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

Technical Appendix

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As part of the shift to a low-carbon economy, 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. 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 cleaned up. These elements are critical to a fair, just, and equitable shift to a low-carbon economy; are urgently needed; and must be sustained over time.

This appendix outlines the methodology and key assumptions used to estimate the costs of providing a comprehensive set of supports to coal miners and workers at coal-fired power plants as coal continues its decline. The full set of policies needed to ensure fair treatment for workers and communities is articulated in the National Economic Transition platform (JTF 2020) and the BlueGreen Alliance Solidarity for Climate Action platform (BGA 2019).

We find that the cost of providing a comprehensive set of supports to the workers who will lose their jobs before reaching retirement age ranges from $33 billion (over 25 years) to $83 billion (over 15 years). This cost estimate represents a reasonable down payment on the full range of investments in workers and communities that will be needed for a truly fair shift to a low-carbon economy.

Methodology and Assumptions

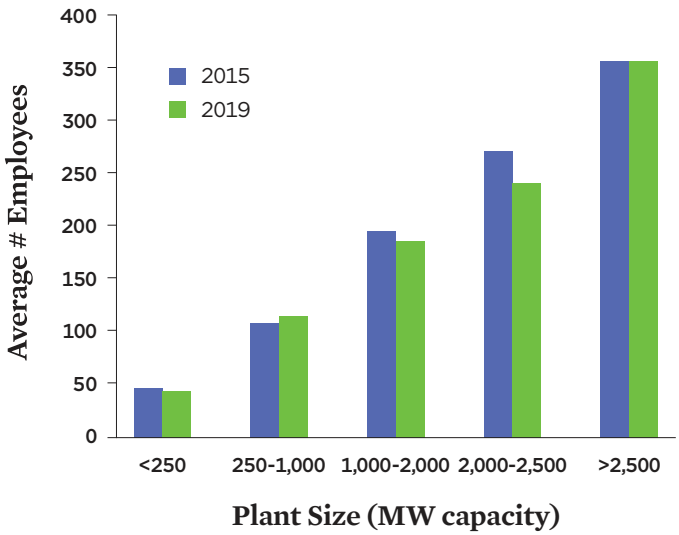
NUMBER OF WORKERS

First, we estimated the number of coal miners and coal-fired power plant workers employed in the United States. The number of coal miners employed by county by year is available from the Energy Information Administration and the Mine Safety and Health Administration (EIA 2020). There were 52,804 individuals employed in coal mining in 2019. Furthermore, reporting indicates that 13,167 jobs were lost in the five years between 2015 and 2019. These figures likely represent a slight overestimate of the number of workers needing assistance because Energy Information Administration statistics include a range of occupations at coal mines, such as office workers, who may not be paid as well but who may need assistance (Pollin et al. 2019).

Reporting for the utility sector, however, does not split out employment statistics by the fuel type at the individual power plant. For regulated utilities, employment at an individual plant is reported to the Federal Energy Regulatory Commission (FERC) on FERC Form 1.[1] We calculated the number of employees per megawatt (MW) at coal plants that reported employment figures for 2019, using five capacity size bins. We then derived an estimate for the remaining coal plants by applying these calculated numbers (employment per MW by capacity size) to the operating capacity of the non-reporting plants. This represents a novel method of estimating the number of workers at coal-fired power plants. We estimate that there were 37,071 workers at coal-fired power plants in 2019. For comparison, the 2020 *U.S. Energy and Employment Report*, in addition to estimating jobs by fuel and by sector, conducts a cross-cutting analysis that found 38,158 individuals employed in coal-related jobs in the utility sector, as well as 55,669 in extraction and 37,670 in wholesale trade, transport, and distribution (NASEO and EFI 2019). This comparison suggests that our estimates for coal miners and coal-fired plant workers are in the ballpark and demonstrates that more coal workers in the distribution and transport sector will need transition support even though they are not considered in this analysis.

