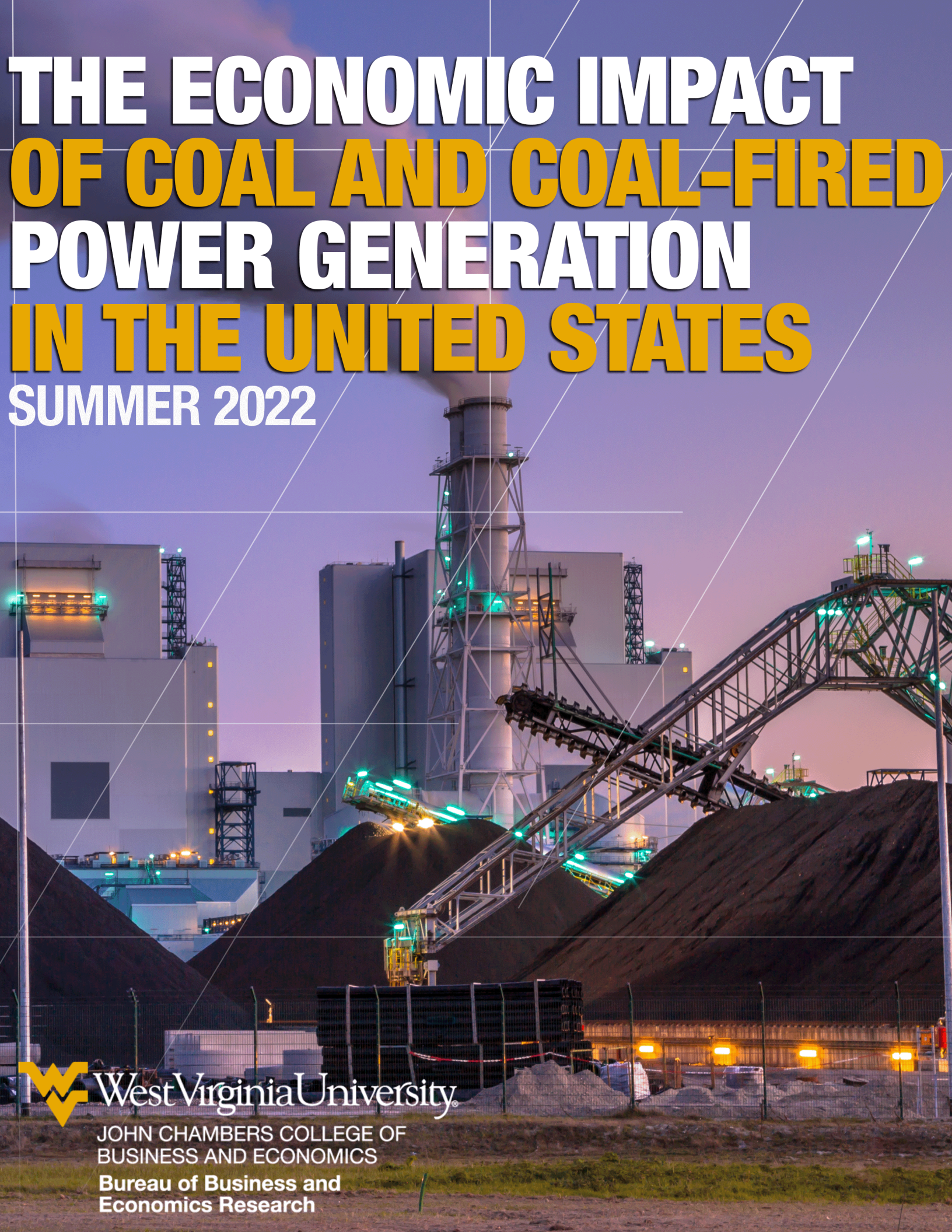
THE ECONOMIC IMPACT OF COAL AND COAL-FIRED POWER GENERATION IN THE UNITED STATES

SUMMER 2022



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Executive Summary

While coal production in the United States has declined by nearly 50 percent since its peak in 2008, the sector remains an important part of the US economy in many ways. In this report, we consider the contribution of coal production and coal-fired power generation to the U.S.' employment base, economic output, labor income, and tax revenue.

The first part of the report examines the economic impact of coal production. We estimate the economic impact of coal for the United States and for the top 10 coal-producing states selected based on 2021 coal production. The second part of the report examines the economic impact of coal-fired power generation, again for the U.S. as well as for the top-10 coal-producing states.

Our estimates show that coal mining directly employed more than 37.3 thousand workers in the United States, and who earned a total compensation of around $3.2 billion in 2021. The total economic impact of these industries, however, does not end there. As coal mines or power plants operate, they purchase various inputs from local suppliers, thereby increasing demand for upstream businesses, generating additional economic activities in the nation. Further, as their workers spend their earnings in the economy, further economic activity is created. The economic impact of the industries is the sum of both the direct and the associated additional economic activities.

