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Coal Industry's Future

Should all coal-fired power plants be closed?

Most U.S. coal is used to generate electricity, but it gives off carbon dioxide and other pollutants, and the industry is getting crushed as power plants turn to cheap, cleaner natural gas and zero-emissions solar and wind power. Recent environmental regulations of power plant emissions are encouraging the shift. Hundreds of coal-fired power plants have closed since 2010, and U.S. coal production has fallen 40 percent from its 2008 peak. Most American coal-mining companies have sought bankruptcy protection in the past two years. Environmentalists want coal-fired electricity plants phased out by 2030, saying they are too costly to operate and too harmful to the environment. But the industry says shutting more coal-fired plants could threaten the reliability of the power grid and that coal-generated electricity is cleaner than decades ago and relatively cheap. Meanwhile, depressed mining communities want increased federal aid to help unemployed miners find new jobs, while industry and coal-mining states are challenging environmental regulations in court.

Coal is transported down the Kanawha River in Charleston, W. Va. Eight years ago, coal generated half of the nation's electricity. Now it generates a third.

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Coal Industry's Future

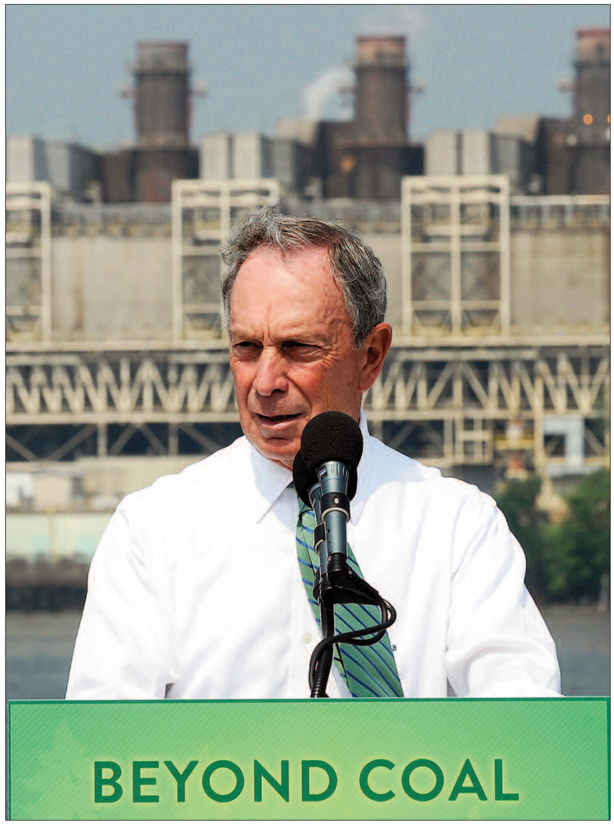
BY BARBARA MANTEL

THE ISSUES

Since 1968, Gail Japp has lived in Gillette, Wyo., the heart of the resource-rich Powder River Basin. "I've seen the oil boom come and go. I've seen good times and bad times, but it's never been this bad," said Japp, one of 235 coal miners laid off by St. Louis-based Peabody Energy in March. [1]

"What in the world am I gonna do? I'm single. I'm 64. I have a mortgage. Am I gonna lose my house?" she asked. Japp can't leave Gillette to find a new job because her 90-year-old father lives there, and she babysits her two grandchildren, she said. [2]

Until a few years ago, energy dollars had made Gillette a boomtown, with high paying jobs and strong economic growth, said City Administrator Carter Napier. "It is an absolute and complete turnaround right now. We have food trucks coming to our community to provide basic supplies for life," he said, as first the oil industry and now coal has contracted. [3]



AFP/Getty Images/Jewel Samad

Former New York City Mayor Michael Bloomberg has given $50 million to the Sierra Club's Beyond Coal campaign, a movement to eliminate coal-fueled electricity. "You'd think the politicians would at least care about the air they breathe themselves," the media mogul said.

The vast majority of U.S. coal is used to fuel electric power plants, but greater energy efficiency, competition from cheap — and cleaner — natural gas, falling costs for solar and wind power and new environmental regulations of power plant emissions are crushing the coal industry. Eight years ago, coal generated half of the nation's electricity. Now it generates a third. [4]

Coal-fired power plants are being shuttered, U.S. coal production has fallen 40 percent from its 2008 peak, and in the past two years most U.S. coal mining companies have filed for Chapter 11 bankruptcy protection. Japp's former employer, Peabody Energy, the world's largest private-sector coal company, filed in April. [5]

Environmentalists are pushing for the closure of all remaining U.S. coal-fired power plants by 2030, saying they no longer make economic sense and create too much pollution. But mining and power companies warn that shutting more plants could threaten the reliability of the power grid and defend coal-generated electricity as relatively cheap and cleaner than decades ago. Meanwhile, depressed mining communities are demanding federal aid, and industry and coal-mining states are challenging the Obama administration's environmental regulations in court.

"We've got to fight for all we're worth to protect the industry that is the backbone of our state," said John O'Neal, a member of the West Virginia House of Delegates. Coal "is our number one natural resource, and we just can't let that go." [6]

But environmentalists and their supporters say the coal industry is rightfully fading. "You'd think the politicians would at least care about the air they breathe themselves," said media mogul and former New York City Mayor Michael Bloomberg, who has given $50 million to the Beyond Coal campaign of the Sierra Club, an Oakland, Calif.-based environmental organization spearheading a movement to eliminate coal-fueled electricity. [7]

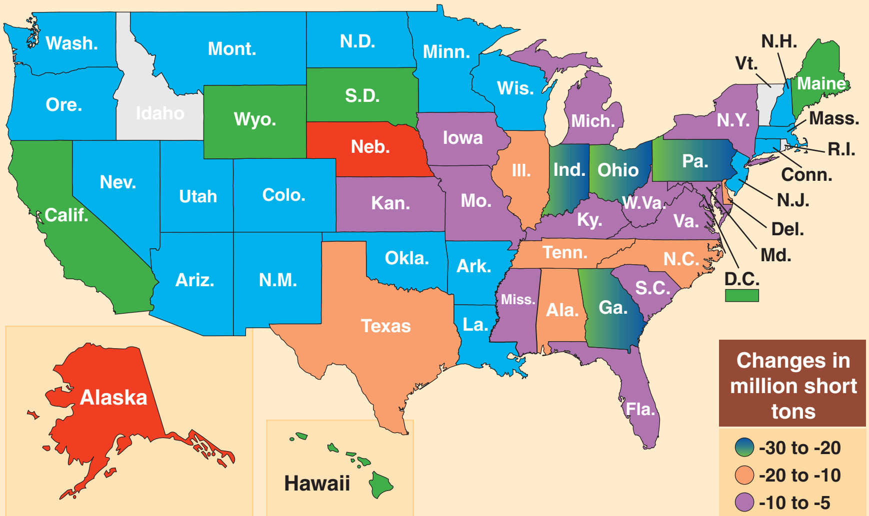
The popular image of a coal miner may be of a soot-covered worker in Appalachia emerging from a deep underground shaft. But these days, only about 25 percent of the nation's coal comes from Appalachia, either from its underground mines or mountaintops that have been blasted away to expose the black rock. Forty percent of the nation's coal now comes from Wyoming, in part because environmental regulations encourage the use of Western low-sulfur coal, found close to the surface and uncovered and removed by large machines. [8]

This shift has taken a decades-long toll on coal jobs in Appalachia. For example, the number of coal-related jobs in Harlan County, Ky., declined from more than 3,000 in 1988 to fewer than 1,000 in 2014, the last year of available government data. [9] Still, 45,000 people worked for coal operators in Appalachia in 2014, compared to fewer than 7,000 in Wyoming. That's because mining the more difficult-to-extract coal in Appalachia is labor intensive. [10]

48 States Cut Coal Use for Power

Between 2007 and 2015, coal consumption fell in every coal-consuming state except Nebraska and Alaska, with the biggest declines in Indiana, Ohio, Pennsylvania and Georgia. Idaho, Vermont and Rhode Island do not use coal to generate power.

Change in Power Sector Coal Demand, 2007-2015, by State



Source: "Power sector coal demand has fallen in nearly every state since 2007," Today in Energy, U.S. Energy Information Administration, http://tinyurl.com/z2lt2rq

Now all of coal mining is losing jobs, from Appalachia to Colorado to Wyoming. A total of 68,000 people worked in coal mining in 2015, a drop of 19 percent from the year before, according to the Bureau of Labor Statistics. [11] And other industries have not replaced lost coal jobs. "The community is not only suffering. It's dying," said Harlan County resident and former mining company driver Chester Napier, 75. [12]

Environmentalists support giving federal aid to coal communities, and in November, Hillary Clinton, the presumptive Democratic presidential nominee, announced a $30 billion aid plan. [13] In contrast, Donald Trump, the presumptive Republican nominee, promised to rescind environmental rules and revive the coal sector and its jobs.

