

Supporting the Nation's Coal Workers and Communities in a Changing Energy Landscape



Union of
**Concerned
Scientists**



The shift to a low-carbon economy has proceeded largely without thoughtful plans or preparation for the workers and communities that have sustained the US economy for more than a century. The economic upheaval resulting from the dramatic job losses in the coal industry over the last decade has uprooted families, deepened economic anxiety, and left community leaders scrambling to keep schools open and social services in place. And the trend is set to continue: many more coal workers and communities are facing the same fate without intentional policies to address these changes.

As part of this shift, the nation must support coal workers in finding new career paths and help coal communities recover from the economic losses stemming from coal's decline (see box). This will require long-term individual supports and benefits, long-term investments in community infrastructure, empowering local leadership to drive place-based solutions, and ensuring that the legacy of coal mines and coal-fired power plants is fully remediated. These elements are critical to a fair, just, and equitable move to low-carbon energy; are urgently needed; and must be sustained over time.

Ultimately, broader changes to our energy systems will impact a larger swath of fossil fuel-dependent workers and communities as we drive toward decarbonizing the economy by 2050. This policy brief focuses on coal-dependent workers because they have faced economic disruption over the past decade and are imminently threatened by the shift to low-carbon energy in the near term.

But fortunately, there are solutions. New analysis by the Union of Concerned Scientists and the Utility Workers Union of America finds both that it is possible to support coal workers in the transition and that these comprehensive policies are

New analysis finds both that it is possible to support coal workers in the transition and that these comprehensive policies are affordable.

affordable. Indeed, relative to the federal response to the Great Recession in 2008–2009 and the COVID-19 pandemic of 2020–2021, as well as the scale of investments needed to decarbonize our economy by 2050, investing in the nation's coal workers comes with a relatively small price tag. Approximately 89,875 coal workers were employed in the United States in 2019. The cost of providing a comprehensive set of supports to the portion of these workers who will face job losses before reaching retirement age represents a tiny fraction of the estimated \$2.5 trillion in additional capital investments in all energy sectors by 2030 that would be needed to reach net-zero emissions by 2050 (Larson et al. 2020). We estimate that the cost of these supports will range from \$33 billion over 25 years to \$83 billion over 15 years.

Multiple Overlapping Economic Crises

The federal government can and does leverage considerable resources in response to a crisis. In the wake of the Great

Forced to Choose Between Jobs and Community

When Dayton Power & Light (a subsidiary of AES Corporation), by far the largest employer in Adams County, Ohio, announced in 2016 that it would close two coal-fired power plants in the county simultaneously, the workers and their families knew that finding new opportunities would almost certainly mean leaving behind the place they called home (MacGillis 2018). By its nature, mass deindustrialization forces people to make the hard choice about whether to stay or go.

Further, the local government faced its own set of challenges as the value of the coal plants dropped by \$56 million due to the planned closures. This created an annual drop of \$218,400 in tax revenue for the county's general fund, which had an annual budget of about \$8 million to pay for public

services and infrastructure. After two more years of further devaluations, the total annual loss to the county budget stood at \$787,800—a gaping hole with nothing to fill it (MacGillis 2018).

For the most part, workers are left to their own devices in answering the question of what comes next and sorting out how to make that happen. In the United States, government has almost entirely failed to act at all, let alone in any comprehensive fashion, in order to plan for or alleviate the economic and social fallout that is resulting from energy system transformations. As the transformation of the energy sector continues to play out chaotically across the country, the challenges faced by the people of Adams County and similar areas are the norm—people and places left behind by a process that leaves them invisible, unheard, and on their own.

Recession, the United States ultimately spent \$831 billion through the American Recovery and Reinvestment Act (CBO 2012). The COVID-induced economic crisis that began in 2020 led to the steepest declines in economic activity and employment since the Great Depression in the 1930s (Wheelock 2020). In 2020 Congress appropriated \$2.59 trillion in new spending in response to the pandemic (CRFB 2021; US Treasury Data Lab 2020), and President Biden signed a \$1.9 trillion COVID-19 relief package in March 2021.

In coal country, the current economic crisis comes on the heels of a decade of massive job losses and the resulting economic upheaval, as well as generations of disinvestment. The shift away from coal has accelerated over the past decade. Coal-fired electricity fell from about 50 percent of the nation's electricity generation in 2010 to about 20 percent in 2020. Cheap and abundant natural gas and steep reductions in costs of wind and solar have led to closures and fuel switching and have driven approximately 90 gigawatts of coal retirements from 2009 to 2019—nearly 29 percent of the 314 gigawatts online in 2009 (EIA 2012b; Bolinger 2020; Aramayo 2020; Storrow 2020; Stromsta 2020). In addition, many states are increasing their renewable electricity standards (Barbose 2021), and eight states plus the District of Columbia and Puerto Rico have adopted 100 percent carbon-free targets (Deyette 2019). Many utilities, including those that still rely on coal-fired electricity, have also made commitments to reducing emissions and increasing renewable electricity generation (Bird and Clevenger 2019).

In the coal mining sector, employment nationally fell from 91,611 in 2011 to 51,795 in 2016 (EIA 2012a; 2017). The job losses were centered in central Appalachia, but the economic pain is now being felt in western mines as well, as evidenced by the high-profile layoffs in Wyoming in 2019 (Erickson 2019). This acute decline in coal mining employment comes after a steady decrease in employment from increased mechanization beginning in the 1960s and the shift toward large mining operations in the West beginning in the 1980s, both of which led to increases in labor productivity over the latter half of the 20th century (Reis and *National Journal* 2013; Schweinfurth 2002).

The latest science underscores the urgency of addressing climate change. Limiting some of the worst impacts of climate change will require cutting global carbon dioxide (CO₂) emissions by about 45 percent by 2030 and reaching net-zero CO₂ emissions no later than 2050 (IPCC 2018). Recent studies show that achieving these targets will require increased deployment of low-carbon energy and would likely lead to a near phaseout of coal (Larson et al. 2020; SDSN 2020). Achieving this emissions trajectory will continue the trend toward low-carbon energy and the closures of coal-fired power plants before the end of their useful lives (Grubert 2020).

