km away, while some is additionally stored onsite at a capture test-site. Additionally, SaskPower is constructing a carbon capture test center which is scheduled to be completed in 2015. The test center will test new carbon capture technologies aimed at lowering the cost of capture. In the United States, the Kemper County Mississippi Integrated Gasification Combined Cycle (IGCC) greenfield plant is scheduled to be fully operational in 2016 and will capture 65% of CO_2 emissions using a pre-combustion process. The WA Parish Petra Nova plant in Thompsons, Texas near Houston, is scheduled to open in late 2016 and will capture 90% of the CO_2 from a 240 MW flue gas stream from an existing power plant using a retro-fitted post-combustion process. Both U.S. plants will use captured CO_2 for EOR operations nearby also. Other such plants are also planned but not as advanced in construction.

that year. To meet the remaining 17% by 2030, the EPA has set a unique reduction target for each state to meet across its fossil-fueled plant fleet now in service (Vermont does not have a standard as it has no applicable fossil-fired plants operating within its borders). These state reduction targets are illustrated in Figure 1. Wyoming's target will require an emissions rate reduction of 19% from 2012 levels. In addition to final targets, unique interim targets in the proposed rules have also been set between 2020 and 2030 for each state, defined as a 10-year average emissions rate during this period. In Wyoming, the interim average target emission rate between 2020 and 2029 is a 14.5% reduction below the rate recorded in 2012.

Proposed statewide targets for existing power plants were established by the EPA using a "building block" approach based on the types and inventory of generation in each state, and whether states had already implemented energy efficiency and renewable generation targets within their borders. The building blocks the EPA defines are, in order,

(i) increasing efficiency at fossil-fueled plants,
(ii) replacing some coal generation with gas-fired generation ("dispatch substitution"),
(iii) increasing renewable or, where applicable, nuclear generation in each state, and
(iv) conservation actions and energy efficiency programs that reduce electricity demand and therefore the need to produce fossil-fired electricity.

While the EPA has left the choice of how targets are to be met to the states themselves, in justifying the determination of its state by state limits, the EPA released modeling estimates of what they believe could be achieved using only the building blocks above to meet targets in each state at reasonable cost. For the first building block, the EPA assumed an average 6% efficiency or "heat-rate" improvement is possible across coal fired power plants nationwide. In its determination of the potential reduction dispatch substitution could provide, the EPA used the state by state inventory of natural gas combined-cycle plants existing and under construction in the year preceding the proposal, and assumed that these plants could be operated at up to a 70% capacity factor (70% of rated capacity continuously, on average). For every state, the EPA also made a determination of what was thought to be the state's future potential to expand renewable or nuclear generation to meet compliance goals. This included consideration of whether states had previously employed renewable portfolio standards or other renewable energy policies. Finally, based on existing energy efficiency programs and reported costs by states employing such programs, EPA modeling determined the potential that such programs could provide in reducing state CO_2 emissions.

Under the existing proposal, to meet the proposed existing plant rules, each state will be required to submit a State Implementation Plan (SIP) describing mitigation strategies to be employed to meet their CPP targets. States will be given a year from the time the final rule goes into effect (expected Summer of 2015) to submit their SIP, and states may request a one-year extension for their submissions. These plans will then be approved by the EPA within a year of their submittal. If a state refuses to create such a plan, the EPA will mandate one for the state as provided for under the Clean Air Act. SIPs will define the use of any or all of the emissions reduction methods described in the building block framework, or they may include any other reduction technology or practice states deem appropriate, provided each state can show their actions will result in the

necessary reductions to meet their mandated targets, and that such reductions are real and verifiable.

To allow greater flexibility, the EPA is also encouraging states to cooperate to reduce the cost of emissions reduction collectively where possible. Such regional cooperation plans would allow collective emissions targets to be defined as weighted averages of the state-specific targets assigned by the EPA and offer the potential for meeting these targets more cost effectively. Since states have different targets, there are likely to be potential gains from trade and cooperation if a region of states were to propose such a plan, and such gains from trade could, for example, allow a local cap and trade system to be used to meet the EPA-imposed overall target emissions rate across the region.[41] Such a scheme could allow states with relatively cheaper emission reduction opportunities to make greater emissions reductions than required in the state by state case, with excess reductions creating permits that could be sold to other states. In effect, by allowing states purchasing permits to pay for reductions made elsewhere where they are cheaper, the overall cost of emission reduction across states could be reduced even beyond those the EPA assumes can occur without cooperation. Such programs have been demonstrated to be effective and have lowered control costs for other pollutants, notably SO_2, where a national trading system has been employed for over two decades (see Schmalansee *et al.* (1998) for a description).

Other potential forms of regional cooperation states may consider include region-wide renewable portfolio standards in which a specific amount of the total generation in a region is produced using renewable technologies. A region-wide approach could be more effective than a state by state approach by allowing states to locate renewable projects in others states within the region if energy production there would be more productive than in their own borders. Other regional approaches are also possible. The EPA, anticipating that some states will propose such cooperative frameworks, has allowed a three year deadline for states choosing to do so to submit their SIPs, since the rulemaking necessary to coordinate actions across jurisdictions could be more complex and time-consuming than the development of single-state plans.

Given that the proposed rules and state targets are not yet final, it can be presumed there is a high likelihood the details of the plan will change. Details may also change in terms of timing if the proposal's implied changes to the electricity grid cause reliability to be a concern without additional infrastructure being built. Furthermore, because of the nature of the rules and the fact that Section 111 of the CAA is not often used, and given questions regarding the interpretation of this section, its applicability to carbon mitigation and the consistency of the proposed rules with this statute; whatever rules are finally proposed are certain to be litigated. For this reason there still remains considerable uncertainty regarding how carbon regulations will be enacted. While final rules may be changed based on comments received, litigation, or new considerations not included in the first rules proposed, the currently proposed rules suggest only one potential means regarding how future carbon regulations may be implemented. With this caveat in mind, the limits as

[41] The Regional Greenhouse Gas Initiative (RGGI) is an example of such a program and has been in operation since 2008 with compliance caps beginning in 2009. Ten state have participated, and the program still includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. New Jersey participated until 2011.

proposed are used to define impact scenarios to determine how such rules could affect Wyoming. This is the basis of the rest of the report. The following describes these results. More detailed tables are presented in the Appendix.

Regulatory Change Projections: The Potential Impact of EPA's 111(d) Proposal on Wyoming

To define a set of projections consistent those EIA projections previously presented in Chapter 3, the Rhodium Group was engaged as a collaborator on this work. As one of the few non-governmental operators of the EIA's NEMS model, Rhodium agreed to provide a set of proprietary simulations to estimate the impact of the EPA's proposed greenhouse gas (GHG) regulations.[42] As described previously, the EPA's proposed Clean Power Plan rules allow states to determine their means of meeting the targets EPA defines. These include the choice of using energy efficiency as a reduction mechanism, and the choice to become involved in regional compliance programs, cooperating with other states.

Table 1: Design of Regulatory Policy Scenarios Considered

	Energy Efficiency efforts allowed	**Energy Efficiency efforts not allowed**
National cooperation	Scenario 1: National Cooperation with Energy Efficiency (EE)	Scenario 2: National Cooperation without Energy Efficiency (EE)
Regional cooperation	Scenario 3: Regional Cooperation with Energy Efficiency (EE)	Scenario 4: Regional Cooperation without Energy Efficiency (EE)

While such choices have clear and different economic impacts, as will be shown, they also entail political choices that may or may not be popular within specific jurisdictions. Given that the combinations of policy states will choose to use is unclear, projections used here encompass four scenarios based on the policy-choices described in Table 1. Scenarios considered include allowing energy efficiency (EE) to be used as a compliance strategy or not, and the degree of state cooperation that might take place.[43] Cooperation scenarios were defined to compare the impact of very limited state collaborative efforts relative to potential outcomes should the nation-wide cooperation occur. In the regional cooperation cases, the ability of states to cooperate was limited

[42] Rhodium Group's website is found at http://rhg.com/. To define a set of regulatory projections estimating the potential effects of the proposed EPA CPP regulations, and to ensure these projections were consistent with the previously used AEO2014 Annual Energy Outlook for comparison, creation of a set of NEMS-derived estimates was necessary. Given the short time-frame involved in this project, and the fact that the NEMS model is not currently available at the University of Wyoming, outside help to model the EPA proposal outcomes from the Rhodium Group was solicited. Regional Wyoming-relevant results from this analysis were created and provided to UW at no cost for use in this project. These simulations are part of a larger study Rhodium conducted in Summer 2014 analyzing the effect of the EPA's proposed Clean Power Plan on the national energy market. This study was conducted in conjunction with the Center for Strategic and International Studies and the study was released in November 2014. See Larsen et al. *Remaking American Power,* (2014) http://csis.org/publication/remaking-american-power.

[43] Note that there are legal questions regarding the EPA's ability to suggest states use energy efficiency as a compliance strategy and the use of the strategy as a best system of emission reduction is likely to be litigated.

to the areas encompassed by their regional electricity markets.[44] Each scenario was run in NEMS at the national level and Rhodium provided the Wyoming-relevant output for this study.

The effect the EPA's proposed CPP regulations could have on Wyoming's coal-production depends on the degree to which the proposed regulations affect electricity generators using Wyoming coal. To meet the requirements of the regulation, firms may opt to close coal-fired facilities, improve their efficiency (reduce their fuel use), or they may choose to reduce the intensity of use of their coal-fired plants. All three actions would reduce the demand for coal as a fuel, reducing either Wyoming coal demand, or reducing coal prices nationally and, therefore, the prices paid for Wyoming coal. Both outcomes would reduce the production and revenues the Wyoming coal economy earns, affecting employment, output and state revenues.[45]

The proposed regulations may also have other effects on energy revenue streams the State receives beyond those directly related to coal. Because the GHG regulations proposed are intended to increase incentives to use natural gas to generate electricity, taking advantage of its reduced carbon intensity, the proposed rules may be expected to cause an increase in natural gas demand and prices also. With respect to the State of Wyoming, the EPA's proposed carbon emissions rules could have two effects – the impact they have on the coal production and the wider coal economy, and the impact the regulations could have on natural gas production and the wider natural gas economy, and the resultant impact this could have on state output, employment and state revenues. With respect to overall state economic activity, natural gas effects therefore could offset, or partially offset, the general losses a reduction in national coal use could cause. Due to the complexity of the market dynamics the newly proposed EPA regulations potentially create, the NEMS framework previously used to identify risks to Wyoming's coal market is well-suited to analyze the regulatory effects these rules may cause in Wyoming. The NEMS model captures the interrelationship of coal, natural gas and other energy markets related to electricity generation.

[44] The NEMS framework does not allow electricity markets to be defined by state boundaries as electricity grids do not conform to these borders thus a treatment of no state cooperation could not be defined in the NEMS framework. Instead, NEMS defines regional electricity markets or balancing areas. In the cases with least cooperation, states were assumed to regionally cooperate within their local electricity markets only. Alternatively, they were assumed to cooperate nationally. The latter might be considered consistent with allowing a national carbon trading market, a policy option that has been suggested as a means of meeting national carbon emission and climate change goals. Wyoming was presumed to cooperate with Colorado only in the regional cooperation scenarios.

[45] As previously noted, we do not attempt to consider the impact on coal lease bonus payments for changes in the competitiveness or regulatory requirements affecting coal plants. Any condition that reduces the competitiveness of coal, and by extension the coal industry, would be expected to negatively influence any coal lease bonus payments the state might earn in the future.

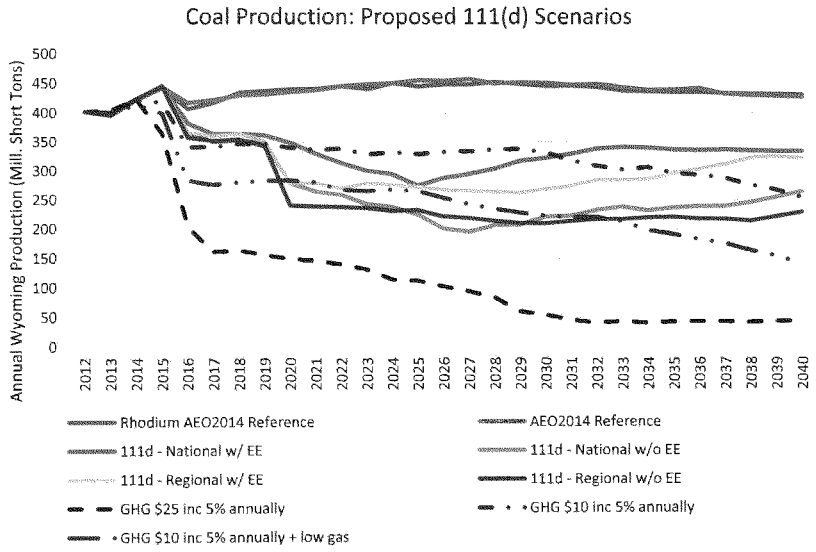


Figure 2: Coal Production Projections across 111(d) Regulatory Scenarios

Figure 2 illustrates the potential significance of the EPA's proposed 111(d) rule on Wyoming coal production based on the Rhodium-provided simulations of the national energy market using NEMS. The "business as usual" reference case suggests that without the proposed GHG limits, Wyoming coal production could be expected to remain a strong sector over the next several decades, with production levels increasing slightly over time from the current 400 million ton per year level to 450 million tons in the late 2020s.[46] Under the reference case, total production of coal is projected to increase by approximately 12% over current levels by 2028 due to economic growth and other drivers of demand. The imposition of existing power plant GHG regulations like those envisioned in the EPA's CPP proposal, however, would result in declines in Wyoming coal output of between 31% and 51% from 2012 levels, depending on the policy scenario assumed, as shown in Figure 2.

[46] The reference scenario used for these simulations is slightly different from that used in the EIA simulations in Chapter 3. Both reference scenarios are shown in Figure 2 for comparison. To be consistent with the proposed EPA rules, the Rhodium reference assumes that 111(b) new source regulations are in place, requiring new coal plants to meet a carbon emissions rate of 1,100lbs/MWh if built. While the previous reference did not include this restriction on new plant emissions, since no significant new plants are built in the EIA reference case previously presented, the change makes little difference. Differences between the Rhodium and EIA reference cases are generally less than 1% in annual estimated coal production and price outcomes.

From the differences in projected outcomes shown in Figure 2, the potential impact of allowing energy efficiency and wide cooperation in limiting the effects of EPA's proposed regulations on Wyoming are clear.[47] Allowing greenhouse gas reductions to be accomplished by a wider set of sectors in the economy, as is the case when energy efficiency is included as a policy response, reduces the pressure to reduce emissions from coal. Energy efficiency allows more cost-effective CO_2 reductions to occur elsewhere in the industrial and household sectors of the economy, thereby reducing the impact of the proposed rules on coal generation and therefore coal production.

Implementing wider cooperation among states to meet the standards has a similar effect. Allowing carbon reductions to be made collectively where they are most cost-effective allows electricity to be produced where it is cheapest and most efficient. This too minimizes the amount of coal generation that is otherwise curtailed by the proposed rules. For Wyoming, wider cooperation and the use of energy efficiency to meet the proposed standards allows more coal to be used in generation, increasing the demand for PRB coal production.

Comparison of the coal production scenarios presented in Figure 2 to those of the previous chapter suggests the regulatory impact on the Wyoming economy would be much more severe than any of the market risk scenarios previously presented. This occurs for two reasons. Coal production declines are much larger in the regulation scenarios than any in Chapter 3, and they occur much more swiftly. In the worst case scenario presented in Chapter 3, the high coal cost projections resulted in a decline in Wyoming coal production of 82 million tons annually relative to the 2012 production level. This decline, however was not fully realized until 2030. In the EPA regulatory scenarios shown here, the least harmful case with respect to coal production outcomes (national cooperation and energy efficiency allowed) results in an annual coal production decline of 127 million tons annually relative to 2012, and this primarily occurs between 2020 and 2025. This outcome implies a 55% worse production outcome occurring five to ten years sooner than in the worst scenario of the previous chapter. In the worst case regulatory scenario (regional cooperation only with no energy efficiency used) presented here, coal production falls by 193 million tons annually by 2030, a decline that is 135% worse than the worst outcome envisioned in the last chapter, and this occurs sooner also, by 2027.

Comparison of the scenarios presented in Figure 2 also demonstrates clearly another implication: how the regulation is implemented by states is of critical importance to Wyoming. The Wyoming coal production outcomes presented can be ordered from best (most production) to worst (least production) in the following order:

- national cooperation with energy efficiency,
- regional cooperation with energy efficiency,

[47] These simulations assume only incremental improvements in carbon-capture technologies for coal-fired plants. The projections do not envision carbon capture being required for modern combined-cycle natural gas-fired plants during the time-period of the scenarios.

- national cooperation without energy efficiency,
- regional cooperation with energy efficiency.

Furthermore, of the two policy choices defining the scenarios used, these simulations suggest that from the perspective of Wyoming's coal economy, using energy efficiency as a compliance policy to reduce emissions is more effective in avoiding coal production declines than the degree of cooperation that takes place among states.

For additional comparison, an alternative set of GHG reduction policies is also shown in Figure 2. The EIA's AEO2014 projection set from which the previous market scenarios in Chapter 3 were drawn from also includes three potential carbon tax scenarios. The impact of these scenarios with respect to their projected Wyoming coal production outcomes are shown by the dashed lines in Figure 2. They include results for a $10 per metric ton carbon tax beginning in 2015 and rising at a rate of 5% annually. They also include a second scenario imposing the same the same tax conditions but assuming that lower natural gas prices like those presented in the low natural gas price case presented in Chapter 3 occur simultaneously, reducing the price of natural gas at the same time the carbon tax is imposed. Finally they include a third $25/ton carbon tax scenario, also assumed to be imposed in 2015, and rising annually at a rate of 5%.[48]

As shown in Figure 2, with respect to coal production, the impact of the EPA 111(d) proposal is roughly similar to the outcomes in the $10/ton GHG carbon tax scenarios. Production outcomes in the 111(d) energy efficiency scenarios are bracketed by the $10/ton GHG tax projections, and the outcomes in cases without energy efficiency result in slightly lower coal production than these $10/ton carbon tax cases. None of the projected 111(d) outcomes is as severe as the impact on coal production a $25/ton carbon tax would have. In this case, by 2030 coal production falls by 90% from levels seen in 2012.

Estimated Energy Revenue Impacts of 111(d) Regulation

Production outcomes cause significant effects on Wyoming coal revenues, which decline relative to 2012 levels regardless of the scenario considered once the rules are imposed in 2020. In all cases, the increases in coal production revenues forecast to occur in the current decade to 2020 shown in the figure are reversed once the 111(d) compliance period begins. This is shown in Figure 3, and revenue cases follow scenario production outcomes, with energy efficiency cases superior to those without. Between the energy efficiency cases, national cooperation outcomes are superior to more limited regional cooperation.

Overall, the impact of the proposed EPA regulations coming into effect is clear in 2020. In real terms, those scenarios that result in the greatest production declines cause coal revenues to decline

[48] The assumptions for gas in this scenario are the same as those in the high gas resource conditions previously considered – overall these would be anticipated to reduce natural gas prices and increase gas use as a generation fuel, thereby reducing coal production by a greater amount that in the $10 tax case alone.

by between 23 and 35 percent relative to revenue levels experienced in 2012 depending on the scenario.[49] The energy efficiency scenarios have reduced production revenue impacts, ranging from 4.5% to 10% declines relative to 2012 revenue levels.

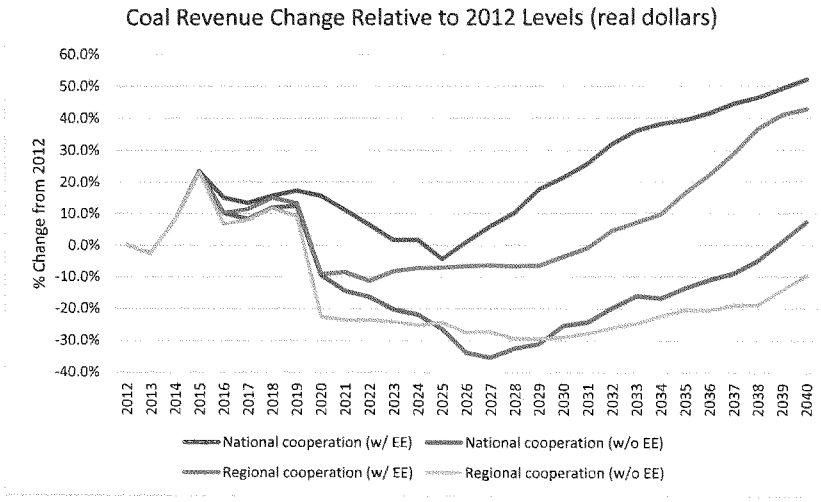


Figure 3: Wyoming Coal Production Revenue changes across 111(d) Regulatory Scenarios

While forecasted coal outcomes are very negatively affected by the EPA's proposed existing power-plant regulations, total energy revenues in Wyoming, that is, the combined revenues of coal, natural gas and oil produced in the state actually rise over the entire projection period considered despite the new regulations. This occurs for two reasons. First, in the Rhodium scenarios described here, it is presumed that in the years leading up to 2020, an anticipated expansion in coal demand occurs, which increases revenues for coal by between approximately 11% and 17% relative to revenue levels in 2012, depending on the scenario assumed. When losses are compared to revenues in 2012, this in part offsets some of the losses in the following decade caused by the new regulations.[50] Losses due to the projected regulatory effects in all cases would be larger if the forecasted increases in coal revenues between 2012 and 2020 do not materialize.

[49] The reader is reminded that 2012 outcomes reflect actual production and price outcomes that occurred. They are not forecasts.

[50] EIA projections exhibit this same property – they project growth in Wyoming coal production in the reference case and most other side-cases presented in the AEO2014 report. As noted in Chapter 3, however, this projected growth, while still present over time has been declining within Annual Energy Outlook projections since 2009.

Secondly, the regulations impact total production revenues from the other sources of energy produced in Wyoming, especially natural gas. Because natural gas demand increases due to the increased generation share natural gas experiences under the 111(d) scenarios, Wyoming gas production and price outcomes increase natural gas revenues, and these otherwise offset some of the coal revenue losses due to the proposed rules.[51] More importantly, however, the Rhodium (and EIA) projections forecast a boom in gas output over the next 15 to 20 years, regardless of whether carbon regulations are implemented, and these gains offset coal losses.

The overall impact of the proposed 111(d) regulations can be split into two time periods. From 2012 to 2022 the regulations and resultant changes in energy markets over the coming decade (through 2022) cause lower total energy revenues than would be expected had no regulations been imposed, but projected total revenues are still significantly higher than those experienced in 2012 (note that revenues presented are measured in real terms implying the revenues are net of any inflation effects). Using Rhodium's NEMS model projections prepared for this report, in the last years of the current decade, in inflation adjusted terms total energy revenues are still between 48% and 56% higher than those in 2012, depending on the scenario assumed. This suggests that a rapid expansion of oil and gas production in the state could offset declines in coal, even significant reductions caused by GHG regulations.

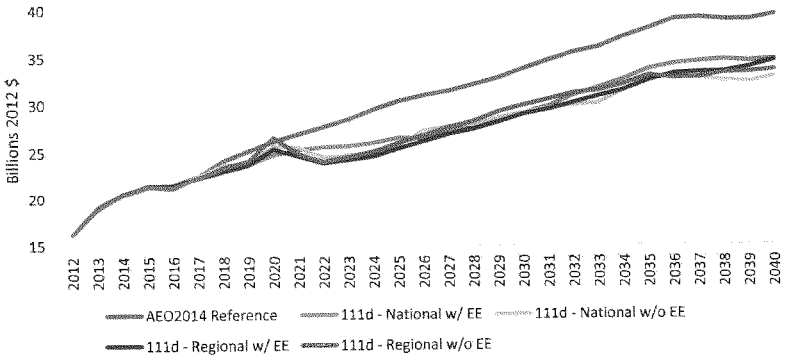


Figure 4: Total Wyoming Energy Production Revenue Projections across 111(d) Scenarios

[51] Oil revenues are affected little by the proposed regulations, mainly because oil is not a widely used generation fuel in the United States. Oil production is forecast to grow over time at similar rates across the four 111(d) scenarios presented here. Oil outcomes are included in total revenue outcomes but are not discussed in the report in any detail. Lower oil prices currently occurring, however, could undermine the bullish gas and oil forecast implicit in the Rhodium and EIA forecasts as they presume higher oil prices lead to greater oil and gas development than may occur under current conditions with oil prices are below $70/barrel.

Figure 4 shows this more clearly. While coal production is significantly impacted by proposed GHG regulations, total production revenues (price x quantity produced) grow in all scenarios. Growth in natural gas and oil revenues more than offsets the coal revenue losses. The result in projected total energy revenues in Wyoming after the imposition of the proposed EPA 111(d) rules is a pause in total revenue growth, with a decline of between approximately 8% and 16% in these revenues by 2022, and afterward total revenues begin to grow at approximately the same rate they would have in the reference case had GHG regulations not occurred. The lesson of Figure 4 is that other pre-existing energy trends could offset predicted losses in the Wyoming economy due to proposed regulations affecting coal. For example, a large increase in international coal exports on the order of 100 million tons per year as analyzed in Chapter 2 or a rapid increase in demand and pricing for natural gas could offset a large portion of the impact the State would otherwise experience under these regulatory scenarios.

Potential Regulatory Impacts to the Wyoming Coal Economy by Scenario:

To estimate the impact of the proposed EPA 111(d) regulations on the wider Wyoming economy, Figure 5 summarizes the coal production impacts projected by scenario in 2016, through 2030 relative to production in 2012. Total coal production in 2012 was approximately 401 million tons, with 389 million tons produced in the PRB, and the remainder produced in the Uinta Basin region of the state. Production projections suggest that output declines begin to occur immediately after regulations are finalized in 2016 as the generating industry increases coal-plant retirements beyond those that would otherwise occur in anticipation of the rules. When the compliance period begins in 2020 through 2030, production declines accelerate, with declines continuing through 2030 in three of the four regulatory scenarios.