"We're going to bring back the coal industry, save the coal industry," Trump said in late May. "I love those people." [14]

But energy analysts say that's probably impossible, given market forces, particularly cheap natural gas, which emits less carbon dioxide than coal. The U.S. Energy Information Administration projects that this year, for the first time, natural gas will generate more of the nation's electricity, at 34 percent, than coal, at less than 31 percent. The shift is happening in part because natural gas prices have been falling since 2009, as energy companies flooded the market with gas extracted through hydraulic fracking from underground shale deposits. [15]

To a lesser extent, coal is also taking a hit from renewable energy. Use of wind and solar power has increased significantly since 2007: They now supply nearly 7 percent of the country's electricity, the result of "federal tax credits, state-level mandates and technology improvements," said government analysts. [16] Those improvements have driven down the cost of wind power per megawatt hour by 61 percent between 2009 and 2015, and the cost of large solar panel arrays fell by 82 percent during the same period. [17]

Meanwhile, the United States has become more energy efficient. The annual demand for electricity has remained flat since 2007, even as the economy, adjusted for inflation, has grown 10 percent. [18]

The Obama administration has issued environmental rules to protect water quality from mining, limit toxic metal emissions from power plants and reduce carbon dioxide pollution. "Over the past eight years and after a huge amount of advocacy, a lot of egregious regulatory loopholes that the coal industry has enjoyed have been closed," says Mary Anne Hitt, director of the Sierra Club's Beyond Coal campaign.

The coal industry sees things differently. "We've been very disadvantaged by this administration's regulatory policies," says Luke Popovich, spokesperson for the Washington-based National Mining Association.

Of all the recent regulations, the Mercury and Air Toxics Standards for Power Plants, promulgated by the Environmental Protection Agency (EPA) in 2012, may have had the biggest impact so far. The standards cut power plant emissions of mercury, arsenic and other toxic pollutants. The EPA gave coal-fired plants and the nation's relatively few oil-fired plants until April 2015 to comply, although some plants got one- or two-year extensions. Many power companies chose to shut down their oldest, smallest and dirtiest coal plants rather than invest in pollution-reducing technology, especially where state regulators did not approve rate increases to cover investment costs. Even some larger plants have been shut.

"It was just not cost effective to retrofit them," says Paul Bailey, head of federal affairs and policy at the Washington-based American Coalition for Clean Coal Electricity, whose members include coal mining, railroad and power companies.

The administration's Clean Power Plan may have an even greater impact on the coal industry. It would require states to devise plans for power companies to significantly reduce emissions of carbon dioxide, the primary greenhouse gas contributing to climate change, starting in 2022. However, the Supreme Court has issued a stay while it's being challenged in court.

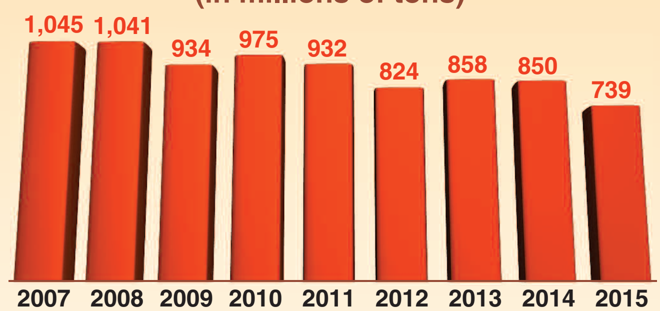
To make matters worse, coal mining companies went deep into debt to expand capacity in anticipation of growing offshore demand that never materialized. The United States sells about 10 percent of its coal abroad, mostly to Europe and Asia. But coal exports have dropped precipitously since setting a record in 2012. Overseas demand has slid for some of the same reasons it has in the United States, and a strong dollar has made U.S. coal more expensive compared to coal from Australia, Indonesia, Colombia, Russia and South Africa. [19]

Against this background, here are questions that mining and power companies, coal communities, environmentalists and government officials are debating:

Demand for Coal Falling

The amount of coal used to generate electric power in the United States fell 29 percent, from a high of more than 1 billion tons in 2007 to an estimated 739 million tons in 2015. Coal use is declining because of improved energy efficiency, stricter environmental regulation of coal-fired power plant emissions and falling prices for other fuel sources, such as natural gas, solar and wind power.

Coal Used to Generate U.S. Electricity (in millions of tons)



Sources: "Power sector coal demand has fallen in nearly every state since 2007," Today in Energy, U.S. Energy Information Administration, April 28, 2016, http://tinyurl.com/z2lt2rq; "Coal Consumption by Sector," http://tinyurl.com/zmpktd4

Should all coal-fired power plants eventually close?

Most U.S. coal-fired power plants were built between 1950 and 1990, a period of rapid growth in electricity demand. [20] However, since early 2010, 236 coal plants have either shut down or announced a retirement date, leaving 287 remaining, according to the Sierra Club. [21]

The environmental organization would like to see those plants shuttered, too, creating a coal-free electricity grid by 2030. "We think that's what the climate science calls for, and we think that's a time frame in which we can have plenty of clean alternatives," says the Sierra Club's Hitt.

Climate warming isn't environmentalists' only concern. The EPA says pollution from coal-generated electricity is linked to cancer, respiratory illness, heart attacks and nervous system damage. [22]

But Bailey of the American Coalition for Clean Coal Electricity says most remaining coal-fired power plants now meet the EPA's 2012 standards for air toxics and mercury, a neurotoxin. And they emit much less sulfur dioxide and nitrogen oxides, contributors to soot, smog and acid rain. Congress required that such emissions be reduced when it passed the 1970 Clean Air Act and subsequent amendments.

"A kilowatt hour of electricity generated from the coal fleet today is 92 percent cleaner than it was in the 1970s. People forget that," says Bailey. The power industry has spent more than $100 billion on advanced air pollution controls since 1970, according Bailey's organization. [23]

But none of that makes coal anything close to clean, says Shannon Fisk, an attorney at Earthjustice, an environmental law organization in San Francisco. "The amount of air pollution that's produced by coal plants is still significant," Fisk says. "And they are the largest source of carbon emissions in the country." Fossil fuel-fired electric power plants, primarily coal, are responsible for the greatest share of emissions of the greenhouse gas in the United States, at 37 percent; transportation, at 31 percent, is next, according to government calculations. [24]

But the National Mining Association's Popovich says climate change is a global issue, and taking coal out of the U.S. energy mix isn't going to significantly reduce worldwide carbon emissions. China accounts for half of the world's coal use, followed by the United States and India, which together account for about a fifth according to government data. [25]

"Why don't we [the government] put a comparable effort into the development of technology that makes coal more socially responsible to use," such as ultra-supercritical combustion? asks Popovich. Ultra-supercritical combustion makes burning coal more efficient so it produces about 15 percent less carbon dioxide than the current coal power fleet, says Jeffrey Phillips, head of advanced coal power generation research at the Electric Power Research Institute, a scientific organization whose members include electric utilities and government agencies.

But there are only two ultra-supercritical coal plants in the United States. "Right now in the U.S., natural gas-fired combined cycle power plants can beat any new coal power plant in terms of initial capital cost and ongoing operating cost," says Phillips in an email. And the new state-of-the art coal plants would still emit twice the carbon dioxide as natural gas, he says. (*See sidebar, p. 542.*)

One of the industry's main arguments for keeping coal-fired power plants running is that natural gas prices are unlikely to stay low forever.

"Let's say there are policies put in place that limit fracking so there is less natural gas," says Bailey. (New York state and cities and counties in California, Colorado and elsewhere have banned fracking over concerns that chemicals used in fracking may contaminate groundwater and that fracking can cause earthquakes. [26]) Natural gas prices would climb, and without coal to fall back on, electricity rates would climb as well, he says. A number of other unforeseen developments could also cause natural gas prices to rise, so "we need diverse sources of electricity," he says.

Mark Haggerty, an analyst with the nonpartisan research group, Headwaters Economics, in Bozeman, Mont., says he sympathizes with the need to move to cleaner fuels but says industry has a point. Transitioning to natural gas is a long-term investment, he says. "We will become dependent on natural gas, and its price is volatile, more so than coal."

Fisk says, "Diversity should not be used as an excuse to prop up a fuel source that simply isn't competitive anymore." Power companies want to invest to keep their coal-fired plants operating because the 32 states that regulate electricity generation typically guarantee power companies about a 10 percent return on any regulator-approved capital investment, says Fisk. When that happens, consumers pay more for electricity.

Getty Images/Mario Tama

The A & G Coal Corp. dynamites an Appalachian mountaintop in Wise County, Va., in 2012. Today, only about 25 percent of the nation's coal comes from Appalachia. Forty percent now comes from Wyoming, in part because environmental regulations encourage the use of Western low-sulfur coal, found close to the surface.

"How much should they be allowed to milk these old plants?" asks Fisk, who, like Sierra Club attorneys, spends a lot of time trying to persuade state regulators to nix capital investments, such as scrubbers to reduce mercury pollution, in aging coal plants. And if plants can't meet pollution standards, they must close. Switching to wind, solar and some natural gas is cheaper for customers, says Fisk.