Highlights of our economic impact analysis are as follows:

Coal Production

- **Coal production generated approximately $43.5 billion in total economic activity in the United States in 2021.**
- **Coal production supported more than 136.0 thousand jobs in the nation in 2021.**
- **Coal production provided around $10.6 billion in labor income in the U.S. in 2021.**
- **Coal production generated around $2.3 billion in tax revenue for state and local governments in the U.S. in 2021**.

Coal-Fired Power Generation

- **Coal-fired power generation generated approximately $217.5 billion in total economic activity in the United States in 2021. This impact is net of the impact associated with the purchase of domestic coal, which is already accounted for in the coal production impact above.**
- **Coal–fired power generation supported around 245.0 thousand jobs in the nation in 2021.**
- **Coal-fired power generation provided around $33.3 billion in labor income in the U.S. in 2021.**
- **Coal-fired power generation supported around $5.8 billion select state and local tax revenue for state and local governments within the U.S. in 2021.**

Coal Production and Coal-Fired Power Generation

- **Coal production and coal-fired power generation combined generated approximately $261.0 billion in total economic activity in the United States in 2021.**
- **Coal production and coal-fired power generation combined supported nearly more than 380 thousand jobs in the U.S. in 2021.**
- **Coal production and coal-fired power generation combined provided around $43.8 billion in labor income in the U.S. in 2021.**
- **Coal production and coal-fired power generation combined supported around $8.1 billion tax revenue for state and local governments in the U.S. in 2021**.

Figure 1: Economic Impact of Coal Mining and Coal-Fired Power Generation in the United States

Type of Impact	Direct	Indirect and Induced	Total
Output ($, billions)	115.7	145.3	261.0
Employment (thousand jobs)	74.9	306.7	381.6
Labor Income ($, billions)	8.0	35.8	43.8
State & Local Tax Revenue ($, billions)	--	--	8.1

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

1 Introduction

While coal production in the United States has declined by nearly 50 percent since its peak in 2008, the sector remains an important part of the U.S. economy in many ways. In this report, we consider the contribution of coal production and coal-fired power generation to the employment, economic output, labor income, and tax revenue within the U.S.

The first part of the report examines the economic impact of coal production. In Section 2, we examine recent trends in coal production, employment, wages, and exports. We close the section with a forecast of the demand for coal within the U.S. In Section 3 we report our estimate of the economic impact of coal for the United States and for the top 10 coal-producing states. Our impact analysis is based on coal production for the year of 2021, from which we identify the top 10 coal-producing states (Figure 2).

In Section 4 we examine the economic impact of coal-fired power generation. Similarly, we begin with a brief look at trends within coal-fired power generation in the U.S., then we report our estimate of the economic impact of the coal-fired power generation for the U.S., as well as for the top-10 coal-producing states (which are reported in Figure 2). Finally, Section 5 summarizes the overall impact of coal production and coal-fired power generation in the United States.

Figure 2: Top-10 Coal-Producing States, 2021

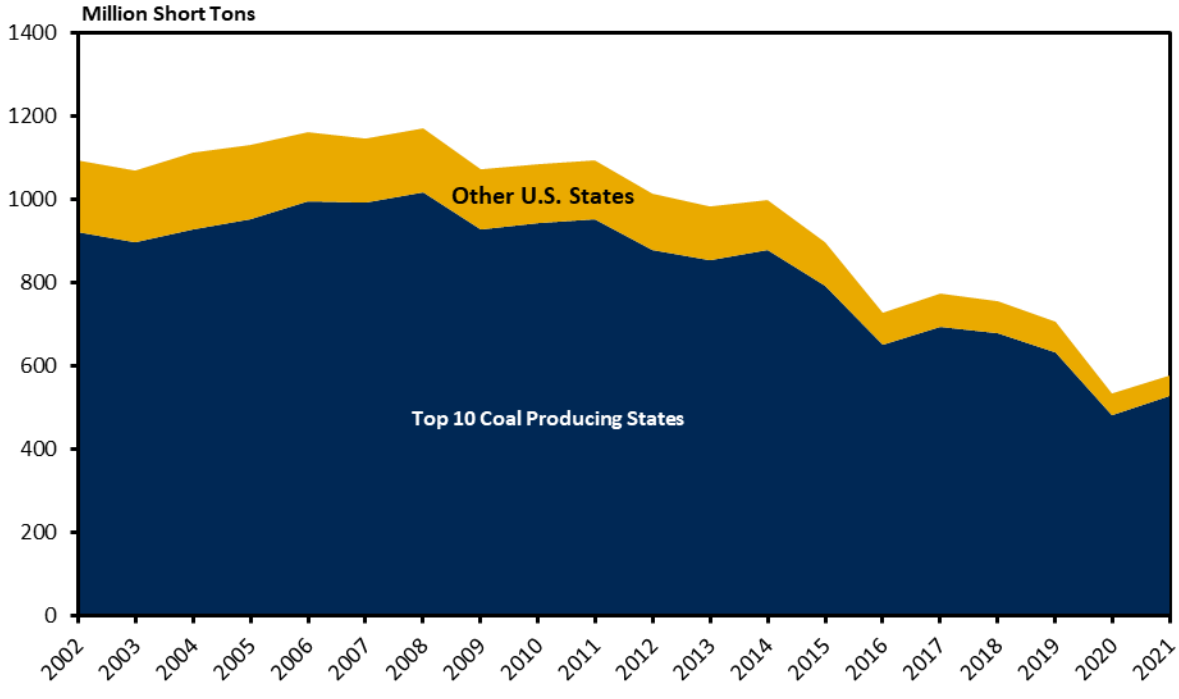
State	Coal Production (Million Short Tons)
Top 10 Coal Producing States	**527.7**
1. Wyoming	239.2
2. West Virginia	78.6
3. Pennsylvania	42.4
4. Illinois	36.8
5. Montana	28.6
6. Kentucky	26.6
7. North Dakota	26.5
8. Indiana	19.5
9. Texas	17.3
10. Utah	12.3
All U.S. States	**578.1**