Importantly, however, the burden of meeting these emissions reductions targets should not fall disproportionately on the workers who have helped keep the lights on for generations—and with well-designed policies at all levels of government, we can ensure that workers and communities are not left behind. While jobs in wind and solar are growing quickly, these new jobs are often not being created in the places where existing fossil fuel jobs are being lost, nor do they offer commensurate pay, benefits, or union density. Intentional policies are needed to create economically equivalent job opportunities in specific geographies and to prepare workers for those new jobs (Zabin et al. 2020), most of which will be outside of the energy sector.

Cost Estimates for Supporting Dislocated Coal Workers

This analysis estimates the cost of providing a range of transitional support for coal miners and workers at coal-fired power plants who will likely lose their jobs before they reach age 65 (see Table 1, p. 4, and methodology section, p. 5). It focuses only on direct employment in coal mining and coal-fired power plants, but indirect jobs in the manufacturing and



The national shift away from coal as a primary source of electricity has largely left coal miners and coal-fired power plant employees behind. Affordable solutions are available today to honor and support the people who have helped power the United States for generations, and to ensure that affected workers have the time and resources they need to adapt to the new national economy.

transportation supply chains will also be impacted and in need of transition assistance (Pollin, Wicks-Lim, and Chakraborty 2020). Importantly, these calculations assume that job losses are spread evenly over time, but in practice these coal plant closures are likely to occur unevenly. Because of this, and because workers may want to avail themselves of these benefits before closures actually occur, policymakers should consider front-loading appropriations. Table 1 shows the low- and high-range estimates for the comprehensive set of supports needed to help workers either transition into retirement or find new economic opportunities (JTF 2020). These supports include the following.

- **Five-year comprehensive wage and benefit replacement:** Five years allows individual workers time to plan and train for new career opportunities. Full wage and benefit replacement (or wage insurance) for all dislocated coal workers includes health care premiums and employer retirement contributions.¹ Employer retirement contributions can come in the form of 401(k) plans or defined-benefit plans (pensions).²
- **Educational benefits:** The educational benefits for returning World War II veterans had a profound impact (DOD 2019), and this benefit would, similarly, allow dislocated workers to access a wide range of educational opportunities that could include vocational school,

certification programs, apprenticeships, or degrees at two- or four-year institutions of higher education.

- **College education for family members:** Children of dislocated workers would also be eligible for educational benefits as a way to help break cycles of generational poverty, similar to how GI Bill educational benefits can be transferred to spouses and children in certain cases (VA 2013).
- **Training programs and job placement services:** Dislocated workers would be presumed eligible for the Adult and Dislocated Worker Programs under the Workforce Innovation and Opportunity Act (WIOA) at the Department of Labor in order to train for new opportunities in their local areas.
- **Additional support structures:** Workers would be able to access mental health and counseling services, as well as relocation allowances when appropriate in individual circumstances.³

Using estimates of the number of dislocated workers and the reported national average salary for both coal miners and non-nuclear power plant operators (see the methodology section below and the technical appendix, online at www.ucsusa.org/resources/support-coal-workers), we can then calculate the range of costs for supporting these workers as

TABLE 1. Estimated Cost of Supporting Dislocated Coal Workers

Policy Support	Low Case Assumed Coal Phaseout=2040 25-Year Program (\$ billions)	High Case Assumed Coal Phaseout=2030 15-Year Program (\$ billions)
Five-year comprehensive wage replacement for dislocated coal workers	\$31.4	\$59.1
Educational benefits	\$0.3	\$7.3
Educational benefits for family members	\$0.6	\$14.6
Job placement services and training programs	\$0.2	\$0.4
Relocation assistance	\$0.5	\$0.8
Educational benefits for previously dislocated coal workers (2015–2019)	\$0.1	\$0.8
Total over life of program	\$33.2	\$82.9

The table shows the range of total inflation-adjusted cost estimates for major components of support for dislocated workers in the high and low cases (assumptions are outlined in the technical appendix). A primary driver of the costs is the assumed length of the program, which would extend five years beyond the year when the last worker exited the industry. As discussed in the methodology section, the shorter time period in the high case means that more workers would require assistance because fewer would reach retirement age during the life of the program.

the coal industry declines (Probst and Burke 2019). Recognizing the significant job losses that have occurred in recent years, we also estimate the costs of offering educational benefits to a portion of workers who lost coal jobs over the last five years (between 2015 and 2019).

A Down Payment on a Comprehensive Solution

These rough estimates represent just one element of the comprehensive set of policies needed to help coal workers continue to support their families while preparing for new careers or job opportunities. For example, the Black Lung Disability Trust Fund, a critical mechanism for providing medical support to disabled miners and their families, is projected to be approximately \$15 billion in debt by 2050 (GAO 2018). The insolvency problem exists even without considering the recent resurgence of the disease (Hall et al. 2019), or future liabilities due to coal company bankruptcies (GAO 2020), meaning that this is likely an underestimate of future benefit needs. The fund could be fixed with a mix of debt forgiveness and continued coal excise taxes (GAO 2018).

Importantly, our cost estimates do not represent the full range of investments needed to ensure that not only workers but also communities have a chance to recover from the decline of coal and diversify their economies (JTF 2020), and more research is needed to quantify the problems. For example, communities heavily dependent on tax revenue from coal plants or coal mines will need temporary support to ensure that fire, police, schools, and other social services continue to operate (Morris, Kaufman, and Doshi 2019), and these costs could be large. Communities will also need grants for assessing economic opportunities and planning for future development—likely coming through expanded grant programs in the various federal programs that were supported during the Obama administration’s POWER Initiative programs (Raimi et al. 2020; Cecire 2019) or new formula-based community development block grants for impacted communities.