But Popovich says the economy suffers as coal disappears from the energy mix. Jobs in mining, coal transportation and mining equipment manufacturing pay, on average, more than $80,000 a year, he says. "One employee can support a family on that, particularly in rural areas where coal is mined," Popovich says. "Annual wages . . . in the renewable industry, they're not near what they are in the fossil energy industry."

Environmental groups support a variety of aid proposals in Congress and from President Obama to help communities transition away from coal. (*See sidebar, p. 540.*)

Is the EPA's plan to reduce CO_2 emissions from power plants legal?

Last August, the EPA released the final version of the administration's Clean Power Plan, which sets state-by-state goals for reducing carbon emissions from existing power plants. States have eight years to meet those goals, starting in 2022. If all goes according to plan, U.S. carbon pollution from the power sector will fall 32 percent below 2005 levels in 2030. [27] (It has already fallen 22 percent since 2005 as coal plants have closed.) [28]

The Clean Power Plan "will give our kids and grandkids the cleaner, safer future they deserve," said EPA Administrator Gina McCarthy. [29]

The plan is central to Obama's international commitment to address global warming. In April, the United States signed the Paris Agreement, a treaty negotiated last December by 195 nations to reduce greenhouse gases in order to keep global warming to no more than 2 degrees Celsius above preindustrial levels.

But a collection of coal companies, coal-burning power companies, industry trade associations and more than two dozen states have challenged the Clean Power Plan in court.

It's a "political power grab of America's power grid to change our country in a diabolical, if not evil, way," said Robert E. Murray, chairman of Murray Energy, the country's largest independent coal producer and a plaintiff in the case. [30] In February, the Supreme Court put the plan on hold, while the U.S. Court of Appeals for the District of Columbia Circuit hears arguments and issues a ruling. No matter how it rules, the case will almost certainly return to the Supreme Court.

"EPA remains fully confident in the legal merits of the Clean Power Plan," an agency spokesperson said in an email statement. But others aren't so sure.

"I think it could go either way," says James Van Nostrand, an environmental law professor at West Virginia University. Although he thinks the Clean Power Plan is within the EPA's statutory authority, foes have raised "some valid legal questions that deserve to be heard in court," he says.

Opponents make two arguments. The first is technical and depends on conflicting language in the Clean Air Act. The EPA is using Section 111(d) of the Clean Air Act as the basis for its authority to issue the Clean Power Plan. But in 1990, the House added language to the Clean Air Act that appears to prevent the agency from regulating a *source category*, such as power plants, under Section 111(d) if that source is already regulated under Section 112. Also in 1990, the Senate added language stating that the EPA cannot regulate *the same pollutant* under the two different sections of the law.

Opponents of the Clean Power Plan prefer the House language, because the EPA already regulates power plants under Section 112 through its four-year-old mercury standards. The EPA likes the Senate language, because the agency has never regulated carbon dioxide emissions from power plants before the Clean Power Plan.

"EPA's interpretation is entitled to deference," says Richard Revesz, a law professor at New York University and director of its Institute for Policy Integrity, a think tank on government decision making.

But Jeffrey Holmstead, an attorney representing operators of coal mines and coal-fired power plants in the case, says even assuming the EPA is correct on this point, the Clean Power Plan faces a bigger problem. The second argument against the plan revolves around how the EPA allows states to cut carbon emissions.

It goes "way, way, way beyond anything the EPA has ever claimed before, and I think goes well beyond what Congress intended under Section 111(d) of the Clean Air Act," says Holmstead.

Under the plan, the EPA gave states three options, to be used as they see fit: require existing coal-fired power plants to become more efficient, which would reduce their carbon emissions; substitute electricity generated from natural gas plants for electricity generated from coal; use zero-emission renewable sources, such as wind and solar, to generate electricity instead of coal.

"The EPA has never, ever in its history asserted that it has authority to require certain plants to be shut down and other types of plants to be built to replace them," says Holmstead. Under Section 111(d) of the Clean Air Act, the EPA has the authority to regulate emissions at a particular plant but not systemwide, he says. So option one is OK, but options two and three are not, he says. And private and government energy analysts agree that states would never achieve the mandated emissions reductions if they limited themselves to option one.

But Revesz says, "They make the claim that it's unprecedented, and that claim is wrong." The EPA has taken a systemwide approach plenty of times, under Section 111(d) and other sections of the Clean Air Act, and previous EPA programs have favored one fuel source over another, he says. For example, in 1995 the EPA allowed municipal waste combustion plants to trade emissions of nitrogen oxides with other plants — a systemwide approach, and the EPA predicted that its 2012 mercury emissions standards would increase natural gas generation at the expense of coal, says Revesz. [31]

If the EPA loses in court, the agency would have to "basically start from scratch," says Holmstead. It would need to limit itself to efficiency improvements at individual power plants, and the required reductions in carbon emissions would have to be smaller, he says.

The Sierra Club's Hitt says even if the Clean Power Plan remains tied up in the courts for a long time, carbon emissions will continue to decline. "Advocacy campaigns and market forces will continue to put pressure on coal, and there's going to be continued new opportunities for clean energy," she says.

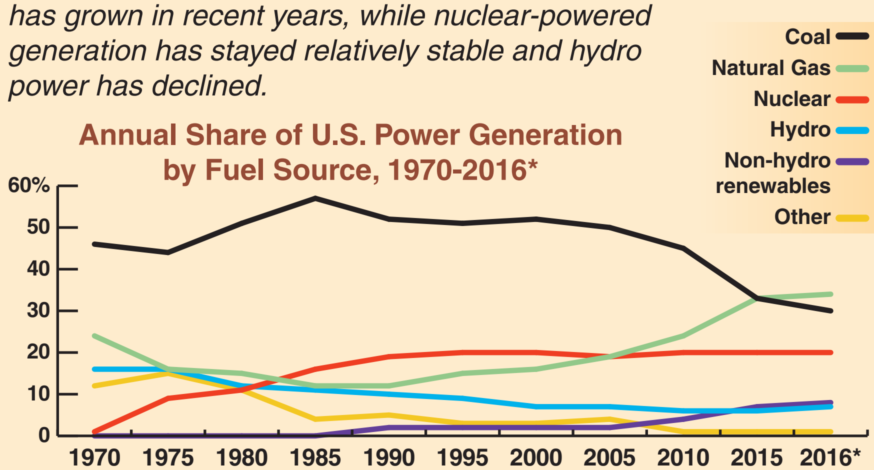
Should the government make companies pay more to mine coal on federal lands?

About 40 percent of the nation's coal comes from public lands, mostly in the West and most of that from the Powder River Basin, which straddles Wyoming and Montana and is the largest source of low sulfur, sub-bituminous coal in the United States. Most of that coal is federally owned and managed by the Interior Department's Bureau of Land Management (BLM), which leases land to coal companies to extract the fuel. [32] The basin's largest mines are in Wyoming.

In January, the Interior Department halted sales of new leases for extracting

Natural Gas Edging Out Coal as Power Source

Natural gas is forecast to surpass coal this year as the largest fuel source for U.S. power generation. Between 2000 and 2008, coal was significantly less expensive than natural gas. Beginning in 2009, the price difference between coal and natural gas began to shrink as the supply of gas produced from shale formations rose. Use of some renewable energy sources, such as wind and solar, has grown in recent years, while nuclear-powered generation has stayed relatively stable and hydro power has declined.



** Projected.*

Source: "Natural gas expected to surpass coal in mix of fuel used for U.S. power generation in 2016," U.S. Energy Information Administration, March 16, 2016, http://tinyurl.com/hoqaghv; the 1950-2015 data are at http://tinyurl.com/h8be395, and the 2016 forecast is at http://tinyurl.com/j9dwlkh

coal on BLM lands while the department analyzes — for the first time in 30 years — the leasing program's environmental impact and whether taxpayers are getting a fair return.

"There's no question that the costs that coal companies have been paying for coal is extremely low — less than a dollar a ton," said Interior Secretary Sally Jewell. The result has been relatively small payments for coal "that belongs to all Americans," she said. [33]

The coal industry opposes the moratorium and review, which the government estimates will take up to three years. "Obama to Wyoming: 'drop dead,' " is how Travis Deti, assistant director of the Wyoming Mining Association in Cheyenne, characterized the January announcement. [34]

"The moratorium and the programmatic review both lead to a lot of uncertainty in what is already a very difficult market," says Rick Curtsinger, spokesperson for Cloud Peak Energy, based in Gillette. Cloud Peak, along with Peabody Energy and the St. Louis-based Arch Coal, dominate coal mining in the Powder River Basin.

For years, environmental groups, the Government Accountability Office (GAO), which is Congress' investigative arm, and the Interior Department's Office of the Inspector General have complained that the government is not getting as much as it should from its coal leases. Weaknesses in the leasing program "could put the Government at risk of not receiving the full, fair market value for the leases," the Inspector General's office said in a 2013 report. [35]

Environmental groups have been harsher. The federal coal leasing system "in effect" is "a major corporate welfare program," the Washington-based Greenpeace said in a March report. [36]

The leasing program in the Powder River Basin has several moving parts. First, a coal company picks a promising area and applies to the BLM for a license to explore for coal on that tract. If the exploration is successful, the company applies for a lease, estimating the amount and quality of the coal it expects to produce. Based on that information, the BLM computes a fair market value for the lease and holds a lease sale, awarding it to the company with the bid that meets or exceeds that fair market value.