2 Coal and the United States Economy: Recent Trends

COAL PRODUCTION: The coal industry in the U.S. has experienced substantial declines over much of the past decade. Total coal production in the nation peaked in 2008 at more than 1,170 million short tons, then declined to around 578 million short tons in 2021, a decline of more than 50 percent. This 2021 production level comes after significant declines in 2020, due to the effects of the COVID pandemic, and some bounce back for 2021. The demand for coal is expected to rise for the near term as world economies continue to recover from the 2020 pandemic and associated economic decline.

The drop in coal demand in the U.S. over the past decade or so has been most pronounced outside of the top 10 coal producing states. Between 2008 and 2021 coal production in the top-10 coal producing states declined by around 48 percent, while coal production in the remaining states declined by a much larger 67 percent. As a result, the top-10 coal producing states' share of the national coal production gradually increased, from about 87 percent in 2008 to more than 91 percent in 2021 (see Figure 3).

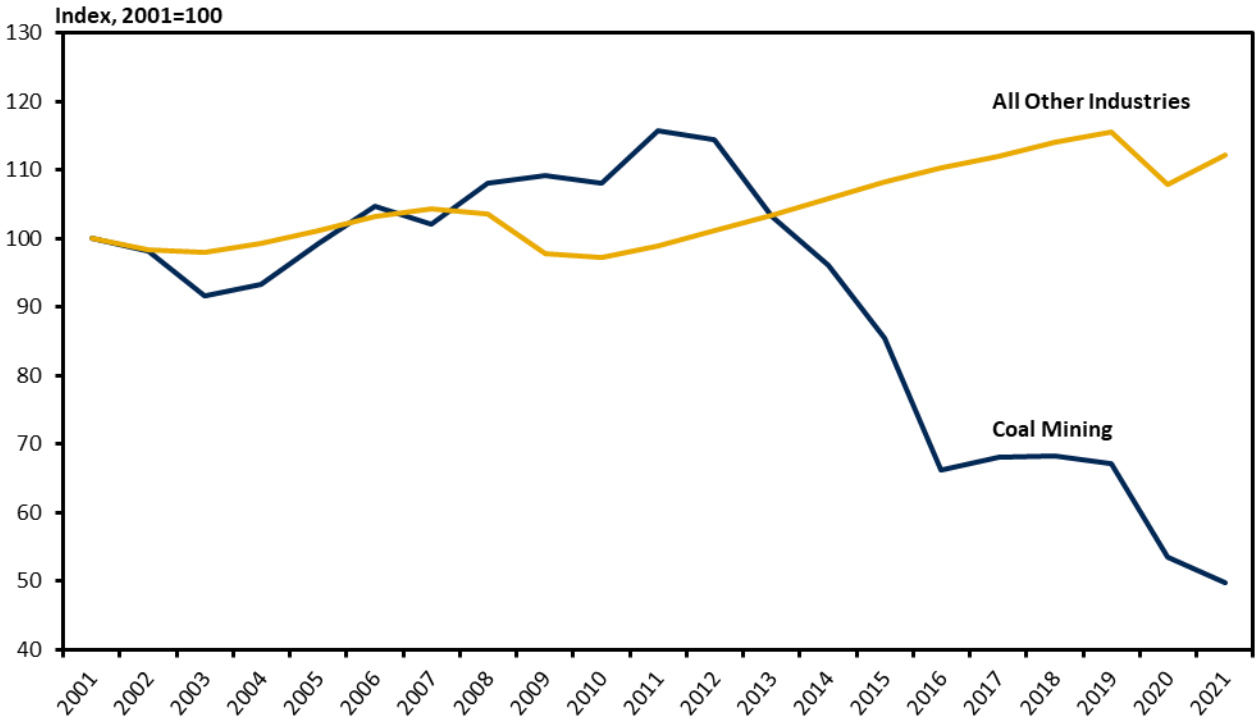
Figure 3: Coal Production in the United States