We repeated the calculation described above to calculate the employee per MW figures for 2015 and found very similar numbers in each capacity bin (see Figure A-1). Comparing estimated employment in 2015 and 2019, we estimated that approximately 10,000 workers lost jobs in coal-fired power plants over that period. This is likely a significant overestimate, since some of the generating capacity was converted to natural gas, and many workers were reassigned to other jobs within their companies. However, as more coal-fired power plants close, reassignments may become more difficult; the *U.S.*

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



The average employment within each size category is fairly consistent between 2015 and 2019. (The 2019 data also appear in the report; see Figure 1.)

Energy and Employment Report found that about 7,700 jobs in coal-fired utilities were lost between 2018 and 2019 alone (NASEO and EFI 2019).

RANGE OF COSTS FOR INVESTING IN WORKERS

In order to estimate the number of workers who will need assistance, we assumed that all coal-fired power generation goes offline and all coal production ceases between 2030 and 2040. The end year is a critical assumption in the analysis: a significant portion of the current workforce will reach retirement age over that time period and thus will not need assistance. Those who do not reach retirement age are considered "dislocated" and eligible for benefits described and quantified here.

We defined a low- and a high-range estimate for total costs. The assumptions used for the analysis are summarized in Table A-1 and in the discussion below.

FULL WAGE REPLACEMENT

The number of coal workers in 2019 is known (described above). National average salaries in 2019 were $91,177 for coal miners and $79,370 for non-nuclear power plant operators (BLS 2019b; 2019a).[2] These dollar figures (as well as tuition estimates described below) were adjusted for inflation to 2020 dollars as the start year of the estimate.

Using the present number of coal workers and their average annual salaries, we calculated the cost of five years of salary replacement. We estimated the number of workers who would reach age 65 by the assumed end date of 2030 and 2045 (i.e., people who would not need all five years of salary replacement). The Bureau of Labor Statistics' Current Population Survey provides estimates for the age distribution of workers in 2019 in different occupations (BLS 2021). The age distribution for coal miners is reported, but for utility sector workers, the survey uses a different industry classification that does not line up with the Occupational Employment Survey, which reports average annual salaries (BLS 2019a). Another limitation of the available data is that the electricity sector age distribution represents a larger pool of employees beyond power plant operators, so there is some uncertainty in whether this represents plant workers accurately. Using the survey data for workers in these age distributions, we estimated that by 2030, approximately 25 percent of coal miners and 27 percent of plant workers will reach age 65, and by 2040, approximately 58 percent of coal miners and 48 percent of plant workers will reach age 65.

Thus, an average annual number of dislocated workers (those who will not reach age 65 over the assumed end date) can be estimated. We also assumed that employment declines linearly over time. This methodology is rough: it does not take into account that facilities will close at unexpected times, does not take into account the potential for company severance packages for early retirement, and excludes any recent hires to fill vacancies caused by retiring workers prior to closure.

To estimate the costs of health care coverage and employer retirement contributions per worker, we added 30 percent (low case) or 60 percent (high case) to the salary estimates. Unionized workforces tend to have benefits closer to the higher end of the range. Employer retirement contributions can come through 401(k) plans or through defined-benefit plans (pensions), for which benefits are determined by age and years of service. Policymakers will have to ensure that these complexities are accounted for in designing full wage replacement.

TABLE A-1. Summary of Key Assumptions

Assumptions	Low Case	High Case
Assumed coal phaseout	2040	2030
Lifetime of program	25 years	15 years
Estimate for health and retirement benefits	30% salary adder	60% salary adder
Education	25% uptake by eligible workers; two-year community college	75% uptake by eligible workers; four-year university
Free post-secondary education for children	50% uptake by eligible children; one child per dislocated worker	75% uptake by eligible children; two children per dislocated worker
Per-worker cost in the Workforce Innovation and Opportunity Act's Adult and Dislocated Worker Programs	$3,424	$4,496
Relocation allowance	$10,000 per worker	$10,000 per worker

Table A-2 summarizes the wage replacement estimates for coal miners and coal plant workers.