But 90 percent of the lease sales have only one bidder, according to a 2014 GAO investigation. It's expensive to open a mine, and the lone bidder is often a company with adjacent operations. [37] Thus, the BLM's fair market value calculation serves as a kind of substitute for bidding competition. But the agency does not independently verify the information in the lease application, and companies could underestimate the amount of coal available on the land they are seeking to lease.

"Without verification, a company could provide incorrect data to BLM, resulting in BLM's undervaluing the [fair market value] and unknowingly accepting a low bid," said the Interior Department Inspector General's report. [38] The Inspector General's office released a list of 15 leases in which the amount of coal eventually produced exceeded the company's original coal reserve estimate, sometimes by almost double. [39]

"The industry controls this process," says Joe Smyth, the author of the Greenpeace report and now a researcher at the Climate Investigations Center, a corporate monitoring group in Alexandria, Va.

Once a coal company wins a lease, it makes a onetime lease payment and then pays the BLM an annual royalty on the value of the company's coal sales. The BLM's official royalty rate is a minimum 12.5 percent for surface mining, which is how coal is mined in the Powder River Basin. But the average reported royalty payment in Wyoming has been 12.2 percent because of BLM-approved discounts. [40]

But Haggerty of Headwaters Economics says the effective royalty rate is actually more like 5 percent, because coal is sometimes sold through company-affiliated brokers, complicating the calculation of the value of coal sales. The National Mining Association's Popovich calls Haggerty's 5 percent effective royalty rate figure "ridiculous."

In any case, the Interior Department is considering raising the minimum royalty rate. Haggerty says that's a good idea and urges the federal government to establish a trust that would hold federal coal revenues for the benefit of struggling coal communities across the country.

But mining companies already pay enough, not only in lease payments and royalties but in federal and state taxes and other fees, says Popovich. American taxpayers "are getting a good deal on the prices that we pay," he says.

Greenpeace and others would like to see the federal government go even further and charge mining companies an extra fee related to the social costs of carbon emissions.

"The federal government sells the coal with no consideration that the coal will be burned and contribute to climate change and air pollution, and none of those costs, which are born by society, are reflected in the costs that the industry has to pay for this coal," says Smyth. "That is a massive subsidy." Government economists estimate what's known as "the social cost of carbon," and it can range as high as $105 a metric ton of carbon dioxide currently. [41]

Meanwhile, the Obama administration says the moratorium will not affect production, because companies will continue to mine coal under existing leases.

"Based on current production levels, coal companies now have approximately 20 years of recoverable coal reserves under lease on federal lands," says Amanda DeGroff, an Interior Department spokesperson. The reserves may last even longer if demand for coal continues to decline as the government forecasts, she says. ■

Getty Images/Monument Mobile/Connie J. Spinardi

Solar panels and wind turbines generate energy in the San Gorgonio Pass in Palm Springs, Calif.; the San Jacinto Mountains rise in the background. U.S. coal production has fallen 40 percent since 2008 as power plants turn to cheap, cleaner natural gas and renewable sources.

BACKGROUND

U.S. Coal Discoveries

The nation's coal formed when heat and pressure cooked and compressed the dead remains of trees and plants that lived in swamps 300 million to 400 million years ago. Seawater swamps produced the high-sulfur coal found in the eastern United States. Freshwater swamps produced the low-sulfur coal found mostly in the West. [42]

The amount of pressure and heat determined which of four types of coal would be created. Lignite, a soft, brownish coal found primarily west of the Mississippi River, is about 60 percent carbon. Dull black sub-bituminous coal, found mostly in Montana and Wyoming and other Western states, contains more carbon than lignite and produces more energy when burned. Bituminous coal is the result of even more pressure and heat and is found primarily in the Midwest and along the Appalachian Mountains. Anthracite, the hardest coal and consisting almost entirely of carbon, gives off the most heat when burned. It is found primarily in eastern Pennsylvania. [43]

"America's great bounty of coal was no secret to early settlers," wrote journalist Jeff Goodell in *Big Coal: The Dirty Secret Behind America's Energy Future*. "Unlike petroleum or natural gas, which pools in reservoirs deep underground and migrates through fissures and fractures, coal rises and falls with the folds of the earth in predictable patterns." Oil and gas was not discovered in the United States until the Industrial Revolution was well underway, wrote Goodell, while coal, often breaking the surface, was used by Hopi Indians of the Southwest nearly 1,000 years ago to fire clay pots. [44]

In 1673, the French explorer Louis Joliet and the missionary Jacques Marquette, the first Europeans to explore the Mississippi River, discovered coal seams in river bluffs in what is now Illinois. In the 1750s, a Philadelphia mapmaker surveying the Ohio River Valley reported that coal "may be picked up in the beds of the streams or from the sides of exposed hills." [45]


AP Photo/David Goldman

Veteran coal miner Dennis Ferrell monitors conveyer belts at the Sally Ann 1 mine in Welch, W. Va., on Oct. 6, 2015. Environmentalists say coal-fired electricity plants are too costly to operate and too harmful to the environment. But the coal industry says shutting more coal-burning plants could threaten the nation's power grid and that coal-generated electricity is relatively cheap and cleaner than decades ago.

The coal that impressed the mapmaker "is part of a vast field that stretches along the Appalachians from Pennsylvania to Alabama," wrote Barbara Freese, a former Minnesota assistant attorney general and enforcer of the state's pollution laws. The field is widest, about 190 miles, in western Pennsylvania, near where the Ohio River forks into the Monongahela and the Allegheny. In 1759, the British built Fort Pitt there. By the late 1790s, this small post had been transformed into Pittsburgh, a major manufacturing center, "propelled in no small part by the concentrated energy beneath its hills," Freese said. [46]

By the 1830s, Pittsburgh had become the steam capital of the Western Hemisphere, its factories powered by steam engines running on cheap, local coal. But the resulting black smoke dirtied clothes, homes and skin. One visitor wrote that it formed "a cloud which almost amounts to night and overspreads Pittsburgh with the appearance of gloom and melancholy." [47]

Mine owners had no way to transport coal over the mountains to the Eastern Seaboard, where most of America's population and factories were located. As a result, except for water-powered textile mills, Americans had not invested in large-scale factory production, unlike in coal-rich Britain. "But this was about to change," wrote Freese. [48]

In 1825, the Schuylkill Canal, the nation's first successful commercial canal, opened in Pottsville, Pa., in the eastern part of the state where anthracite coal had been discovered 70 years earlier. Winding mountain paths and treacherous river rapids had made the coal difficult to transport, but canal boats pulled by horse or mule could easily travel the couple of hundred miles to Philadelphia. Navigation companies, mine owners and other investors began building a series of canals, extending eastward through New Jersey and up into New York. Coal canals "quickly paid for themselves as coal use multiplied," Freese said. [49]

But boats were slow, and the canals froze in winter. Soon rail companies were laying track alongside the canals, draining away business. The Philadelphia and Reading Railroad dominated the trade in anthracite, which was well suited for iron production. Cheap coal and iron "led to the rise of mass production between 1835 and 1855," wrote Freese. [50]

Railroad companies also extended their reach into the bituminous coal country in the Appalachians. In 1877, for example, the Chesapeake & Ohio Railway (C&O) tunneled through the mountains to extend its track from Richmond, Va., to Huntington, W. Va. New C&O rail lines into the remote region allowed mine companies to begin shipping coal to national markets. "The great West Virginia coal rush was on," wrote historian James Green in *The Devil Is Here in These Hills: West Virginia's Coal Miners and Their Battle for Freedom.* [51]

After the Civil War, railroads extended their tracks to the Pacific, bringing settlers west and their crops east. [52] The railroads were instrumental in the development of commercial coal mining in the West.

U.S. government mapping expeditions had discovered coal in what is now western Wyoming in 1843 and in the Powder River Basin in 1859. But commercial coal mining did not begin until the arrival of the Union Pacific Railroad in 1867. The Wyoming Coal and Mining Co. leased land from the Union Pacific and sold the coal it mined to the railroad, whose steam-powered locomotives depended on coal. In the 1870s, the railroad effectively took over the mines, gaining a monopoly in coal production in the territory, according to the Wyoming State Historical Society. [53]

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Chronology

1825-1890 ***Coal mines are developed and workers unionize.***

1825
Schuylkill Canal brings coal from Pottsville, Pa., to Philadelphia.

1843
Philadelphia and Reading Railroad competes with the Schuylkill Canal.

1867
Union Pacific Railroad opens Wyoming's Powder River Basin to coal mining; the railroad soon takes control of the territory's coal mines.