Source: U.S. Energy Information Administration

COAL MINING EMPLOYMENT: As shown in Figure 4, 37.3 thousand workers were employed in the coal mining industry in 2021. This reflects a significant decline of around 37.8 thousand jobs, or more than 50 percent, from 2001. Notice that jobs in the coal industry continued to decline in 2021, even as the U.S. economy was recovering from the COVID pandemic. Jobs in the other industries in the U.S., on the other hand, increased by more than 12 percent during the same period. Overall, this reflects a gradual shift in the national economy away from coal over time.

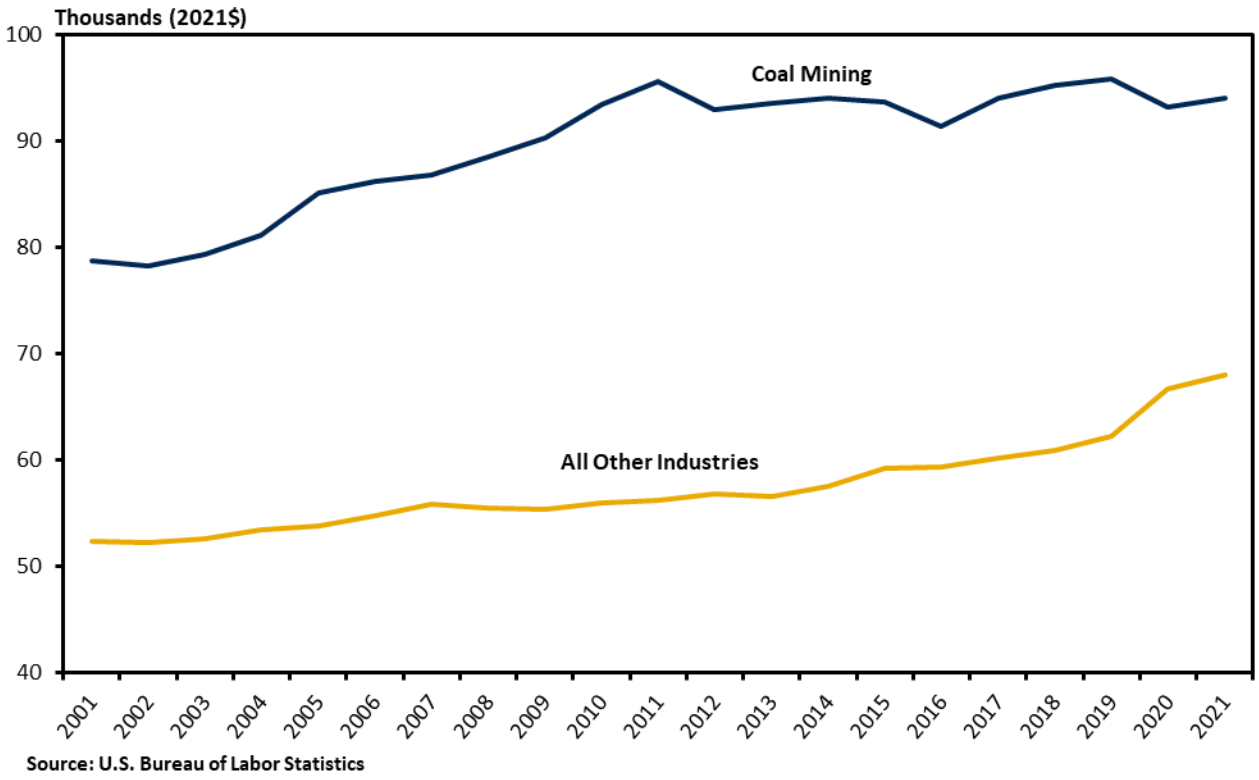
Figure 4: Employment in Coal Mining and Other Industries, United States



Source: U.S. Bureau of Labor Statistics and authors' calculations
Note: 2021 figures are estimates

COAL MINING WAGES: The coal industry's contribution to the national economy is more pronounced when we consider employee income. Despite production and employment losses in the industry, the average annual wage for the coal industry has been consistently well above the average wage for all private industries in the nation. In 2021, the coal industry paid its workers an average of $91.7 thousand annually, nearly 35 percent higher than the average annual wages for all private industries in the nation (Figure 5). In 2021, total wages in coal mining industry amounted to 4.1 percent of total wages in the nation, noticeably larger than the industry's 3.0 percent contribution of the nation's total employment.