Ensuring the cleanup of the legacy of coal extraction and combustion is a critical element needed to facilitate future economic development. Mine reclamation has been hamstrung by lax enforcement and the recent wave of coal bankruptcies, with more to come (Bruggers 2021; Moore 2020). The existing estimates of the cost of mine reclamation do not account for the expected shortfalls due to declining coal production and future coal bankruptcies when coal companies will attempt to shed their cleanup responsibilities (and likely succeed). Burning coal also creates toxic ash that often remains in large ponds or impoundments. Upwards of 90 percent of these ponds are leaking (Earthjustice 2020), and many are contaminating groundwater and drinking water (Frank and Maloney

2020). Finally, historical and ongoing air pollution from burning coal harms public health, particularly overburdened and underserved communities, whose residents are often people of color and have low incomes (Thind et al. 2019; Sergi et al. 2020; Johnston and Cushing 2020).

For all of these issues, we must ensure that coal companies and utilities are held liable for the costs to the greatest extent possible before saddling taxpayers with the bill.

Managing the shift away from coal-fired electricity—with proper planning, robust stakeholder engagement, and sustained funding—can lead to successful outcomes for workers, underserved communities, and local governments. Plant closures can also allow for redevelopment or repurposing of sites, facilitating new economic opportunities, job creation, and community engagement. Comprehensive cleanup can create significant local jobs (French 2020; 2019; NPRC and IBEW 2018), and cleaning up legacy issues such as contaminated groundwater will allow these communities to become places where people want to live and work. This will help improve health outcomes for communities and attract new residents and new businesses. Investments in infrastructure, especially broadband, will help drive new economic development.

Managing the shift away from coal-fired electricity—with proper planning, robust stakeholder engagement, and sustained funding—can lead to successful outcomes.

The United States need not start from scratch—Germany and Canada have both adopted national comprehensive plans to manage the shift away from coal (TFJTCCPWC 2018; CGSCE 2019). States are beginning to lead the way, with New Mexico (Energy Transition Act 2019) and Colorado (JTAC 2020) enacting policies aimed at helping workers and communities dependent on the coal industry chart new paths.

Overview of Methodology

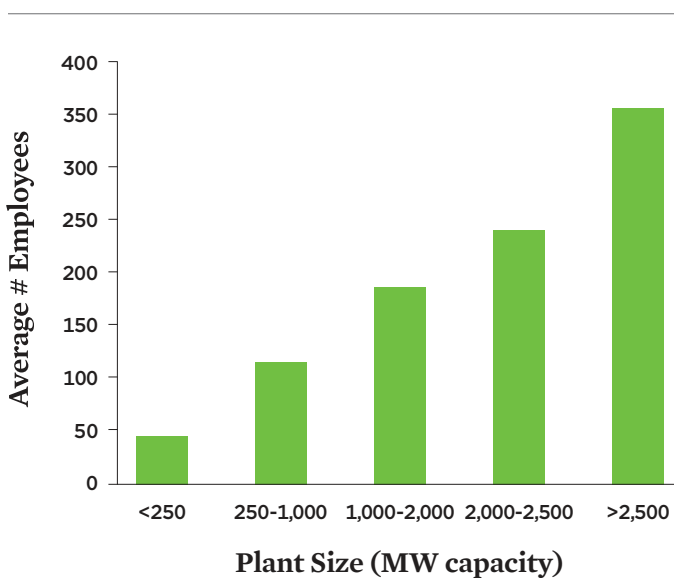
Here we summarize the methodology for estimating the costs of worker supports and name some key assumptions. For a more complete description, please see the technical appendix.

NUMBER OF WORKERS AFFECTED

First, we estimated the number of coal miners and coal-fired power plant workers employed in the United States. There were 52,804 individuals employed in coal mining in 2019 (EIA 2020). Notably, the data from the Energy Information Administration include some occupations such as yard workers and office workers, so this represents an overestimate (Pollin et al. 2019). For coal-fired power plants, however, employment data are available only for rate-regulated utilities for which annual reporting to the Federal Energy Regulatory Commission is required. Using these data, we calculated the average number of employees in five different sizes of power plants, defined in terms of plants' generating capacity in megawatts (MW) (see Figure 1). These averages were then applied to the remainder of the non-reporting coal plants to estimate employment based on generating capacity. Using this method, we estimated that 37,071 people were employed at coal-fired power plants in 2019. For comparison, the 2020 *U.S. Energy and Employment Report* found 38,158 individuals employed at coal-fired utilities (NASEO and EFI 2019).

Smaller coal plants tend to be located in more urban areas and used only when electricity demand is high. Larger plants are often located in more rural areas where the utility may be the largest employer in town and the hundreds of lost jobs

FIGURE 1. Employment at Rate-Regulated Coal-Fired Power Plants



This figure summarizes reported employment data from rate-regulated coal-fired power plants of different sizes. These data were used to estimate employment for the rest of the nation's coal-fired power plants (see technical appendix).

mark a significant hit to the local economy—this is reflected in our definition of counties most at risk from coal closures (see risk criteria below).

The basic assumption of this analysis is that all of these workers will lose their jobs as the coal industry declines. Importantly, however, not all of them will require assistance because workers who reach age 65 by the time they face layoffs will not be eligible for wage replacement or require retraining (Pollin, Wicks-Lim, and Chakraborty 2020; Pollin et al. 2019). A limitation of this analysis is that actual closure dates cannot be predicted with certainty, so we estimated the average annual number of dislocated workers based on the demographics of the workforce (see technical appendix).

The analysis defines four criteria for defining a “coal county” based on existing jobs or recently lost jobs in coal mining or coal-fired power plants. A coal county, for the purposes of this analysis, is defined as:

- a county that reported coal production or coal mining employment in 2015 or 2019,⁴ or
- a county that has faced the retirement of a coal-fired generating unit since the beginning of 2015 or where a coal-fired generating unit was in operation at the end of 2019.