EDUCATION AND TRAINING

Dislocated workers will need access to education or retraining as well as job placement assistance and career counseling connected to local job markets. Some of these resources could be provided through increased appropriations to existing federal programs like the Adult and Dislocated Worker programs authorized by the Workforce Innovation and Opportunity Act and administered by the Department of Labor. A report on the efficacy of these programs found that the costs ranged from approximately $3,500 to $4,500 per worker (adjusted for inflation) depending on the level of services received (Fortson et al. 2017). Importantly, the report found that the biggest factor in the lack of improved economic outcomes for program participants was the lost income while in training, which underscores the importance of wage replacement policies in helping workers get back on their feet.

For additional education or retraining opportunities, we assumed that dislocated workers would be eligible for free access to either a two-year community college (low end) or a four-year university (high end) as part of a program akin to the GI bill (DOD 2019). Average annual tuition and room and board for the 2018–19 academic year was $11,389 for community colleges and $28,123 for universities (NCES 2019). These amounts should also cover other forms of education and training opportunities, such as vocational or apprenticeship programs (JTAC 2020). We also include a rough estimate of the cost of providing free tuition and room and board to children of dislocated workers. For both dislocated workers and their children, we assumed that not all eligible people would take advantage of the benefit—see Table A-1 for assumptions on uptake in each case.

Finally, recognizing that previously dislocated workers may still be struggling with recent closures, we estimated the costs of providing these same educational benefits (including reimbursements for costs incurred) to coal workers who have lost jobs in the last five years (2015–2019). We chose 2015 for two reasons: this year marked a substantial increase in retirements of coal-fired generating capacity (Aramayo 2020), and it seems unlikely that policymakers would have much appetite for providing support going much farther back in time, although this could change based on their level of ambition. For example, central Appalachia faced dramatic job losses in coal mining between roughly 2010 and 2015, and policymakers could consider extending benefits back to that period.

RELOCATION ALLOWANCE

In some cases, it will be necessary for workers and their families to relocate in order to find new employment. Policies should provide support for this contingency. This analysis assumes $10,000 per worker, as recommended by the Canadian Task Force on Just Transition (TFJTCCPWC 2018). While relocation support will be critical for some workers and families, it is important to design the policy in such a way that it does not incentivize further collapse of the affected communities and should therefore be used as a last resort.

INFLATION

All cost numbers reported in this analysis have been adjusted for inflation. Assumptions in dollar figures (e.g., average salaries or average tuition) were first converted to 2020 dollars using the Consumer Price Index (BLS, n.d.). While future

TABLE A-2. Wage Replacement Estimates

Assumptions	Low Case	High Case
Assumed coal phaseout	2040	2030
Lifetime of program	25 years	15 years
Total number of dislocated coal miners	22,340	39,603
Total number of dislocated coal plant workers	19,275	27,128
Five-year comprehensive wage replacement for coal miners ($ billions)	$17.6	$36.3
Five-year comprehensive wage replacement for coal plant workers ($ billions)	$13.5	$22.1
Total comprehensive wage replacement for coal workers ($ billions)	$31.0	$58.4

Breakout of comprehensive wage replacement estimates for coal miners and coal-fired power plant workers in the high and low cases. Costs are in billions and adjusted for inflation.

inflation levels are difficult to project, providing an estimate that accounts for the effect of inflation is critical to ensuring that those who become eligible for benefits late in the life of the program will have sufficient resources. (That is, a worker who loses her job in 2035 should be entitled to her average salary in 2035, not her average salary in 2020.) To estimate the costs adjusted for inflation, we used the Congressional Budget Office projections for the Core Personal Consumption Expenditures price index, which goes out 10 years (CBO 2020). Beyond that, we assumed that the Core Personal Consumption Expenditures price index remains constant at the value of the final projection year. The use of those assumptions works out to approximately 2 percent inflation annually.

Risk Criteria

The report contains a complete description of the definitions of a coal county as well as the different risk criteria used by this analysis (see pp. 6–7). Figure 2 in the report shows all 462 coal counties colored by risk criterion. Figures A-2 through A-4 below show the same information but split out by mining and power plant counties.

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ENDNOTES

1 https://www.ferc.gov/industries-data/electric/general-information/electric-industry-forms/form-1-electric-utility-annual.