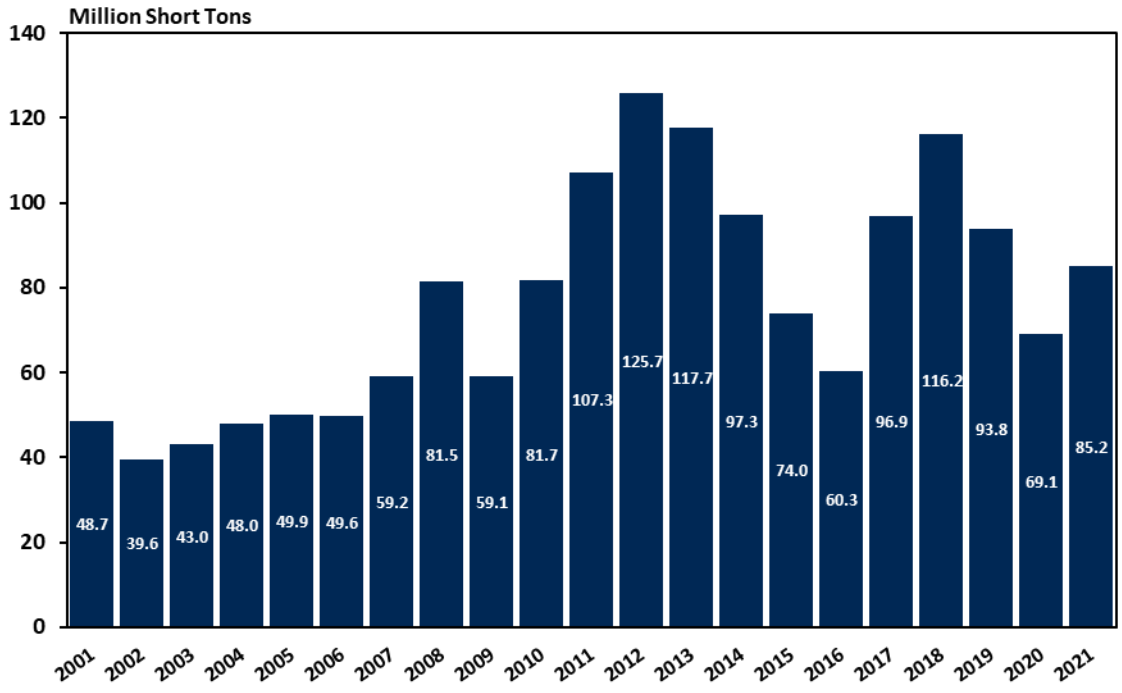
Figure 5: Average Annual Wage, Coal Mining and Other Industries, United States



Source: U.S. Bureau of Labor Statistics

U.S. COAL EXPORTS: Coal exports are a potential growth for U.S. coal production. U.S. coal exports have exhibited significant volatility over much of the past decade. Indeed, the nation's coal exports declined from nearly 126 million short tons in 2012, to about 60 million short tons in 2015, rose back up to more than 116 million short tons in 2018, before falling again through 2020. As the world economy is poised to recover from the economic decline in 2020, exports rose to more than 85 million short tons in 2021 (see Figure 6).