Based on these criteria, we identified 462 counties (out of a total of 3,142 counties or county-equivalents in the United States) that have or had a direct connection to coal. We used 2015 as a starting date because that year marked a substantial uptick in retirements of coal-fired generating capacity, but this assumption excludes some coal mining counties that faced dramatic job losses during the downturn in the coal industry in the early part of the 2010s.

RISK CRITERIA FOR COUNTIES' DEPENDENCE ON THE COAL INDUSTRY

To evaluate the dependence of a county on the coal industry, we identified 10 risk criteria for the severity of the economic fallout from the decline of the industry. This is not intended to be an exhaustive list, and additional criteria and economic metrics could also be considered as part of future work.

For past coal mining counties:

- Loss of at least 25 percent of mining jobs between 2015 and 2019, or
- Decline of at least 10 percent in coal production from 2015 to 2019.

For current (2019) coal mining counties:

- At least 50 people employed by coal mines in 2019.

For counties with recent coal-fired power plant closures:

- Retirement of at least 100 MW of coal-fired generating capacity between 2015 and 2019, inclusive,⁵ or
- Retirement of at least 100 MW of coal-fired generating capacity in 2020.

For counties with operating coal-fired power plants:

- At least 50 people employed at coal-fired power plants in 2019, or
- Announced early retirement of at least 100 MW of coal-fired generating capacity by the end of 2030.

For any coal county:

- Number of coal jobs as a fraction of population is more than twice the average of all coal counties,⁶ or
- The five-year average unemployment rate is higher than the national average, or

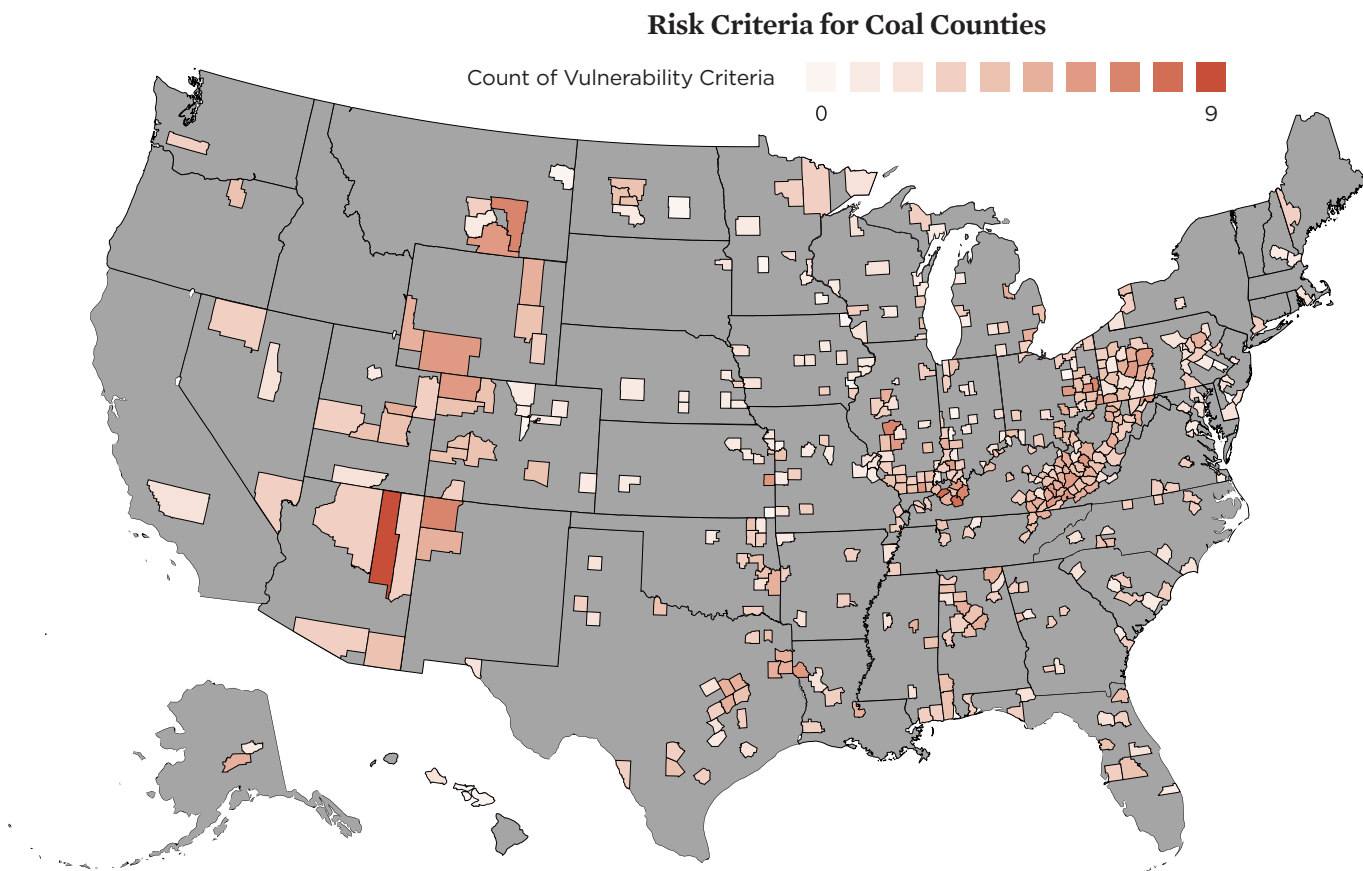
- The five-year average poverty rate is higher than the national average.

These 10 risk criteria provide an initial look at which counties have been and will be most affected by the decline of the coal industry.