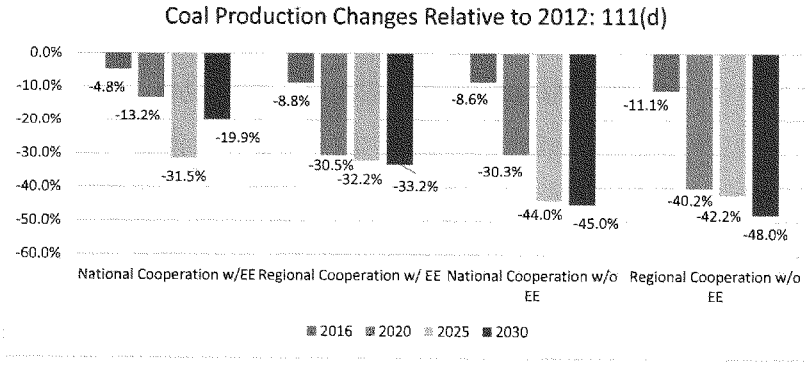


Figure 5: Coal Production Changes across 111(d) Scenarios Relative to 2012 levels

Estimated statewide employment impacts resulting from these coal production changes are shown in Figure 6, while the impacts in the two coal-producing regions are shown in Figures 7 and 8.

These impacts include estimated effects on those directly employed in the mining, railroad transport and electricity generation sectors, the indirect employment impacts changes in these sectors have on industries that supply these activities, and induced employment changes caused by changes in expenditures made by those employed in mining, railroads and generation. Statewide and in the PRB, employment outcomes follow the general statewide production outcomes described in Figure 5. Across the state, in the best case (national cooperation case that includes energy efficiency) the imposition of the proposed EPA regulations results in a loss of over 7,000 jobs by 2025 compared to 2012. In this case employment recovers slightly by 2030, resulting in the regulations reducing employment in the coal economy by nearly 5,000 jobs relative to 2012 by the end of the 111(d) compliance period. In all other cases the employment losses relative to 2012 employment levels continue to worsen throughout the projection period to 2030, with losses ranging from nearly 8,000 positions to over 11,000 in the coal economy, depending on the scenario considered.

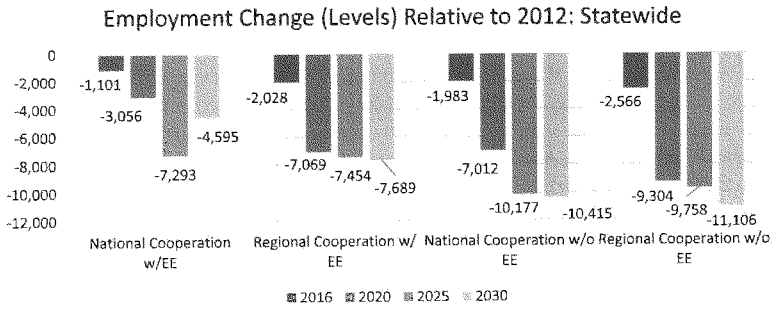


Figure 6: 111(d) Coal Economy Total Employment Change: Statewide relative to 2012

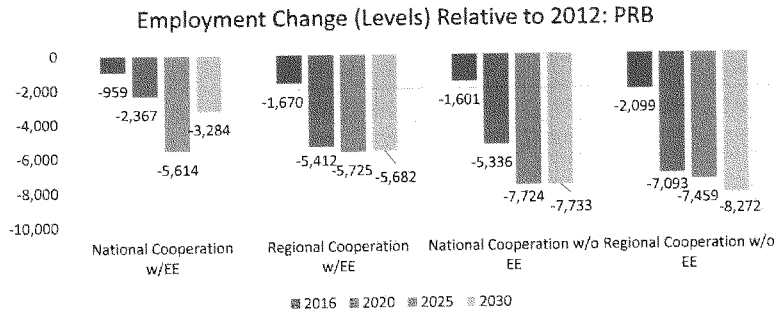


Figure 7: 111(d) Coal Economy Total Employment Change: PRB Relative to 2012

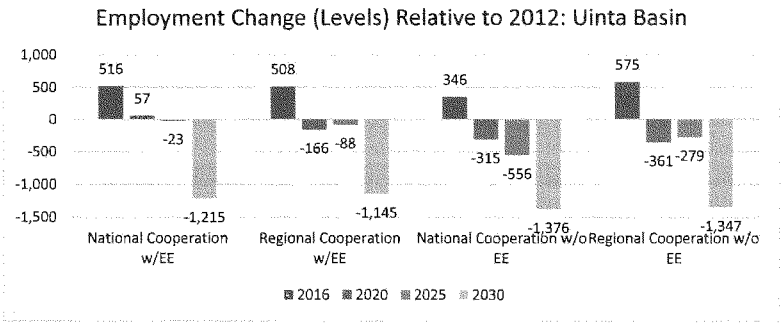


Figure 8: 111(d) Coal Economy Total Employment Change: Uinta Basin Relative to 2012

Regional employment outcomes in the PRB reflect those at the statewide level by scenario, with losses in the coal economy ranging from approximately 5,500 to over 8,000 by the end of 2030. Uinta Basin employment losses, however, contrast to those elsewhere. Projections initially forecast employment increases at the mines in this region, as the electricity generators they supply increase output and fuel demand increases at these stations. This increase occurs due to the increased generator retirements elsewhere in the country. By 2020, however, these increases have been reversed and total employment in the coal economy ranges from approximately what it was in 2012 in the best case scenario, to reductions of over 500 positions by 2025 in the worst case. As described in the market cases previously considered in Chapter 3, projected 2030 employment reductions occur in this region regardless of scenario due to the scheduled retirement of two large Wyoming generating stations. In the reference case this results in the reduction of approximately 1,000 jobs, and in the regulatory scenarios this rises to approximately 1,200 to 1,400 total positions lost. Nominal employment losses also occur outside of the PRB and Uinta regions.

The scale of the impacts the potential coal production changes presented here could have on statewide employment due to the EPA's proposed carbon regulations are significant. In 2012, the coal economy represented 5.9% of all jobs in the state. Forecast employment losses as a percentage of statewide employment in 2012 for the regulation scenarios highlighted here range from just under 2% to over 2.5% in the worst years considered. Given how quickly the impacts occur once the required emissions reductions begin to occur, these impacts in isolation would be recessionary, assuming no other mitigating effects occurred in the economy to absorb employment lost in the coal economy.

Regional impacts are potentially far worse than statewide outcomes. Coal production declines and contraction in the coal economy results in employment losses approaching 10% in the PRB region, starting as early as 2020 and persisting through 2030 depending on the scenario. As previously described, Uinta Basin impacts do not result in employment losses nearly as large, and the worst employment losses in the region occur due to the retirement of aging generation plants late in the

decade regardless of scenario. The effects of the regulations, however, are potentially quite contractionary for the state as a whole and would be especially destructive to the economy of the PRB region where almost one job in ten would be eliminated.

Considering Natural Gas Impacts of Proposed 111(d) Regulation:

As noted previously, the proposed EPA regulations on carbon emissions affect more than just the coal economy. EPA modeling released when the proposed rules were announced in 2012 suggests approximately 25% of current coal-fired generation would be replaced, primarily by natural gas generation, with additional energy efficiency efforts, expanded renewable generation and nuclear power making up the remainder.[52] With respect to Wyoming, natural gas production is also a significant part of the economy, thus it is unclear to what degree such effects would potentially offset the coal economy contraction the proposed regulations could cause.

Using estimates for Wyoming natural gas production outcomes in each of the regulatory scenarios considered, the simultaneous effects of coal and natural gas effects occurring due to the proposed regulations were estimated.[53] To compute the effects of the EPA's proposed 111(d) regulation in isolation from any underlying trends affecting coal and natural gas production, the forecasted annual coal and gas outcomes in each regulatory scenario were subtracted from the reference forecast in the same year.[54] Estimated production changes are presented in Figures 9 and 10.

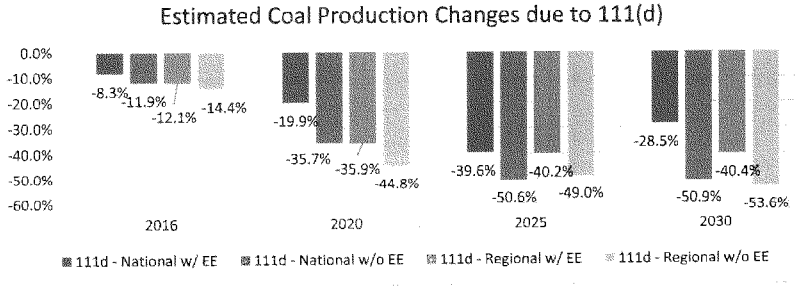


Figure 9: 111(d) Coal Production: Difference from Reference Case in each year

With respect to coal, as noted previously even before the compliance period begins in 2020, anticipation of the rules is estimated to accelerate reductions in coal use. This is demonstrated by

[52] EPA modeling is found on their Clean Power Plan website:
http://www.epa.gov/airmarkets/programs/ipm/cleanpowerplan.html

[53] Natural gas outcomes are not strictly defined within state boundaries and are instead defined by gas and oil basin. Projections were downscaled to derive estimates of natural gas production within Wyoming and then further downscaled to the two Wyoming regions we consider. Details regarding this procedure are available from the authors upon request.

[54] The previous section presented total production relative to 2012 levels thus all production changes projected were shown, whether they were caused by regulation changes or other trends forecast to occur in energy production.

the fact that, as shown in Figure 9, coal production falls relative to the reference level in 2016. Once emission limits take effect in 2020 through 2030, coal production falls further, with additional declines in production as emission limits become stricter over time. Estimated production changes are sensitive to scenario considered. In 2030, the final target year of the proposed 111(d) regulations, coal production has fallen relative to the no-regulation reference by between 29% to 54% depending on the scenario.

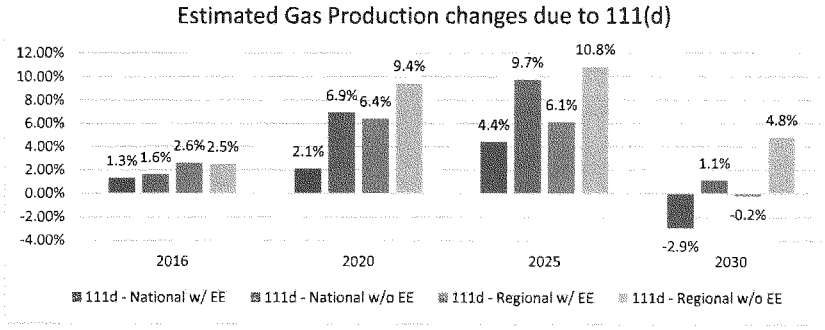


Figure 10: 111(d) Gas Production: Difference from Reference Case in each year

Natural gas production outcomes are presented in Figure 10. In all cases, production is higher in 2016 than it would have been in the absence of regulation, and this is true through 2025, suggesting the regulations cause gas production to increase even before the compliance period begins. Beyond 2025, natural gas production continues to increase in those cases that are harshest with respect to coal production (the scenarios that do not include energy efficiency measures being used). Reduced coal production implies greater generation is occurring through the use of natural gas. By 2025, the estimated increases in natural gas production range from 4.4% to 10.8% beyond those forecasted if no regulation is implemented. The projected 2030 increases in gas production are much smaller than those in 2025 because an underlying boom in natural gas production towards the end of the decade has already been factored into the reference case forecast. In scenarios including energy efficiency, gas production increases are reversed as coal production begins to rebound late in the decade as shown in Figure 9.[55] Those cases that do not include energy efficiency, however, continue to see expanded natural gas output.

Using the production changes caused by regulation alone, the estimated statewide employment impacts corresponding to the production changes in Figures 9 and 10 for coal and natural gas are presented in Figures 11 and 12. The total combined effects of both sectors on employment is then

[55] As shown previously in Figure 5, coal production rebounds in the national cooperation/energy efficiency scenario and declines end in the regional cooperation case with energy efficiency. This results in less demand for natural gas and causes estimated Wyoming gas production to decline or remain flat compared to 2025 in these two scenarios.

presented in Figure 13. Each figure shows the change in employment between the reference case in a given year and the estimated level of employment in the scenario considered. These employment changes are then expressed as a percentage change relative to the statewide employment level in 2012.

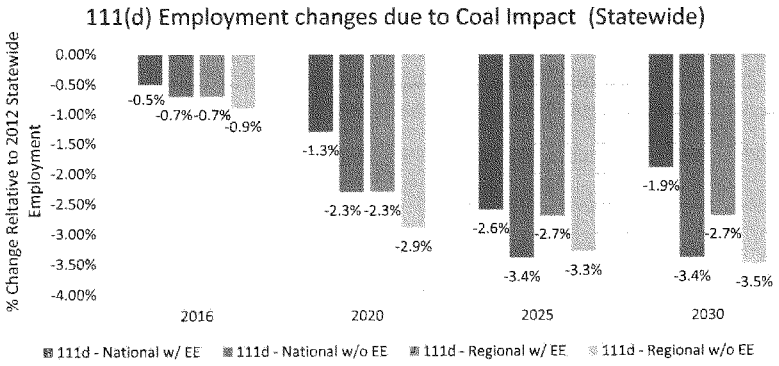


Figure 11: 111(d) Coal Employment Impact: Change from Reference by Year

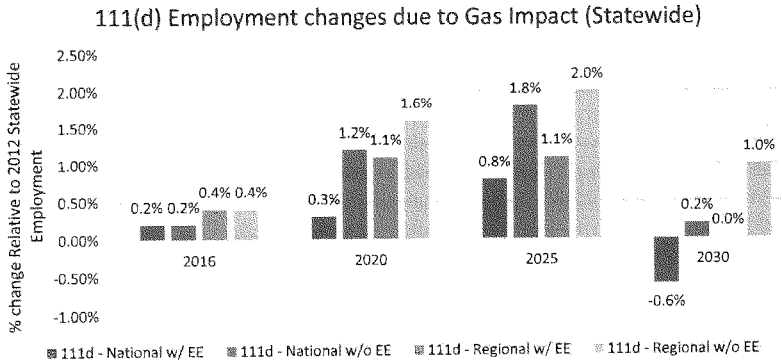


Figure 12: 111(d) Natural Gas Employment Impact: Change from Reference by Year

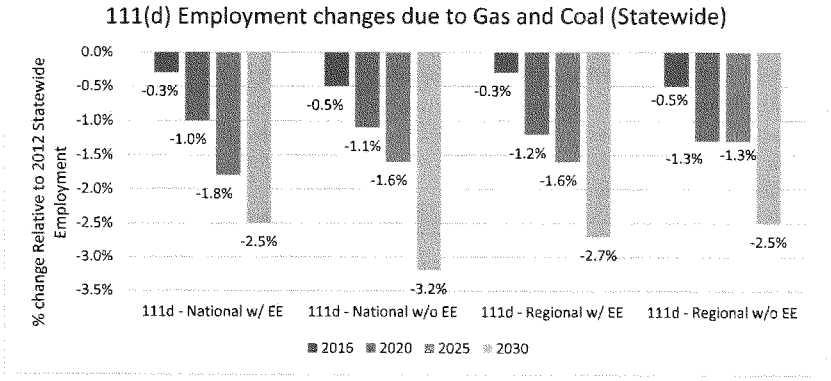


Figure 13: 111(d) Combined Employment Impact: Difference from Reference by Year

Summarizing the results presented in Figures 11 to 13, some conclusions can be made regarding the regulatory effects of the EPA's proposed 111(d) rules on Wyoming energy production, and on employment outcomes in the state. First, *employment losses in the state's coal industry are not offset by employment increases caused by increased natural gas production.* Comparing employment changes, the negative impact to the state from reduced coal production is approximately two to four times larger than the positive natural gas employment effects the new regulations cause, depending on the year and scenario considered. This suggests that considering the regulatory effects alone, the impacts of coal production losses dominate the gains in natural gas production due to regulation in the state. As shown previously, employment impacts would be largest in the coal-producing regions, but growth in gas producing regions could provide employment for some of those job losses thus the regulation would be anticipated to cause some labor migration from coal producing to natural gas producing regions of the state. Not all displaced workers in the coal sector, however, would be able to find employment in the expanding natural gas sector even assuming one could easily transition from one field to the other.

Secondly, for the proposed regulations regarding 111(d), *to avoid a significant decline in economic activity in the state, an expansion in economic activity would have to occur elsewhere in the economy.* Wyoming's diversified energy base and the nature of the proposed regulations shifting coal demand to natural gas could provide such a lift or at least some relief, but the impact of the regulations alone would be expected to lead to a contraction in statewide economic activity and employment absent any other offsetting economic growth elsewhere in the state economy.

Thirdly, *how the proposed rules are implemented matters to the state's production of natural gas and coal, but the implications for the optimal implementation plan are less clear than when considering coal outcomes alone.* Use of energy efficiency to reduce carbon emissions results in higher coal production than otherwise would occur, and reduced contraction in this sector. To a

lesser degree, wider regional cooperation has a same effect. For the natural gas sector, however, the opposite is true. With respect to the impact on the entire Wyoming economy, the worst case scenario in terms of employment impact occurs under national cooperation without energy efficiency. In this case the impact on coal is severe due to the lack of energy efficiency, while national cooperation allows carbon reductions elsewhere in the country to reduce the need for more local use of Wyoming natural gas relative to other scenarios. The result is the worst employment outcome of the four scenarios considered with a reduction in employment of over 3% relative to the number of jobs available in 2012.

The other three scenarios experience little difference in total employment, though the composition of output is different in each case. Those cases that include energy efficiency have more coal production and preserve employment in that sector at the expense of greater expansion of the natural gas sector. In the regional cooperation without energy efficiency case, coal production impact is the most severe of any of the cases considered leading to the greatest coal economy employment losses. Simultaneously however, this is the best case for natural gas output, which leads to the greatest offsetting effect in employment from this sector. Overall, the total effect is similar to the two energy efficiency cases with respect to employment, with reductions in employment across all three scenarios equivalent to a 2.5% to 2.7% reduction in 2012 employment levels despite differences in how the employment declines occur.

Impact of Regulatory Scenarios on State Revenues

Figures 14 and 15 describe the state revenue outcomes for the 111(d) scenarios considered. To isolate the revenue impacts caused by changes in production due to implementation of carbon regulations, changes in revenue relative to the reference case are presented for the years 2016, 2020, 2025 and 2030. As shown previously, the impact of the proposed EPA rules is to reduce coal revenues due to the impact they have on coal production, but also to stimulate gas revenues through the additional natural gas demand the rules create. Total economic activity was shown to decline when carbon regulations are imposed due to the fact that the coal effect dominates the natural gas effect. Figures 5 and 6 in this chapter present the state revenue outcomes for the coal economy alone, and the combined coal and natural gas effects using the same revenue model utilized to derive the Chapter 3 results.[56]

As with the previous economic impact outcomes described, the most favorable tax revenue outcomes from the wider coal economy occur in the cases in which energy efficiency is used as a compliance strategy. This is shown in Figure 14 by comparing tax revenue changes. The worst coal revenue cases continue to be the cases without energy efficiency, which exhibit generally worse revenue outcomes, especially in the later time periods presented.

[56] Coal economy tax revenues and total energy tax revenues are presented in Figures 14 and 15 respectively. Total energy revenues include estimated oil revenues, however these were found not to be sensitive to the regulatory scenario considered.

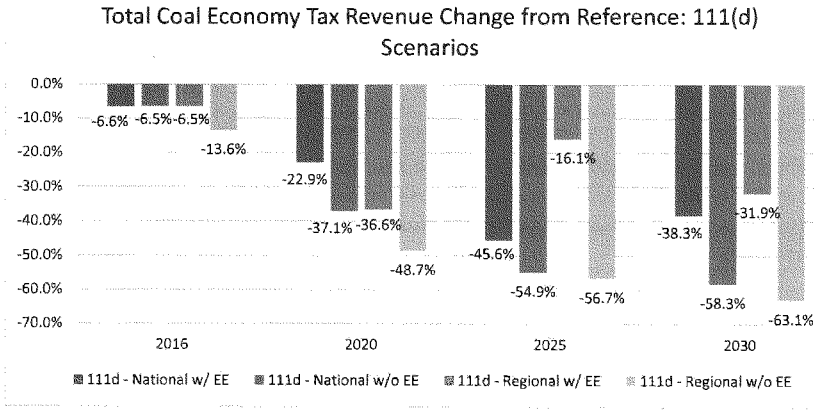


Figure 14: Total Coal Economy Tax Revenue Change from Reference: 111(d) Scenarios

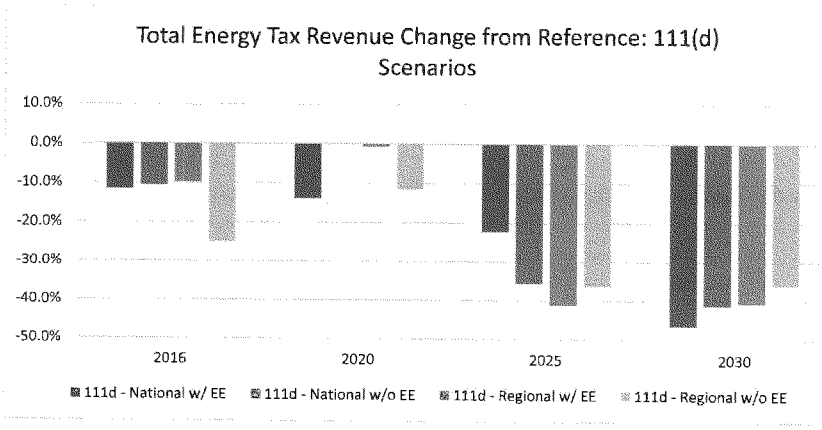


Figure 15: Total Energy Economy Tax Revenue Change from Reference: 111(d) Scenarios

With respect to total energy revenues shown in Figure 15, however, this pattern is reversed. Total energy tax revenues decline in all cases through most years, but the most dramatic declines occur in 2030 in the cases where energy efficiency is allowed. This occurs because of the impact natural

gas revenues have on total revenues, and how natural gas production is affected by the cases considered. In those cases that allow energy efficiency, gas production increases less because coal production is not as dramatically affected by the assumed regulations. With less fuel switching, natural gas revenues are reduced, and therefore tax revenues fall. The fact that these outcomes under the energy efficiency cases are worse for the state reflect the differential rates of tax applied to each commodity. The general finding found previously, however, remains. The increase or stimulative effects that the proposed 111(d) rules might have on natural gas production and therefore the natural gas tax revenues under these regulations do not offset the losses to coal tax revenues due to the regulation. Overall, the imposition of carbon regulation results in a decline in tax revenues to the state relative to the reference case where 111(d) regulations are assumed not to be imposed.

Results shown in Figure 15 pose an interesting dilemma for policymakers in the State. While tax revenue falls in all scenarios, the scenarios in which total revenues are impacted least are often those that are worst for the wider coal economy in terms of jobs and production (for example, the regional cooperation without energy efficiency scenario). If one were to consider the worst long-term revenue outcome for the State in Figure 15, it occurs under conditions of national cooperation and energy efficiency being used. Referring to Figure 13, this worst revenue case is actually the least destructive to the statewide economy of the scenarios considered. Therefore, what is good for the economy may be at odds with the state's revenue interests, especially by the end of the compliance period in 2030. With respect to policy response, from the point of view of the state's revenues and general economy, as seen in the market cases in Chapter 3, what may be optimal for tax revenue may not be optimal for the Wyoming coal economy. This most often occurs for regulatory scenarios that allow energy efficiency, which are typically better for the state economy than they are for tax revenues.

Policy Conclusions

Overall, what Wyoming chooses to do with respect to the use of energy efficiency or statewide cooperation will ultimately have less effect on the Wyoming economy than actions taken by the rest of the nation. Because only 7% of Wyoming coal output is used by utilities in the state, the impact on Wyoming of proposed carbon regulations will be determined by how such carbon regulations affect its coal and natural gas exports to the rest of the country. If the state wishes to protect its coal industry, a sector that produces directly or indirectly over 11% of Wyoming's gross state product, then it should attempt to ensure that energy efficiency is a policy option available and widely utilized by other states, especially by those using Wyoming coal. Furthermore, it should also attempt to ensure that regional cooperation is maximized among states. Both efforts would result in the least impact on the Wyoming coal sector if carbon regulations like those currently proposed by the EPA are implemented.

How policies to meet the proposed rules are implemented also has an impact on state revenues. In contrast to the general economy's interests, those policy choices of greatest importance to the state coal economy, and by extension the state economy as a whole, may result in the greatest decline in state revenue. This suggests that the state may have to decide whether to prioritize state production and employment or its own revenues in deciding how to implement its carbon mitigation strategy. The state should also think carefully about how it may attempt to influence how other states approach their own carbon mitigation strategies.

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Data Sources:

US Environmental Protection Agency (EPA):

EPA new, existing and modified plant rules websites:

http://www2.epa.gov/carbon-pollution-standards/regulatory-actions

General information in the EPA's efforts to reduce carbon:

http://www2.epa.gov/carbon-pollution-standards

Proposed standards published in the Federal Register:

New Plants:

https://www.federalregister.gov/articles/2014/01/08/2013-28668/standards-of-performance-for-greenhouse-gas-emissions-from-new-stationary-sources-electric-utility

Existing Plants:

https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating

Modified and Reconstructed Sources:

https://www.federalregister.gov/articles/2014/06/18/2014-13725/carbon-pollution-standards-for-modified-and-reconstructed-stationary-sources-electric-utility

Technical Support Documents including the EPA's State by State simulation outcomes for possible carbon reductions Strategies

http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents

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Technical Appendices

Appendix

The Appendix includes greater data and analysis detail than presented in the text of the report. Data used in the figures presented in the report, along with greater detail regarding impact estimates is presented in order of the report's chapters.