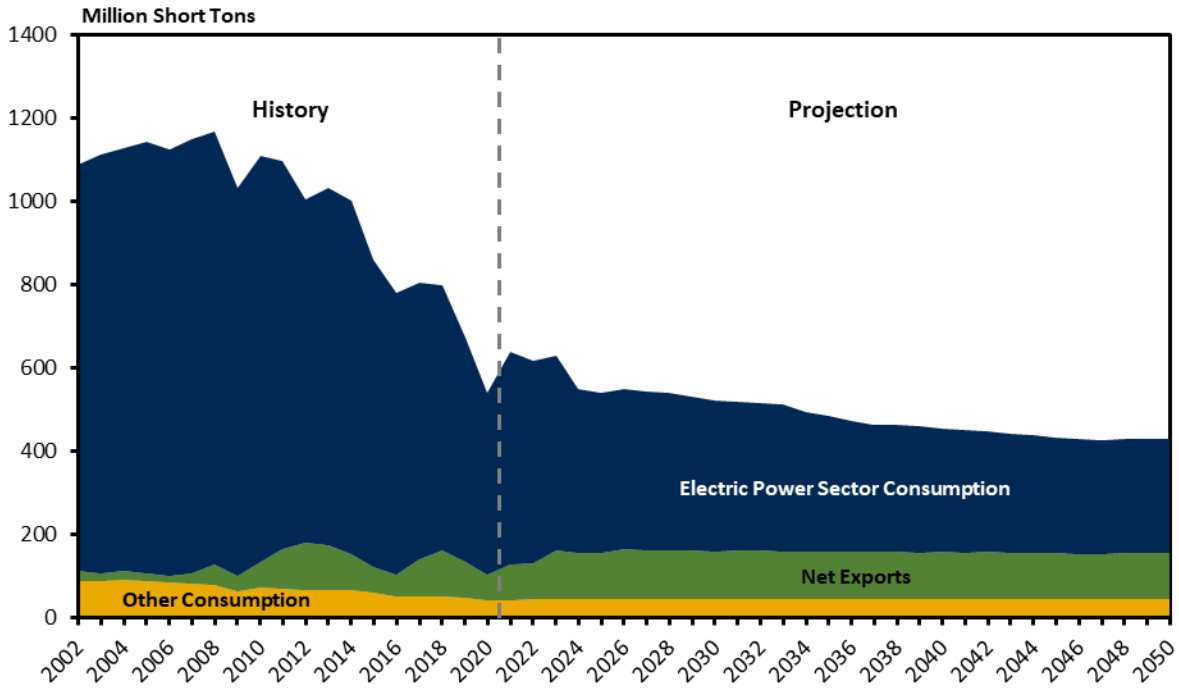
Figure 6: U.S. Coal Exports



Source: U.S. Energy Information Administration

COAL PRODUCTION FORECAST: After considering recent trends in coal consumption, we now examine coal consumption projections for the long run. The U.S. Energy Information Administration (EIA) predicts that after a significant drop in 2020, domestic demand for U.S. coal is expected to rise in 2021. The momentum of the economic recovery is expected to sustain this level of demand through 2023. Eventually, as competition with natural gas continues, the domestic demand for coal is expected to drop again in 2024 and will gradually decline after that through 2050 (Figure 7). Coal exports are expected to grow slowly over the next decade and will stay relatively flat after that through 2050.

Figure 7: U.S. Coal Demand Forecast



Source: Annual Energy Outlook 2021, U.S. Energy Information Administration

3 Economic Impact of Coal Production in the United States

In this section we examine the economic impact of coal production on the U.S. economy in 2021. To estimate the economic impact, we use IMPLAN and RIMS-II modeling software. They are industry-standard input-output software that apply a detailed model of the national economy, outlining how industry-specific trade-flows interact with key economic indicators such as employment, income, output, and tax revenue.

ECONOMIC IMPACT ANALYSIS BACKGROUND: Expenditures that take place directly to mine coal and compensate coal mine workers are referred to as the direct economic impact of coal production. This is typically about the same as the total revenue received from the sale of the coal.[1] The total economic impact of coal production, however, is not limited to the direct impact, but also includes the secondary economic impacts accrued as those initial direct expenditures are re-spent throughout the rest of the economy. For example, to support coal mining, contractors providing services such as site preparations, tunneling, coal stripping, truck transportation, etc., will increase their production in correspondence with an increase in coal mining. As these suppliers increase production, their subsequent suppliers will increase production, and so on. All of this additional economic activity that stems from coal mining is referred to as indirect impacts. In addition, the coal mine and these suppliers employ numerous workers, part of whose income will be spent in the West Virginia economy, generating additional output, income, and employment. This activity associated with employees spending their income in the state is referred to as induced impacts. These indirect and induced impacts together form what is known as the "multiplier effect." The original stimulus to the economy from the operation's total expenditures is re-spent multiple times through the rest of the economy. The combined direct impact and secondary impacts constitute the total economic impact of coal mining.

[1] Employment data are provided by the U.S. Bureau of Labor Statistics, Quarterly Censes of Employment and Wages, NAICS code 2121, shown in Figure 4 above.

3.1 Economic Impact of Coal Production in the United States

We estimate the direct impact of the coal production based on the revenue received from the sale of coal. More specifically, we estimate the revenue by multiplying the amount of the coal produced in 2021 by the average coal's minemouth price in 2021. We estimate that coal production in the U.S. generated $20.1 billion in output in 2021. As reported in Figure 8, this direct expenditure is estimated to generate $23.4 billion in secondary output impacts, resulting in a total economic impact of $43.5 billion in output in the United States economy.

Further, the 37,300 coal mining jobs in nation in 2021 are expected to generate 99,000 additional jobs in the U.S. economy, resulting in a total employment impact of 136,300 jobs. The large multiplier (3.7) is driven by the fact that coal miners earn relatively high incomes. Further, coal production generates around $10.6 billion in labor income in the nation. Finally, coal production is estimated to generate $2.3 billion revenue from coal severance and select state and local revenue for state and local governments within the U.S. (Figure 8).

The rest of this section presents our estimates of the economic impact of coal production in of the top-10 coal producing states.