Counties at Risk

Based on our definition of a coal county and the 10 risk criteria for evaluating the severity of the economic fallout from coal's decline, we created a map showing the regions of the country that have been or may be hardest hit (see Figure 2). Navajo County, Arizona, meets nine of the 10 risk criteria, the most of any county nationally. Two counties—Muhlenberg and Webster counties in Kentucky—meet eight of the criteria. Five additional counties meet seven criteria: Sangamon

FIGURE 2. Coal Counties



This map shows the 462 coal counties as defined by this analysis, with darker shades representing those meeting more of the risk criteria. Approximately 16 percent of the coal counties identified in this analysis meet half of the criteria, and more than 60 percent meet a third of the criteria.

County, Illinois; Ohio County, Kentucky; Rosebud County, Montana; San Juan County, New Mexico; and Jefferson County, Ohio. In all, 28 counties meet at least six criteria, 74 counties meet at least five, and 163 counties meet at least four. Only 14 counties of those we identified as coal counties do not meet any of the criteria.

The 28 counties that met at least six criteria are listed in Table 2. Of these counties, 26 were either above the national average for five-year average unemployment rate or five-year average poverty rate, 26 saw a decline of at least 10 percent in coal production, 23 had at least 50 people employed by coal mines in 2019, and 20 had at least 50 people employed at coal-fired power plants in 2019.

But as Figure 2 illustrates, the impact of the shift away from coal will be felt nationwide, rather than limited to the counties where coal is most concentrated. Coal mining tends to be concentrated in a few regions of the country, including Appalachia, the Powder River Basin, the Illinois Basin, and tribal lands in the Southwest. Many of these places are rural and isolated, meaning that the coal mine is the only opportunity for well-paying jobs in the area and that many other businesses in the community either support mining activities or depend on coal miners as customers.

Coal-fired power plants, on the other hand, are more geographically dispersed. The closure of coal plants, particularly the larger power plants located in more rural areas, result in a significant portion of job losses and lost tax revenue that supports county services.

A Call for an Intentional Vision

Although workers and communities have suffered and are facing an uncertain future as the coal industry declines, solutions are readily available with bold and visionary action from policymakers. Comprehensive solutions include long-term individual supports and benefits for dislocated workers, long-term investments in community infrastructure, empowering local leadership to drive place-based solutions, and ensuring that the legacy of coal mines and coal-fired power plants is fully cleaned up. These elements are critical to a fair, just, and equitable shift to a low-carbon economy, and it will take decades of robust and sustained investment.

A comprehensive set of systemic supports is needed for workers who lose their jobs as a result of the decline in the coal industry. At a minimum this includes: five years of comprehensive wage replacement; guaranteed health care coverage; continued employer contributions to retirement funds or pension plans (that recognize time of service); robust education opportunities including paid tuition for academic, vocational, and other programs; job placement assistance;

access to social services; and potential relocation allowances (BGA 2019; JTF 2020). This analysis develops for policymakers an initial ballpark estimate of the cost of supporting these future dislocated workers in finding new jobs with family-sustaining wages and the ability to join a union, as well as support for workers who have already lost their jobs in recent years. In total, the cost of these supports ranges from approximately \$33 billion over 25 years to \$83 billion over 15 years, a small fraction of the money that will be invested in the energy system in the coming decades as we shift to a low-carbon economy. This is only a down payment, however, as more support will be needed for communities to clean up legacy issues and invest in economic diversification.

Much has been said and written about coal in the last decade—especially over the last four years, when a theme has been bringing back coal jobs. But the industry, and the jobs and economic activity that it supports, has reached a moment of reckoning. The reality is that coal will not return to its heyday; the industry will continue its decline simply because cheaper and cleaner technologies are widely available and rapidly scaling. As the energy mix changes, rather than offer false hope for reinvigorated coal markets, we must acknowledge that thoughtful and intentional planning and comprehensive support are critical to honoring the workers and communities that have sacrificed so much to build this country. The fact is that this shift is already happening, largely without any intentionality at all, leading to devastating consequences for families and communities. We owe far more to those who have given us so much.

Jeremy Richardson is a senior energy analyst at the Union of Concerned Scientists. Lee Anderson is the government affairs director at the Utility Workers Union of America.

ACKNOWLEDGMENTS

This report was made possible by the generous support of members of the Union of Concerned Scientists.

The authors would like to thank the following people for their thoughtful review of the report: Dennis Dougherty of the Colorado AFL-CIO, Ted Boettner of the Ohio River Valley Institute, and Daniel Raimi of Resources for the Future.

The authors are also grateful to their colleagues at the Utility Workers Union of America and the Union of Concerned Scientists for their thoughtful input, advice, feedback and support, especially Erin Bzymek, Jim Harrison, Julie McNamara, Steve Clemmer, Sam Gomberg, Joe Daniel, and Rachel Cleetus. Special thanks go to Bryan Wadsworth, Heather Tuttle, Karin Matchett, and Bradie Bradshaw for their roles in the report's editing and production.

Organizational affiliations are listed for identification purposes only. The opinions expressed herein do not necessarily reflect those of the individuals who reviewed the work. The Union of Concerned Scientists and Utility Workers Union of America bear sole responsibility for the report's contents.