1875
Union Pacific Railroad replaces striking miners with Chinese immigrants.

1877
Chesapeake & Ohio Railway transports coal from West Virginia.

1882
Inventor Thomas Edison opens the nation's first coal-fired power plant in lower Manhattan.

1886
West Virginia mine operators import Hungarians to replace strikers.

1890
United Mine Workers of America (UMWA) is formed.

1900-1950 ***Coal mining fatalities rise and regulation begins.***

1900
Nearly half a million people work in U.S. mines; 1,489 are killed in mine accidents.

1902
UMWA coal strike in Pennsylvania wins a 10 percent wage increase.

1907
Nearly 700,000 people are employed in U.S. mines; fatalities peak at 3,242.

1910
Congress establishes the Bureau of Mines within the Interior Department to reduce mining accidents.

1921
Striking West Virginia coal miners battle law enforcement; President Warren Harding sends troops and Army bombers and ends strike.

1935
Public Utility Holding Company Act breaks up utility holding companies with regional monopolies.

1938
Fair Labor Standards Act establishes the minimum wage, overtime pay, record keeping and child-labor standards for workers.

1950
Coal accounts for just under half of U.S. electric power generation as natural gas erodes its dominance; 643 of just under a half-million coal miners die in mining accidents.

1970-Present

Congress passes environmental laws; cheap natural gas crushes coal.

1970
Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set emissions standards for air pollutants.

1973-1974
OPEC oil embargo causes an energy crisis in the United States.

1977
President Jimmy Carter calls for doubling U.S. coal production to lessen dependence on imported oil. . . . Utility companies build new coal-fired power plants.

1985
Coal-fired power plants generate 57 percent of the nation's electricity.

1990
Clean Air Act amendments establish a cap-and-trade system for emissions of acid rain-causing sulfur dioxide; tighten motor vehicle emission standards; and regulate 189 toxic air pollutants harmful to human health, up from seven.

2010
Explosion at Massey Energy's Upper Big Branch Mine in West Virginia kills 29 coal miners, the deadliest U.S. mining disaster in 40 years.

2012
EPA issues Mercury and Air Toxics Standards.

2015
EPA introduces the Clean Power Plan to reduce carbon emissions at coal-fired power plants; coal states, power companies and coal mine operators sue. . . . Electric utilities are using 29 percent less coal than during coal's high in 2007 and paying 75 percent less for natural gas.

2016
U.S. Supreme Court stays the Clean Power Plan as legal challenges in federal court proceed (February). . . . Since 2010, a total of 236 coal plants have closed or announced a retirement date, leaving 287 remaining. . . . Coal is expected to account for less than a third of U.S. electricity generation, falling behind natural gas for the first time.

Struggling Coal Towns Seek a Brighter Future

"This is an effort to supplement the coal jobs we've lost."

Rusty Justice has worked in mining all his life. Now he's a co-owner of one-year-old Bit Source, a website developer in the eastern Kentucky town of Pikeville, deep in the heart of Appalachian coal country. The company's nine employees are laid-off coal miners whom Bit Source has trained to write computer code. When Justice first advertised the positions, nearly 1,000 people applied. [1]

"Our slogan is 'a new day, a new way,' " Justice told NPR in May. "And it's a new day here in Appalachia and we're trying to do things a new way." [2]

But eastern Kentucky must improve its broadband infrastructure for Bit Source to thrive, said company manager John Handshoe. "We're not shipping coal out of here anymore; we're shipping code." The region's internet speeds lag behind those in most cities. [3]

There's no shortage of billion-dollar proposals to help depressed coal mining communities like Pikeville, most of which are located in Appalachia. Presumptive Democratic presidential nominee Hillary Clinton has a plan, members of Congress are sponsoring legislation and private analysts have suggestions.

One plan, although relatively small, is already up and running. Last year, the Obama administration launched the Partnerships for Opportunity and Workforce and Economic Revitalization, known as the POWER Initiative.

"The Obama administration is committed to supporting our workers and communities as they face challenges related to a changing energy landscape in this country," said Jay Williams, assistant secretary of Commerce for economic development, whose department is leading the program. The POWER Initiative pools money from various federal agencies and awards grants to local groups in coal country for workplace and economic development. [4]

Last October it announced 36 awards across 12 states and tribal nations worth a total of nearly $15 million. They include a grant to the state of Kentucky to expand and improve broadband access; a grant to a Kentucky drug abuse program; and a grant to a Kentucky nonprofit to train workers for high tech jobs. In March, the Obama administration announced it would give out another $66 million this fiscal year, with $46 million reserved for Appalachia. [5]

But to some observers, the POWER initiative is small potatoes. "The Obama administration is off to a promising if modest start," said Tom Sanzillo, director of finance at the Cleveland-based Institute for Energy Economics and Financial Analysis, a research group favoring a transition from coal to renewable energy. "More must be done." [6] The administration wants to expand the program to $10 billion, calling it the POWER+ Plan, but that would require congressional approval. [7]

Sanzillo said he would like to see the federal government emulate the Department of Defense's Office of Economic Adjustment, which helps communities transition when a military base closes or a defense contractor scales back. Such a program could include economic assistance to local businesses; money to local governments to cover budget gaps and job training and health benefits for laid-off workers. But perhaps most importantly, local and state governments need to strategize on how best to attract small businesses and big corporations and to capture jobs in the growing wind and solar energy sector, he said. [8]

"Whole new energy markets can be created in most places in the U.S., and a large, existing infrastructure or rural cooperatives and municipal electric systems already have the organization to drive such development," said Sanzillo. [9]

Last November, Clinton committed to making the United States a "clean energy superpower" and proposed a $30 billion aid plan for coal country to ease the transition, similar to what Sanzillo has in mind. It would ensure health and retirement benefits for retired workers of bankrupt coal companies; safeguard local school budgets hit by mine closures; invest in new roads, bridges, water systems, airports and transmission lines; expand

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Rise of Unions

The industrialists who owned the coal mines depended on "keeping labor costs down so they could sell their coal at low prices and gain an edge in the national market," wrote Green. [54]

For example, in 1873 the Reading Railroad, which was buying up anthracite coal mines in eastern Pennsylvania, formed a "pool" with other railroads and independent mine owners in the region to fix coal prices and fight unionization, gravely weakening miners' efforts to organize themselves, wrote Freese. [55]

In West Virginia, syndicates of northern industrialists, bankers and investors were building mines and constructing company towns, where miners lived in company-owned housing, worshipped at company-built churches, shopped in company-owned stores and paid in company-issued currency. A mine operator hired and fired at will, and "hit down with a heavy hand on any activity that might menace his business," wrote Green. [56]

Strikes were quickly suppressed, from Appalachia to the West. In 1871, the Wyoming Coal & Mining Co. fired striking miners demanding decent working conditions and better pay and replaced them with Scandinavian immigrants who worked for the cut-rate wage of $2 a day. Four years later, the Union Pacific Railroad replaced striking miners protesting a cut in pay with Chinese immigrant labor, wrote energy analyst Richard Martin in *Coal Wars: The Future of Energy and the Fate of the Planet*. [57] In 1886, West Virginia broadband access; streamline permitting for renewable-energy permits; support research at local universities; provide tax incentives to companies investing in coal communities and provide local grants for job training, health care, housing and the arts. [10]

In Congress, Republican and Democratic lawmakers from Appalachia are supporting the Reclaim Act, which is also part of Obama's proposed POWER+ Plan. It would direct the federal government's $2.8 billion Abandoned Mine Lands fund, used to help clean up abandoned mine sites, to allocate $1 billion to develop reclaimed land to attract new industries.

"We're not giving up on coal," said House Appropriations Committee Chairman Hal Rogers, R-Ky., a sponsor of the bill. "It's going to be around for a good while, although greatly diminished. . . . But this is an effort to supplement — not replace, but supplement — the coal jobs that we've lost." [11]

But the bipartisan bill has opposition. "West Virginians want their good-paying coal jobs, not government bailouts," said Rep. Alex Mooney, R-W. Va. [12] In any case, diversifying coal communities, especially in Appalachia, is going to be extraordinarily difficult, says Mark Haggerty, an analyst with Headwaters Economics, an economic analysis group in Bozeman, Mont.

"These communities are isolated, they only really exist because of extractive industries, and they are not in a position to capture jobs that are being created, such as in finance, health care or technology," he says. "Those jobs are being created in around universities, where there is access to markets, such as an airport, and an educated population. Many of these small communities don't have these things."

— *Barbara Mantel*

[1] Erica Peterson, "From Coal To Code: A New Path For Laid-Off Miners In Kentucky," NPR, May 6, 2016, http://tinyurl.com/hjs66po.

[2] *Ibid.*

[3] *Ibid.*

AP Photo/David Goldman

After the coal mine he worked at closed, Mark Muncy got a government-backed loan and opened the Riverside Cafe and Bakery in Welch, W. Va.

[4] "Senior Administration Officials and KY Governor Steve Beshear Announce the Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative," press release, U.S. Economic Development Administration, March 27, 2015, http://tinyurl.com/jsly37k.