Figure 8: Economic Impact of Coal Production in the United States

Type of Impact	Direct	Indirect and Induced	Total
Output ($, billions)	20.1	23.4	43.5
Employment (thousand jobs)	37.3	99.0	136.3
Labor Income ($, billions)	3.2	7.4	10.6
State & Local Tax Revenue ($, billions)	--	--	2.3

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.2 Economic Impact of Coal Production in Wyoming

Wyoming is the largest coal producing state in the United States. In 2021, the coal industry produced 239.2 million short tons of coal and employed around 4.5 thousand workers. Wyoming coal, however, is priced relatively low compared to that of other coal-producing states. We estimate that this coal production generated around $3.2 billion in output in 2021. This output is estimated to generate nearly $2.0 billion in secondary output impacts, resulting in a total economic impact of $5.1 billion in output in the Wyoming economy (Figure 9).

We estimate that the 4.5 thousand coal mining jobs in Wyoming in 2021 are expected to generate nearly 8.0 thousand additional jobs in the state economy, resulting in a total employment impact of nearly 12.5 thousand jobs. Further, coal production generates $781.5 million in labor income in the state. Finally, the coal production is estimated to generate nearly $250.0 million in select state and local tax revenue.

Figure 9: Economic Impact of Coal Production in Wyoming

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	3,201.5	1,938.8	5,140.4
Employment (jobs)	4,500	7,992	12,492
Labor Income ($, millions)	405.4	376.1	781.5
State & Local Tax Revenue ($, millions)	--	--	249.5

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.3 Economic Impact of Coal Production in West Virginia

West Virginia is the second largest coal producing state in the United States. In 2021, the coal industry produced 78.6 million short tons of coal and employed around 10.7 thousand workers. Unlike Wyoming, West Virginia coal, more specifically Southern West Virginia coal, receives a relatively high price among coal-producing states, given its high quality and its metallurgical uses. We estimate that this coal production generated around $5.6 billion in output in 2021, which was more than 70 percent higher than Wyoming, and was the highest value of coal production in the nation. This output is estimated to generate 2.0 billion in secondary output impacts, resulting in a total economic impact of $7.6 billion in output in the West Virginia economy (Figure 10).

We estimate that the 10.7 thousand coal mining jobs in West Virginia in 2021 are expected to generate 10.5 thousand additional jobs in the state economy, resulting in a total employment impact of 21.2 thousand jobs. Further, coal production generates around $1.6 billion in labor income in the state. Finally, coal production is estimated to generate $550.0 million in select state and local tax revenue.

Figure 10: Economic Impact of Coal Production in West Virginia

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	5,555.8	2,079.6	7,635.4
Employment (jobs)	10,700	10,509	21,209
Labor Income ($, millions)	987.9	619.4	1,607.3
State & Local Tax Revenue ($, millions)	--	--	550.0

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.4 Economic Impact of Coal Production in Pennsylvania

Pennsylvania is the third largest coal producing state in the United States. In 2021, the coal industry produced 42.3 million short tons of coal and employed around 4.4 thousand workers. Like West Virginia coal, Pennsylvania coal receives a price that is among the highest in the nation. We estimate that this coal production generated around $2.4 billion in output in 2021. This output is estimated to generate $2.1 billion in secondary output impacts, resulting in a total economic impact of nearly $4.5 billion in output in the Pennsylvania economy (Figure 11).

We estimate that the 4.4 thousand coal mining jobs in Pennsylvania in 2021 are expected to generate nearly 8.5 thousand additional jobs in the state economy, resulting in a total employment impact of 12.9 thousand jobs. Further, this coal production generates nearly $1.1 billion in labor income in the state. Unlike Wyoming and West Virginia, Pennsylvania does not impose a coal severance tax. Overall, the coal industry is estimated to generate $247.7 million in select state and local tax revenue.

Figure 11: Economic Impact of Coal Production in Pennsylvania

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	2,422.6	2,068.9	4,491.5
Employment (jobs)	4,400	8,470	12,870
Labor Income ($, millions)	441.7	637.3	1,079.0
State & Local Tax Revenue ($, millions)	--	--	247.7

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.5 Economic Impact of Coal Production in Illinois

Illinois is the fourth largest coal producing state in the United States. In 2021, the coal industry in the state produced 36.8 million short tons of coal and employed around 1,700 workers. We estimate that this coal production generated more than $900.0 million in output in 2021. This output is estimated to generate $852.0 million in secondary output impacts, resulting in a total economic impact of nearly $1.8 billion in output in the Illinois economy (Figure 12).

We estimate that the 1,700 coal mining jobs in Illinois in 2021 are expected to generate around 3.7 thousand additional jobs in the state economy, resulting in a total employment impact of nearly 5.5 thousand jobs. Further, this coal production generates $376.5 million in labor income in the state. Finally, the coal production is estimated to generate $71.0 million in select state and local tax revenue.