Appendix A2

Appendix A2 includes additional text prepared for the report. Specifically, it includes a description of previous literature on Wyoming's coal economy in more detail, and a description of Wyoming's coal-fired generation sector, which could be impacted by future carbon regulations, including the EPA's proposed 111(d) rules.

Appendix A3

Appendix A3 documents the assumptions used in the EIA projection scenarios used in Chapter 3.

Appendix:

Wyoming Coal Production and State Revenue Statistics used in Chapter 1

Table 1. Wyoming Coal Production: 1970-2013

Year	Production Short Tons	Price/Ton (Nominal)	Price/Ton (2012$)	Value of Production (Nominal)	Value of Production (2012$)	Employment Jobs
1970	7,039,980	$6.30	$29.01	$44,351,874	$204,211,159	621
1971	7,743,347	$7.13	$31.24	$55,210,064	$241,911,499	727
1972	10,043,161	$7.78	$32.67	$78,135,793	$328,110,958	943
1973	14,272,350	$8.71	$34.69	$124,312,169	$495,070,406	1,179
1974	19,957,726	$16.01	$58.50	$319,523,193	$1,167,626,308	1,411
1975	23,141,105	$19.79	$66.19	$457,962,468	$1,531,676,224	2,038
1976	30,298,432	$20.11	$63.76	$609,301,468	$1,931,757,381	2,511
1977	44,577,218	$20.59	$61.47	$917,844,919	$2,740,043,560	3,314
1978	56,456,133	$22.36	$62.37	$1,262,359,134	$3,521,245,219	3,928
1979	68,792,573	$12.55	$32.34	$863,346,791	$2,224,616,927	5,265
1980	90,527,538	$11.08	$26.19	$1,003,045,121	$2,370,776,450	6,231
1981	98,410,522	$12.18	$26.33	$1,198,640,158	$2,591,196,860	6,015
1982	104,014,096	$12.75	$25.95	$1,326,179,724	$2,699,405,331	5,681
1983	107,902,764	$12.63	$24.73	$1,362,811,909	$2,668,593,255	5,401
1984	125,931,155	$12.41	$23.47	$1,562,805,634	$2,955,384,370	5,336
1985	135,105,204	$11.36	$20.82	$1,534,795,117	$2,812,407,192	5,275
1986	128,145,751	$10.85	$19.49	$1,390,381,398	$2,497,396,893	4,671
1987	132,753,011	$9.80	$17.16	$1,300,979,508	$2,278,694,395	4,423
1988	163,801,374	$9.16	$15.50	$1,500,420,586	$2,539,117,495	4,533
1989	171,140,004	$8.63	$14.06	$1,476,938,235	$2,405,855,856	4,560
1990	184,005,701	$8.43	$13.24	$1,551,168,059	$2,436,618,275	4,623
1991	193,863,806	$8.06	$12.25	$1,562,542,276	$2,375,451,564	4,663
1992	189,470,256	$8.13	$12.08	$1,540,393,181	$2,289,569,742	4,648
1993	209,925,826	$7.12	$10.34	$1,494,671,881	$2,169,976,313	4,562
1994	236,908,067	$6.62	$9.41	$1,568,331,404	$2,229,444,717	4,572
1995	263,938,023	$6.38	$8.88	$1,683,924,587	$2,344,845,894	4,374
1996	278,424,956	$6.15	$8.41	$1,712,313,479	$2,341,616,503	4,398
1997	281,481,516	$5.68	$7.64	$1,598,815,011	$2,149,646,253	4,303
1998	314,962,091	$5.41	$7.20	$1,703,944,912	$2,266,386,599	4,335
1999	336,459,938	$5.19	$6.81	$1,746,227,078	$2,289,934,379	4,606
2000	338,852,148	$5.40	$6.92	$1,829,801,599	$2,346,201,994	4,414
2001	368,878,135	$5.75	$7.21	$2,121,049,276	$2,658,768,666	4,532
2002	373,195,431	$6.66	$8.22	$2,485,481,570	$3,068,409,903	4,684
2003	376,565,247	$6.85	$8.29	$2,579,471,942	$3,122,042,936	4,788
2004	395,725,278	$6.88	$8.10	$2,722,589,913	$3,207,348,494	4,903

Table 1. Wyoming Coal Production: 1970-2013 continued

	Production	Price/Ton	Price/Ton	Value of Production	Value of Production	Employment
2005	404,488,849	$7.88	$8.99	$3,187,372,130	$3,638,186,871	5,330
2006	444,880,617	$9.02	$9.99	$4,012,823,165	$4,443,823,515	6,030
2007	452,134,704	$9.98	$10.77	$4,512,304,346	$4,867,734,946	6,463
2008	466,319,331	$10.09	$10.68	$4,705,162,050	$4,978,550,380	6,760
2009	432,481,322	$10.51	$11.04	$4,545,378,694	$4,772,738,537	6,822
2010	442,061,036	$12.47	$12.94	$5,512,501,119	$5,718,979,582	6,869
2011	438,380,012	$13.28	$13.51	$5,821,686,559	$5,923,397,825	7,004
2012	401,457,074	$14.34	$14.34	$5,758,367,789	$5,758,367,789	6,902
2013	387,995,072	$13.43	$13.21	$5,210,773,817	$5,126,553,471	6,516

Source: Various

Table 2. Wyoming State and Local Government Coal Revenue & Distributions- FY2012

Type	Amount	State	Local Govt	Education
Ad Valorem - Production	$256,803,632	$0	$64,766,236	$192,037,396
Severance Taxes	$297,529,638	$288,055,423	$9,474,215	$0
Federal Mineral Royalties	$290,865,387	$168,314,431	$10,940,086	$111,610,870
Ad Valorem - Property	$28,494,612	$0	$7,155,774	$21,338,839
Sales and Use Taxes	$32,116,566	$16,110,077	$16,006,489	$0
State Rents & Royalties	$62,692,701	$62,692,701	$0	$0
Coal Lease Bonus Payments	$145,329,794	$1,875,000	$5,625,000	$137,829,795
Abandoned Mine Lands Distributions (1)	$150,018,677	$131,168,677	$0	$18,850,000
Total Government Revenue	$1,263,851,007	$668,216,310	$113,967,799	$481,666,899
Percent		52.9%	9.0%	38.1%

(1) Includes AML "prior balance replacement funds"

Source: Concise Guide to Wyoming Coal

Table 3. Wyoming State and Local Government Coal Revenue: 2003-2013

Type	2003	2004	2005	2006
Severance Taxes	$122,317,716	$129,288,833	$142,749,359	$159,518,200
Federal Mineral Royalties	$160,538,396	$157,080,983	$173,175,513	$193,774,658
Ad Valorem - Production	$105,309,581	$109,519,807	$121,049,585	$135,448,194
Abandoned Mine Lands (1)	$29,305,188	$30,320,649	$29,469,486	$29,469,486
Federal Mineral Bonus Payments	$74,027,873	$47,268,222	$216,875,806	$169,803,329
Sales and Use Taxes	$30,125,220	$31,658,022	$32,359,109	$35,590,449
Ad Valorem - Property	$10,660,280	$10,930,031	$12,623,178	$12,777,329
State Rents & Royalties	$2,025,958	$627,795	$6,332,601	$7,276,526
Total S/L Government Revenue	$534,310,212	$516,694,343	$734,634,636	$743,658,171

Type	2007	2008	2009	2010
Severance Taxes	$201,699,897	$228,415,835	$261,614,042	$266,819,130
Federal Mineral Royalties	$218,340,926	$268,040,035	$292,578,495	$293,501,279
Ad Valorem - Production	$173,394,725	$198,178,407	$222,025,920	$230,576,515
Abandoned Mine Lands (1)	$30,471,022	$82,700,759	$100,783,068	$117,352,070
Federal Mineral Bonus Payments	$169,803,329	$170,045,991	$208,916,391	$47,222,161
Sales and Use Taxes	$36,170,776	$37,305,546	$34,598,506	$35,364,883
Ad Valorem - Property	$17,215,997	$20,259,156	$24,215,757	$24,667,154
State Rents & Royalties	$41,758,438	$35,629,666	$51,222,918	$35,923,907
Total S/L Government Revenue	$888,855,111	$1,040,575,395	$1,195,955,097	$1,051,427,099

Type	2011	2012	2013
Severance Taxes	$284,711,738	$297,529,638	$288,487,852
Federal Mineral Royalties	$319,640,528	$290,865,387	$259,252,342
Ad Valorem - Production	$246,002,072	$256,803,632	$251,614,091
Abandoned Mine Lands (1)	$133,062,524	$150,018,677	$14,235,000
Federal Mineral Bonus Payments	$47,222,006	$145,329,794	$237,467,799
Sales and Use Taxes	$35,070,401	$32,116,566	$31,039,606
Ad Valorem - Property	$24,667,154	$28,494,612	$30,320,850
State Rents & Royalties	$14,304,776	$62,692,701	$39,357,566
Total S/L Government Revenue	$1,104,681,199	$1,263,851,007	$1,151,775,105

(1) Includes AML "prior balance replacement funds" for 2008 through 2012. AML payments were capped at $15 million by Congress after 2012.

Source: Concise Guide to Wyoming Coal

Table 4: Summary of Estimated WY State and Local Government Revenue from Coal- 2012 (Data used in Figure 6, Chapter 1)

Type	Amount	%	State	Local Government	Education	Total
Ad Valorem - Production	$256,803,632	20.3%	$0	$64,766,236	$192,037,396	$256,803,632
Severance Taxes	$297,529,638	23.5%	$288,055,423	$9,474,215	$0	$297,529,638
Federal Mineral Royalties	$290,865,387	23.0%	$168,314,431	$10,940,086	$111,610,870	$290,865,387
Ad Valorem - Property	$28,494,612	2.3%	$0	$7,155,774	$21,338,839	$28,494,612
Sales and Use Taxes	$32,116,566	2.5%	$16,110,077	$16,006,489	$0	$32,116,566
State Rents & Royalties	$62,692,701	5.0%	$62,692,701	$0	$0	$62,692,701
Coal Lease Bonus Payments	$145,329,794	11.5%	$1,875,000	$5,625,000	$137,829,795	$145,329,795
Abandoned Mine Lands Distributions (1)	$150,018,677	11.9%	$141,168,677	$0	$8,850,000	$150,018,677
Total Government Revenue	$1,263,851,007	100.0%	$678,216,310	$113,967,799	$471,666,899	$1,263,851,008
			53.7%	9.0%	37.3%	100.0%

Source: Concise Guide to Wyoming Coal

(1) Includes AML "prior balance replacement funds" were to end in 2014. AML payments were capped at $15 million in 2013 by Congress. Total Wyoming government revenue in 2012 was approximately $11.3 billion.

Table 5: Wyoming Mine Detailed Characteristics

Company	Mine	County	Type	Employees	Production	Production/ Employee
Alpha Coal West	Belle Ayr	Campbell	Surface	346	24,227,846	70,023
Alpha Coal West	Eagle Butte	Campbell	Surface	305	22,466,733	73,661
Buckskin Mining	Buckskin	Campbell	Surface	381	18,058,827	47,398
Cloud Peak	Cordero Rojo	Campbell	Surface	628	39,204,737	62,428
Peabody	Cordero	Campbell	Surface	277	16,841,183	60,798
Peabody	North Antelope/Rochelle	Campbell	Surface	1,368	107,639,188	78,684
Peabody	Rawhide	Campbell	Surface	211	14,721,376	69,770
Thunder Basin	Black Thunder	Campbell	Surface	1,635	93,083,524	56,932
Thunder Basin	Coal Creek	Campbell	Surface	145	7,564,231	52,167
Western Fuels	Dry Fork	Campbell	Surface	77	6,006,787	78,010
Wyodak	Wyodak	Campbell	Surface	80	4,245,981	53,075
Arch of Wyoming	Elk Mountain	Carbon	Surface	1	786	786
Arch of Wyoming	Seminoe II	Carbon	Surface	10	0	0
Cloud Peak	Antelope	Converse	Surface	536	34,316,314	64,023
Grass Creek	Grass Creek	Hot Springs	Surface	4	24,040	6,010
Westmoreland	Kemmerer	Lincoln	Surface	281	4,659,485	16,582
Black Butte Coal	Black Butte	Sweetwater	Surface	194	2,871,825	14,803
Bridger Coal	Bridger	Sweetwater	Underground	216	4,636,557	21,466
Bridger Coal	Bridger	Sweetwater	Surface	189	887,654	4,697
Haystack Coal	Haystack	Uinta	Surface	18	0	0
Total				**6,902**	**401,457,074**	**58,165**
Powder River Basin				5,989	388,376,727	64,848
Other				913	13,080,347	14,327

Industry Output	Production (tons)	Price/ton	Revenue	
Surface	396,820,517	$14.15	$5,616,597,598	97.5%
Underground	4,636,557	$30.58	$141,776,640	2.5%
Total	401,457,074	$14.34	$5,758,374,238	100.0%

Wyoming Coal Economy Economic Impact Estimates Presented in Chapter 2

Table 6: Economic Impact of WY Coal Industry - 2012

	Coal Mining	Railroad Hauling	Electrical Generation	Total Impact	Coal Per MTon
Tons	401,457,074				1,000
Output					
Direct	$5,758,374,238	$730,341,681	$1,333,034,814	$7,821,750,733	$19,483.40
Indirect	$762,534,381	$159,409,693	$168,784,854	$1,090,728,928	$2,716.93
Induced	$543,735,177	$111,722,639	$90,552,257	$746,010,073	$1,858.26
Total	$7,064,643,796	$1,001,474,013	$1,592,371,925	$9,658,489,734	$24,058.59
Multiplier	1.23	1.37	1.19	1.23	1.23
Employment					
Direct	6,902.0	1,655	1,132	9,689	0.024135
Indirect	4,121.3	1,242	1,191	6,554	0.016326
Induced	5,016.9	1,031	854	6,902	0.017193
Total	16,040.2	3,928	3,177	23,145	0.057653
Multiplier	2.32	2.37	2.81	2.39	2.39
Labor Income					
Direct	$944,903,650	$183,178,780	$141,879,556	$1,269,961,986	$3,163.38
Indirect	$228,442,073	$59,892,024	$60,290,024	$348,624,121	$868.40
Induced	$179,997,006	$36,985,793	$30,336,968	$247,319,767	$616.06
Total	$1,353,342,729	$280,056,597	$232,506,548	$1,865,905,874	$4,647.83
Multiplier	1.43	1.53	1.64	1.47	1.47
Value Added					
Direct	$3,999,991,672	$365,404,300	$486,189,669	$4,851,585,641	$12,084.94
Indirect	$390,412,831	$84,365,714	$82,839,243	$557,617,788	$1,388.98
Induced	$334,150,276	$68,658,246	$55,634,492	$458,443,014	$1,141.95
Total	$4,724,554,779	$518,428,260	$624,663,404	$5,867,646,443	$14,615.88
Multiplier	1.18	1.42	1.28	1.21	1.21
Average Earnings Per Job					
Direct	$136,903	$110,682	$125,335	$131,073	$131,073
Indirect	$55,430	$48,211	$50,642	$53,192	$53,192
Induced	$35,878	$35,874	$35,512	$35,832	$35,832
Total	$84,372	$71,292	$73,190	$80,617	$80,617
			WY Total	**Coal Economy**	**% Coal**
Total Employment			392,348	23,145	5.9%
Total Labor Income			$20,114,143,000	$1,865,905,874	9.3%
Gross State Product			$41,839,000,000	$5,867,646,443	14.0%

Table 7: Economic Impact of PRB Coal Industry - 2012

	Coal Mining	Railroad Hauling	Electrical Generation	Total Impact	Coal MTons
Tons	388,376,727				1,000
Output					
Direct	$5,497,084,194	$730,341,681	$755,976,869	$6,983,402,744	$17,981.00
Indirect	$564,505,487	$115,527,479	$75,860,513	$755,893,479	$1,946.29
Induced	$348,220,326	$78,184,126	$37,728,442	$464,132,894	$1,195.06
Total	$6,409,810,007	$924,053,286	$869,565,823	$8,203,429,116	$21,122.35
Multiplier	1.17	1.27	1.15	1.17	1.17
Employment					
Direct	5,989.0	1,611.8	642.0	8,243	0.021224
Indirect	3,037.6	966.6	579.7	4,584	0.011803
Induced	3,313.2	744.0	367.8	4,425	0.011394
Total	12,339.8	3,322.4	1,589.4	17,252	0.044420
Multiplier	2.06	2.06	2.48	2.09	2.09
Labor Income					
Direct	$819,911,469	$178,397,099	$84,316,456	$1,082,625,024	$2,787.56
Indirect	$166,378,919	$43,917,525	$26,067,943	$236,364,387	$608.60
Induced	$108,950,004	$24,462,587	$11,939,990	$145,352,581	$374.26
Total	$1,095,240,392	$246,777,211	$122,324,389	$1,464,341,992	$3,770.42
Multiplier	1.34	1.38	1.45	1.35	1.35
Value Added					
Direct	$3,795,994,591	$360,453,020	$279,590,044	$4,436,037,655	$11,422.00
Indirect	$289,883,592	$60,484,064	$35,700,448	$386,068,104	$994.06
Induced	$217,230,314	$48,773,092	$23,536,359	$289,539,765	$745.51
Total	$4,303,108,497	$469,710,176	$338,826,852	$5,111,645,525	$13,161.56
Multiplier	1.13	1.30	1.21	1.15	1.15
Average Earnings Per Job					
Direct	$136,903	$110,682	$131,334	$131,342	$131,342
Indirect	$54,773	$45,435	$44,971	$51,565	$51,565
Induced	$32,884	$32,880	$32,466	$32,848	$32,848
Total	$88,757	$74,277	$76,961	$84,881	$84,881

	Regional	Coal	Coal %	Coal Economy	Coal Economy%
Total Employment	84,241	5,989.0	7.1%	17,252	20.5%
Total Labor Income	$4,347,582,000	$819,911,469	18.9%	$1,464,341,992	33.7%

Table 8: Economic Impact of Southwest Coal Industry - 2012

	Coal Mining	Electrical Generation	Total Impact	Coal MTons
Tons	13,056,307			1,000
Output				
Direct	$394,444,633	$577,057,945	$971,502,578	$74,408.68
Indirect	$57,037,835	$52,785,756	$109,823,591	$8,411.54
Induced	$44,993,854	$24,696,332	$69,690,186	$5,337.66
Total	$496,476,322	$654,540,033	$1,151,016,355	$88,157.88
Multiplier	1.26	1.13	1.18	1.18
Employment				
Direct	909.0	490.0	1,399.0	0.107151
Indirect	280.9	388.1	669.0	0.051239
Induced	428.9	242.2	671.1	0.051403
Total	1,618.8	1,120.3	2,739.1	0.209793
Multiplier	1.78	2.29	1.96	1.96
Labor Income				
Direct	$124,444,709	$61,617,598	$186,062,307	$14,250.76
Indirect	$16,880,215	$18,777,510	$35,657,725	$2,731.07
Induced	$13,473,168	$7,493,714	$20,966,882	$1,605.88
Total	$154,798,092	$87,888,821	$242,686,913	$18,587.71
Multiplier	1.24	1.43	1.30	1.30
Value Added				
Direct	$198,028,925	$210,659,694	$408,688,619	$31,302.01
Indirect	$29,598,001	$24,441,065	$54,039,066	$4,138.92
Induced	$28,060,469	$15,404,670	$43,465,139	$3,329.05
Total	$255,687,395	$250,505,428	$506,192,823	$38,769.98
Multiplier	1.29	1.19	1.24	1.24
Average Earnings Per Job				
Direct	$136,903	$125,750	$132,997	$132,997
Indirect	$60,093	$48,384	$53,301	$53,301
Induced	$31,413	$30,936	$31,241	$31,241
Total	$95,625	$78,449	$88,600	$88,600

	Regional	Coal	Coal %	Coal Economy	Coal Economy%
Total Employment	64,048	909	1.4%	2,739	4.3%
Total Labor Income	$3,919,310,000	$124,444,709	3.2%	$242,686,913	6.2%

Wyoming Coal Export Impacts Presented in Chapter 2

Table 9: Potential Economic Impact of Coal Exports in the PRB

	Additional Coal Exports		
Tons Exported Annually	100,000,000	50,000,000	25,000,000
Output			
Direct	$1,603,449,806	$801,724,903	$400,862,451
Indirect	$175,096,220	$87,548,110	$43,774,055
Induced	$109,791,453	$54,895,727	$27,447,863
Total	$1,888,337,478	$944,168,739	$472,084,370
Employment			
Direct	1,957.1	978.5	489.3
Indirect	1,031.0	515.5	257.8
Induced	1,044.7	522.3	261.2
Total	4,032.7	2,016.4	1,008.2
Labor Income			
Direct	$257,046,445	$128,523,222	$64,261,611
Indirect	$54,147,541	$27,073,770	$13,536,885
Induced	$34,351,336	$17,175,668	$8,587,834
Total	$345,545,320	$172,772,660	$86,386,330
Value Added			
Direct	$1,070,210,268	$535,105,134	$267,552,567
Indirect	$90,213,350	$45,106,675	$22,553,338
Induced	$68,491,078	$34,245,539	$17,122,769
Total	$1,228,914,696	$614,457,348	$307,228,674

	Regional	**100,000,000**	**50,000,000**	**25,000,000**
Total Employment	84,241	4,032.7	2,016.4	1,008.2
Percentage increase		4.8%	2.4%	1.2%
Total Labor Income	$4,347,582,000	$345,545,320	$172,772,660	$86,386,330
Percentage increase		8.0%	4.0%	2.0%

Table 10: Potential Economic Impact of Coal Exports Statewide

	Additional Coal Exports		
Tons Exported Annually	100,000,000	50,000,000	25,000,000
Output			
Direct	$1,616,239,340	$808,145,670	$404,072,835
Indirect	$229,649,478	$114,824,739	$57,412,369
Induced	$163,269,714	$81,634,857	$40,817,428
Total	$2,009,210,531	$1,004,605,266	$502,302,633
Employment			
Direct	2,131	1,066	533
Indirect	1,336	668	334
Induced	1,506	753	377
Total	4,974	2,487	1244
Labor Income			
Direct	$280,997,024	$140,498,512	$70,249,256
Indirect	$71,821,900	$35,910,950	$17,955,475
Induced	$54,048,817	$27,024,408	$13,512,204
Total	$406,867,740	$203,433,870	$101,716,935
Value Added			
Direct	$1,087,387,981	$543,693,991	$271,846,995
Indirect	$118,263,838	$59,131,919	$29,565,960
Induced	$100,336,636	$50,168,318	$25,084,159
Total	$1,305,988,455	$652,994,228	$326,497,114

	Statewide	**100,000,000**	**50,000,000**	**25,000,000**
Total Employment	392,348	4,974	2,487	1,244
Percentage increase		1.3%	0.6%	0.3%
Total Labor Income	$20,114,143,000	$406,867,740	$203,433,870	$101,716,935
Percentage increase		2.0%	1.0%	0.5%
Gross State Product	$41,839,000,000	$1,305,988,455	$652,994,228	$326,497,114
Percentage increase		3.1%	1.6%	0.7%

Fundamental Market Risk Data Presented in Chapter 3

Table 11: Summary of Outcomes for Fundamental Coal Market Projections

Percent Changes from 2012

Reference Case

Millions, Short Tons

Production	2016	2020	2025	2030	Average Production: 2012-2030	2030 Production
Reference	3.8%	8.4%	13.3%	12.1%	434.5	450.1
High Coal Cost	-2.0%	-2.1%	-7.2%	-20.5%	377.4	319.3
Low Coal Cost	7.0%	15.0%	21.0%	21.9%	457.0	489.2
High Econ	5.6%	12.1%	14.3%	16.0%	443.7	465.6
Low Econ	1.4%	7.4%	11.1%	7.8%	426.8	432.7
Hi Gas Res	-4.3%	4.7%	7.7%	4.1%	413.8	418.0
Low Gas Res	6.2%	12.1%	17.4%	15.5%	446.7	463.5
Low Oil Price	6.3%	9.3%	17.2%	16.2%	444.7	466.4

(2012 dollars)

Coal Price	2016	2020	2025	2030	Average Price: 2012-2030	2030 Price
Reference	20.5%	37.0%	56.7%	74.0%	19.7	24.7
High Coal Cost	33.8%	76.3%	141.6%	215.7%	27.7	44.9
Low Coal Cost	8.6%	6.7%	0.4%	-9.0%	14.5	12.9
High Econ	21.4%	37.4%	57.6%	75.3%	19.9	24.9
Low Econ	19.7%	37.5%	56.5%	73.8%	19.8	24.7
Hi Gas Res	19.6%	34.7%	52.3%	66.5%	19.3	23.7
Low Gas Res	21.0%	38.8%	60.1%	77.6%	20.0	25.3
Low Oil Price	16.7%	32.6%	50.2%	66.7%	19.1	23.7

Billions, 2012 dollars

Coal Revenue	2016	2020	2025	2030	Average Revenue: 2012-2030	2030 Revenue
Reference	25.2%	48.5%	77.6%	95.1%	8.6	11.1
High Coal Cost	31.2%	72.5%	124.1%	151.1%	10.2	14.3
Low Coal Cost	16.2%	22.6%	21.5%	10.9%	6.6	6.3
High Econ	28.2%	54.1%	80.2%	103.3%	8.9	11.6
Low Econ	21.3%	47.7%	73.9%	87.3%	8.5	10.7
Hi Gas Res	14.5%	41.0%	63.9%	73.4%	8.0	9.9
Low Gas Res	28.5%	55.6%	88.0%	105.1%	9.0	11.7
Low Oil Price	24.1%	44.9%	76.0%	93.7%	8.6	11.1