[5] "Fact Sheet: Administration Announces New Workforce and Economic Revitalization Resources for Communities through POWER Initiative," The White House Office of the Press Secretary, Oct. 15, 2015, http://tinyurl.com/jt27aez; Vicki Rock, "Workshop participants discuss help for coal communities," *The Daily American* (Somerset, Pa.), April 27, 2016, http://tinyurl.com/zxmz4y4.

[6] Tom Sanzillo, "How to Invest in Struggling Coal-Industry Communities? Let Us Count the Ways," Institute for Energy Economics and Financial Analysis, April 6, 2016, http://tinyurl.com/j7n2nst.

[7] "What is the POWER+ Plan?," powerplusplan.org, www.powerplusplan.org/whatispowerplus.

[8] Sanzillo, *op. cit.*

[9] *Ibid.*

[10] "Fact Sheet: Hillary Clinton's Plan for Revitalizing Coal Communities," Hilary for America, November 2015, http://tinyurl.com/gpu8hzh.

[11] Devin Henry, "Coal country rages against fall," *The Hill*, April 25, 2016, http://tinyurl.com/jh3e8lh.

[12] *Ibid.*

mine operators imported Hungarian workers to replace striking miners, predominantly African-Americans, at the Pocahontas coal field. [58]

The striking workers were not only demanding more pay but were protesting unsafe working conditions. Mining was dangerous. In Wyoming, more than 300 miners died in mine explosions and fires between 1886 and 1924. Pennsylvania's deeper anthracite mines were even deadlier. Hundreds were killed each year by cave-ins, explosions, gases and floods. "Union representatives took the initiative and spoke up publicly to protest mining disasters, insisting on more compensation for dependents of miners killed," according to the Wyoming State Historical Society. "Labor unions attracted new members by promising to seek greater safety." [59]

In 1890, representatives from local unions met in Columbus, Ohio, and formed the United Mine Workers of America (UMWA), which successfully organized miners across several states, winning the eight-hour workday in the late 1890s. A UMWA strike in Pennsylvania's anthracite mines in 1902 won public sympathy even though it caused a coal shortage in the United States. President Theodore Roosevelt intervened, pressuring the mine-owning railroads to settle. They granted the miners a 10 percent wage increase. The successful strike was a "vivid lesson in how dependent the nation was on coal," Freese said. [60]

But union activists had little luck organizing in West Virginia, where between 1890 and 1912, miners suffered the highest death rate in America. Most

Clean-Coal Technology Alluring But Pricey

"Companies are not going to invest when cheaper options are available."

On a 2010 December morning, workers broke ground at a remote site in Kemper County, Miss., for a power plant billed as a national showcase for clean coal technology.

"The Left said there's no such thing as clean coal — well, this is it!" then-Gov. Haley Barbour, a Republican, declared. The $2.4 billion plant, which was scheduled to open in 2014, "is going to produce reliable power for Mississippi for decades and decades to come," Barbour said. [1]

The state-of-the-art plant would gasify coal, making combustion more efficient and thus producing less carbon dioxide, the primary greenhouse gas. The plant would then capture and compress most of the carbon dioxide produced and sell it to an oil company, which would force it into its wells to extract more crude. Most of the plant's carbon dioxide would never be emitted into the atmosphere.

Five and a half years later, however, the plant remains unfinished, and its price tag has ballooned to $6.6 billion. The facility is generating electricity, but it uses natural gas and won't switch to coal until later this year. The Securities and Exchange Commission (SEC) is investigating whether the owner, Atlanta-based Southern Co., misled the public about how long construction would take, and local businesses are suing the company. They claim they are being harmed by rate hikes to cover cost overruns. [2]

The plant is a "boondoggle," said their attorney, Michael Avenatti. The company said it is cooperating with the SEC and that the ratepayer lawsuit is "without merit." [3]

The Kemper plant demonstrates the difficulties of producing so-called clean coal, which the federal government has promoted over the past 30 years with tax credits, industry grants and research.

Two steps are involved in constructing a clean coal plant: making it burn coal more efficiently; and capturing the carbon dioxide and sequestering it in the ground. Carbon capture and sequestration technology can also be added to an existing, conventional power plant.

Coal can be burned more efficiently if it is first turned into a gas, as at the Kemper plant. But that requires tricky and expensive technology. For example, gasification is responsible for much of Kemper's delays, says Howard Herzog, a senior research engineer at MIT. Only two other U.S. power plants gasify coal, TECO Energy's Polk Power Station in Polk County, Fla., and Duke Energy's Edwardsport Generating Station in Knox County, Ind. But those plants do not capture and sequester carbon dioxide emissions.

Coal power also can be made more efficient through ultra-supercritical pulverized coal combustion, which creates steam in ultra-high-pressure, ultra-high-temperature boilers. Only two such plants operate in the United States, AEP's John W. Turk, Jr. Power Plant in Fulton, Ark., and MidAmerican Energy's Walter Scott, Jr. Energy Center in Council Bluffs, Iowa, and they don't capture carbon dioxide either.

Both technologies allow power plants to use less coal, their primary purpose. But given cheap coal prices, "it has been difficult to justify investing capital to save on fuel costs," says Jeffrey Phillips, head of advanced coal power generation research at the Electric Power Research Institute, whose members include electric utilities and government agencies. In addition, while

miners there were so afraid of their employers that a union organizer said he "could do nothing." [61]

Mining remained dangerous. In that first decade of the new century, coal mine fatalities exceeded 2,000 annually, and in 1910, Congress established the Bureau of Mines within the Department of the Interior to reduce coal mining accidents. However, it had no inspection authority until 1941. Since then, Congress has periodically strengthened its mine safety laws, culminating in the Federal Mine Safety and Health Act of 1977, which expanded the rights of miners and created the Mine Safety and Health Administration within the Department of Labor. Mining fatalities dropped sharply from 272 in 1977 to 86 in 2000. [62]

Mine owners in the early 20th century suppressed miners' efforts to unionize in West Virginia. After World War I, miners who had fought in Europe during the war returned to West Virginia emboldened to fight for their rights. Wildcat strikes exploded in the state, culminating in a pitched battle in early September 1921. Known as the Battle of Blair Mountain, the clash between an estimated 10,000 armed miners and 3,000 state police, sheriff's deputies and mine guards was the largest civil insurrection in the United States since the Civil War. [63] President Warren Harding imposed martial law and sent in federal troops and Army aircraft, and the strikes failed. [64]

Elected in 1932 during the Great Depression, President Franklin D. Roosevelt signed the Fair Labor Standards Act six years later. The act established the minimum wage, overtime pay, record keeping and child labor standards for government and private sector workers. [65] The president's pro-labor legislation sparked the resurgence of the United Mine Workers of America.

"Following the most successful organizing drive the nation had ever witnessed, the [UMWA] was once again the nation's strongest union," wrote Freese. [66]

Era of Regulation

Roosevelt also overhauled the nation's power sector. Inventor Thomas Edison had flipped the switch on the nation's first coal-fired power plant in lower Manhattan in 1882 to these kinds of plants reduce carbon emissions by about 15 percent compared to conventional coal plants, they still produce about twice the carbon dioxide of natural gas-fired plants, which are cheaper to build and operate, says Phillips.

Pairing carbon capture and sequestration (CCS) with gasification or ultra-supercritical pulverized coal combustion or bolting the technology onto an existing, conventional plant would be the only ways to significantly reduce a coal plant's carbon dioxide emissions, theoretically by up to 90 percent. [4] "We believe that CCS offers a significant step forward to remove carbon dioxide emissions from modern power plants," says Rick Curtsinger, spokesperson for Cloud Peak Energy, a mining company in Gillette, Wyo. "As more work is done on CCS, as more plants come on line, we believe that the cost will fall."

However, no U.S. power plants currently use carbon capture and sequestration, and only two are in the works: the Kemper plant and a NRG Energy plant near Houston. NRG, which is retrofitting a conventional coal plant, expects it to be operational later this year. [5]

The lack of investment in CCS is easy to explain, says Phillips. "Companies are not going to invest in a more expensive, complicated option when cheaper, less complicated options are available," such as natural gas, although the carbon dioxide reduction would not be as large.

CCS also would burn more coal. "About 25 to 30 percent of the energy produced by the power plant would have to be used in capturing, compressing, transporting and sequestering the carbon dioxide," says Richard Heinberg, a senior fellow-in-residence at the Post Carbon Institute, a climate change think tank in Santa Rosa, Calif. "We would actually have to burn 30 percent more coal to get the same amount of energy."

"You're much better off spending that money developing new, cleaner technologies," such as ways to store the intermittent solar and wind energy, says Shannon Fisk, an attorney at San Francisco-based Earthjustice, an environmental law organization. "And CCS does not fix a lot of the other environmental problems caused by the whole life cycle of coal," such as land and water pollution from mining, says Mary Anne Hitt, director of the Sierra Club's Beyond Coal campaign, which aims to eliminate coal power.

But Herzog says he doesn't expect a breakthrough in energy storage in the next several decades so the country will need more than renewable energy sources to reduce greenhouse gas emissions to near zero. The country will need nuclear power and carbon capture and sequestration; it just won't be paired with coal, he says.