TABLE 2. The 28 Most At-Risk Coal Counties

County	State	Count of Criteria	Risk Criteria									
			1	2	3	4	5	6	7	8	9	10
Navajo	AZ	9	✓	✓	✓	✓	✓	✓	✓		✓	✓
Muhlenberg	KY	8	✓	✓	✓	✓	✓	✓			✓	✓
Webster	KY	8	✓	✓	✓	✓		✓		✓	✓	✓
Jefferson	OH	7	✓	✓				✓	✓	✓	✓	✓
Ohio	KY	7	✓	✓	✓			✓		✓	✓	✓
Rosebud	MT	7		✓	✓			✓	✓		✓	✓
San Juan	NM	7		✓	✓	✓		✓	✓		✓	✓
Sangamon	IL	7		✓	✓			✓	✓	✓	✓	✓
Alleghany	MD	6	✓	✓	✓			✓			✓	✓
Big Horn	MT	6		✓	✓				✓		✓	✓
Boone	WV	6	✓	✓	✓					✓	✓	✓
Clearfield	PA	6	✓	✓	✓	✓					✓	✓
Coshocton	OH	6	✓				✓	✓	✓		✓	✓
Daviess	KY	6		✓			✓	✓	✓		✓	✓
De Soto	LA	6		✓	✓				✓	✓	✓	✓
Harlan	KY	6	✓	✓	✓					✓	✓	✓
Harrison	OH	6	✓	✓	✓					✓	✓	✓
Indiana	PA	6	✓	✓	✓				✓		✓	✓
Linn	KS	6	✓	✓					✓		✓	✓
Marshall	WV	6			✓	✓			✓		✓	✓
Moffat	CO	6		✓	✓				✓	✓	✓	✓
Montgomery	IL	6	✓	✓	✓	✓					✓	✓
Perry	KY	6	✓	✓	✓					✓	✓	✓
Pike	IN	6	✓	✓			✓		✓	✓		
Pike	KY	6	✓	✓	✓					✓	✓	✓
Saline	IL	6	✓	✓	✓					✓	✓	✓
Sweetwater	WY	6	✓	✓	✓				✓		✓	
Wise	VA	6		✓	✓				✓		✓	✓
Total Counties Meeting Each Criterion			19	26	23	10	7	20	7	16	26	26

Risk Criteria:

1. Loss of at least 25 percent of mining jobs between 2015 and 2019
2. Decline of at least 10 percent in coal production from 2015 to 2019
3. At least 50 people employed by coal mines in 2019
4. Retirement of at least 100 MW of coal-fired generating capacity between 2015 and 2019, inclusive
5. Retirement of at least 100 MW of coal-fired generating capacity in 2020
6. At least 50 people employed at coal-fired power plants in 2019
7. Announced early retirement of at least 100 MW of coal-fired generating capacity by the end of 2030
8. Number of coal jobs as a fraction of population is more than twice the average of all coal counties
9. The five-year average unemployment rate is higher than the national average
10. The five-year average poverty rate is higher than the national average

ENDNOTES

- 1 For the purposes of this analysis, we assume full five-year wage replacement for all dislocated workers. Policymakers could also design this as a wage differential, which would lower total costs—dislocated workers who find new employment during the five-year period would be eligible for only the difference between their old and new salary.
- 2 Employer contributions to 401(k) plans can range from 5 to 7 percent. Defined-benefit plans are difficult to quantify because eligibility requirements are based on age and time of service. This analysis assumes that these are captured within the adders of 30 percent to 60 percent assumed in the high and low cases, respectively (see technical appendix at www.ucsusa.org/resources/support-coal-workers).
- 3 The cost of both of these benefits is likely to be small relative to the total. Counseling services are assumed to be included in the rough estimate of full wage replacement as part of health care coverage. Relocation eligibility must be designed carefully to avoid incentivizing the negative social and economic impacts on communities that arise from depopulation.
- 4 Coal mines that reported no production may still have a small number of employees present, and they are included in the definition of a coal county.
- 5 This criterion also applies to unit-level retirements, in which portions of a power plant are permanently shut down without shuttering the entire plant.
- 6 This works out to about 1.5 percent of the county's population employed as coal miners or plant workers.