Table 12: Summary of Employment Impacts by Region and Scenario

Statewide
Employment changes relative to 2012

	2016	**2020**	**2025**	**2030**
Reference Case	0.2%	0.5%	0.8%	0.7%
High Economic Growth	0.3%	0.7%	0.8%	0.9%
Low Economic Growth	0.1%	0.4%	0.7%	0.5%
High Coal Costs	-0.1%	-0.1%	-0.4%	-1.2%
Low Coal Costs	0.4%	0.9%	1.2%	1.3%
High Gas Resource	-0.3%	0.3%	0.5%	0.2%
Low Gas Resource	0.4%	0.7%	1.0%	0.9%
Low Oil Prices	0.4%	0.6%	1.0%	1.0%

Powder River Basin Region
Employment changes relative to 2012

	2016	2020	2025	2030
Reference Case	0.7%	1.7%	2.8%	2.8%
High Economic Growth	1.0%	2.5%	3.0%	3.6%
Low Economic Growth	0.2%	1.5%	2.3%	1.9%
High Coal Costs	-0.5%	-0.5%	-1.5%	-4.0%
Low Coal Costs	1.3%	3.0%	4.4%	4.8%
High Gas Resource	-1.0%	0.9%	1.6%	1.1%
Low Gas Resource	1.2%	2.5%	3.6%	3.5%
Low Oil Prices	1.2%	1.9%	3.6%	3.6%

Southwest Region
Employment changes relative to 2012

	2016	2020	2025	2030
Reference Case	0.9%	0.3%	0.2%	-1.4%
High Economic Growth	0.8%	0.3%	0.2%	-1.4%
Low Economic Growth	0.7%	0.4%	0.2%	-1.4%
High Coal Costs	0.4%	0.0%	-0.1%	-1.8%
Low Coal Costs	1.0%	0.7%	0.5%	-0.9%
High Gas Resource	0.5%	0.3%	0.3%	-1.4%
Low Gas Resource	0.9%	0.4%	0.4%	-1.3%
Low Oil Prices	0.9%	0.5%	0.3%	-1.3%

Table 13: Contribution to Gross State Product (Value Added) Impacts by Market Case
Note: Defined relative to 2012 gross state product

	2016	2020	2025	2030
Reference Case	0.5%	1.2%	1.9%	1.7%
High Economic Growth	0.8%	1.7%	2.0%	2.2%
Low Economic Growth	0.2%	1.0%	1.6%	1.1%
High Coal Costs	-0.3%	-0.3%	-1.0%	-2.9%
Low Coal Costs	1.0%	2.1%	2.9%	3.1%
High Gas Resource	-0.6%	0.7%	1.1%	0.6%
Low Gas Resource	0.9%	1.7%	2.4%	2.2%
Low Oil Prices	0.9%	1.3%	2.4%	2.3%

Regulatory Impacts: Impacts of Proposed 111(d) Presented in Chapter 4

Table 14: Summary of Coal Outcomes for Regulatory Scenarios

	Percent Changes from 2012 Reference Case				Millions Short Tons	
Production	**2016**	**2020**	**2025**	**2030**	**Average Production: 2012-2030**	**2030 Production**
Reference	1.3%	9.4%	10.7%	10.9%	434	445
National Cooperation w/EE	-4.8%	-13.2%	-31.5%	-19.9%	343	322
National Cooperation w/o EE	-8.6%	-30.3%	-44.0%	-45.0%	296	221
Regional Cooperation w/ EE	-8.8%	-30.5%	-32.2%	-33.2%	321	268
Regional Cooperation w/o EE	-11.1%	-40.2%	-42.2%	-48.0%	293	209
					(2012 Dollars)	
Coal Price	**2016**	**2020**	**2025**	**2030**	**Average Price: 2012-2030**	**2030 Price**
Reference	20.1%	37.0%	55.6%	72.9%	20	25
National Cooperation w/EE	20.8%	33.3%	39.5%	51.6%	18	22
National Cooperation w/o EE	20.5%	29.9%	31.3%	35.4%	18	19
Regional Cooperation w/ EE	20.8%	30.8%	37.0%	44.2%	18	21
Regional Cooperation w/o EE	19.9%	29.5%	30.6%	36.3%	18	19
					Billions, 2012 Dollars	
Coal Revenue	**2016**	**2020**	**2025**	**2030**	**Average Revenue: 2012-2030**	**2030 Revenue**
Reference	21.7%	49.9%	72.2%	91.7%	8.6	10.9
National Cooperation w/EE	15.1%	15.7%	-4.4%	21.5%	6.2	6.9
National Cooperation w/oEE	10.2%	-9.5%	-26.4%	-25.5%	5.1	4.2
Regional Cooperation w/ EE	10.2%	-9.2%	-7.1%	-3.7%	5.7	5.5
Regional Cooperation w/o EE	6.6%	-22.6%	-24.4%	-29.1%	5.0	4.0

Table 15: Summary of Coal Employment Impacts by Region and Scenario

Statewide
Employment changes relative to 2012

	2016	2020	2025	2030
Reference	0.1%	0.6%	0.6%	0.6%
National Cooperation w/EE	-0.3%	-0.8%	-1.9%	-1.2%
Regional Cooperation w/ EE	-0.5%	-1.8%	-1.9%	-2.0%
National Cooperation w/o EE	-0.5%	-1.8%	-2.6%	-2.7%
Regional Cooperation w/o EE	-0.7%	-2.4%	-2.5%	-2.8%

Powder River Basin Region
Employment changes relative to 2012

	2016	2020	2025	2030
Reference	0.2%	1.9%	2.2%	2.6%
National Cooperation w/EE	-1.1%	-2.8%	-6.7%	-3.9%
Regional Cooperation w/EE	-2.0%	-6.4%	-6.8%	-6.7%
National Cooperation w/o EE	-1.9%	-6.3%	-9.2%	-9.2%
Regional Cooperation w/o EE	-2.5%	-8.4%	-8.9%	-9.8%

Southwest Region
Employment changes relative to 2012

	2016	2020	2025	2030
Reference	0.5%	0.3%	0.2%	-1.5%
National Cooperation w/EE	0.8%	0.1%	0.0%	-1.9%
Regional Cooperation w/EE	0.8%	-0.3%	-0.1%	-1.8%
National Cooperation w/o EE	0.5%	-0.5%	-0.9%	-2.1%
Regional Cooperation w/o EE	0.1%	-0.1%	-0.1%	-0.3%

Table 16: Contribution to Gross State Product (Value Added) by Scenario - Coal Effects only
Note: Defined relative to 2012 Gross State Product

	2016	2020	2025	2030
Reference	0.2%	1.3%	1.5%	1.5%
National Cooperation w/EE	-0.7%	-1.9%	-4.4%	-2.8%
Regional Cooperation w/ EE	-1.2%	-4.3%	-4.5%	-4.7%
National Cooperation w/o EE	-1.2%	-4.2%	-6.2%	-6.3%
Regional Cooperation w/o EE	-1.6%	-5.6%	-5.9%	-6.7%

Table 17: Summary of Natural Gas Outcomes for Regulatory Scenarios

	Percent Changes from 2012 Reference Case				Trillion cubic feet	
Production	**2016**	**2020**	**2025**	**2030**	**Average Production: 2012-2030**	**2030 Production**
Reference	0.8%	13.5%	23.3%	38.7%	2.31	2.78
National Cooperation w/EE	2.1%	15.8%	28.7%	34.7%	2.34	2.70
National Cooperation w/o EE	2.4%	21.3%	35.2%	40.2%	2.43	2.81
Regional Cooperation w/ EE	3.4%	20.8%	30.8%	38.4%	2.38	2.78
Regional Cooperation w/o EE	3.3%	24.2%	36.6%	45.3%	2.44	2.91
					(2012 Dollars)	
Gas Price	**2016**	**2020**	**2025**	**2030**	**Average Price: 2012-2030**	**2030 Price**
Reference	23.4%	57.9%	75.1%	92.9%	3.83	4.77
National Cooperation w/EE	30.4%	66.4%	75.1%	83.6%	3.89	4.54
National Cooperation w/o EE	31.8%	99.3%	74.1%	115.7%	4.16	5.33
Regional Cooperation w/ EE	36.4%	93.6%	56.6%	97.6%	3.88	4.89
Regional Cooperation w/o EE	35.7%	120.7%	73.9%	121.9%	4.18	5.49
					Billions 2012 Dollars	
Gas Revenue	**2016**	**2020**	**2025**	**2030**	**Average Revenue: 2012-2030**	**2030 Revenue**
Reference	24.3%	79.3%	115.8%	167.6%	9.0	13.28
National Cooperation w/EE	33.1%	92.7%	125.3%	147.3%	9.2	12.27
National Cooperation w/o EE	35.0%	141.7%	135.4%	202.4%	10.3	15.00
Regional Cooperation w/ EE	41.0%	133.8%	104.8%	173.3%	9.4	13.56
Regional Cooperation w/o EE	40.2%	174.1%	137.6%	222.4%	10.4	16.00

Table 18: Summary of Combined Coal and Gas Employment Impacts by Region and Scenario

Statewide
Employment changes relative to 2012

	2016	2020	2025	2030
National Cooperation w/EE	0.0%	1.6%	2.4%	4.0%
Regional Cooperation w/EE	0.0%	1.3%	2.7%	3.7%
National Cooperation w/o EE	-0.2%	1.4%	2.6%	3.3%
Regional Cooperation w/o EE	-0.2%	1.2%	2.9%	3.9%

Powder River Basin Region
Employment changes relative to 2012

	2016	2020	2025	2030
National Cooperation w/EE	-0.9%	-0.8%	-3.1%	0.4%
Regional Cooperation w/EE	-1.5%	-3.8%	-3.0%	-1.9%
National Cooperation w/o EE	-1.6%	-3.7%	-4.8%	-4.2%
Regional Cooperation w/o EE	-2.1%	-5.4%	-4.3%	-4.2%

Southwest Region
Employment changes relative to 2012

	2016	2020	2025	2030
National Cooperation w/EE	1.2%	3.1%	5.5%	4.8%
Regional Cooperation w/EE	1.4%	3.7%	5.8%	5.6%
National Cooperation w/o EE	1.0%	3.6%	5.9%	5.6%
Regional Cooperation w/o EE	1.5%	4.1%	6.6%	6.6%

Table 19: Contribution to Gross State Product (Value Added) by Scenario - Combined Coal and Gas Effects
Note: Defined relative to 2012 Gross State Product

	2016	2020	2025	2030
National Cooperation w/EE	-0.1%	2.3%	3.1%	6.3%
Regional Cooperation w/EE	-0.3%	1.2%	3.6%	5.4%
National Cooperation w/o EE	-0.6%	1.3%	3.1%	4.2%
Regional Cooperation w/o EE	-0.7%	0.7%	3.7%	5.2%

Table 20: Production changes Caused by Regulatory Assumptions for Coal and Natural Gas

Coal Production Changes relative to AEO Reference Case in the same Year

	(Change - million short tons)				Percentage Change from Reference			
	2016	**2020**	**2025**	**2030**	**2016**	**2020**	**2025**	**2030**
111d - National w/ EE	-34	-87	-180	-128	-8.3%	-19.9%	-39.6%	-28.5%
111d - National w/o EE	-50	-155	-230	-229	-11.9%	-35.7%	-50.6%	-50.9%
111d - Regional w/ EE	-51	-156	-183	-182	-12.1%	-35.9%	-40.2%	-40.4%
111d - Regional w/o EE	-60	-195	-223	-241	-14.4%	-44.8%	-49.0%	-53.6%

Gas Production Changes relative to AEO Reference Case in the same Year

	(Change - trillion cubic feet)				Percentage Change from Reference			
	2016	**2020**	**2025**	**2030**	**2016**	**2020**	**2025**	**2030**
111d - National w/ EE	0.027	0.047	0.108	-0.080	1.3%	2.1%	4.4%	-2.9%
111d - National w/o EE	0.033	0.156	0.239	0.031	1.6%	6.9%	9.7%	1.1%
111d - Regional w/ EE	0.053	0.146	0.150	-0.007	2.6%	6.4%	6.1%	-0.2%
111d - Regional w/o EE	0.051	0.215	0.267	0.133	2.5%	9.4%	10.8%	4.8%

Table 21: Computed Statewide Employment Impacts for Production Changes

Coal Economy Impacts

	(Change - Employment total)				Percentage Change from 2012 Employment			
	2016	**2020**	**2025**	**2030**	**2016**	**2020**	**2025**	**2030**
111d - National w/ EE	-1989	-4999	-10374	-7400	-0.5%	-1.3%	-2.6%	-1.9%
111d - National w/o EE	-2870	-8955	-13259	-13220	-0.7%	-2.3%	-3.4%	-3.4%
111d - Regional w/ EE	-2915	-9013	-10535	-10493	-0.7%	-2.3%	-2.7%	-2.7%
111d - Regional w/o EE	-3454	-11248	-12839	-13911	-0.9%	-2.9%	-3.3%	-3.5%

Natural Gas Impacts

	(Change - Employment total)				Percentage Change from 2012 Employment			
	2016	**2020**	**2025**	**2030**	**2016**	**2020**	**2025**	**2030**
111d - National w/ EE	771	1354	3130	-2327	0.2%	0.3%	0.8%	-0.6%
111d - National w/o EE	946	4529	6927	885	0.2%	1.2%	1.8%	0.2%
111d - Regional w/ EE	1547	4221	4338	-196	0.4%	1.1%	1.1%	0.0%
111d - Regional w/o EE	1473	6211	7741	3838	0.4%	1.6%	2.0%	1.0%

Appendix A2:

A2. 1 PREVIOUS STUDIES OF THE ECONOMIC ROLE OF COAL IN WYOMING'S ECONOMY

Previous studies of the impact of coal on Wyoming's economy can be classified by their methodology and emphasis. The first type focuses on an historical narrative, describing the development of the coal industry in Wyoming, associated industries such as the railroad, and their impact on Wyoming's development. Coal has played an important role in Wyoming's economy since the late 1800's. The most recent historical economic survey was conducted by Foulke, *et al.* (2002), and was revised as Foulke, *et al.* (2013). The studies focus on the role of coal in the economic development and settlement patterns in Wyoming between 1865 to the present. The coal industry's history in Wyoming is divided into two distinct periods with a short transition period between. The authors of these studies define the first period as the Rail Era (1865-1954), when coal was primarily mined in underground mines for use as fuel in railroads. This period ended in the mid-1950s with the demise of the steam locomotive. After what they refer to as a transition period in which coal production hit a post-war production and employment low, they define the Energy Era (1969-2002) as a period of resurgence extending until today. During this period coal was and still is primarily produced from surface mines and mostly shipped via rail to power plants in other states to generate electricity. During this last era, Wyoming coal production rose from under 1% of the nation's output to over 40% by 2010, and the state became the largest coal producing state in the country.

The second type of study has focused on the recent past since 1970 and considered the impact Wyoming coal production has had on the state of Wyoming's economy, and on the national economy as the country's largest source of generation fuel. During this period the State's economic relationship to coal mining has been driven primarily by demand for fuel for electric power production. Nationally, in 2012 coal generated 37% of electric power, and in 2012 Wyoming accounted for 39% of all coal mined in the country. Wyoming coal was exported to 34 states in 2012, and within the state, coal powered 24 individual coal-fired generating units across twelve plants, and another three industrial generating units not connected to the power grid. At seven plants in the state, conveyor systems at the mine-mouth transport coal to co-located power plants. Wyoming coal is also exported internationally to Asia and to Europe. Current negotiations by industry are underway to expand this capacity.

In this second set of studies, the benefits of coal as a low cost and abundant energy supplier are contrasted with ongoing national policy debates with respect to pollution and greenhouse gas emissions. Coal prices generally tend to be lower than other fossil fuels for electricity production. Current policy debates at the national level juxtapose this benefit/cost dichotomy. Ellerman *et al.* (2000) and Gerking and Hamilton (2008) evaluate the effect of PRB coal utilization in the presence

of both air pollution regulation and imperfect competition in the transportation market (rail) that coal depends upon. The authors ask whether greater use of PRB coal has occurred since the 1970s because of the low sulfur content in PRB coal and its favorable cost benefits in meeting air pollution standards, or whether this expansion in the use of Wyoming coal was driven by other cost factors. They find that while both factors have been important, factors other than environmental policy had a greater impact on utilization. In particular, a decline in freight rates due to deregulation of the railroads in the 1980's coupled with an elastic demand by power plants had a greater impact on the growth of Wyoming's coal production in the Powder River Basin (PRB) than pollution regulation.

Another set of studies has focused on the relative cost benefits of using coal over alternative fuels in power generation. In particular, these studies consider the impact on generation cost that would occur if coal were deemed to be too polluting to continue its use, particularly with respect to greenhouse gas emissions. In an analysis for the Wyoming Mining Association, Considine (2009) evaluates PRB-produced coal's impact on national electricity production. He reports that market penetration of PRB coal is largest in the middle part of the United States ranging from Texas to Michigan and estimates that to replace coal with natural gas in this region would require a quantity of gas of almost 6 trillion cubic feet. This would represent 30% of national demand for gas at the time, which in turn would result in increased gas prices. His estimates suggested that switching to gas would cost U.S. energy users $162 billion more each year for electricity, and additionally, due to natural gas price effects, increase non-electricity natural gas expenditures by an additional $118 billion more per year. Considine (2013) updates this study, comparing coal-based electricity costs to what those costs would be if it were replaced with natural gas. He finds that by using PRB coal, the U.S. economy avoids $107 billion per year in higher energy costs.

Still another set of studies have focused on the impact of coal production on Wyoming. Coal commerce has important implications for the Wyoming economy as well as the nation, creating mining jobs, income, and state and local tax revenues both directly through the mining process and indirectly through purchasing by mines and mine employees and through the production of electric power in the state. The earliest analysis of this set of economic relationships was conducted by Borden, Fletcher, and Taylor (1994), who estimated the economic impact of coal mining on the economy of Wyoming in 1991 using an economic impact model created at the University of Wyoming. The analysis collected primary data from mines across the state building a 12 sector input-output model. Based upon 1991 production of 194 million tons of coal, the authors estimated that coal mining generated almost $462 million in personal income directly and indirectly. The industry also generated approximately 18,600 jobs. These contributions represented approximately 5% and 7% of personal income and employment respectively. The authors also estimated that coal mining produced over $262 million in taxes and federal mineral royalties to the state. In this analysis tax revenues were only those direct revenues accrued to the State of Wyoming, and did not include tax revenues generated from indirect impacts from coal mining thus actual tax revenues generated from coal mining were higher than those reported in the report.

Two more recent studies of the regional social and economic effects of coal mining in the Powder River Basin have been undertaken for the Bureau of Land Management in support of coal lease and other BLM management activities on federal lands. These reports assess the economic and social effects of coal mining in the PRB. The first, conducted in 2005 by ENSR Corporation and Sammons/Dutton LLC (2005), catalogued an inventory of effects and trends in the counties located in the PRB during the expansion of coal mining activities since the 1970s. The 2005 report was updated in 2013 by AECOM (2013), who conducted a technical study assessing existing conditions and projected future cumulative impacts associated with energy-related reasonably foreseeable development (RFD) in the Wyoming PRB and, for specific resources, the Montana PRB. The analysis was based on two RFD scenarios. From a production level of 428 million tons per year (mmty) in 2010 within the Wyoming portion of the PRB, output was projected to increase to 473 mmty by 2030 under the lower production scenario, and to 630 mmty under the higher production scenario. The authors used an updated REMI™ model for their analysis, calibrated to be representative of two economic regions: the first consisting of Campbell County alone, and the second composed of the Wyoming counties that border Campbell County and that are economically linked to it (Converse, Crook, Johnson, Sheridan, and Weston). Outcome estimates suggested that under the low production scenario, increased coal production would create over 3,500 jobs in Campbell County alone and over 10,000 in total in the region between 2010 and 2030, while under the high production outcome estimates rose to over 5,700 and 12,700 jobs respectively. Estimated employment impacts included both direct mining, indirect mining service and support and induced jobs due to the increased economic activity in the area.

A third type of study has focused on the relationship of coal production and government revenues. Previously cited studies focused on economic linkages of coal to the broader economy and to the electric grid, which powers the economy. Several studies have also looked at the relationship between coal production and government revenues in Wyoming. Coupal, Taylor, Pindell, and Cabe (1999) calculated the direct and indirect impacts from federal revenue sharing (mineral leasing, royalty, lease bonus, PILT, and grazing fees generated and re-spent through State and local governments). In this analysis the authors modeled the re-spending effects of federal mineral royalties and coal bonus payments allocated to state and local government agencies. The authors used a modified IMPLAN™ analysis where revenues were disaggregated into sources of revenues and state and local government were modeled as separate endogenous sectors. Revenues from federal mineral sharing (typically 50% of federal revenues are repatriated to the State) were analyzed, and the authors found that these funds generated over 11,670 jobs in 1995 and $287 million in labor income. 41% of these revenues were allocated to state Government, 13 percent allocated to local governments, and the remainder allocated to various education accounts ranging from K-12 to community colleges, and to the University of Wyoming.

Gerking, *et al.* (2000) examined the relationship between tax rates on coal production and coal revenues by analyzing coal tax incentives and tax generation in Wyoming, evaluating both changes in severance taxes and changes in coal transportation taxes. Specifically, the authors attempted to

evaluate the claim that lower coal taxes in the state would lead to lower delivered prices and an increase in demand and production. To evaluate this claim the authors developed an econometric model of coal supply, rail transportation to evaluate tax and environmental changes that impact the coal economy and considered a reduction of the Wyoming severance tax by two percent, from 7% to 5%. Their results found such a tax decrease generated an increase in coal output of 1.42 million short tons (a 0.47% increase in output) and caused the mine-mouth prices of coal to fall by about $0.12. The delivered price of coal, however, was found to fall by about $.02. This difference suggested a market adjustment occurred in rail rates per ton of coal hauled along a route of average length of about $0.10 or 0.77% for the tax change modeled. Based on historic data, the results suggested that changes in tax rates on coal would in fact have little effect on the market, but could have significant effect on state revenues due to the fact that railroads appear to use their monopoly power in shipping to adjust freight rates to ensure delivered prices seen by utilities change little. For the decrease in tax rates modeled in their study the authors conclude that, contrary to industry claims that decreased tax rates in the state would result in greater overall production, that for a tax reduction, the increase in quantity of coal demanded by utilities is relatively small. The authors estimated that the tax rate reduction would drive down coal severance tax collections by 27% and that a 2% reduction in coal severance tax rates would result in a comparatively small increase in coal production and a comparatively large reduction in coal severance tax collections.

In a final study, Geiger, *et al.* (2010) evaluated the potential effect of a carbon tax on Wyoming State government revenues. The implementation of federal climate change legislation would alter the relative price advantages of fossil fuels produced in Wyoming and resultant tax revenue. Their policy model suggested that for the implementation of a carbon tax the prices and quantities produced of coal, natural gas, oil, and wind energy would all change. With carbon dioxide equivalent (CO_2-e) tax charges ranging from $0–$70/ton, the study found that such a tax would actually cause Wyoming tax revenues to rise. This occurred because of resultant increases in price and production of natural gas the tax caused. An increase in total Wyoming tax revenues occurred despite a decline in coal revenue. Coal production and prices fell in the study due to the fact that the higher carbon intensity of coal reduced demand and output of the fuel.

Overall, studies of coal production in Wyoming have considered its historical, economic, pollution and revenue implications in the state and on the nation. Many of these studies are quite old and do not reflect current economic conditions in the country or the state. Studies focusing on the economic linkages between coal production and induced production, employment or revenue outcomes have also only considered very few alternative scenarios and describe only specific regions of the state. In particular, the most recent BLM-sponsored studies have considered only historical impacts and projected ones under two production scenarios and evaluated economic outcomes only in Campbell County and its neighboring counties. Studies of regulatory impacts on Wyoming coal production have sought to explain the relative determinants of increased coal output historically in the PRB, or the potential cost of reducing Powder River Basin coal as a generation

fuel in the country. Only one study (Geiger *et al.* (2010)) includes estimates of the potential revenue impacts recently proposed regulation could cause on state revenues.

The current study attempts to fill some of these gaps in past research. First it attempts to inventory current economic outcomes with respect to coal in the state. Secondly, it attempts to quantify the current relationships between the coal industry and wider economic outcomes in Wyoming, and thirdly and by extension it attempts to consider the potential revenue linkages these statewide impacts have on government revenues. The study further attempts a comparative analysis of the potential impacts changes to the coal market could have in the future based on changes in fundamental market conditions, and with respect to regulatory changes. By considering multiple market and regulatory scenarios and causes, the estimated effects these could have on coal demand in each case, and the impact they could have not only on economic conditions within the state as a whole and on its coal producing regions, as well as on state revenues are estimated. In this way this study attempts to fill some of the gaps missing with respect to our current knowledge of the importance of the coal economy to the State of Wyoming.