CCS "can be used on natural gas plants, it can be used on biomass," he says. "CCS is more than just coal."

— Barbara Mantel

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[1] Jennifer Jacob Brown, "Mississippi Power breaks ground on Kemper County IGCC Power Plant," *The Meridian* (Miss.) Star, Dec. 17, 2010, http://tinyurl.com/hfp2a3r.

[2] Rebecca Smith, "Southern's Clean-Coal Woes Mount," *The Wall Street Journal*, May 14, 2016, http://tinyurl.com/j8dzaq5.

[3] *Ibid*.

[4] "Carbon Dioxide Capture and Sequestration," U.S. Environmental Protection Agency, www3.epa.gov/climatechange/ccs/index.html.

[5] "WA Parish CO2 Capture Project," NRG Energy, http://tinyurl.com/jfvewe6.

provide nearby residents with electricity to light their homes and businesses. By the time Roosevelt was inaugurated, "largely unregulated private utility holding companies, mostly coal-powered, controlled more than 90 percent of the nation's electricity," wrote Martin. [67]

Roosevelt's response was the Public Utility Holding Company Act of 1935, which forced the holding companies to register with the Securities and Exchange Commission, spin off unrelated businesses, simplify their ownership and limit their geographic reach. [68] By 1950, natural gas, and to a lesser extent oil, had made inroads in power generation, accounting for just under a quarter of electricity generation in the United States. Coal accounted for just under half and hydropower the rest. [69]

The most intense period of regulation for coal mining and coal-fired utilities came in the 1970s, at the beginning of the environmental movement. In 1970, dense, visible smog in the nation's cities prompted Congress to pass the Clean Air Act, which set 1975 as the deadline for cleaning up the nation's air. The law required the newly created Environmental Protection Agency to set National Ambient Air Quality Standards, which it did the following year for six pollutants: particulate matter, nitrogen oxides, ozone, lead, carbon monoxide and sulfur dioxide. The greatest source of sulfur dioxide by far were coal-fired power plants, "which doubled their SO_2 emissions every decade between 1940 and 1970," according to Freese. States had to devise plans to meet those standards. [70]

The law also required the EPA to set emission standards for hazardous air pollutants, such as heavy metals, that may cause cancer or other serious health effects. Initially, the agency set standards for only seven such pollutants. [71]

At about the same time, international events led to a sustained upswing in coal use and production.

The 1973-74 oil embargo by the Organization of the Petroleum Exporting Countries (OPEC) and the resulting energy crisis triggered long lines at the gas pump, prompting President Jimmy Carter to call for energy independence and an almost doubling of U.S. coal production to help reduce oil imports. In 1975, about 15 percent of electricity was generated using petroleum. [72] Utility companies "embarked on a huge program to build new power plants that burned domestic fuels — mostly coal and uranium," Martin said. By 1985, coal-fired power plants were generating 57 percent of the nation's electricity, and petroleum accounted for just 4 percent.

Regulators approved retail electricity rate hikes to cover the costs of the construction, "leading to a vicious cycle of price increases and overbuilding, and sending several big [privately owned utilities] to the brink of bankruptcy," according to Martin. By the 1990s, the industry had consolidated in a wave of mergers that "created an industry landscape similar to that of the reviled holding companies of the 1920s," wrote Martin. [73]

Congress passed sweeping revisions to the Clean Air Act in 1990 "designed to curb three major threats to the nation's environment and to the health of millions of Americans: acid rain, urban air pollution, and toxic air emissions," according to an EPA overview of the law. Among other things, the amendment capped emissions of sulfur dioxide, a component of acid rain that had been killing aquatic life in the nation's lakes, and allowed power plants to trade SO_2 emission allowances to meet the law's requirements. It also tightened emission standards for motor vehicles and raised the number of regulated toxic air pollutants harmful to human health from 7 to 189. [74]

By 2008, coal production reached a peak, and coal plants were generating half of the country's electricity. [75]

But in 2010, an explosion ripped through Massey Energy's Upper Big Branch Mine in West Virginia, killing 29 coal miners, the deadliest U.S. mine disaster in 40 years. Then-CEO Donald Blankenship had "spent much of his time pushing faster, more efficient, and cheaper production," wrote Peter Galuszka in *Thunder on the Mountain: Death at Massey and the Dirty Secrets Behind Big Coal.* Blankenship battled regulators and supported coal-friendly politicians and judges. [76] This April, a federal judge in West Virginia sentenced Blankenship to a year in prison for conspiring to commit mine safety violations before the explosion. [77]

By the time of the explosion, U.S. coal production had begun to slip from its 2008 peak, and coal-fired power was on the decline as cheap natural gas extracted from the nation's shale formations flooded the market.

The EPA's Mercury and Air Toxics Standards also played a role. After the agency proposed the standards in 2011, a coalition of states and trade associations challenged them in court. In 2014, the case came before the U.S. Supreme Court, which said last year that the EPA had failed to properly account for costs. A federal appeals court then allowed the rules to stand while the EPA conducted a formal cost-benefit analysis. Power companies had already spent billions either complying by retrofitting coal-fired plants or shutting them down.

Last year, the EPA issued its Clean Power Plan to reduce carbon dioxide emissions at existing power plants, which is being challenged in court by 27 states, coal companies, owners of coal-fired power plants and trade associations. ■

CURRENT SITUATION

Regulations Challenged

The EPA is facing a renewed legal challenge to its Mercury and Air Toxics Standards.

In mid-April, the EPA ruled that a cost evaluation did not change the agency's determination that regulating hazardous air pollutant emissions from coal- and oil-fired power plants is "appropriate and necessary." The agency estimated that the rules would cost the industry $9.6 billion a year to implement, compared with up to $90 billion in annual health benefits to the public. [78]

Murray Energy, a major U.S. coal company, promptly challenged the finding in the U.S. Circuit Court of Appeals for the District of Columbia Circuit. "This final 'finding' is flagrantly arbitrary, and fails to comply with the law and with the Supreme Court's mandate," the company said in a statement. [79] The EPA said in an email that it cannot comment on active litigation.

Meanwhile, in mid-June, the Supreme Court refused to hear an appeal from a group of states, led by Michigan, of last year's lower court decision to allow the mercury rules to remain intact. [80]

In May, the D.C. court postponed a hearing before a three-judge panel on the Clean Power Plan lawsuit, originally scheduled for this month, until September before the full bench. "The move to skip the customary three-panel review . . . is almost unheard of and could signal that the judges feel the issues of the case are so significant that they all must weigh in," said Tim Profeta, the founding director of Duke University's Nicholas Institute for Environmental Policy Solutions. [81]

If the court rules in favor of the EPA, the plan will not go into effect until the case is presented to the U.S. Supreme Court, which put the plan on temporary hold in February while the challenge proceeded. If opponents decide not to take the case to the Supreme Court, the plan would take effect.

"But, there is zero chance of that happening," says plaintiff attorney Holmstead. "I think whoever loses in the D.C. Circuit is 100 percent likely to go to the Supreme Court," he says.

Campaign Controversy

As presumptive presidential nominees Clinton and Trump campaign

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At Issue:

Should the federal moratorium on new coal leases be permanent?

JEREMY NICHOLS
CLIMATE AND ENERGY PROGRAM DIRECTOR, WILDEARTH GUARDIANS

WRITTEN FOR *CQ RESEARCHER*, JUNE 2016

Limiting rises in global temperature means our society must move away from fossil fuels. In fact, studies have confirmed that to safeguard the climate, we must keep virtually all coal reserves in the ground.

Given this, it makes sense for our federal government to lead the way and stop leasing publicly owned coal.

The climate footprint of the federal coal program is enormous. More than 40 percent of all coal produced in the United States comes from publicly owned deposits managed by the Department of the Interior. Most of these deposits lie in the West, a landscape whose rugged beauty symbolizes freedom around the world.

A staggering 11 percent of all U.S. greenhouse gas emissions can be traced to mining and burning of publicly owned coal. This makes the federal coal program — and, by extension, the Interior Department — a root contributor to global warming in the United States.

In early 2016, Interior Secretary Sally Jewell enacted a pause on new leasing. Responding to mounting controversy and the need to modernize the way publicly owned coal is managed, she called for a "time out" to adopt reforms.

The pause makes sense, but the moratorium must become permanent.

Leasing conveys not only a right but also a mandate to mine. Every ton of coal leased to industry guarantees more carbon pollution. In other words, for every ton leased, the U.S. government is sending the message that it's OK to keep investing in coal. To continue this policy would be nothing short of climate denial.

We can't flip a switch and stop all coal burning tomorrow. Yet if we don't take meaningful steps today to wind down our reliance, we'll never fully move on to clean energy.

Industry already has more than a decade of publicly owned coal reserves under lease. A moratorium would ensure an orderly, yet effective, end to the federal coal program. It also would guarantee an end to our government's role in fueling global warming.

The opportunity could not be greater. Leading coal companies such as Peabody Energy and Arch Coal have filed for bankruptcy protection. At the same time, renewable energy is taking hold and becoming more affordable and profitable.