2 The Occupational Profile code is 51-8013, which includes workers who "control, operate, or maintain machinery to generate electric power" and "includes auxiliary equipment operators" but excludes nuclear power plant operators.

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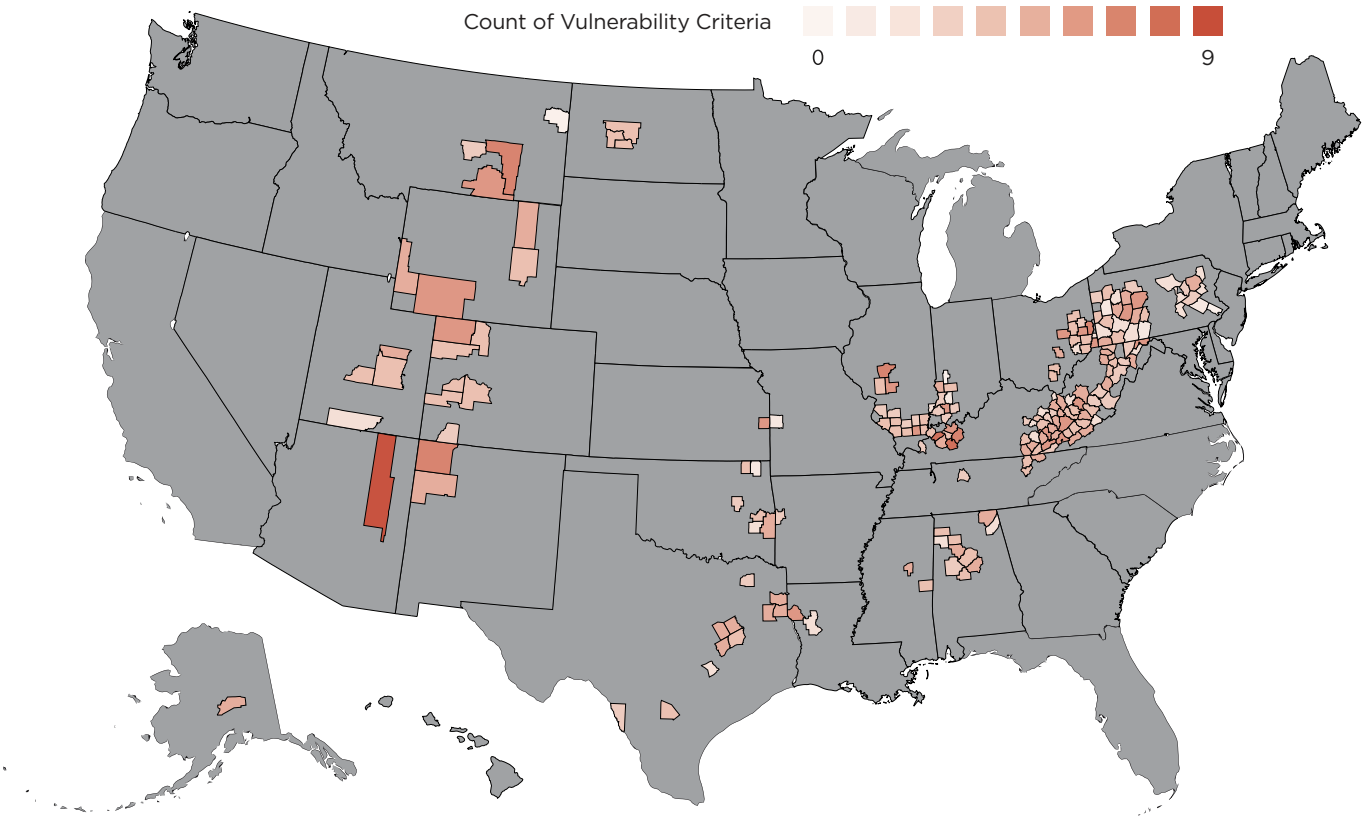
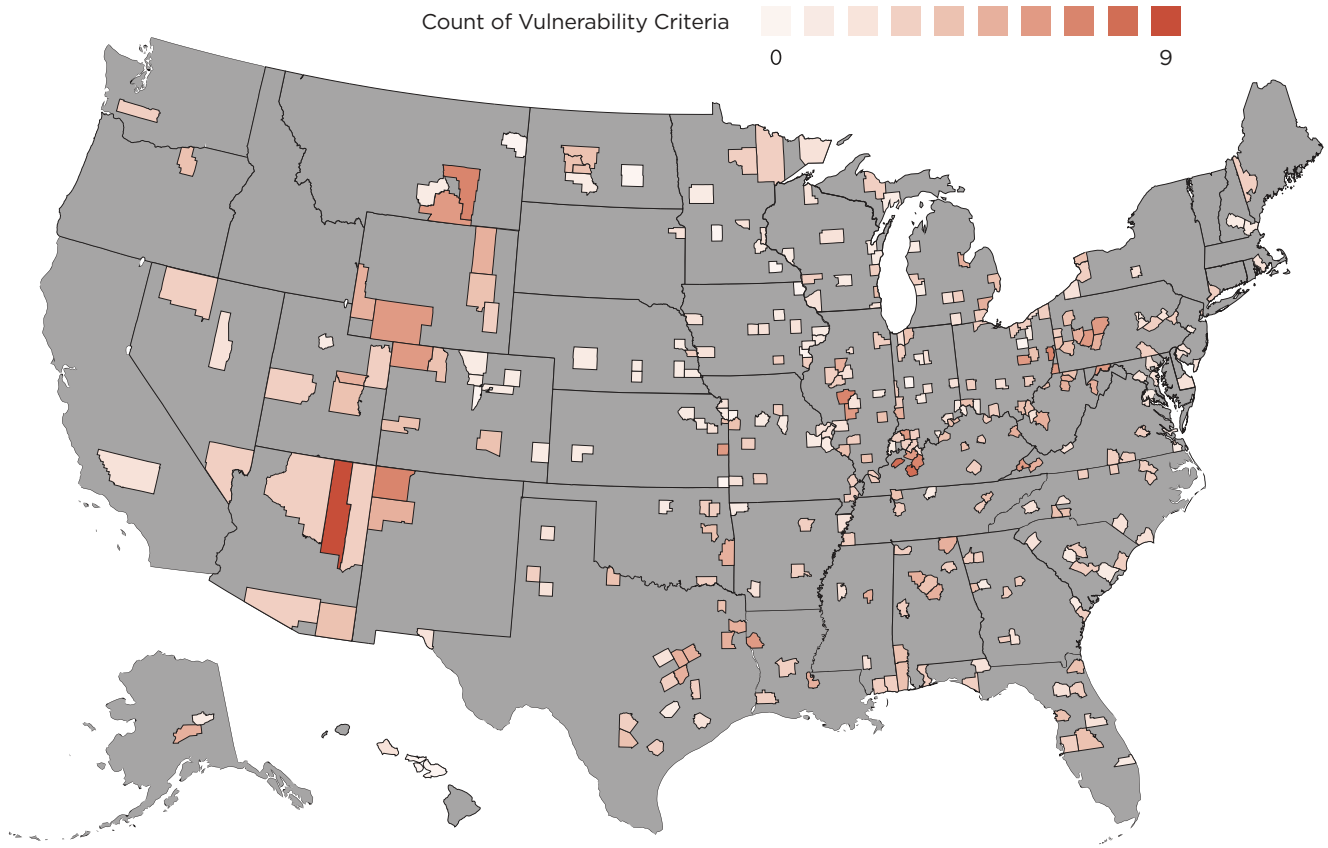
FIGURE A-2. Coal Mining Counties