A2. 2 WYOMING COAL FIRED ELECTRICITY GENERATION CHARACTERISTICS

Summary and Key facts:

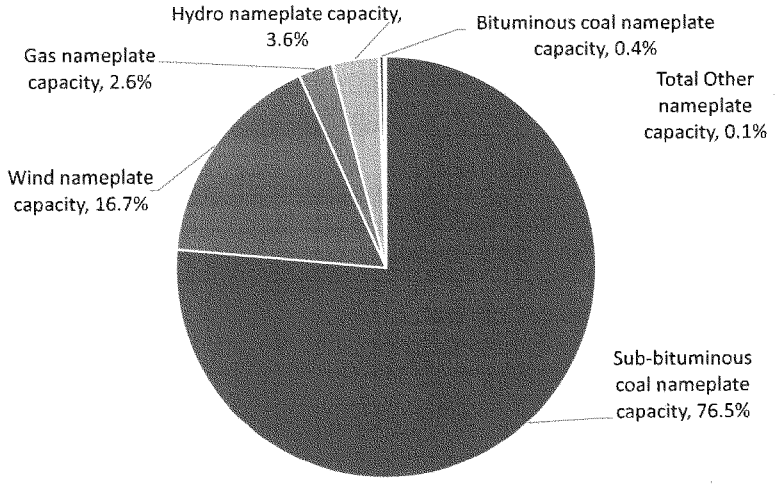
- In 2012, twelve coal-fired power plants in Wyoming were operated by three utilities. The remaining plants in Wyoming average over 40 years old today.
- Utility-operated plants accounted for over 76% of total potential electricity generation and over 87% of total electricity production in the state in 2012.
- Total net generation by these plants in 2012 totaled 43,135 GWh, using 26.4 million short tons of coal. The share of coal-fired generation as a percentage of total power generated in Wyoming is substantially higher than the national average (compare 84.9% vs. 37% in April 2014 for example).
- 65.8% of the power generated in Wyoming from all sources was exported to other states.
- Wyoming power demand composition is significantly different from the national average demand, with industrial use comprising 59% of total load in 2012 (compared to 26.7% nationally), commercial demand accounting for 25% (compared to 35.9% nationally) and residential demand accounting for 16% of Wyoming load (compared to 37.2% nationally).
- Growth of Wyoming load is anticipated to be greater than growth in the surrounding region, and expected to grow at rates between 1.2% and 3.2% depending on the utility.
- Since 2012 Black Hills Corp has retired two coal-fired facilities in Wyoming (Osage and Neil Simpson I plants). PacifiCorp plans to convert the Naughton Unit 3 to gas-fired power in early 2018. Collectively these retirements account for approximately 380 MW of combined potential generation.
- Average heat rates of these operating plants in Wyoming was 11,246 Btu/kWh in 2012 as compared to the national average rate of 10,555 Btu/kWh (6.5% higher than the national average). Heat rates differ by utility and plant, and in 2012 ranged from a low of 10,156 Btu/kWh at Basin's Laramie River Station to a high of 12,185 Btu/kWh at Neil Simpson II. PacifiCorp plants (including Wyodak) averaged 11,095 Btu/kWh, Basin plants 10,376 Btu/kWh and Black Hills plants 11,852 Btu/kWh (excluding Neil Simpson 1 and Osage, including Wyodak).
- Wyoming coal-fired plants have lower rates of SO2, NOx and CO2 emissions than the US average for utility-sized plants in 2012.
- Wyoming plants already plan to or are in the process of installing significant emissions control system upgrades to accommodate stricter mercury and regional haze rules. Regional Haze rules alone are estimated by the EPA to cost between $500 and $700 million.

Introduction

Since the 1950s electricity generation has dominated the demand for Wyoming coal. Coal-fired power plants are a significant source of demand to this day in the state, and several mines in the southwest portion of Wyoming and in the Powder River Basin operate solely to provide some of these power plants with fuel. The following sections describe Wyoming's coal-fired generation and its local market.

Wyoming Electricity Generation Overview

Figure 1: Wyoming Nameplate Capacity Potential by Fuel Type (2012)

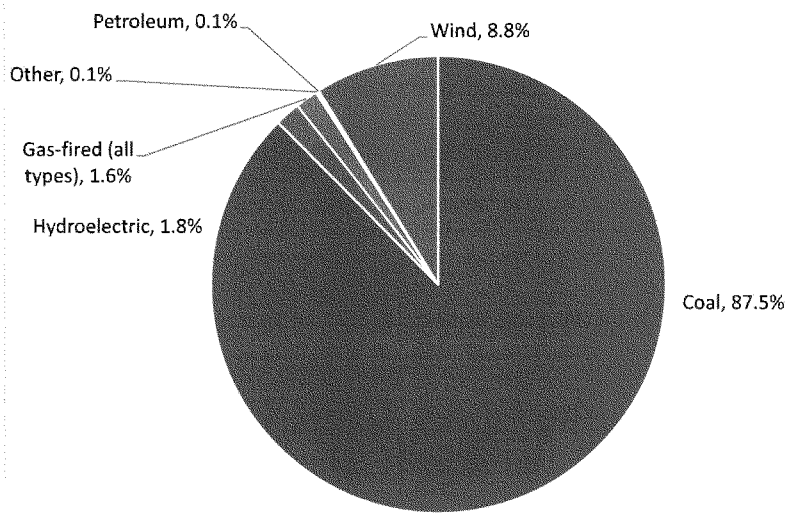


Source: Energy Information Administration

The State of Wyoming's electricity generation is primarily provided by one of three utilities: PacifiCorp (Rocky Mountain Power), Basin Electric Power Cooperative (which supplies several cooperatives in the State of Wyoming) and Black Hills Corp (including Cheyenne Light, Fuel and Power). Operated by these three utilities, Wyoming's coal-fired generation fleet provides the backbone of the state's generation infrastructure, comprising 10 plants (as of summer of 2014) and over 6300MW of summer production capacity. In terms of nameplate generation capacity, in 2012 (the last full year of available data), almost 77% of electricity production potential in the state was coal-fired, with all of this fueled by native Wyoming sub-bituminous coal (see Figure 1). Of this coal-fired capacity, PacifiCorp-operated generation accounted for two thirds at just over 4200MW,

while Basin Electric accounted for 2100MW and Black Hills Corp 379MW, as described in Table 1.

Figure 2: Net Electricity Generation by Fuel Type (2012)



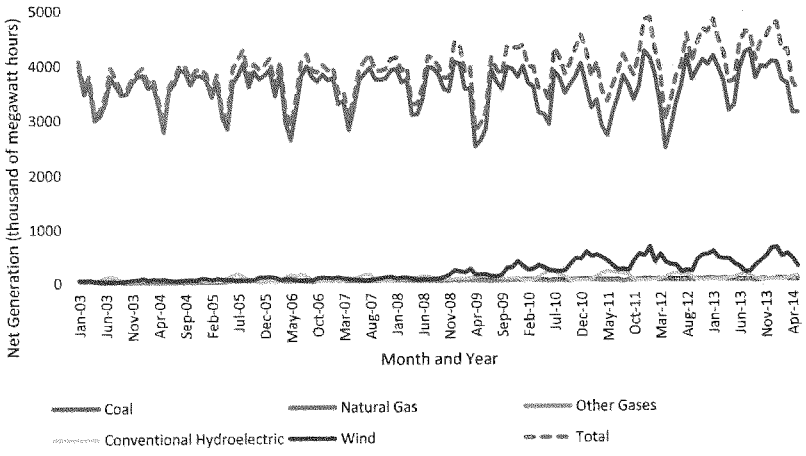
Source: Energy Information Administration

While coal is the predominant source of electricity generation in Wyoming, wind capacity has increased significantly since the turn of the 21st century and now makes up 16.7% of potential energy production in the state, though given the intermittence of this resource that capacity is rarely all available at one time.[57] Hydro capacity, at 3.6% is the third largest potential source of power in Wyoming though again, the actual capacity at a point in time depends on climactic, seasonal and water use considerations. Gas-fired generation, at 2.6% makes up nearly all the rest of the state's generation potential capacity. Wyoming has no nuclear generation, and petroleum-powered generation is available in limited amounts that is rarely used, while a negligible solar and other renewable capacity make up the remainder of the generation in the state.

[57] Wind generation capacity factors (actual production relative to potential production if generators operated at maximum output all the time) in the state are typically in the high 30% to low 40% range, reflecting the excellent wind resource in the Wyoming. These capacity factors are 25 to 50% higher than experienced in many other parts of the country.

Given the intermittency of the state's renewable sources, actual electricity production shares by fuel type more typically occur in the quantities shown in Figure 2. Monthly output by type does vary, depending on load levels, availability and cost. The variation in production shares over time is shown in Figure 3. While making up less than 77% of potential generation, due to the intermittency of renewable generation and the low-cost of production, coal more often generates closer to 90% of electricity produced in Wyoming. Until 2008, coal's share of total output was often well over 90% of total generation but since that time this share has fallen somewhat as significant new wind facilities in Wyoming and the region were developed. Seasonal influences on Wyoming generation are also clear in Figure 3. Lower spring-time loads have traditionally reduced the demand for Wyoming generation, while higher winter and mid-summer loads result in periods of higher demand. Coal-fired generation output follows this demand seasonality. More recently, it has also had to follow the seasonality of wind production as greater wind-generation availability typically occurs in the winter months. Accommodating this production on the grid has caused coal-fired generation to more often have to ramp up or down accordingly as wind power becomes available.

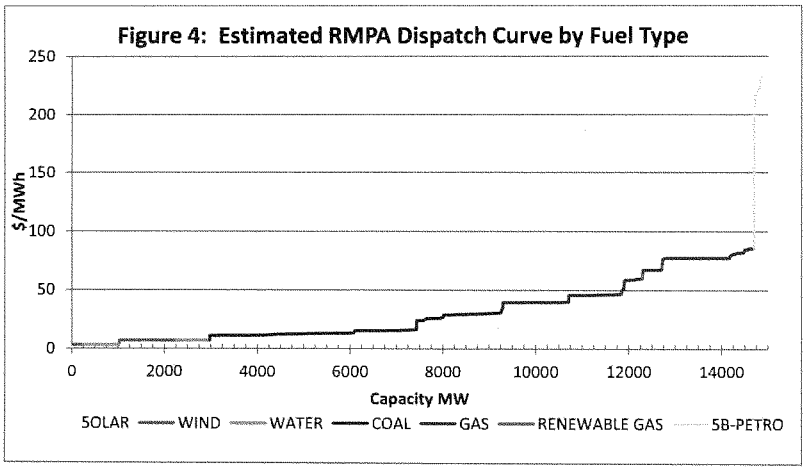
Figure 3: Total Wyoming Generation by Fuel Source Over Time



Source data: Energy Information Administration

Actual production of electricity by source depends on more than demand and availability – it also depends on cost. Much of Wyoming's generation is produced for use in a wider region called the Rocky Mountain Power Area (RMPA) comprising eastern Wyoming, all of Colorado, small portions of western Nebraska and South Dakota and a very small portion of northwestern New Mexico. PacifiCorp generation also includes a six-state area to the west within its service region.

Within this region power is generally dispatched in relation to the cost of production following what is known as a dispatch curve. A dispatch curve is really a supply curve denoting total production of electricity available at each price, assuming a marginal cost of production at each generation facility.[58] While not always possible in practice due to operating constraints and other considerations, grid operators are required to attempt to minimize the total cost of power production, and doing so requires calling on generators in the order of their marginal costs as shown by the dispatch curve. While actual generation costs by plant are proprietary, a dispatch curve for the RMPA in the summer of 2008 was estimated by Godby, Torell and Coupal (2014) and is shown in Figure 4. It is illustrative of the relative marginal costs of production by fuel type.[59] Depending on the load that generation is required to serve at a point in time, the merit order of available production, defined by the dispatch curve, determines the order in which plants are generally called upon to produce electricity to ensure demand is satisfied.



Source: Godby, Torell and Coupal (2014)

As can be seen in Figure 4, when it is possible, renewable energy due to its nearly zero marginal cost (fuel costs for wind, hydro and solar are free) will be dispatched first when it is available.[60] Coal production is generally dispatched next, followed by natural gas-fired power. Most of the remainder of the power shown in Figure 4 is petroleum (diesel) fueled, and called upon only in

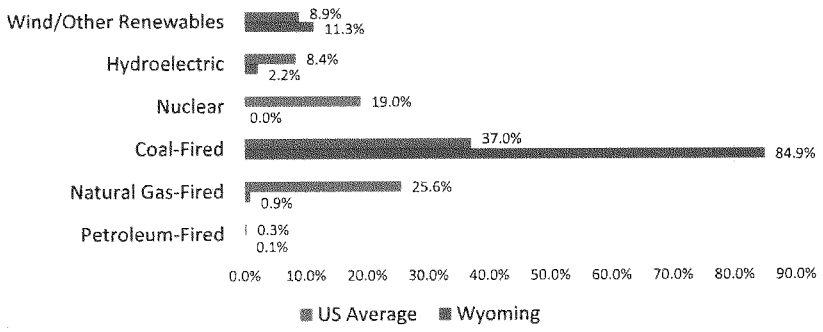
[58] Marginal cost of generation refers to the actual costs of producing electricity at a point in time. It is determined by variable operations and maintenance costs (wear and operations cost incurred when a plant is generating electricity), fuel costs, the cost of running environmental controls and any transmission costs to deliver power to market. Marginal costs do not include capital and other fixed costs included in the total cost of operation of a generation facility.

[59] The details of how this dispatch curve was computed are described in Godby, Torell and Coupal (2014).

[60] Wyoming does charge wind a $1/MWh wind generation production tax.

emergency. Wyoming's coal-fired generation is cheaper than that available elsewhere in the RMPA and makes up the first of the coal-fired steps in Figure 4, and therefore is generally called upon immediately after available renewable production is first dispatched. For this reason the increase in wind generation in the RMPA and particularly in Wyoming has caused the state's coal-fired output to vary more as a share of total generation since 2008 depending on the availability of renewable power and load conditions (how much power is needed). Wyoming gas-fired generation has historically been considered "peak" generation, comprised of more expensive gas turbines operating only when other sources are unavailable or load conditions are very high.[61] These sources are located well up the dispatch curve presented.

Figure 5: Wyoming vs. National Electricity Production fuel Mix (Apr. 2014)



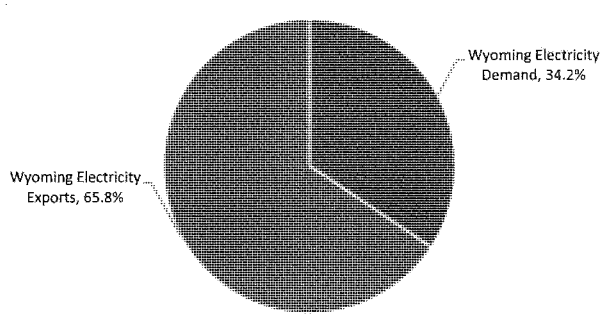
Source: Energy Information Administration

Wyoming's coal-generation output is uncommonly high compared to national averages, as shown in Figure 5. This is due to the fact that Wyoming exports a large portion of its coal-fired electricity generation to neighboring states, taking advantage of minemouth plants to produce electricity at very low cost. Wyoming's production of electricity from coal accounted for 84.9% of total output, more than double the US national share of electricity produced from coal. Due to the plentiful deposits of low-sulfur, sub-bituminous coal allowing reduced sulfur-emissions and scrubbing, and the fact that this coal lies in easily mined deposits, Wyoming coal, particularly in the Powder River Basin allows coal-fired energy to be produced at very low cost, resulting in higher exploitation of this fuel source than occurs in the rest of the United States. This advantage also allows the state to

[61] New Wyoming gas-fired generation opened in 2014 (Black Hills' Cheyenne Prairie station) includes 95 MW of combined cycle capacity that runs more cheaply than gas turbines, and includes additional gas-turbine capacity for peak production.

export much of its energy to other states as base-load power in the region, and this is particularly true for Basin Electric and PacifiCorp operated generators. The state's large wind capacity is also evident in the outcomes presented in Figure 5, and accounts for over 11% of total generation, significantly more than the share observed across the rest of the nation, where an 8.9% share is more typical. Conversely, Wyoming's share of electricity produced from gas-fired generation is very low relative to the national outcomes, again reflecting the comparative cost differences and availability of cheaper renewable and coal-fired generation in Wyoming.

Figure 6: Wyoming Electricity Demand as a Proportion of Total Electricity Generated (2012)



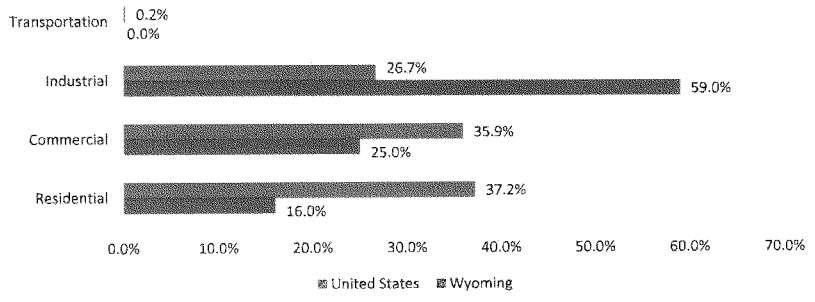
Source: Energy Information Administration

As noted, much of Wyoming-generated power is exported, taking advantage of the state's native coal deposits to produce electricity cheaply. Figure 6 shows the total share of electricity used for domestic demand in Wyoming relative to that produced. Given the amount of electricity generated in Wyoming, the difference between the state's actual electricity demand and its production can be presumed to be exported since no facility in the state exists to store surplus electricity generated. In 2012, the state's electricity exports amounted to almost 66% of the 49,588,606 megawatt hours (MWh) of electricity produced in Wyoming from all sources, or 32,617,252 MWh of energy. Existing transmission corridors from Wyoming allow most electricity exports to be sent to Colorado in the Rocky Mountain Power Area (RMPA), and to PacifiCorp customers in Idaho, Utah and the Northwest. Basin Electric's power exports flow predominantly southward and eastward and power not used locally is sent both to Colorado and eastward to neighboring states, particularly Nebraska, South and North Dakota.

Wyoming Electricity Demand

Wyoming's electricity demand is significant relative to the state's population size. As the smallest state in the nation by census at 0.18% of the national population, electricity demand in the state is comparatively large. Total retail sales of electricity (in btu) to all sectors in the state ranked Wyoming 40th in the nation in 2012, with total consumption greater than that used in ten other states and the District of Columbia. The intensity of Wyoming demand relative to its population base can be in large part described by the production economy in Wyoming, with economic activity dependent on high-electricity demand, primary production sectors including mining (coal, soda ash), oil and natural gas production. Unlike national demand, which reflects the demand patterns found in most states, Wyoming's largest consumption sector is in industrial use, followed by commercial and residential demand. This pattern is the exact opposite to that found across most of the rest of the country (see Figure 7).

Figure 7: Sectoral Demand Shares (2012)



Source: Energy Information Administration

In coming years growth in Wyoming demand is forecast to exceed growth elsewhere in the region. Wyoming load in the state's two largest service areas, served by Rocky Mountain Power (PacifiCorp) and Cheyenne Light, Fuel and Power (Black Hills), is forecast to grow at annual rates of 1.2% and 1.5% in the current decade respectively, according to each firm's most recent Integrated Resource Plan. Historically such rates of growth are low compared to those observed in the 1990s and early 2000s, however, these rates are significantly higher than those forecast for the immediate surrounding states over the same time periods. Basin Electric forecasts its total load growing at 3.2% annually, driven in large part by growth in North Dakota's Bakken-development activity, served by exports from Basin's Laramie River Station plant. Reflecting the experience of Basin Electric, growth in the rest of Wyoming could potentially exceed current forecasts by PacifiCorp and Black Hills if energy development within the state expands significantly due to new oil and gas development.

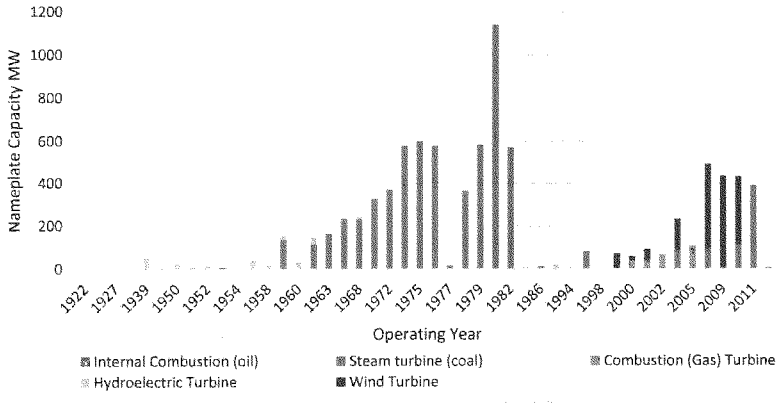
Wyoming Coal-fired Generation Characteristics

The three major electric utilities in Wyoming operated 12 coal-fired power stations in Wyoming as of 2012 – the last year complete data is available for Wyoming electricity generation. In addition to the utility-operated generators in the state, three industrial electricity generation facilities are also present in Wyoming - the FMC-Westvaco and Tata Chemical plants in Sweetwater County, which provide power for two soda ash mines, and the Western Sugar plant that provides power for a sugar refinery in Torrington. These plants and their owners are listed in Table 1. All plants except the Tata Chemicals plant are primarily powered by Wyoming-mined sub-bituminous coal. Tata Chemicals' plant uses coal from Utah and Colorado. All coal-fired generators utilize steam turbines with coal used to provide boiler heat.

Since 2012, two Black Hills plants have been retired and decommissioning of both has begun. These retirements included the Osage plant in Wyoming's Weston County and the Neil Simpson I plant in Campbell County. PacifiCorp has also recently announced its intention to convert the coal-fired Naughton Unit 3 generator to exclusively burn natural gas no later than 2018. These changes suggest that by 2018, the potential coal-fired generating capacity in the state will be reduced from 2012 levels by 380 MW.

Wyoming's coal-fired plants are of various vintages, with the oldest being the Dave Johnston plant, which first opened in 1959, and the newest being the Dry Fork facility which began operations in 2011. The now retired Osage plant was the oldest plant in the state and first opened in 1948. As shown in Figure 8, only hydro-electric generation is typically older than coal-fueled plants in Wyoming, with the majority of Wyoming's coal-fleet capacity opened between 1959 and 1982, making the average fleet age over 40 years old. These plants primarily operate only single generator units ranging in size from 80 MW to 330 MW in nameplate capacity, but the four largest plants (Jim Bridger, Laramie River Station, Dave Johnston and Naughton) operate multiple generator and boiler units at the same facility (see Table 2).

Figure 8: Generator Type by Vintage and Capacity



Source: Energy Information Administration

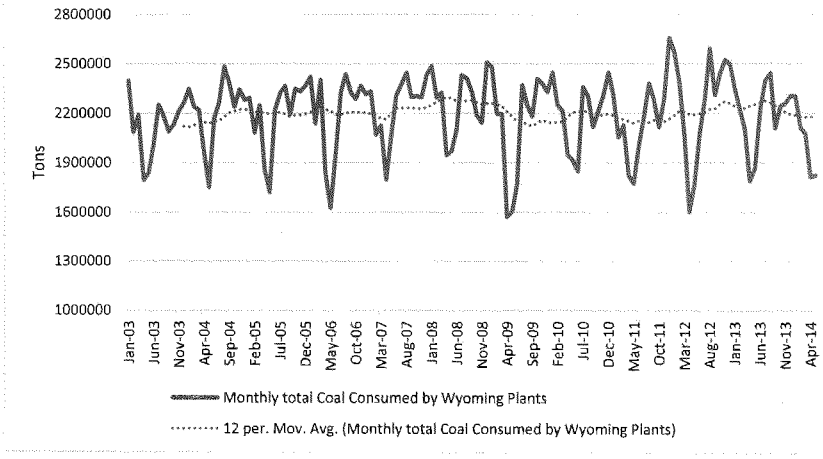
As shown in Tables 3 to 5 and Figure 9, fuel use and energy outputs vary by year at each plant, dependent on seasonal demands, emissions controls present and maintenance and operations considerations. As shown in Table 3, capacity factors at all plants have ranged from 75% of rated annual output capacity or more over the past four years.[62] Coal use in Wyoming at all the state's generating stations shown in Table 4 and Figure 9 has remained relatively constant over the last decade, averaging 2.2 million tons per month and showing no appreciable decline and relatively constant seasonal patterns. Similarly, plant output (Table 5) at all plants that have remained operating has remained stable throughout the past four years of reported data. Net efficiencies at all plants, that is, energy in fuel inputs relative to energy output, have been greater than 28% with the exception of the two recently retired Black Hills plants (Osage and Neil Simpson I). Plant capacity factors are relatively high compared to national averages for coal-fired plants, reflecting the fact that Wyoming coal-fired generation is among the cheapest sources of power in the region and therefore is called upon to provide a significant share of RMPA electricity output.

While Wyoming appears to have largely avoided the national trend toward expanded natural gas-fired generation, which has reduced the share of total generation powered by coal in the country, the pressures of low natural gas prices coupled with higher costs of environmental controls and increasing facility age have resulted in increased plant retirements in the state recently (both planned and completed). Although Wyoming relies heavily on its abundant, inexpensive low-sulfur coal to maintain low plant production costs, reductions in Wyoming utilities' coal-plant

[62] Note that output capacity can differ from nameplate capacity as rated output of a plant may change with seasons or age. Nameplate capacity is a nominal capacity based on the electric generator rating, while output capacity is more often an operating limit.

fleets are occurring. These replacements and conversions, detailed in Table 6 are being facilitated mainly by the low cost of natural gas generation. Black Hills and PacifiCorp have also noted in press releases and regulatory filings that these actions are being taken to avoid the additional emissions control costs required to meet regional haze and Mercury and Air Toxics Standards (MATS) rules.

Figure 9: Total Wyoming Coal Consumed by Wyoming Plants



Source: Energy Information Administration

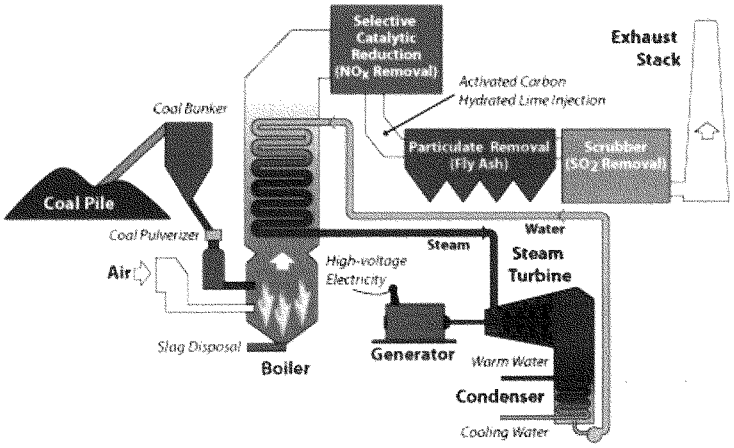
The retired Black Hills generation capacity will be replaced by the newly constructed natural-gas fired 120 MW Cheyenne Prairie Generating station, which opened in October 2014. This new plant and PacifiCorp's announced conversion of its Naughton 330 MW Unit 3 illustrate that while Wyoming's coal-fleet is very cost competitive, the state is not immune to larger market trends and influences moving the industry away from coal-fired generation.