Our future does not lie with coal. It's time to acknowledge this reality and end leasing of our publicly owned coal.

LAURA SHEEHAN
SENIOR VICE PRESIDENT OF COMMUNICATIONS, AMERICAN COALITION FOR CLEAN COAL ELECTRICITY

WRITTEN FOR *CQ RESEARCHER*, JUNE 2016

One way to strangle an industry is through more and increasingly onerous government regulations, an approach the Obama administration uses all too frequently in its crusade to eliminate coal-based power from America's energy portfolio. A recent example of this in action is the radical, 2,100 page rewrite of policy governing the mining of coal on federal lands, quietly released in mid-January by the Interior Department's Office of Surface Mining.

Buried within this mountain of paper is a moratorium on leases to mine low-sulfur coal from government owned land. Forty-one percent of the nation's coal comes from federal lands, with a majority, 85 percent, being mined in the Powder River Basin of Wyoming and Montana.

Some want the moratorium to be made permanent, but doing so would be an egregious act of bureaucratic malpractice. These new regulations not only defy dozens of existing laws, they place one of our nation's largest coal reserves off-limits. This is bad news not just for the coal industry but for America's entire economy as it further restricts the way we produce power, forcing an overreliance on more expensive, less reliable energy sources.

We're told that the moratorium would allow additional time to study the environmental considerations of mining this Western coal. The administration's actions thus far, as evidenced by a perpetual juggernaut of regulations from the Mercury Air Toxics Standards, to the Stream Protection Rule and Clean Power Plan, suggest a larger effort designed to cause death by a thousand paper cuts.

The costs of these rules are staggering. The Power Plan alone would cost $30 billion or more per year and raise electricity costs in all of the lower 48 states, with 41 seeing double digit increases. Rate hikes of this nature will be devastating to low- and middle-income families, America's manufacturing base and our economy as a whole.

The temporary freeze on new leases to mine coal on federal lands is a bad idea. Making it permanent is exponentially worse. We can balance environmental concerns with the need for a reliable and clean source of electricity without risking America's economic standing. That balance cannot be achieved, however, when the government is determined to eliminate coal as a power source, regardless of the facts or the havoc it wreaks.

Continued from p. 544

across the country, the depressed coal industry and the loss of jobs in coal mining states has turned out to be a hot topic.

In March, Democratic candidate Clinton stirred up controversy when she told CNN that she wanted to help coal country benefit from the move toward renewable energy "because we're going to put a lot of coal miners and coal companies out of business, right?" After getting slammed, by Trump and others, she later apologized for the wording of her comments, which were part of a longer answer that was hardly mentioned in the attacks: "Now we've got to move away from coal and all the other fossil fuels, but I don't want to move away from the people who did the best they could to produce the energy that we relied on." Several months earlier, Clinton had announced a $30 billion plan with a long list of initiatives, from ensuring health and retirement benefits for coal workers and safeguarding local school funding to building roads and bridges in coal country, expanding broadband access and repurposing mine lands and retired power plant sites. [82]

But Democratic leaders in West Virginia say the out-of-context comment has severely damaged Clinton's chances of winning the general election in the state where in 2008 she won the Democratic primary in a landslide. The airways have been "just pummeled with that [quote], just constant," said former West Virginia Democratic Party Chairman George Carenbauer. [83]

AFP/Getty Images/Jim Watson

Demonstrators at the White House on Sept. 27, 2010, urge the Obama administration to end mountaintop mining, which environmentalists say pollutes water and causes other environmental problems. The administration's Clean Power Plan would require states to devise plans for power companies to significantly reduce emissions of carbon dioxide, the primary greenhouse gas contributing to climate change, starting in 2022. The plan is on hold pending a legal challenge.

In May, it was Trump's turn. At an oil industry conference in North Dakota, Trump promised to rescind the Clean Power Plan if elected president. "Regulations that shut down hundreds of coal-fired power plants and block the construction of new ones — how stupid is that?" Trump said. Energy analysts and journalists quickly questioned his grasp of the issue.

The next president would not have the authority to unilaterally rescind the plan, according to *The New York Times*, although Trump could affect the outcome of the court challenge to the plan by appointing a conservative to the open position on the U.S. Supreme Court. [84]

Trump promised that his actions would restore coal jobs, but energy analysts questioned his logic. "Most analysts would say that coal is hurting because natural gas prices have collapsed," said Robert McNally, an energy consultant and a senior energy official in the George W. Bush administration. "Donald Trump would have to find a way to raise natural gas prices." [85] But energy markets determine that.

Bankruptcies and Cleanup

Under the Surface Mining Control and Reclamation Act of 1977, coal companies must restore the land they've mined once they stop operations, but the recent wave of bankruptcies is threatening to undermine the process, said Tom Sanzillo and David Schlissel of the Cleveland-based Institute for Energy Economics and Financial Analysis, a research group committed to moving the country away from nonrenewable energy. Coal company collapses "threaten to leave behind a costly legacy that will haunt taxpayers and consumers for years," Sanzillo and Schlissel wrote in an April editorial in *The New York Times*.

Regulators over the years had allowed many large coal companies to "self-bond" to cover cleanup costs rather than purchase outside surety bonds — basically insurance — or put up cash or other collateral. A self-bond is basically a promise, an IOU. As companies work out their finances in bankruptcy courts, the courts may allow cash-strapped companies to earmark amounts that do not cover the full cost of reclamation, Sanzillo and Schlissel said. [86]

For example, bankrupt Alpha Natural Resources anticipates replacing all of its self-bonds in Wyoming with outside insurance or other collateral, but only 60 percent of its self-bonds in West Virginia, according to *The New York Times*. [87]

A few weeks after Sanzillo and

Schlissel's article, bankrupt Peabody Energy wrote a letter in response. "Just in the last decade, Peabody has paid many millions of dollars to restore our own mined lands in high-quality fashion, as we should," said Vic Svec, head of global investor relations. "Each year, we restore thousands of acres into hardy and productive rangeland, wildlife habitat, hardwood forests and wetlands." [88]

But it's the future, not the past, that worries outside analysts who question who will have to pay the cost of reclamation going forward. "The states have, I think, a significant risk — the federal government does as well," said coal analyst James Stevenson at the consulting firm IHS, based in Englewood, Colo. [89]

Environmentalists have called on the federal government to reform its regulations that allow coal companies to self-bond. And some companies are voluntarily shifting away from the practice. "We are proactively working to address the ongoing regulatory uncertainties regarding self-bonding programs by seeking to voluntarily transition fully to third-party surety bonds," Heath Hill, Cloud Peak Energy's chief financial officer, told analysts in April. [90] Cloud Peak is the only publicly traded Powder River Basin coal operator to avoid bankruptcy. ■

OUTLOOK

Smaller, Cleaner, Safer

The coal mining industry will certainly be smaller in 10 years' time, but also more efficient and cleaner, says the National Mining Association's Popovich. "And I see a steady increase in mine safety. We had a record year last year." Eleven people died in coal mine accidents in 2015, the lowest number since the federal Mine Safety and Health Administration was created nearly 40 years ago. [91]

Curtsinger of Cloud Peak Energy says he agrees with government forecasts that coal-fired power plants will still generate about a quarter of the country's electricity if the Clean Power Plan is fully implemented, and more if it is not. And the company's mines are well positioned to supply that demand, he says. "The Powder River Basin, where Cloud Peak's mines are located, produces some of the lowest cost, highest quality coal in the country. It also supplies some of the country's newest power plants," he says.

In April, Cloud Peak reported a $36.4 million first-quarter loss, nearly eight times its losses for the same period a year earlier. The company blamed, in part, one of the mildest winters on record. [92]

Paul Bailey of the American Coalition for Clean Coal Electricity says coal's future largely "depends on who the next president is and what policies they put in place."

It may also depend on the U.S. Supreme Court's decision on the Clean Power Plan, the centerpiece of Obama's strategy to arrest global warming. "If I were betting, I would say that the Supreme Court probably strikes down the Clean Power Plan," says industry attorney Holmstead.

NYU law professor Revesz disagrees. "The best that I can do is predict, based on my understanding of the strength of the arguments. . . . I think the Supreme Court, when it takes this case, will uphold the Clean Power Plan," he says.

The Supreme Court's stay of the Clean Power Plan was a blow to the EPA and the environmental community. The decision was 5-4, and Associate Justice Antonin Scalia was in the majority. But Scalia died in February, and the Republican-controlled Senate has vowed to block President Obama's nominee, Chief Judge Merrick Garland of the U.S. Court of Appeals for the District of Columbia. Thus, the plan's fate will likely be determined by the next president.

But the Sierra Club's Hitt says it won't matter so much who is president or whether the Clean Power Plan is enacted soon. "Our advocacy is largely targeting state and local decision makers of utilities and PCs," says Hitt, referring to public utility/services commissions. "So we have a strategy that is resilient to the political winds no matter which way they blow."

Earthjustice's Fisk predicts zero-emission renewable energy will continue to grow rapidly over the next decade, which, he says, "will be better for the environment and will actually be better for job creation and economic development." ■

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The Next Step:

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