REFERENCES

- Aramayo, Lindsay. 2020. "More than 100 Coal-Fired Plants Have Been Replaced or Converted to Natural Gas since 2011." *Today in Energy* (blog). August 5, 2020. Washington, DC: Energy Information Administration. <https://www.eia.gov/todayinenergy/detail.php?id=44636>
- Barbose, Galen. 2021. "U.S. Renewables Portfolio Standards Status Update: Early Release." March 1, 2021. Berkeley, CA: Lawrence Berkeley National Laboratory. <https://emp.lbl.gov/news/berkeley-lab-publishes-its-2021-rps-status>
- BGA (BlueGreen Alliance). 2019. "Solidarity for Climate Action." Washington, DC.
- Bird, Lori, and Tyler Clevenger. 2019. "2019 Was a Watershed Year for Clean Energy Commitments from U.S. States and Utilities." *World Resources Institute* (blog). December 20, 2019. <https://www.wri.org/blog/2019/12/2019-was-watershed-year-clean-energy-commitments-us-states-and-utilities>
- Bolinger, Mark. 2020. "Utility-scale Wind and Solar in the U.S.: Comparative Trends in Deployment, Cost, Performance, Pricing, and Market Value." Webinar, December 8, 2020. Berkeley, CA: Lawrence Berkeley National Laboratory Electricity Markets and Policy Group. <https://emp.lbl.gov/webinar/utility-scale-wind-and-solar-us>
- Bruggers, James. 2021. "Blackjewel's Bankruptcy Filing Is a Harbinger of Trouble Ahead for the Plummeting Coal Industry." *Inside Climate News*, March 3, 2021. <https://insideclimatenews.org/news/03032021/blackjewel-bankruptcy-kentucky-abandoned-mines/>
- CBO (Congressional Budget Office). 2012. "Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011." Washington, DC. <https://www.cbo.gov/sites/default/files/112th-congress-2011-2012/reports/02-22-ARRA.pdf>
- Cecire, Michael H. 2019. *The POWER Initiative: Energy Transition as Economic Development*. R46015. Washington, DC: Congressional Research Service.
- CGSCE (Commission on Growth Structural Change and Employment). 2019. *Final Report of the Commission on Growth Structural Change and Employment*. Berlin, Germany: Federal Ministry for Economic Affairs and Energy.
- CRFB (Committee for a Responsible Federal Budget). 2021. "How Much COVID Relief Money Is Left?" *Committee for a Responsible Federal Budget* (blog). January 27, 2021. Washington, DC. <https://www.crfb.org/blogs/how-much-covid-relief-money-left>
- Deyette, Jeff. 2019. "States March toward 100% Clean Energy: Who's Next?" *The Equation* (blog). August 28, 2019. Cambridge, MA: Union of Concerned Scientists. <https://blog.ucsusa.org/jeff-deyette/states-march-toward-100-clean-energy-whos-next>
- DOD (Department of Defense). 2019. "75 Years of the GI Bill: How Transformative It's Been." January 19, 2019. Arlington, VA. <https://www.defense.gov/Explore/Features/Story/Article/1727086/75-years-of-the-gi-bill-how-transformative-its-been/>
- Earthjustice. 2020. "Mapping the Coal Ash Contamination." October 6, 2020. San Francisco, CA. <https://earthjustice.org/features/map-coal-ash-contaminated-sites>
- EIA (Energy Information Administration). 2012a. *Annual Coal Report 2011*. Washington, DC.
- . 2012b. "Competition Among Fuels for Power Generation Driven by Changes in Fuel Prices." *Today in Energy* (blog). July 13, 2012. Washington, DC. <https://www.eia.gov/todayinenergy/detail.php?id=7090>
- . 2017. *Annual Coal Report 2016*. Washington, DC.
- . 2020. *Annual Coal Report 2019*. Washington, DC. <https://www.eia.gov/coal/annual/index.php>
- Energy Transition Act. 2019. New Mexico state legislature, Senate bill 489, 54th legislature, 1st session. <https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.html>
- Erickson, Camille. 2019. "Two Wyoming Coal Mines Close, Send 700 Workers Home After Bankruptcy Filing." *Casper Star-Tribune Online*, July 1, 2019. https://trib.com/business/energy/two-wyoming-coal-mines-close-send-700-workers-home-after-bankruptcy-filing/article_773100d1-b5b4-57d8-af49-842518b9e219.html
- Frank, Indra, and Tim Maloney. 2020. *Our Waters at Risk, Part 2*. Indianapolis, IN: Hoosier Environmental Council. <https://www.hecweb.org/issues/environmental-health-justice/coal-ash/>
- French, Kate. 2019. "Doing It Right II: Job Creation through Colstrip Cleanup." Billings, MT: Northern Plains Resource Council. <http://www.worc.org/doing-it-right-means-more-jobs-for-colstrip-and-around-the-united-states/>
- . 2020. "Coal Mine Cleanup Works." Billings, MT: Western Organization of Resource Councils.
- GAO (Government Accountability Office). 2018. *Black Lung Benefits Program: Options for Improving Trust Fund Finances*. GAO-18-351. Washington, DC. <https://www.gao.gov/products/gao-18-351>
- . 2020. *Black Lung Benefits Program: Improved Oversight of Coal Mine Operator Insurance Is Needed*. GAO-20-21. Washington, DC. <https://www.gao.gov/products/GAO-20-21>
- Grubert, Emily. 2020. "Fossil Electricity Retirement Deadlines for a Just Transition." *Science* 370 (6521): 1171-1173. <https://doi.org/10.1126/science.abe0375>
- Hall, Noemi B., David J. Blackley, Cara N. Halldin, and A. Scott Laney. 2019. "Current Review of Pneumoconiosis Among U.S. Coal Miners." *Current Environmental Health Reports* 6 (3): 137-147. <https://doi.org/10.1007/s40572-019-00237-5>