Emissions Controls

As the least refined fuel source commonly available for electricity generation, coal has several emissions disadvantages. Coal burning results in more pollutants created than the equivalent energy produced by any other commonly used generation fuel. Control of these emissions and byproducts greatly increases the cost of coal-fired electricity generation and potentially undermines the cost advantages low-cost of Wyoming coal. Coal combustion directly results in emissions of sulfur dioxide (SO_2), nitrous oxides (NOx), mercury, arsenic, particulate matter (PM), carbon monoxide (CO), and other pollutants, while also creating significant quantities of ash that must be disposed of or shipped for beneficial reuse. NOx, SO_2 and particulate matter also

contribute to regional haze, requiring additional control if such emissions are determined to contribute to haze near national parks in the region. The greater carbon content in coal relative to other fuels also creates greater greenhouse gas production, specifically carbon dioxide (CO_2).

Figure 10: Typical Emission Controls in Coal-fired Generation Facilities



Source: Basin Electric Power Cooperative, Integrated Resource Plan 2012

To control these emissions several technologies are employed. The most prevalent include wet or dry flue-gas desulfurization (FGD) often referred to as "scrubbers", selective catalytic and non-catalytic reduction (SCR and SNCR), activated carbon injection (ACI), dry sorbent injection (DSI), ACI and/or DSI with fabric filters ("baghouses") and electrostatic precipitators (ESP). Cyclones can also be used to separate particulates from exhaust or flue gas streams. Improved combustion technologies such as low-excess-air firing, staged combustion, and fluidized bed combustion (FBC) or low-NOx burners can also reduce emissions. Non-combustion emissions control technologies typically use catalyzing agents to react with pollutants to remove them or act as a filtration system to remove ash, PM and other pollutants from the flue stream, thereby reducing pollutant emission. Such controls are typically powered by the electricity generated by the plant as a parasitic load and therefore increase plant costs not only through the need for the additional chemicals used in emission reduction processes, but also in reduced net generating efficiency and increased plant maintenance costs. A list of commonly used control technologies is provided in Table 7. The typical layout of emission controls in a pulverized coal-fired generation station like those used in Wyoming is shown in Figure 10.

The choice to burn low-sulfur coal like that produced in Wyoming's Powder River Basin can also reduce SO2. While switching to lower-sulfur Wyoming coal can reduce emission and fuel costs for plants inside and outside the state, using Wyoming coal has some disadvantages as it has lower heat (energy) and increased moisture content relative to other coals, requiring additional fuel to generate a given output of electricity, and often plant modification to use it. Use of Wyoming coal, particularly at eastern plants also incurs greater transportation costs than eastern coals, reducing its net benefit. Increases in emission stringency across the United States, however, have increased the benefits of using Wyoming coal with its lower need for scrubbing, and over the past two decades these advantages have outweighed disadvantages for plants across the nation. This has resulted in PRB coal being used for power generation in 34 states as of 2012. The increased use of PRB coal since the 1970s has largely been driven by the fact that while PRB coal is otherwise disadvantaged as a fuel compared to others when emissions regulations are absent, the additional control costs that competitors' coals entail has created a competitive cost advantage.

Meeting tightening emissions standards in coming years are the greatest challenges facing Wyoming PRB coal and coal-fired generation plants in general as these compliance costs threaten to undermine coal's historic cost advantages over natural-gas fired generation. Uncertainty regarding future environmental regulation currently exists in three areas: climate change regulations, non-greenhouse gas emissions and water quality. Even though CO_2, controls are not yet mandated, reductions in discharge rates of CO_2 are anticipated in the United States to combat climate change. CO_2 control technologies can be of two forms (i) reduced coal burning and fuel substitution to a lower carbon fuel such as natural gas to reduce CO_2 discharge rates, or (ii) carbon sequestration, in which carbon dioxide is removed from the flue gas stream to be stored or disposed of off-site. Both pose challenges for Wyoming. Currently the first option is far less expensive for plant operators to adopt than the second as carbon capture, utilization and storage (CCUS) is only beginning to be proven at commercial scale.

Limits on the amount of coal as a fuel allowed to be used (for example to control CO_2) would undermine the competitiveness of Wyoming's generators. Curtailing the use of coal would imply curtailing the use of Wyoming power plants to generate electricity. Replacing this energy generation from other sources would almost certainly increase energy prices in the state, making both economic development more difficult to attract, and increasing residents' energy costs. Similarly, CCUS technologies appear to be years away from widespread use, and currently their costs are prohibitive. Implementing either control strategy will undermine Wyoming's current power-sector competitiveness. Given uncertainties regarding the future cost-competitiveness of coal generation in a potentially carbon-constrained world, continued low natural gas prices are likely to result in greater replacement of Wyoming generation with natural-gas fired production over time regardless of when new CO_2 measures are adopted.

Non-GHG regulation is also of great concern to Wyoming's coal-plant operators. The most pressing of these in the next two to four years are new mercury rules and regional haze regulation. Plant reviews and implementation of facility improvements where necessary to meet the Mercury

and Air Toxics Standards (MATS) are ongoing across the country, with plants expected to meet requirements by April 16, 2015 (with extensions of one year only possible with approval by regulators) and are widely anticipated to result in approximately 40 GW or more of coal-fired generation being shuttered nationally. In Wyoming, current plans are to accommodate these requirements through additional plant controls and the previously described coal to gas conversion of the Naughton plant. New regional haze regulations have also recently required new emissions equipment installations and modifications at coal-fired facilities in Wyoming.

The US Environmental Protection Agency has also recently announced new proposed standards regarding coal combustion residuals (ash and scrubber waste). As these rules come into effect in the latter half of this decade, additional compliance costs will be incurred.[63] New ozone regulations are also being considered that could affect existing and any new Wyoming power plants. Other new rules are also expected by the end of the decade that would require modification of cooling water intake systems to mitigate their environmental impact, and for water discharge controls at water cooled plants. The latter would control toxic metal discharges occurring due to the operation of flue-gas desulfurization equipment. Ash and ozone concerns may affect Wyoming plant operators, however their effect remains to be determined and current planning suggests that they pose little immediate threat. Water-based rules may also be of less concern in Wyoming given that plants in the state do not utilize naturally occurring bodies of water for their cooling operations and several are air-cooled. All new regulations, however, are of concern to the coal industry and plant operators in part because of their potential to lead to tighter regulations that could increase costs and/or hasten plant retirement.

Current emissions controls by plant in Wyoming are detailed in Table 8. Of note is the fact that plant controls differ by plant vintage. Older plants do not fall under the same restrictions as newer plants built after the Clean Air Act came into effect, provided they have not had major retrofits since that time, or have not been judged to cause significant impacts. For this reason some plants, specifically Dave Johnston 1 and 2, Osage and Neil Simpson I have minimal controls (other than good operating practices and the use of low-sulfur coal as a fuel). All other utility-operated plants are required to have NOx controls in place as described in the table. Mercury controls were in place at all plants but Laramie River Station, Wygen 1, and Neil Simpson II at the time of this writing, along with those already identified as having no controls. Sulfur dioxide removal efficiencies across plants with controls range from 80 to 99%. Controls are also necessary not only for utility power plants, but also industrial facilities. Of the industrial plants, no information was reported for Western Sugar's plant, in part because of the small size of the boiler but it has very few controls installed. FMC Westvaco's two operating (non-stand-by) boilers employ NOx and sulfur dioxide controls, while Tata Chemical's boilers only include NOx control equipment.

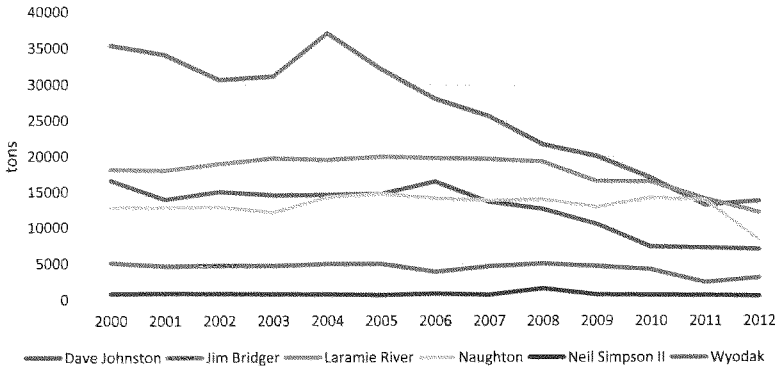
[63] Proposed rules made public in December 2014 do not require such measures for ash, but are only proposed and leave regulation to states thus the threat of increased control costs to mitigate ash threats remain a possibility. See for an overview of the recently announced rules: http://www2.epa.gov/coalash/coal-ash-rule.

As already noted, major retrofits of equipment may require a new source review, in which case plants will be required to employ the Best Available Control Technology (BACT) deemed necessary by state or federal regulators. This appears to have contributed to Black Hill's decision to retire the Neil Simpson I and Osage plants as previously noted. Compliance by states is required with federal emissions and air quality laws, and as noted above, these regulations may change in coming years as emissions rules become stricter. In addition to the plant closures noted, the impact of Regional Haze Rule (RHR) and Mercury Air Toxics (MATS) requirements have already caused state regulators to require additional or improved plant emission control systems to be installed in the near future, especially NOx control equipment. These are detailed in Table 9.

The Regional Haze rule has been especially contentious in the state. Recent RHR actions taken by the State of Wyoming have resulted in the decision to require PacifiCorp's Jim Bridger plant to install new Low-NOx burners and Selective Catalytic Reduction controls on all four boilers. Such requirements also contributed to the decision to convert Naughton Unit 3 to burn natural-gas by 2018. While currently under litigation, the recent decision by the US Environmental Protection Agency (EPA) to reject the State's less stringent RHR controls implementation in favor of tighter control requirements at the Dave Johnston Unit 3, Laramie River Station and Wyodak facilities has resulted in the proposed additional equipment changes indicated in Table 9. These additional controls required by the EPA could cost the affected utilities over $500 million by the EPA's own estimates, assuming the Dave Johnston Unit 3 plant installs only new Low NOx burners and Overfire Air controls and then agrees to shut down the generator down in 2027. The costs of complying with the EPA requirements increases to over $700 million across all plants if PacifiCorp decides to add SCR technology as shown in the table, which the EPA projects would allow the plant to remain open until the end of its anticipated useful life in 2038. Under the same order, the EPA also noted that the State has agreed to consider requiring NOx controls to be added to Dave Johnston Units 1 and 2 in the State's next planning period. Overall, the costs of meeting new regulations are considerable and thus the source of considerable controversy when announced.

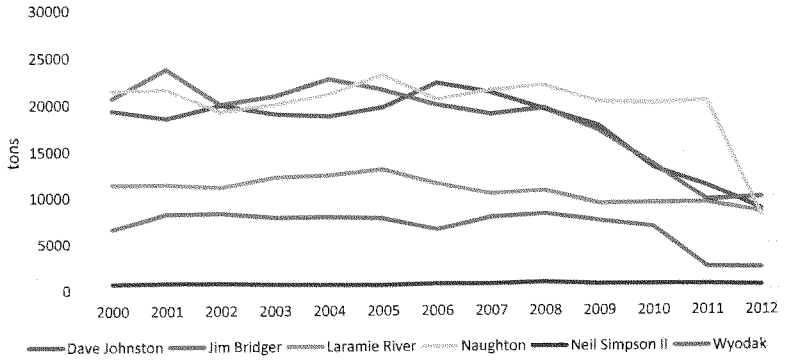
Wyoming power plants as a group are among the cleaner coal-fired facilities in the country. Compared to national levels, emissions rates at Wyoming coal-fired power plants are not excessively high in the criteria pollutants, specifically NOx and SO_2 where they are much lower than average, and compare favorably with average emissions rates nationally for CO_2 as shown in Table 10. Further, PacifiCorp plants have notably decreased their emissions rates in both of these pollutants in the past decade, halving their total emissions in SO_2 and NOx during the 2000s (see Figures 10 and 11). This reflects a more aggressive installation of emissions controls at their plants compared to the other two utilities in Wyoming over the past decade.

Figure 11: Total NOx Emissions at Wyoming's Oldest Plants



Source: EPA Air Markets Program data

Figure 12: Total SO2 Emissions at Wyoming's Oldest Plants



Source: EPA Air Markets Program data

Given the performance of Wyoming's coal-fired power plants, the greatest concerns facing Wyoming operators are the aforementioned regulations regarding mercury and regional haze, for which controls are already planned or being installed, and proposed new CO_2 regulations. The latter regulations are clearly where Wyoming's coal-plants are at the greatest risk. Mitigation

technologies such as CCUS are still unproven at scale and costs are unknown. Alternatively plants could make efficiency improvements, co-fire with natural gas or reduce their output.[64]

Increases in plant efficiency can reduce emissions rates by reducing the coal burned, however heat rates are difficult to modify on existing plants due to their underlying designs, particularly smaller plants of older vintage, without triggering new source performance reviews. Among Wyoming's air-cooled plants especially, emissions rates are relatively high compared to the national average due to less efficient cooling technology and fuel quality impact on boiler efficiency. The exceptions are the Dry Fork and Wygen III stations, reflecting their relatively new and state of the art technology. CO_2 emissions rates directly reflect the plant efficiencies and heat rates described in Table 3, with lower heat rates (higher plant efficiencies) performing much better. These plant efficiencies also directly reflect the fact that all Wyoming's coal-generators use sub-critical boilers. Given this, heat rates among Wyoming plants are near or above the national average of 10,555 Btu/kWh.[65]

To achieve heat rates closer to the highest performing units in the country would require super-critical or ultra-critical boiler technology, investments that are not likely to be adopted in Wyoming given the regulatory uncertainty around coal-generation. This reflects the trend to avoid building new coal-fired plants nation-wide. As a group, the Black Hills plants face the greatest challenge should CO_2 regulations come into force as their heat rates are generally highest (efficiency lowest) among the Wyoming power plants due to their engineering designs, while Basin Electric and PacifiCorp-operated plants face less of a challenge. All companies operating plants in Wyoming, however, have CO_2 emissions rates in excess of 2200 lbs/MWh, or more than double the proposed standards for new plants proposed under the EPA's proposed 2014 New Source Performance Standards rules, and could face significant threat should tight CO_2 rules be enforced or high carbon taxes be introduced. For this reason, barring a breakthrough in new CCUS technologies, if proposed rules become law Wyoming power plants could face increases in production cost due to the cost of acquiring emission credits from other sources. Alternatively these plants could see reduced operation or be shut down entirely under suitably stringent rules as they would likely be too expensive to operate at expected fuel price and emissions reduction costs.

[64] The proposed EPA's Clean Power Plant Rule uses a state-wide emissions rate target thus one mitigation strategy to meet the target is to reduce coal-fired plant output at individual plants, substituting their output with new generation from renewables or gas-fired facilities.

[65] Source: Power Engineering, 2014 http://www.power-eng.com/articles/print/volume-118/issue-7/features/america-s-best-coal-plants.html

Table 1: Wyoming Coal-fired Generating Stations (Utility Owners)

Plant	Owners	County	Generator Unit(s)	Nameplate Capacity (MW)	First Operating Date	Primary Fuel	Primary Mine Source(s)	Secondary Fuel
Naughton	Berkshire Hathaway Energy (PacifiCorp)	Lincoln	3	707.2	May-63	sub-bituminous coal	Kemmerer Mine	Natural Gas
Jim Bridger	Berkshire Hathaway Energy (PacifiCorp)	Sweetwater	4	2317.7	Nov-74	sub-bituminous coal	Black Butte Jim Bridger	Diesel Fuel Oil
Dave Johnston	Berkshire Hathaway Energy (PacifiCorp)	Converse	4	816.7	Feb-59	sub-bituminous coal	Dry Fork Rawhide Coal Creek Cordero	Diesel Fuel Oil
Wyodak	Berkshire Hathaway Energy (PacifiCorp - operator)/ Black Hills Corp.		1	362	Sep-78	sub-bituminous coal	Wyodak	Diesel Fuel Oil
Laramie River Station	Missouri Basin Power Project/ Basin Electric (operator)	Platte	3	1710	Jul-81	sub-bituminous coal	Cordero Dry Fork Black Thunder Antelope Belle Ayr	Diesel Fuel Oil

							North Antelope	
Dry Fork Station	Basin Electric Power Coop (operator)/ Wyoming Municipal Power Agency	Campbell	1	390	Nov-11	sub-bituminous coal	Dry Fork	Waste/ Other Oil
Wygen I	Black Hills Corp.	Campbell	1	88	Jan-03	sub-bituminous coal	Wyodak	Natural Gas
Wygen II	Black Hills Corp.	Campbell	1	95	Jan-08	sub-bituminous coal	Wyodak	Natural Gas
Wygen III	Black Hills Corp.	Campbell	1	116.2	Apr-10	sub-bituminous coal	Wyodak	Natural Gas
Neil Simpson I*	Black Hills Corp.	Campbell	1	21.7	Sep-69	sub-bituminous coal	Wyodak	Diesel Fuel Oil
Neil Simpson II	Black Hills Corp.	Campbell	1	80	Sep-95	sub-bituminous coal	Wyodak	Diesel Fuel Oil
Osage*	Black Hills Corp.	Weston	3	34.5	Oct-48	sub-bituminous coal	Wyodak	

* retired/decommissioned as of 2014. Osage has been idle since 2010, Neil Simpson I was officially retired 2014.

Table 1a: Wyoming Coal-fired Industrial Generators

Plant	Owner/ Operator	County	Generator Unit(s)	Nameplate Capacity (MW)	First Operating Date	Primary Fuel	Secondary Fuel
FMC Westvaco	FMC Westvaco	Sweetwater	6	41	Jun-53	sub-bituminous coal	Natural Gas
Tata Chemicals Partners	General Chemical	Sweetwater	2	30	May-68	bituminous coal	Natural Gas
Western Sugar	Western Sugar	Goshen	1	2	Oct-78	sub-bituminous coal	Natural Gas

Table 2: Plant Characteristics (Units and Capacity)

Plant	Generator Unit(s)	Nameplate Capacity (MW)	First Operating Date	Technology	Primary Fuel	Secondary Fuel	Cooling
Naughton	1	163.2	May-63	Steam Turbine	sub-bituminous coal	Natural Gas	Water
	2	217.6	Oct-68	Steam Turbine	sub-bituminous coal	Natural Gas	
	3	326.4	Oct-71	Steam Turbine	sub-bituminous coal	Natural Gas	
Jim Bridger	1	577.9	Nov-74	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Water
	2	577.9	Dec-75	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
	3	577.9	Sep-76	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
	4	584	Nov-79	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
Dave Johnston	1	114	Feb-59	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Water
	2	113.6	Jan-61	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
	3	229.5	Dec-64	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
	4	360	Jul-72	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
Wyodak	1	362	Sep-78	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Air
Laramie River Station	1	570	Sep-81	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Water
	2	570	Jul-81	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	
	3	570	Nov-82	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	

Dry Fork Station	1	390	Nov-11	Steam Turbine	sub-bituminous coal	Waste/Other Oil	Air
Wygen I	1	88	Jan-03	Steam Turbine	sub-bituminous coal	Natural Gas	Air
Wygen II	1	95	Jan-08	Steam Turbine	sub-bituminous coal	Natural Gas	Air
Wygen III	1	116.2	Apr-10	Steam Turbine	sub-bituminous coal	Natural Gas	Air
Neil Simpson I*	1	21.7	Sep-69	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Air
Neil Simpson II	1	80	Sep-95	Steam Turbine	sub-bituminous coal	Diesel Fuel Oil	Air
Osage*	1	11.5	Oct-48	Steam Turbine	sub-bituminous coal		Water
	2	11.5	Oct-49	Steam Turbine	sub-bituminous coal		
	3	11.5	Sep-52	Steam Turbine	sub-bituminous coal		

* retired/decommissioned

Table 2a: Industrial Plant Characteristics (Units and Capacity)

Plant	Generator Unit(s)	Nameplate Capacity (MW)	First Operating Date	Technology	Primary Fuel	Secondary Fuel
FMC Westvaco	1	3.5	Jun-53	Steam Turbine	sub-bituminous coal	Natural Gas
	2	3.5	Jun-53	Steam Turbine	sub-bituminous coal	Natural Gas
	3	4	Jun-64	Steam Turbine	sub-bituminous coal	Natural Gas
	4	10	Jun-72	Steam Turbine	sub-bituminous coal	Natural Gas
	5	10	Jun-75	Steam Turbine	sub-bituminous coal	Natural Gas
	6	10	Jun-75	Steam Turbine	sub-bituminous coal	Natural Gas
Tata Chemicals Partners	1	15	May-68	Steam Turbine	bituminous coal	Natural Gas
	2	15	Jan-77	Steam Turbine	bituminous coal	Natural Gas
Western Sugar	1	2	Oct-78	Steam Turbine	sub-bituminous coal	Natural Gas

Table 3: Wyoming Coal-fired Station Heat Rates and Capacity Factors

Plant	Generator Unit(s)	Nameplate Capacity MW	Summer Capacity MW	Winter Capacity MW	2012 Heat Rate Btu/kWh	2013 Heat Rate Btu/kWh	4-Year Average Heat Rate Btu/kWh	net efficiency 2012	net efficiency 2013	net efficiency 4-year Average	4- year Average Capacity Factor
Naughton	3	707	687	687	10,877	10,688	10,704	31.4%	31.9%	31.9%	87.2%
Jim Bridger	4	2,318	2,111	2,111	10,308	10,299	10,304	33.1%	33.1%	33.1%	75.7%
Dave Johnston	4	817	760	762	11,258	11,284	11,243	30.3%	30.2%	30.3%	74.7%
Wyodak	1	362	332	340	11,938	11,969	11,970	28.6%	28.5%	28.5%	80.0%
Laramie River Station	3	1,710	1,710	1,710	10,156	10,268	10,235	33.6%	33.2%	33.3%	79.1%
Dry Fork Station*****	1	390	380	405	10,596	10,469	NA.	32.2%	32.6%	NA.	89.2%
Wygen I***	1	88	70	90	11,742	NA.	11,762	29.1%	NA.	29.0%	98.5%
Wygen II	1	95	85	95	12,050	12,040	12,059	28.3%	28.3%	28.3%	84.7%
Wygen III****	1	116	100	100	11,345	NA.	11,355	30.1%	NA.	30.0%	86.4%
Neil Simpson I**	1	22	15	19	14,198	NA.	14,244	24.0%	NA.	24.0%	101.0%
Neil Simpson II***	1	80	80	80	12,185	NA.	12,257	28.0%	NA.	27.8%	91.0%
Osage*	3	35	30	30	16,937	NA.	16,693	20.1%	NA.	20.4%	77.4%
US Average:					**10,555**	**10,555**	**10,555**				

* last operating year 2010, 2010 values reported, 4-year average 2007-2010 reported

** data does not include 2013, 4-year average as of 2012 reported instead, closed 2014

*** data does not include 2013, 4-year average as of 2012 reported instead

**** data does not include 2013, 3-year average reported, opened 2010

***** Opened 2011, 2013 Capacity factor reported

Source Data: EIA Form 860 and Form 923. US national average Heat Rates comes from Power Engineering (2014), http://www.power-eng.com/articles/print/volume-118/issue-7/features/america-s-best-coal-plants.html

Table 4: Wyoming Coal-plant Historical Fuel Use

Plant	Generator Unit(s)	Nameplate Capacity (MW)	Fuel use 2012 (tons)	Fuel use 2012 (MMBtu)	Fuel use 2013 (tons)	Fuel use 2013 (MMBtu)	Fuel use - 4 year average (tons)	Fuel use - 4 year average (MMBtu)
Naughton	3	707	2,802,967	54,991,689	2,949,936	59,072,940	2,847,712	56,160,846
Jim Bridger	4	2,318	7,527,469	140,358,801	8,163,413	152,488,427	7,789,024	144,240,243
Dave Johnston	4	817	3,382,634	55,126,134	3,693,228	59,672,555	3,484,734	55,984,573
Wyodak	1	362	1,894,868	30,099,627	1,894,647	30,081,562	1,792,716	28,201,457
Laramie River Station	3	1,710	6,511,645	111,480,592	7,039,534	120,697,465	7,121,494	121,264,526
Dry Fork Station (5)	1	390	2,029,604	32,726,310	2,001,161	32,097,072	NA.	NA.
Wygen I (3)	1	88	502,081	8,027,587	NA.	NA.	512,778	8,115,288
Wygen II	1	95	440,605	7,056,376	513,157	8,274,062	505,064	8,053,276
Wygen III (4)	1	116	605,089	9,688,378	NA.	NA.	541,065	8,589,651
Neil Simpson I (2)	1	22	135,890	2,177,226	NA.	NA.	130,710	2,092,165
Neil Simpson II (3)	1	80	432,377	6,922,255	NA.	NA.	493,886	7,820,932
Osage (1)	3	35	144,249	2,271,894	NA.	NA.	216,359	3,431,123

(1) Last operating year 2010, 2010 values reported, 4-year average 2007-2010 reported.
(2) Data does not include 2013, 4-year average as of 2012 reported instead, closed 2014
(3) Data does not include 2013, 4-year average as of 2012 reported instead
(4) Data does not include 2013, 3-year average reported, opened 2010
(5) Opened 2011, 2013 Capacity factor reported

Table 5: Wyoming Coal-plant Historical Output

Plant	Generator Unit(s)	Nameplate Capacity (MW)	Net Generation 2012 - all primemovers from coal (MWh)	Net Generation 2013 - all primemovers from coal (MWh)	Net Generation 4-year average - all primemovers from coal (MWh)
Naughton	3	707	5,055,739	5,527,207	5,246,836
Jim Bridger	4	2,318	13,617,042	14,806,673	13,998,133
Dave Johnston	4	817	4,896,447	5,288,384	4,979,292
Wyodak	1	362	2,521,266	2,513,197	2,356,096
Laramie River Station	3	1,710	10,977,111	11,754,247	11,847,686
Dry Fork Station*****	1	390	3,088,683	3,066,049	NA.
Wygen I***	1	88	683,671	683,671	689,986
Wygen II	1	95	585,609	687,216	667,847
Wygen III****	1	116	853,966	NA.	756,474
Neil Simpson I**	1	22	153,352	NA.	146,883
Neil Simpson II***	1	80	568,102	NA.	638,059
Osage*	3	35	134,138	NA.	205,547

* last operating year 2010, 2010 values reported, 4-year average 2007-2010 reported
** data does not include 2013, 4-year average as of 2012 reported instead, closed 2014
*** data does not include 2013, 4-year average as of 2012 reported instead
**** data does not include 2013, 3-year average reported, opened 2010
***** Opened 2011, 2013 Capacity factor reported

Table 6: Plant Retirements and Fuel-source changes

Plant	Activity	Replacement Power
Osage	All three generator units were officially retired March 21st, 2014	Cheyenne Prairie Gas-fired plant (opens late 2014)
Neil Simpson	Retired March 21st, 2014	Cheyenne Prairie Gas-fired plant
Naughton Unit 3	To be retired no later than January 1, 2018, planned conversion 2015.	To be retrofitted to burn natural gas.