Of the 462 coal counties identified in our analysis, 194 reported coal production or employment in 2015 or 2019. These counties are concentrated geographically.

FIGURE A-3. Coal Plant Counties



Of the 462 coal counties identified in our analysis, 339 had an operating coal-fired power plant at the end of 2019 or had a coal-fired generating unit of at least 100 MW go offline between 2015 and 2019 (inclusive). Our definition of a coal-fired generating unit includes those that can switch between different fuels or can use co-firing of multiple fuels.

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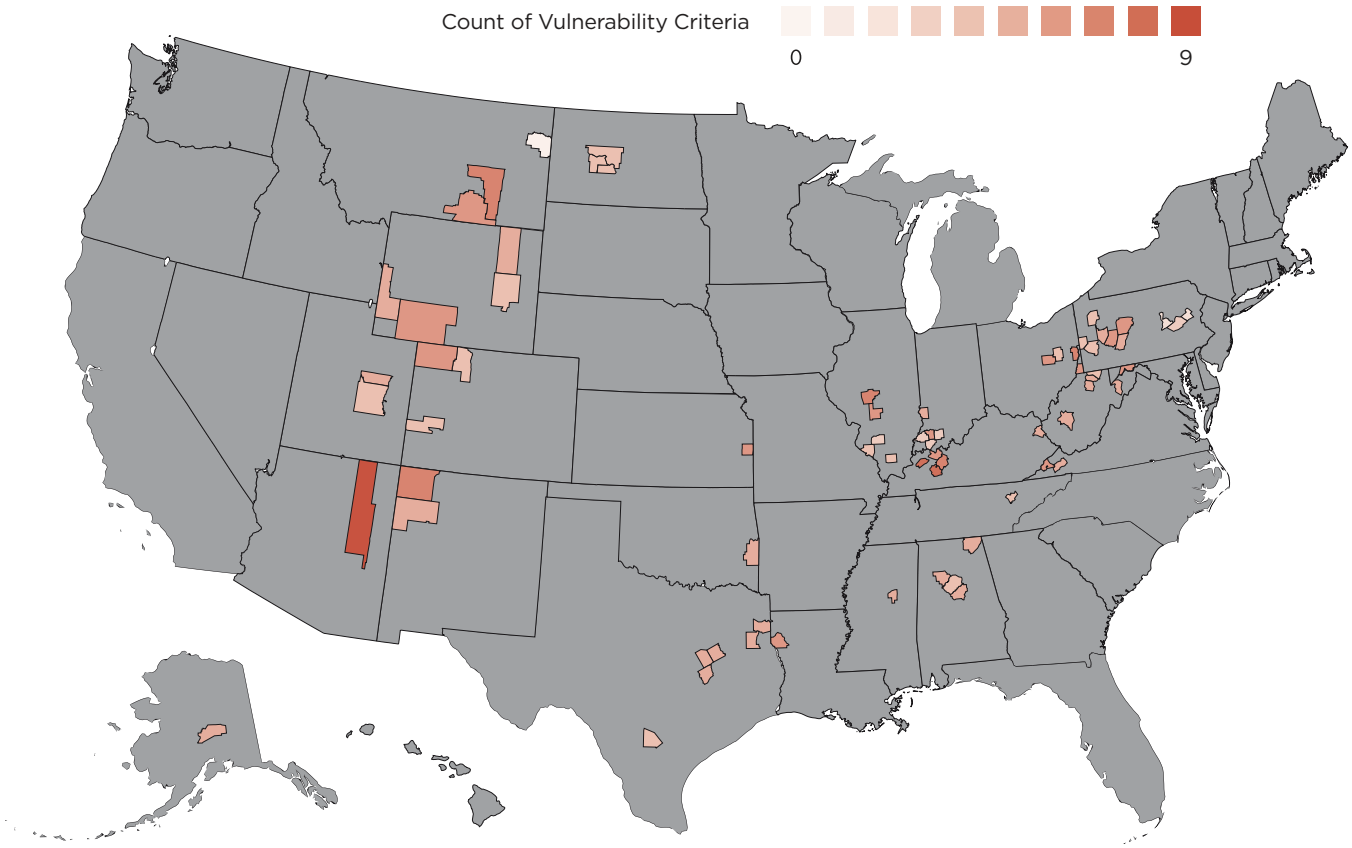
FIGURE A-4. Coal Counties with Both Mines and Plants



Of the 462 coal counties identified in our analysis, 71 were classified as both coal mining and coal plant counties. As expected, these counties tend to be higher risk (darker red) overall.

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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.

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