- IPCC (Intergovernmental Panel on Climate Change). 2018. "Summary for Policymakers." In *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, edited by V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield. Geneva, Switzerland. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_HR.pdf
- Johnston, Jill, and Lara Cushing. 2020. "Chemical Exposures, Health, and Environmental Justice in Communities Living on the Fenceline of Industry." *Current Environmental Health Reports* 7 (1): 48–57. <https://doi.org/10.1007/s40572-020-00263-8>
- JTAC (Just Transition Advisory Committee). 2020. "Colorado Just Transition Action Plan." Denver, CO: Colorado Department of Labor and Employment.
- JTF (Just Transition Fund). 2020. "National Economic Transition Platform." <https://nationaleconomictransition.org/platform/>
- Larson, E., C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, et al. 2020. *Net Zero America: Potential Pathways, Infrastructure, and Impacts, Interim Report*. Princeton, NJ: Princeton University. https://environmenthalffcentury.princeton.edu/sites/g/files/toruqf331/files/2020-12/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf
- MacGillis, Alec. 2018. "Forced to Choose Between a Job—and a Community." *ProPublica*, May 23, 2018. <https://www.propublica.org/article/adams-county-ohio-coal-forced-to-choose-between-a-job-and-a-community>
- Moore, Molly. 2020. "Bankruptcy Proposal Would Dodge Mine Cleanup Laws." *The Appalachian Voice* (blog). December 15, 2020. Boone, NC. <https://appvoices.org/2020/12/15/blackjewel-mine-reclamation/>
- Morris, Adele C., Noah Kaufman, and Siddhi Doshi. 2019. *The Risk of Fiscal Collapse in Coal-Reliant Communities*. New York: Columbia School of International and Public Affairs Center on Global Energy Policy. <https://www.energypolicy.columbia.edu/research/report/risk-fiscal-collapse-coal-reliant-communities>
- NASEO (National Association of State Energy Officials) and EFI (Energy Futures Initiative). 2019. *2020 U.S. Energy and Employment Report*. Arlington, VA. <https://www.usenergyjobs.org/>
- NPRC (Northern Plains Resource Council) and IBEW (International Brotherhood of Electrical Workers Local 1638). 2018. *Doing It Right: Colstrip's Bright Future with Cleanup*. Billings, MT: Northern Plains Resource Council. https://northernplains.org/wp-content/uploads/2018/07/DoingItRight_FullStudy_FNL_WEB.pdf
- Pollin, Robert, Jeannette Wicks-Lim, and Shouvik Chakraborty. 2020. "Industrial Policy, Employment and Just Transition." In *America's Zero Carbon Action Plan*. New York: Sustainable Development Solutions Network. <https://www.peri.umass.edu/economists/robert-pollin/item/1366-employment-creation-and-just-transition-through-a-u-s-zero-carbon-program>
- Pollin, Robert, Jeannette Wicks-Lim, Shouvik Chakraborty, and Tyler Hansen. 2019. *A Green Growth Program for Colorado*. Amherst, MA: University of Massachusetts, Amherst, Political Economy Research Institute. <https://www.peri.umass.edu/publication/item/1168-a-green-growth-program-for-colorado>
- Probst, Jim, and Paul Burke. 2019. "A New Day for the Coalfields." Presentation at the Citizens Climate Lobby Conference, Washington, DC, June 21, 2019. <https://ccl.podbean.com/e/a-new-day-for-the-coalfields-ccl2019-conference/>
- Raimi, Daniel, Wesley Look, Molly Robertson, and Jake Higdon. 2020. *Economic Development Policies to Enable Fairness for Workers and Communities in Transition*. Report 20-08. Washington, DC: Resources for the Future and Environmental Defense Fund. <https://www.rff.org/publications/reports/economic-development-fairness-workers-communities/>
- Reis, Patrick, and *National Journal*. 2013. "Coal Country's Decline Has a Long History." *The Atlantic*, October 31, 2013. <https://www.theatlantic.com/politics/archive/2013/10/coal-countrys-decline-has-a-long-history/453144/>
- Schweinfurth, Stanley P. 2002. "Coal—A Complex Natural Resource." Circular 1143. Washington, DC: U.S. Geological Survey.
- SDSN (Sustainable Development Solutions Network). 2020. "Zero Carbon Action Plan." New York: Sustainable Development Solutions Network. <https://www.unsdsn.org/Zero-Carbon-Action-Plan>
- Sergi, Brian J., Peter J. Adams, Nicholas Z. Muller, Allen L. Robinson, Steven J. Davis, Julian D. Marshall, and Inês L. Azevedo. 2020. "Optimizing Emissions Reductions from the U.S. Power Sector for Climate and Health Benefits." *Environmental Science and Technology* 54 (12): 7513–7523. <https://doi.org/10.1021/acs.est.9b06936>
- Storrow, Benjamin. 2020. "More Coal Has Retired Under Trump Than in Obama's 2nd Term." *E&E News*, June 22, 2020. <https://www.eenews.net/stories/1063430425>
- Stromsta, Karl-Erik. 2020. "EIA: Coal Plants 'Uneconomical in Most Regions.'" *Institute for Energy Economics and Financial Analysis* (blog). August 13, 2020. Lakewood, OH. <https://ieefa.org/eia-coal-plants-uneconomical-in-most-regions/>
- TFJTCCPWC (Task Force on Just Transition for Canadian Coal Power Workers and Communities). 2018. *A Just and Fair Transition for Canadian Coal Power Workers and Communities*. En4-361/2019E-PDF. Gatineau, Quebec: Government of Canada Publications. <http://publications.gc.ca/site/eng/9.867000/publication.html>
- Thind, Maninder P. S., Christopher W. Tessum, Inês L. Azevedo, and Julian D. Marshall. 2019. "Fine Particulate Air Pollution from Electricity Generation in the U.S.: Health Impacts by Race, Income, and Geography." *Environmental Science and Technology* 53 (23): 14010–14019. <https://doi.org/10.1021/acs.est.9b02527>
- US Treasury Data Lab. 2020. "Federal Response to COVID-19." Accessed March 24, 2020. <https://datalab.usaspending.gov/federal-covid-funding/>
- VA (Department of Veterans Affairs). 2013. "History and Timeline: Education and Training." Washington, DC. <https://www.benefits.va.gov/gibill/history.asp>
- Wheelock, David C. 2020. "Comparing the COVID-19 Recession with the Great Depression." 2020, No. 39. Economic Synopses. St. Louis, MO: Federal Reserve Bank of St. Louis. <https://doi.org/10.20955/es.2020.39>
- Zabin, Carol, Roxanne Auer, J. Mijin Cha, Robert Collier, Richard France, Jenifer MacGillvary, Holly Myers, Jesse Strecker, and Steve Viscelli. 2020. *Putting California on the High Road: A Jobs and Climate Action Plan for 2030*. Berkeley, CA: University of California, Berkeley, Center for Labor Research and Education. <https://laborcenter.berkeley.edu/putting-california-on-the-high-road-a-jobs-and-climate-action-plan-for-2030/>

Supporting the Nation's Coal Workers and Communities in a Changing Energy Landscape

The people who have powered the United States for generations deserve to be part of the new national economy.

The national shift away from coal as a primary source of electricity generation has accelerated over the last decade, leaving coal workers and their families behind while unraveling the social fabric of their communities. The workers and the communities they call home have powered the nation for generations; they deserve a fighting chance to be a part of a new national economy and to be honored for the service they have given the nation.

The Utility Workers Union of America and the Union of Concerned Scientists understand that a fair and equitable

transformation of the nation's energy sector will require intentional, robust, and sustained investments in coal workers, their families, and their communities. Investing in the future of this workforce means providing workers with empowering resources that will offer them the tools—and allow them the time necessary—to truly adapt, to secure family-sustaining wages and benefits, and to have the ability to join a union. Not only is it possible to meaningfully honor and support coal workers, but these comprehensive policies are also affordable.

FIND THIS DOCUMENT ONLINE:

www.ucsusa.org/resources/support-coal-workers

**Union of
Concerned
Scientists**



The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with people across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

Chartered in 1945, the Utility Workers Union of America (UWUA), AFL-CIO represents around 50,000 active members employed in America's utility sectors including the electric, gas, water, and related professional and service industries.

NATIONAL HEADQUARTERS

Two Brattle Square
Cambridge, MA 02138-3780
(617) 547-5552

1300 L Street, NW, Ste. 1200
Washington, DC 20005
(202) 899-2851