Table 7: Common Pollutants and Control Technologies

Pollutant	Control Technology to Address Toxic Pollutant
Mercury	Selective Catalytic Reduction (SCR), Flue-gas Desulfurization (FGD), Activated Carbon Injection (ACI) and ACI with Fabric Filter (FF), Electrostatic Precipitators (ESP), the use of halogenated coal additives (either bromine or iodine) and scrubber additives are also used in mercury control programs.
Sulfur Dioxide	Wet and dry FGD or "scrubbers", Dry Sorbent Injection (DSI) with FF, fluid-bed combustion, substitution of low-sulfur coal in fuel mix.
Acidic Gases	Wet and dry FGD, DSI and DSI with FF, Wet ESP
Dioxins and Furans	Work Practice Standards (inspection, adjustment and maintenance/repair of facility to ensure optimal combustion), ASI and ASI with FF.
Non-mercury metals	FF, ESP, ASI and ASI with FF
Particulate matter	ESP, FF, cyclones, wet and dry FGD (note – PM controls often combined with Mercury controls)
Nitrogen Oxides	SCR and Selective non-Catalytic Reduction (SNCR), FBD, low-NOx burners, low-excess-air firing, staged combustion (Overfire air), Flue Gas Recirculation

Table 8: Current Emissions Controls by Coal-fired Plant in Wyoming

Utility Owned Plants	Generator Unit	NOx Controls	Mercury Controls	PM Controls	Sulfur Dioxide	SO2 Removal Efficiency
Naughton	1	Low NOx Burner	None	Cold-side ESP + Cyclone + Wet FGD	low-sulfur coal	
	2	Low NOx Burner	None	Cold-side ESP + Cyclone + Wet FGD	low-sulfur coal	
	3	Low NOx Burner, Overfire Air	Mercury FGD	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
Jim Bridger	1	Low NOx Burner, Overfire Air	Mercury FGD	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
	2	Low NOx Burner, Overfire Air	Mercury FGD	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
	3	Low NOx Burner, Overfire Air	Mercury FGD	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
	4	Low NOx Burner, Overfire Air	Mercury FGD	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
Dave Johnston	1	None	None	Cold-side ESP + Fabric Filter	low-sulfur coal	
	2	None	None	Cold-side ESP	low-sulfur coal	
	3	Low NOx Burner, Overfire Air	Dry FGD	Cold-side ESP + Fabric Filter + Dry FGD	low-sulfur coal, FGD, DSI	90%

	4	Low NOx burner, Overfire Air	Wet FGD	Fabric Filter + Wet FGD	low-sulfur coal, FGD, DSI, byproduct recovery	90%
Wyodak	1	Low NOx Burner, Overfire Air	Dry FGD	Cold-side ESP + Fabric Filter + Dry FGD	low-sulfur coal, FGD, DSI, byproduct recovery	80%
Laramie River Station	1	Low NOx Burner, Overfire Air	None	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
	2	Low NOx Burner, Overfire Air	None	Cold-side ESP + Wet FGD	low-sulfur coal, FGD, DSI	90%
	3	Low NOx Burner, Overfire Air	None	Cold-side ESP + Dry FGD	low-sulfur coal, FGD, DSI	90%
Dry Fork Station	1	Low NOx Burner, Overfire Air, Selective Catalytic Reduction	ACI, FGD	Fabric Filter + SCR + Dry FGD + ACI	low-sulfur coal, FGD, DSI	100%
Wygen I	1	Low NOx Burner, Selective Catalytic Reduction	None	Fabric Filter + SCR + Dry FGD	low-sulfur coal, FGD, DSI	90%
Wygen II	1	Advanced Overfire Air, Low NOx Burner, Selective Catalytic Reduction	FGD	Fabric Filter + SCR + Dry FGD + ACI	low-sulfur coal, FGD, DSI	90%
Wygen III	1	Low NOx Burner, Overfire Air, Selective Catalytic Reduction	Dry FGD, FGD	Fabric Filter + SCR + Dry FGD + ACI	low-sulfur coal, FGD, DSI	90%

Neil Simpson II	1	Low NOx Burner	None	None	low-sulfur coal, FGD, DSI	90%
Neil Simpson I*	1	None	None	None	low-sulfur coal	
Osage*	1	None	None	None	low-sulfur coal	
	2	None	None	None	low-sulfur coal	
	3	None	None	None	low-sulfur coal	

*retired

Industrial Facilities

FMC Westvaco	1	None (stand-by boiler)	None	None	low-sulfur coal	
	2	None (stand-by boiler)	None	None	low-sulfur coal	
	3	None (stand-by boiler)	None	None	low-sulfur coal	
	4	None (stand-by boiler)	None	None	low-sulfur coal	
	5	Low NOx Burner, Overfire Air	None	None	low-sulfur coal, FGD, DSI	80%
	6	Low NOx Burner, Overfire Air	None	None	low-sulfur coal, FGD, DSI	80%
Tata Chemicals Partners	1	Flue Gas Recirculation, Low NOx Burner	None	None	None	
	2	Flue Gas Recirculation, Low NOx Burner	None	None	None	
Western Sugar	1	No Information	No Information	No Information	No Information	

Table 9: Future Emissions Control Changes required or likely to Occur

Utility Owned Plants	Generator Unit	Regional Haze Rule*/Other Required Changes
Naughton	1	Low NOx burner, Overfire Air/Mercury Control
	2	Low NOx burner, Overfire Air/Mercury Control
	3	Conversion to Natural Gas, 2018 (2013 IRP suggests this will occur in 2015)
Jim Bridger	1	New Low NOx Burner, Overfire Air, SCR by 2022
	2	New Low NOx Burner, Overfire Air, SCR by 2021
	3	New Low NOx Burner, Overfire Air, SCR by 2015
	4	New Low NOx Burner, Overfire Air, SCR by 2016
Dave Johnston	1	State to consider imposing Low NOx burner, Overfire Air in future/Mercury Control
	2	State to consider imposing Low NOx burner, Overfire Air in future/Mercury Control
	3	Low NOx Burner, Overfire Air, Selective Catalytic Reduction, or shutdown in 2027 w/o SCR*/Mercury Control
	4	Low NOx burner, Overfire Air/Mercury Control
Wyodak	1	Low NOx Burner, Overfire Air, Selective Catalytic Reduction*/Mercury Control
Laramie River Station	1	Low NOx Burner, Overfire Air, Selective Catalytic Reduction*/Mercury Control
	2	Low NOx Burner, Overfire Air, Selective Catalytic Reduction*/Mercury Control
	3	Low NOx Burner, Overfire Air, Selective Catalytic Reduction*/Mercury Control
Wygen I	1	N.A./Mercury Control
Neil Simpson II	1	N.A./Mercury Control

* EPA required changes for regional haze currently contested by State of Wyoming.

Table 10: 2012 Plant Emissions Rates

Facility Name	Year	SO2 Emissions (tons)	SO2 emissions Rate (lbs/MWh)	NOx Emissions (tons)	NOx emissions Rate (lbs/MWh)	CO2 Emissions (tons)	CO2 emissions Rate (lbs/MWh)	Net Generation 2012 - all primemovers from coal (MWh)
Dave Johnston	2012	8722.4	3.6	6999.3	2.9	5,720,671	2332	4,906,510
Dry Fork Station	2012	691.5	0.4	619.6	0.4	3,555,713	2299	3,093,371
Jim Bridger	2012	9974.8	1.5	13761.7	2.0	14,994,886	2201	13,625,135
Laramie River	2012	8384.0	1.5	12188.0	2.2	13,324,303	2423	10,997,853
Naughton	2012	7993.1	3.2	8311.0	3.3	5,661,930	2236	5,064,299
Neil Simpson II	2012	419.6	1.5	502.6	1.8	780,568	2746	568,601
Wygen I	2012	394.0	1.2	558.8	1.6	895,126	2615	684,671
Wygen II	2012	164.8	0.6	222.1	0.8	745,459	2536	587,832
Wygen III	2012	325.9	0.8	200.6	0.5	1,004,748	2350	855,131
Wyodak	2012	2297.9	1.8	3051.1	2.4	3,315,332	2627	2,524,024
Wyoming Average			**1.6**		**1.8**		**2436**	
US Average			**4.0**		**2.0**		**2437***	

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*excludes plants whose reported emissions rates were negative or greater than 10,000 lbs/MWh

Tables Data Sources:

Tables 1 to 5: EIA Form 860 and 923 data.
Table 5: US national average Heat Rates comes from Power Engineering (2014), http://www.power-eng.com/articles/print/volume-118/issue-7/features/america-s-best-coal-plants.html
Table 6: PacifiCorp and Basin Electric.
Table 8: EIA Form 860 data, reporting year 2012.
Table 9: US EPA, Wyoming Regional Haze Rule State and Federal Implementation Plan, Federal Register, January 30, 2014. http://www2.epa.gov/sites/production/files/2014-02/documents/wyomingregionalhazefip_rulejan2014_0.pdf
Table 10: EPA: CPP Proposed 111(d) data, EIA Form 923 Data, EPA Air Markets Program Data http://ampd.epa.gov/ampd/

Appendix A3: NEMS Model Assumptions used in AEO2014 EIA Market Projections

Scenario	Population Growth/Year (2012-2040)	Nonfarm Employment/Year (2012-2040)	Labor Productivity/Year (2012-2040)	Real GDP Growth/Year (2012-2040)	Real Disposable Income per capita Growth/Year (2012-2040)
Reference Case	0.70%	0.80%	1.80%	2.40%	1.70%
Low Economic Growth	0.60%	0.70%	1.40%	1.90%	1.30%
High Economic Growth	0.80%	1.00%	2.00%	2.80%	1.70%
Low Coal Cost	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case
High Coal Cost	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case
Low Oil and Gas Resource	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case
High Oil and Gas Resource	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case	As in Ref. Case

Table A.2: Oil Price Assumptions

Scenario	Oil Market Assumptions
All coses except low oil price	Real Brent crude oil prices (in 2012 dollars) rise from $112/barrel in 2012 to $109 in 2025, rising slowly to $130 in 2035 and $141/barrel in 2040.
Low oil price case	Real Brent Crude price falls to $70/barrel by 2016, remains there through 2023, rising to $75/barrel by 2040.

* real = inflation adjusted to 2012 dollars

Table A.3: Coal Market Cost Assumptions:

Scenario	Productivity Growth Rate	Coal Miner Wages	Mine Equipment Costs	Coal Transportation Rates
Low Coal Cost	2.3% greater than reference case	Lower than reference, falling to 25% below reference by 2040	Lower than reference, falling to 25% below reference by 2040	Lower than reference, falling to 25% below reference by 2040
High Coal Cost	2.3% lower than reference case	Higher than reference, rising to 25% above reference by 2040	Higher than reference, rising to over 25% above reference by 2040	Higher than reference, rising to over 25% above reference by 2040

Table A.4: Natural Gas Assumptions

Scenario	Ultimate Recovery per Shale Gas	Ultimate Recovery per Tight Gas	Ultimate Recovery per Tight Oil
Low Oil and Gas Resource	50% lower than in the Reference case. All other resource assumptions remain the same as in the Reference case.	50% lower than in the Reference case. All other resource assumptions remain the same as in the Reference case.	50% lower than in the Reference case. All other resource assumptions remain the same as in the Reference case.
High Oil and Gas Resource	50% higher and well spacing is 50% than in the Reference case. Tight oil resources are added to reflect new plays or expansion of known tight oil plays and estimated ultimate recovery for tight and shale wells increases 1%/year to reflect additional technological improvement. Also includes 50% higher undiscovered resources in lower 48 offshore states, Alaska, and shale gas in Canada than in the Reference case	50% higher and well spacing is 50% than in the Reference case. Tight oil resources are added to reflect new plays or expansion of known tight oil plays and estimated ultimate recovery for tight and shale wells increases 1%/year to reflect additional technological improvement. Also includes 50% higher undiscovered resources in lower 48 offshore states, Alaska, and shale gas in Canada than in the Reference case	50% higher and well spacing is 50% than in the Reference case. Tight oil resources are added to reflect new plays or expansion of known tight oil plays and estimated ultimate recovery for tight and shale wells increases 1%/year to reflect additional technological improvement. Also includes 50% higher undiscovered resources in lower 48 offshore states, Alaska, and shale gas in Canada than in the Reference case

Senator BARRASSO. The Governor states about the study that the study determined the single largest threat to Wyoming's coal industry is EPA's Clean Power Rule. In fact, the study says that 111(d) climate regulation has the potential to drastically decrease Wyoming coal production. Production coal output under the most favorable production circumstances decreases by 32 percent of the 2012 production by the year 2025.

The study goes on to say even the best case impact modeling of the 111(d) scenario suggests a loss of over 7,000 jobs across the State by 2025 relative to the employment in 2012. It also says overall proposed carbon regulations result in a predicted decline in the State's combined coal and natural gas revenues of between 36 percent and 46 percent by 2030.

So our State is finding that this Rule will cost thousands of good paying jobs, will drastically slash State revenue that pays for college scholarships, schools, medical emergency services, road safety programs, environmental protection programs, water quality services, veteran services, other vital services. Wyoming children, seniors, veterans, fish and wildlife, they don't deserve, I believe, this dramatic cut in revenue by the EPA.

So I find this is recklessly irresponsible, where the costs are so clear and devastating, and the benefits are theoretical or unknown. So my question to the two of you is this: Are these statistics and findings similar to what you are seeing and you are concerned about in your States? And how will essential services, State services for children, seniors, as well as the environment, be impacted both in Oklahoma, as well as in West Virginia?

Mr. MORRISEY. Sure. So I think you raise a number of very important issues. We have obviously received a great deal of feedback from coal operators, from power plants, from coal miners in the State of West Virginia about the devastating impact of these rules. But there are a couple other implications as well.

For instance, West Virginia, as its tax base, relies very heavily on coal severance revenues. If you were to look at a chart and examine some of the revenues that come into each of the counties from 2011 to now, you will start to see a very rapid decline. Just recently we have seen news publications about a number of people that were laid off in the counties because the coal severance tax revenue had declined.

The regulations here have far-reaching implications well beyond coal operators. The fact is for every job that you have related to coal directly in West Virginia, there are probably seven jobs that tie in indirectly. It has a fundamental impact on our economy, and that is just one of the many reasons why our office has been focused so much on this, because it would be an absolute travesty to finalize a rule that ultimately has a real likelihood of being struck down in the courts.

Senator BARRASSO. So the regulations have a direct impact on the people and the quality of life of the people in your State.

Mr. MORRISEY. Without a doubt. I mean, as you are looking at these issues, there are always a wide variety of reasons that give rise to a particular decision by a power plant operator or a mine operator to change employment status, but regulatory burdens is always very high on that list.

Mr. PRUITT. And, Senator, if I could add to General Morrisey's comments. Though we do not have a robust coal economy, we do actually have coal in the State of Oklahoma, we are vertical in our energy diversity, I think what is lost in the debate at times is the impact on consumers, those that will be consuming electricity in the future. In the State of Oklahoma, between coal and natural gas, 78 percent of our electricity is generated. As I indicated in my opening comment, 15 percent of our electricity is generated through the wind.

The choices available to the State of Oklahoma to comply with this mandate from the EPA of reducing CO_2 by over 30 percent, it puts us in the position of having to make decisions about the shuttering of coal generation, which, as I indicated, makes up over 40 percent of our electricity generation. That is going to increase costs substantially to consumers; this one rule.

To give you an example, in the Clean Air Act there is something called the regional haze statute, as you know, section of the Clean Air Act. That one rule alone, between PSO, Public Service Company of Oklahoma, and OG&E in the State of Oklahoma have seen 15 to 20 percent increases in their generation of electricity with just one rule. When we combine all these others, it is going to be, obviously, substantially more than that in the future for consumers in the State of Oklahoma.

Senator BARRASSO. So these regulations would directly hurt, hurt the people of Oklahoma.

Mr. MORRISEY. Some of the folks that can least afford it.

Senator BARRASSO. Thank you.

Thank you, Madam Chairman.

Senator CAPITO. Thank you.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you very much, Madam Chairman. This is an interesting hearing because the questioners on the Republican side and the attorneys general who are present are all from States that have the characteristic that Attorney General Pruitt just described, i.e., they have a robust coal economy. And clearly we have a practical problem in that the burning of coal for electric generation creates some very, very dangerous consequences; but they are not fairly distributed. So where there is a robust coal economy, this creates one kind of problem.

In Rhode Island, where our oceans are up 10 inches against the shore where our fishermen are seeing fisheries disappear, where houses that have been there for generations are falling into the ocean, we have a very different set of problems. And I think it is important, if we are going to address this, that we, on the one hand, recognize that there may very well be economic effects within coal economies from trying to unburden ourselves of the environmental consequences of coal burning; and we are, I think, very willing to work with you to mitigate those consequences.

But we can't allow those consequences to take us to a point where we deny that the problem exists. That is just irresponsible and factually wrong, and ultimately, I think, potentially really quite disgraceful to the institutions that we all serve.

So let me ask you first, Attorney General Pruitt, you said that one of the problems with the EPA regulation was that this issue

should be left to the local level. Please tell me what Oklahoma is doing at the local level to address carbon pollution and climate change.

Mr. PRUITT. Senator, if I could, in response to your question, also say that I did not make a reference to the coal economy in the State of Oklahoma. We do not have a robust coal economy. In fact, our percentage of generation of electricity attributable to coal is 40 percent, which is less, I think, than perhaps Maryland, as it was referenced earlier.

Senator WHITEHOUSE. Well, I wrote it down as you said it, and it was robust coal economy. But if that wasn't correct, then I apologize and I stand corrected. The record will be what the record is.

Mr. PRUITT. But I think what Oklahoma has done is engage in a very much a balancing effort between diverse fuel sources, from renewables at 15 percent of generated electricity to 40 percent in coal.

Senator WHITEHOUSE. Why? How does climate change roll into that calculation?

Mr. PRUITT. Well, our focus through public utility corporation decisionmaking, as well as my focus as attorney general, is not to engage in policy debate about whether climate action is occurring or not.

Senator WHITEHOUSE. Why not?

Mr. PRUITT. It is to look at the statute to determine whether the EPA is engaging in a process that is consistent with the authority that you have given the EPA.

Senator WHITEHOUSE. But why would you be willing to look at the consequences of the regulation on, for instance, the coal economy, but not be willing to look at the consequences of this regulation on environmental protection? Why is that the debate that you think you need to stay out of when you are willing actively to get into the debate on the other side? That doesn't seem balanced.

Mr. PRUITT. Again, Senator, I think my comments were referring to the decisionmaking, the discretion that the State is engaged in as far as balancing generation of electricity between coal and fossil fuels.

I would also say to you it is Congress that should be jealous about protecting its role and what it has told agencies what they can and cannot do. It is Congress that has set up the framework that we are talking about this morning between 111 and Section 112.

Senator WHITEHOUSE. Well, we passed the statute that it is following, and I am comfortable that they are following it. So I am not actually jealous at all; I think they are doing exactly what Congress intended. So I am very comfortable with that.

What I am concerned about, we heard from Senator Barrasso here, from Wyoming, a very important coal State, that the benefits of this rule are theoretical or unknown. They are not theoretical or unknown. They are very clear. They are very specific. And there are people who are very knowledgeable about it.

If I could use the remainder of my time to quote one very well known scientist on this who says, "We know precisely how fast CO_2 is going up in the atmosphere. We have made a daily measurement of it since 1957. We have ice core data before that. We know with-

out any question that it has increased by almost 40 percent since the industrial revolution, and that that increase is due to human activity, primarily fossil fuel burning and, secondarily, bad use in agriculture. There is no debate about that."

He continues, "There are lots of scientific uncertainties, but the fact that the planet's warming and the fact that CO_2 is a greenhouse gas, and the fact that is increasing in the atmosphere and that it increased in the atmosphere due to humans, about those things there is no debate."

And that is a statement of Dr. Berrien Moore III, who is the Dean of the University of Oklahoma's College of Atmospheric and Geographic Sciences. And I think we need to be a little bit fairer about these hearings if we are going to get to a suitable result.

My time has expired and I yield back.

Senator CAPITO. Thank you.

I think I would like to ask another question, make another statement. I believe the chairman of the full committee and Senate, certainly, if you are here still, we will go through another round.

I would just react a little bit to some of the comments that were made in terms of the constitutionality and the legal authority that we are looking at here. I think we all need to be mindful that this can swing both ways in different administrations. Just because this time I think the constitutional overreach is too much and is something that bears terrific scrutiny, it is not to say that in another 10 years another administration, that Senator Whitehouse would be thinking the same thing because of the direction it is going. So I think this is extremely important to look at the legal implications.

Also, the comment was made that there was tremendous outreach to the State regulators, and I would reinforce what I said in my opening statement, and that I have said before this committee before and actually testimony was in front of the committee, that the primary administrator in charge of this at the EPA wouldn't even come in to the State, our State, to hear about the seniors whose prices of electricity are going up, the miners who have lost their jobs, the manufacturers who are going out of business who are concerned about the price. So I think maybe there has been outreach, but there hasn't been enough outreach, in my opinion, to the regular folks that are really being heavily impacted in those States, where I live.

I am going to ask really quickly a question to Mr. Martella. We have heard a lot about whether the—I am getting back into the legal authority on the four building blocks. What legal authority, if any, does the EPA have under the Clean Air Act to impose disposal requirements on natural gas-fired power plants? Because that is one of their building blocks.

Mr. MARTELLA. So thank you for asking that question, and the question about the building blocks two, three, and four, the dispatching the renewable energy, the energy efficiency.

Senator CAPITO. I am going to ask the same question about all of them, so just wrap it in there.

Mr. MARTELLA. OK, maybe I can give you the same answer to all of them. They sync up with your question about constitutionality, cooperative federalism in this relationship we are hearing

from all the witnesses on the relationship between the Federal Government and the States. I would like to answer it in this one way, and it is something that Professor Heinzerling said in her written testimony. A lot of people make analogies to the ESPS and the NO_x program, which is something this committee is very familiar with. People say, well, EPA has always been able to implement the NO_x program; the Supreme Court has endorsed it. Professor Heinzerling said this is not materially different than that.

But it is materially different, and I think this is the answer to your question. In the NO_x program, Congress has specifically authorized EPA to regulate NO_x pollutants, and it has authorized EPA to delegate that authority to the States. So there are two things that are different there. At the outset, there is no doubt that Congress has delegated this authority to EPA, and Congress has said you can give this authority to the States or you can take it back.

The fundamental distinction with the Clean Power Plan, when we talk about blocks two, three, and four, is EPA saying we now want States to implement a renewable portfolio standard, or dispatching system, or an energy efficiency system; and the distinction here is there is no debate that Congress has never authorized EPA itself to run a renewable portfolio standard in West Virginia, or a dispatching system in Oklahoma, or an energy efficiency program in Rhode Island. So Congress itself has never given that authority to EPA. EPA cannot, therefore, delegate that authority further to the States.

That is just kind of a summary way that I think brings together these themes of cooperative federalism, constitutional issues, and the flexibility questions that have come up so far today.

Senator CAPITO. So just so I understand specifically, you are saying that in the area of NO_x, that there is specific legislative authority for the EPA to go into the direction that they have gone.

Mr. MARTELLA. That is correct. That has been well settled; the Supreme Court has addressed that several times and it is very clear what Congress set up this cooperative federalism system there. Again, if a State decides, if my colleague here from Oklahoma decides not to implement the EPA NO_x, Congress has specifically said, well, EPA has the authority in the first instance. If Oklahoma decides not to implement a renewable portfolio standard, Congress has never authorized EPA to implement that renewable portfolio standard.

Senator CAPITO. Thank you.

Attorney General Morrisey, how many States did you say joined in the case that you just recently brought?

Mr. MORRISEY. Well, right now we have 15 States, which includes both attorneys general and Governors; and obviously in the D.C. Circuit there were three cases that came together and were consolidated. We led the State effort and then there were other industry efforts as well.

Senator CAPITO. Would you characterize the 18 States as ones similar to West Virginia, Wyoming, Oklahoma, energy producing States, or are they just heavily reliant on coal, or is it all over the board?

Mr. MORRISEY. My sense is that these are strong energy producing States, but I would note that this is a bipartisan coalition. The State of Kentucky is also on board with our lawsuit as well, so we have obviously been reaching out to more and more States because we believe that even non-coal producing States or energy producing States should care fundamentally about whether this 111(d) Rule gets finalized because of some of the legal implications.

Senator CAPITO. Thank you.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you very much, Chairman.

Attorney General Morrisey, is climate change a problem anywhere in the world?

Mr. MORRISEY. Well, Senator, my role is to serve as the chief legal officer of the State of West Virginia.

Senator WHITEHOUSE. That is a pretty simple question.

Mr. MORRISEY. So I am not going to make an argument today about climate change and whether the temperature is evolving, because regardless of the policy merits of anyone's proposal, policies have to be implemented in a lawful manner, and that is one of my main obligations as the attorney general of the State of West Virginia.

Senator WHITEHOUSE. Well, let me just ask Attorney General Pruitt, is climate change a problem anywhere in the world?

Mr. PRUITT. Senator, I think that the process matters that the EPA engages in to address these issues.

Senator WHITEHOUSE. I get that. But I didn't ask you a process question; I asked you a question about whether climate change is a real problem anywhere in the world.

Mr. PRUITT. I think the question about climate action plan of the President, climate change, is something that is a policy consideration of this Congress. If you want EPA to address that in a direct way, you can amend the Clean Air Act to provide that authority and the statutory power to do so, so that the States can know how to conduct themselves in a way that is consistent with statutory construction.

Senator WHITEHOUSE. So, to be clear, neither of the attorneys general present will concede that climate change is a real problem anywhere in the world.

Mr. PRUITT. Senator, I think it is immaterial to discussions about the legal framework of the Clean Air Act.

Senator WHITEHOUSE. Immaterial or not, I get to ask the questions, so it is material to my question.

All right, let's go on to something else.

We have talked a lot about kilowatt hour cost, and I would like to make a point, which is that the price of electricity in Rhode Island, my home State, was 15.2 cents per kilowatt hour. That compares to 9.67 cents per kilowatt hour in Oklahoma and it compares to 9.52 cents per kilowatt hour in West Virginia. However, because of Rhode Island's investment in efficiency and a whole variety of programs particularly through RGGI, which has been mentioned earlier, that have been able to bring our usage down, Rhode Islanders paid only $91.48 per month for electricity, compared to $110.47 in Oklahoma and $106.44 in West Virginia.

Will both of the attorneys general from West Virginia and Oklahoma concede that the real impact to a consumer is the dollar amount that they have to write on the check that pays the bill?

Mr. MORRISEY. Well, Senator, I think where you are going right now, some of the details in terms of how electricity prices may vary across the State is a policy question. In West Virginia we have heard deep concern from power plant operators, from coal operators about what the impact will be on electricity prices, so we have seen that in the context of other proposed regulations that have gone through.

But I think it is important to reiterate right now to choose a policy objective and try to advance it through unlawful means is something that everyone in this body should reject.

Senator WHITEHOUSE. Can I go back to the question that I actually asked? Isn't the economic effect of a policy made real in a consumer's life by the amount of the check that they actually write, rather than a per kilowatt hour cost?

Mr. MORRISEY. I think Senator, most people look at the amount that they are paying when they get in the bill; they don't analyze the economic effect.

Senator WHITEHOUSE. That is right.

Attorney General Pruitt, you agree?

Mr. PRUITT. I think, Senator, that what is important for utility companies across the Country is to have choices, flexibility in the diversity of the portfolio to generate electricity.

Senator WHITEHOUSE. I agree with all that, but my question was quite specific, and that is when you are a utility consumer, in terms of the economic effect on you, what really matters is the amount of the check you write, correct?

Mr. PRUITT. And the long-term economic effect of shuttering coal generation or fossil fuel generation in this Country, long-term, will be substantial on consumers.

Senator WHITEHOUSE. Well, you didn't answer my question; you segued into your lobbying on behalf of coal. But the answer to the question is yes or is it no, that the real difference is made by what the bill is?

Mr. PRUITT. Senator, I maintain that the State of Oklahoma is experiencing an increase in cost to consumers because of the EPA's heavy hand of eliminating fossil fuels from the energy mix.

Senator WHITEHOUSE. Well, I would suggest to you that you try what Rhode Island did, because our costs are higher than you, but our bills are lower than yours because we actually took the trouble to invest in a significant way in energy reduction and efficiency.

With that, my time has expired.

Senator CAPITO. Senator Inhofe.

Senator INHOFE. Thank you, Madam Chairman.

We have been talking about this since 2002, and I can remember down on the Senate floor they tried to pass a similar thing that this regulation would do, but pass it by legislation; and I saw what happened. In fact, that first bill was the McCain-Lieberman bill; and McCain was a Republican. We decisively defeated that bill and every bill since that time. Senator Markey is not here now. He actually had a bill up also. Now, that has happened.

This discussion about the science is settled, the science is settled, the science is settled, every time something comes up where the science isn't settled, all they talk about is that science is settled because they don't want to elaborate on that. I want to make a part of the record an article a couple weeks ago in The Wall Street Journal called The Myth of Climate Change 97 Percent.

This whole thing, they keep saying 97 percent of the scientists. This totally diffuses that. It would take me too long to read it, so I will put it into the record without objection.

Senator CAPITO. Without objection.

[The referenced article follows:]

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COMMENTARY

The Myth of the Climate Change '97%'

What is the origin of the false belief—constantly repeated—that almost all scientists agree about global warming?

By **JOSEPH BAST** And **ROY SPENCER**
May 26, 2014 7:13 p.m. ET

Last week Secretary of State John Kerry warned graduating students at Boston College of the "crippling consequences" of climate change. "Ninety-seven percent of the world's scientists," he added, "tell us this is urgent."

Where did Mr. Kerry get the 97% figure? Perhaps from his boss, President Obama, who tweeted on May 16 that "Ninety-seven percent of scientists agree: #climate change is real, man-made and dangerous." Or maybe from NASA, which posted (in more measured language) on its website, "Ninety-seven percent of climate scientists agree that climate-warming trends over the past century are very likely due to human activities."

Yet the assertion that 97% of scientists believe that climate change is a man-made, urgent problem is a fiction. The so-called consensus comes from a handful of surveys and abstract-counting exercises that have been contradicted by more reliable research.

One frequently cited source for the consensus is a 2004 opinion essay published in Science magazine by Naomi Oreskes, a science historian now at Harvard. She claimed to have examined abstracts of 928 articles published in scientific journals between 1993 and 2003, and found that 75% supported the view that human activities are responsible for most of the observed warming over the previous 50 years while none directly dissented.

Ms. Oreskes's definition of consensus covered "man-made" but left out "dangerous"—and scores of articles by prominent scientists such as Richard Lindzen, John Christy, Sherwood Idso and Patrick Michaels, who question the consensus, were excluded. The methodology is also flawed. A study published earlier this year in Nature noted that

abstracts of academic papers often contain claims that aren't substantiated in the papers.

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Another widely cited source for the consensus view is a 2009 article in "Eos, Transactions American Geophysical Union" by Maggie Kendall Zimmerman, a student at the University of Illinois, and her master's thesis adviser Peter Doran. It reported the results of a two-question online survey of selected scientists. Mr. Doran and Ms. Zimmerman claimed "97 percent of climate scientists agree" that global temperatures have risen and that humans are a significant contributing factor.

The survey's questions don't reveal much of interest. Most scientists who are skeptical of catastrophic global warming nevertheless would answer "yes" to both questions. The survey was silent on whether the human impact is large enough to constitute a problem. Nor did it include solar scientists, space scientists, cosmologists, physicists, meteorologists or astronomers, who are the scientists most likely to be aware of natural causes of climate change.

The "97 percent" figure in the Zimmerman/Doran survey represents the views of only 79 respondents who listed climate science as an area of expertise and said they published more than half of their recent peer-reviewed papers on climate change. Seventy-nine scientists—of the 3,146 who responded to the survey—does not a consensus make.

In 2010, William R. Love Anderegg, then a student at Stanford University, used Google Scholar to identify the views of the most prolific writers on climate change. His findings were published in Proceedings of the National Academies of Sciences. Mr. Love Anderegg found that 97% to 98% of the 200 most prolific writers on climate change believe "anthropogenic greenhouse gases have been responsible for 'most' of the 'unequivocal' warming." There was no mention of how dangerous this climate change might be; and, of course, 200 researchers out of the thousands who have contributed to

the climate science debate is not evidence of consensus.

In 2013, John Cook, an Australia-based blogger, and some of his friends reviewed abstracts of peer-reviewed papers published from 1991 to 2011. Mr. Cook reported that 97% of those who stated a position explicitly or implicitly suggest that human activity is responsible for some warming. His findings were published in Environmental Research Letters.

Mr. Cook's work was quickly debunked. In Science and Education in August 2013, for example, David R. Legates (a professor of geography at the University of Delaware and former director of its Center for Climatic Research) and three coauthors reviewed the same papers as did Mr. Cook and found "only 41 papers—0.3 percent of all 11,944 abstracts or 1.0 percent of the 4,014 expressing an opinion, and not 97.1 percent—had been found to endorse" the claim that human activity is causing most of the current warming. Elsewhere, climate scientists including Craig Idso, Nicola Scafetta, Nir J. Shaviv and Nils- Axel Morner, whose research questions the alleged consensus, protested that Mr. Cook ignored or misrepresented their work.

Rigorous international surveys conducted by German scientists Dennis Bray and Hans von Storch—most recently published in Environmental Science & Policy in 2010—have found that most climate scientists disagree with the consensus on key issues such as the reliability of climate data and computer models. They do not believe that climate processes such as cloud formation and precipitation are sufficiently understood to predict future climate change.

Surveys of meteorologists repeatedly find a majority oppose the alleged consensus. Only 39.5% of 1,854 American Meteorological Society members who responded to a survey in 2012 said man-made global warming is dangerous.

Finally, the U.N.'s Intergovernmental Panel on Climate Change—which claims to speak for more than 2,500 scientists—is probably the most frequently cited source for the consensus. Its latest report claims that "human interference with the climate system is occurring, and climate change poses risks for human and natural systems." Yet relatively few have either written on or reviewed research having to do with the key question: How much of the temperature increase and other climate changes observed in the 20th century was caused by man-made greenhouse-gas emissions? The IPCC lists only 41 authors and editors of the relevant chapter of the Fifth Assessment Report addressing "anthropogenic and natural radiative forcing."

Of the various petitions on global warming circulated for signatures by scientists, the

one by the Petition Project, a group of physicists and physical chemists based in La Jolla, Calif., has by far the most signatures—more than 31,000 (more than 9,000 with a Ph.D.). It was most recently published in 2009, and most signers were added or reaffirmed since 2007. The petition states that "there is no convincing scientific evidence that human release of . . . carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate."

We could go on, but the larger point is plain. There is no basis for the claim that 97% of scientists believe that man-made climate change is a dangerous problem.

Mr. Bast is president of the Heartland Institute. Dr. Spencer is a principal research scientist for the University of Alabama in Huntsville and the U.S. Science Team Leader for the Advanced Microwave Scanning Radiometer on NASA's Aqua satellite.

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Senator INHOFE. Talk about some of the scientists. I know Richard Lindzen. I have talked to him. He was quite upset back when then-Vice President Al Gore was using this politically for his career. Richard Lindzen is an MIT professor who is recognized as being one of the top professors around in the climate and the very thing that we are talking now, and people ask him the question why is it that people are so concerned about regulating CO_2. He said it is a power grab. He said, and these are his words, regulation of carbon is a bureaucrat's dream. If you regulate carbon, you regulate life.

So this whole idea that the science is settled, the science is settled is just flat not true.

Now, I know that people have 12 years of their life wrapped up in this issue as the only issue of our time; they don't like to recognize this fact, but, nonetheless, this is a problem. In fact, I will do this from memory because I have said it so many times. You go back and you see these cycles that take place in the world. In 1895 we went into the first cold spell that has been really talked about, it was about a 30-year cold spell; and that's when they first said another ice age is coming and all of that, trying to get people alarmed. Because the world is always coming to an end when this happens.

Then in 1918 we went into a warm spell that lasted about 30 years, and that was the first time you heard global warming. That was 1918. That was a long time ago.

Then 1945 they changed and it started going into a cold spell.

Now, this is the interesting thing about these 30-year cycles; and it goes right up until today: the year that we had the greatest surge in emissions of CO_2 was right after the second World War, you guys know this, it was 1945; and that precipitated not a warming period, but a cooling period.

These are realities. I can remember speeches I made on the floor in response to things that my good friend from Rhode Island has said when I talk about what is the reality of what is going on today.

So we are going to hear more of this and I know that there is an effort now to have this bureaucratic thing that, in my opinion, it doesn't have what it is supposed to have. The only thing I want to get back in and get the response from both attorneys general is a matter of what we have been talking about, flexibility. Senator Markey talked about it, Ms. Heinzerling talked about it. The EPA often talks about the flexibility and would say that the EPA simply is hiding behind the flexibility while, in reality, forcing States to figure out how to make the least economically devastated decisions.

So I would just ask the two of you does the Clean Power Plan provide States with any real flexibility? Every witness has talked about flexibility.

Mr. MORRISEY. I think if you look at this concept of flexibility, it is a false concept. The reality is that States are having an enormous amount of pressure applied to them to develop a State implementation plan within 1 year. Based upon the declarations that we receive from many of the States, people really don't think that is possible; that the goals of this proposal are so severe that States are not going to be able to come into compliance. So when you look

at the proposal the way it is constituted, I don't think it is fair to say that it is flexible.

But our argument has always been regardless of whether people think that is desirable from a policy perspective, the law actually doesn't even allow the EPA to go outside the fence to develop that kind of flexible approach.

The final point I would also make is that if you look at the predicate rule that is required before finalizing the 111(d) Rule that is for new source performance standards, that obviously does not rely on outside-the-fence technology. When they develop their best system of emission reductions, it is much more narrow.

Senator INHOFE. General Pruitt.

Mr. PRUITT. I think that my colleague, my fellow panelist here, Roger, addressed it well earlier. Flexibility with respect to how plans are adopted is something the States endeavor to possess and have, but flexibility with respect to performance standards, inside-the-fence versus outside-the-fence, that is what we are really facing here. The EPA has taken an approach of forcing performance standards upon the State of Oklahoma that outside-the-fence, they are providing less options in the future as far as how to comply.

Senator INHOFE. Thank you, Madam Chairman.

Senator CAPITO. Thank you.

Senator Carper.

Senator CARPER. Thanks much.

If I could, I am not a lawyer either. I studied economics, got an MBA, but I am not a lawyer, and I don't understand some of this discussion when we get into these technicalities. But I do know this: I have seen us pass legislation when I was in the House with Senator Inhofe and in the Senate where we were putting the same bill, conflicting approaches to the same issue. In some cases we were just unable to resolve our differences, so we put both in and say somebody else will figure this out. I think, in a way, when I saw this discussion around Section 111(d) of the Clean Air Act, it reminded me of that kind of behavior.

I am looking at your testimony, Lisa, where you say based on the text of Section 111(d) alone, EPA has persuasively defended its proposed view that the statute is ambiguous and that its interpretation is reasonable. These are the criterion for the Chevron deference and EPA has met them.

Explain this so I can understand. I think I do, but we have these two amendments, one dropped out of the Code, but now I am told it still is in another life. Explain this to us, please.

Ms. HEINZERLING. So, Congress, in 1990, passed two different amendments to Section 111(d). One seemed to look to pollutants; one seemed to look to sources. But as EPA has explained, as I note there, they are not entirely clear, either one of them standing alone, and the combination is not entirely clear coming together. So what EPA has tried to do is try to take from each amendment something, and what it said is you cannot regulate the same pollutants from the same sources under both programs, Section 111 and 112.

That is the kind of judgment, as you are suggesting, that agencies make all the time. There are many times when statutes aren't entirely clear. They may contain provisions that are in contention

with each other, and agencies resolve them. And this usually is a straightforward application of what I call there as Chevron deference, which is a case in which the Supreme Court said that if a statute is not clear, if policy judgments are left to the agency to make, then the agency gets deference to a reasonable interpretation of the statute.

And here I think the text allows EPA's interpretation. I would also say, in light of the comments earlier about the problem of global warming, just imagine if the EPA said, no, we will take the interpretation that does not allow us to regulate the sources of greenhouse gases that emit the most greenhouse gases in this Country, and to attack the problem of climate change by doing that; we are going to pick the interpretation that does not permit us to do that. That would be quite strange.

Senator CARPER. Yes, it would.

Question if I could, Ms. Backman, please. I want to go back to the issue of whether the science of climate change is settled law. Just very briefly, do you think it is or do you think it is not?

Ms. SPEAKES-BACKMAN. I am sorry, could you repeat that?

Senator CARPER. The question on whether the science of climate change is indeed settled law. Do you believe it is? Do you believe it is not?

Ms. SPEAKES-BACKMAN. Well, Senator, I am also not a lawyer, and I am not a climate scientist, but I do choose to believe the overwhelming majority of climate scientists who say it is real and say it is caused by humans. So now we need to act. And I can tell you also that there is a cost to action, but there is also a cost to inaction. And I can tell you, as one who is responsible for consumers, electricity consumers who depend on reliable, affordable energy, that certain ways to help the system include renewable energy, include energy efficiency, include demand reduction to help with those reliability issues and to help with the resiliency of our system.

Senator CARPER. OK, that is fine. Just hold it right there.

One last question, if I could, for Lisa. Are EPA's proposed carbon standards supported by the three Supreme Court decisions in Massachusetts v. EPA and American Electric Power v. Connecticut and Utility Air Regulatory Group v. EPA? Thanks very much.

Ms. HEINZERLING. Yes.

Senator CARPER. Tell us more.

Ms. HEINZERLING. Yes. Massachusetts v. EPA, of course, held that greenhouse gases are air pollutants within the meaning of the Clean Air Act. I think much of what we hear against EPA's Clean Power Plan is an attempt to re-litigate that case, to tell us that carbon dioxide is not really an air pollutant, it is not dirty somehow, so, therefore, it is not regulable under the Clean Air Act. That case clearly holds that these pollutants are regulable under the Clean Air Act.

American Electric Power is interesting because it relied on regulation under Section 111(d) in holding that there was no so-called Federal common law, court made law of global warming pollution. That is significant because if this regulation goes by the boards, then all the reasons for that common law come back to force.

And the last, the Utility Air Regulatory Group, it seems to me that case can be understood most generally first as a victory for most of EPA's greenhouse gas program that was at issue there and, second, it asked EPA to look section-by-section and make sure that regulation under a particular provision of the Clean Air Act made sense for particular pollutants. That is exactly what EPA has done here.

Senator CARPER. Madam Chair, I would just say this is a good panel, and I commend you and our staffs for pulling them together.

Thank you all for coming. If I ever go to law school, I would like you to be my professor.

Senator CAPITO. Thank you very much. I would like to thank the panel and thank the Senators.

Senator WHITEHOUSE. Will there be questions for the record allowed?

Senator CAPITO. Yes. We will leave the record open for 2 weeks and you can submit questions for the record.

Senator WHITEHOUSE. Very well. We will do that.

Senator CAPITO. Thank you all very much. Appreciate it. Appreciate your patience when we had to leave.

This hearing is adjourned.

[Whereupon, at 11:52 a.m. the committee was adjourned.]

[An additional statement submitted for the record follows:]

STATEMENT OF HON. BENJAMIN L. CARDIN,
U.S. SENATOR FROM THE STATE OF MARYLAND

I want to welcome Maryland Public Service Commissioner, and Chair of the Regional Greenhouse Gas Initiative, Kelly Speakes-Backman to the Committee and thank her for her service and willingness to testify before the Committee. Commissioner Speakes-Backman has served on the Maryland PSC for 4 years and has spent more than 20 years working on energy, sustainability, and environmental business strategies.

She is a tremendous asset to RGGI for which I am proud Maryland is an active participant. Through her work on the PSC, the Maryland Energy Administration and RGGI, she has helped Maryland take steps to reduce its carbon footprint while maintaining affordable and reliable energy and helped grow new and exciting business opportunities in the State.

Thank you for being here.

With bi-partisan support, Congress passed the Clean Air Act that President Richard Nixon signed into law on the last day of the year in 1970. The Clean Air Act came about in response to devastating air pollution that made it nearly impossible to see the sky during certain times of the year in cities like Los Angeles, New York and my home town of Baltimore.

After almost 45 years, the Clean Air Act has effectively helped clean up the air in most major cities. The proof is in the decline of bad-air days we experience in the Mid-Atlantic and Northeast during the hot summer months. It used to be that in the DC-Baltimore metropolitan areas during the 1970s, 1980s and 1990s, anytime the temperature reached into the 90s we'd inevitable have ground level ozone levels so high that the National Weather Service would issue "red alerts" for air quality.

The Clean Air Act is working. The number of "red alert" and "orange alert" days have been in decline, despite our region experiencing some of the hottest summers on record since the start of this century. Not to mention that our nation's economy has expanded exponentially under the Clean Air Act.

I'd like to address a legislative proposal that recently passed the House allowing States to opt out of the Clean Air Act. When EPA promulgates rules to reduce smog causing pollutants like NO_x and SO_x, Members of Congress may complain about the stringency of the requirements, but Congress has never entertained legislation allowing upwind polluters to opt out of the regulations designed to protect their neighbors' air quality and public health. Yet the approach of excusing responsibility of States from contributing to addressing a national problem is precisely what is mov-

ing through Congress and that the majority leader is writing letters to Governors urging them to do.

EPA's authority to regulate CO_2 under the Clean Air Act has been affirmed by the Supreme Court in two landmark Clean Air Act cases. When the commonwealth of Massachusetts, among other States, took EPA to court over a petition of certiorari for abdicating its responsibility to regulate greenhouse gases under the Clean Air Act, the court, in Massachusetts v. EPA (2007), found in favor of Massachusetts.

The Clean Air Act defines "air pollutant" as "any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive . . . substance or matter which is emitted into or otherwise enters the ambient air." On remand from Massachusetts v. EPA, EPA found that six greenhouse gases, emitted from the combustion of carbon based fuels, "in the atmosphere may reasonably be anticipated both to endanger public health and to endanger public welfare."

The Court prescribed EPA conduct an endangerment finding process to determine how greenhouse gases "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."

In 2009, EPA conducted its endangerment finding, it was subject to public comment, there were several public hearings, thousands of public comments were received and eventually the Endangerment Finding was finalized. Without surprise the Endangerment Finding was challenged.

The U.S. Chamber of Commerce and The National Manufacturing Association, under a coalition named "The Coalition for Responsible Regulation," brought the challenge in a consolidated court case. This group also challenged the Light Duty Truck Rule: a rule developed to harmonize regulations to reduce GHGs and improve fuel economy in small trucks; and the Tailoring Rule: which set GHG thresholds for regulating GHGs under New Source Review Prevention of Significant Deterioration.

In Coalition for Responsible Regulation v. EPA, the petitioners sought judicial review of EPA's determination in the U.S. Court of Appeals, D.C. Circuit. On June 26, 2012, the court issued an opinion which dismissed the challenges to the EPA's endangerment finding and the related GHG regulations.

The three-judge panel unanimously upheld the EPA's central finding that GHGs such as CO_2 endanger public health and are likely responsible for the global warming experienced over the past half-century.

Prior to the D.C. Circuit's ruling in CRR v. EPA, the Supreme Court heard another case of importance and influence regarding carbon pollution. In American Electric Power Company v. Connecticut (2011) was a unanimous SCOTUS decision which held that corporations cannot be sued individually for GHGs emissions under Federal common law, because the Clean Air Act delegates the management of GHGs emissions to the EPA. This is important because it further lays the groundwork for nationwide regulation of carbon pollution.

Most recently, on June 23, 2014, the Supreme Court once again upheld and affirmed EPA's responsibility to regulate carbon pollution under the Clean Air Act.

This specific challenge was to EPA's authority to regulate stationary sources, precisely what the Clean Power Plan does. The Supreme Court, in a decision where Justice Scalia wrote the majority opinion and all justices concurring with at least some portions of decision, affirmed EPA's legal authority to regulate GHGs under its existing Clean Air Act authorities.

The bottom line is that this Committee is not the Supreme Court. The final arbiter on the legality of the Clean Power Plan is the Supreme Court, and based on the rulings in the case law that preceded, instructed and informed EPA's proposed Clean Power Plan it would seem very likely that the Supreme Court will uphold this rule.

The statutory authority granted under the 1970 Clean Air Act, and three Federal court decisions including two Supreme Court decisions, laid the legal groundwork for a commonsense approach to regulating carbon pollution under Section 111(d) of the Clean Air Act.

Sec. 111 authorizes EPA to establish baseline performance standards for power plants, which in the case of this rule we are talking about achieving a 30 percent net reduction in carbon pollution from power plants, using 2005 as the baseline, by 2030.

Moreover, the rule is flexible in how these "performance standards" are met by applying these standards broadly across each State's fleet of power plants, rather than demanding these reductions from each individual power plant.

This approach to regulation puts States in control of how their fleet of power generation facilities will meet these reduction targets. The performance standard is applied across all power generation facilities, including carbon intensive facilities like coal power plants, and zero emission power like nuclear, hydro and wind.

Through this rule, solutions can be sought outside the fence, it may be possible for States to meet these standards through increased in-state development of renewable energy and improved energy efficiency standard, without having to shut down or drastically change the operations of its coal power plants.

States will be in control of how they will meet these standards and there are a wide variety of tools in the toolbox for States to use to meet these standards.

Using RGGI as its model and approach for compliance with the rule, RGGI generates more than $200 million annually in revenues for Maryland, meaning compliance with this rule will continue to bring needed revenues into the State. Moreover, electricity rates have stabilized in Maryland providing price certainty for ratepayers which would be unchanged so long as Maryland remains a RGGI State. Last, MD's regulated community understands and appreciates the regulatory certainty the RGGI has provided.

That's why our State's largest electricity generator has submitted comments that support the goals of the proposed rules, while at the same time suggest how the rule may be improved to better accommodate nuclear power generation.

I applaud Exelon's constructive participation and approach to the rulemaking process. I'm proud that Maryland's energy companies, like Constellation/Exelon are making investments to reduce the carbon output of its power generation fleet in Maryland and in the other States they are operating in.

These early adopters made the correct investments and assumptions about where regulation was headed all based on information that everyone in the power generation sector had available.

The actions taken by Maryland's power sector and State regulators show an understanding of how important addressing climate change is to Maryland. After all, it makes good business sense in Maryland for power providers to do their part to reduce the causes of climate change, because 70 percent of the State's population live in the coastal regions of the State.