Figure 12: Economic Impact of Coal Production in Illinois

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	903.4	852.4	1,755.8
Employment (jobs)	1,700	3,774	5,474
Labor Income ($, millions)	150.8	225.7	376.5
State & Local Tax Revenue ($, millions)	--	--	71.0

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.6 Economic Impact of Coal Production in Montana

Montana is the fifth largest coal producing state in the United States. In 2021, the coal mining industry in the state produced around 28.5 million short tons of coal and employed around one thousand workers. We estimate that this coal production generated around $550 million in output in 2021. This output is estimated to generate more than $338.0 million in secondary output impacts, resulting in a total economic impact of around $889.0 million in output in the Montana economy (Figure 13).

We estimate that the one thousand coal mining jobs in Montana in 2021 are expected to generate around 1,600 additional jobs in the state economy, resulting in a total employment impact of more than 2,600 jobs. Further, coal production generates $235.6 million in labor income in the state. Finally, the coal production is estimated to generate nearly $83.0 million in select state and local tax revenue.

Figure 13: Economic Impact of Coal Production in Montana

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	550.4	338.4	888.9
Employment (jobs)	1,004	1,631	2,635
Labor Income ($, millions)	116.5	119.2	235.6
State & Local Tax Revenue ($, millions)	--	--	82.8

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.7 Economic Impact of Coal Production in Kentucky

In 2021, the coal mining industry in the state of Kentucky produced around 26.6 million short tons of coal and employed around 3.5 thousand workers. We estimate that this coal production generated around $1.4 billion in output in 2021. This output is estimated to generate $1.0 billion in secondary output impacts, resulting in a total economic impact of mor than $2.4 billion in output in the Kentucky economy (Figure 14).

We estimate that the 3.5 thousand coal mining jobs in Kentucky in 2021 are expected to generate nearly 5.0 thousand additional jobs in the state economy, resulting in a total employment impact of 8.5 thousand jobs. Further, coal production generates more than $670.0 million in labor income in the state. Finally, the coal production is estimated to generate $172.0 million in select state and local tax revenue.

Figure 14: Economic Impact of Coal Production in Kentucky

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	1,387.1	1,059.9	2,447.0
Employment (jobs)	3,497	4,989	8,486
Labor Income ($, millions)	312.6	358.0	670.6
State & Local Tax Revenue ($, millions)	--	--	172.0

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.8 Economic Impact of Coal Production in North Dakota

The coal mining industry in the state of North Dakota produced around 26.5 million short tons of coal in 2021, employing around 1,150 workers. We estimate that this coal production generated around $555 million in output in 2021. This output is estimated to generate more than $326.0 million in secondary output impacts, resulting in a total economic impact of $882 million in output in the North Dakota economy (Figure 15).

We estimate that the 1,150 coal mining jobs in North Dakota in 2021 are expected to generate 2.3 thousand additional jobs in the state economy, resulting in a total employment impact of 3.4 thousand jobs. Further, coal production generates nearly $220.0 million in labor income in the state. Finally, the coal production is estimated to generate nearly $30.0 million in select state and local tax revenue.

Figure 15: Economic Impact of Coal Production in North Dakota

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	555.6	326.3	882.0
Employment (jobs)	1,150	2,283	3,433
Labor Income ($, millions)	105.0	114.8	219.8
State & Local Tax Revenue ($, millions)	--	--	29.7

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.9 Economic Impact of Coal Production in Indiana

The coal mining industry in the state of Indiana produced around 19.4 million short tons of coal in 2021, employing around 1.8 thousand workers. We estimate that this coal production generated around $812 million in output in 2021. This output is estimated to generate nearly 645.0 million in secondary output impacts, resulting in a total economic impact of $1.5 billion in output in the Indiana economy (Figure 16).

We estimate that the 1.8 thousand coal mining jobs in Indiana in 2021 are expected to generate 3.4 thousand additional jobs in the state economy, resulting in a total employment impact of 5.2 thousand jobs. Further, coal production generates around $302.4 million in labor income in the state. Finally, the coal production is estimated to generate $48.7 million in select state and local tax revenue.

Figure 16: Economic Impact of Coal Production in Indiana

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	811.7	648.7	1,460.4
Employment (jobs)	1,796	3,419	5,215
Labor Income ($, millions)	134.0	168.4	302.4
State & Local Tax Revenue ($, millions)	--	--	48.7

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.10 Economic Impact of Coal Production in Texas

In 2021, the coal mining industry in the state of Texas produced around 17.2 million short tons of coal and employed around 1.7 thousand workers. We estimate that this coal production generated around $324.2 million in output in 2021. This output is estimated to generate $317.5 billion in secondary output impacts, resulting in a total economic impact of $641.7 million in output in the Texas economy (Figure 17).

We estimate that the 1.7 thousand coal mining jobs in Texas in 2021 are expected to generate 3.4 thousand additional jobs in the state economy, resulting in a total employment impact of 5.1 thousand jobs. Further, coal production generates around $371.8 million in labor income in the state. Finally, the coal production is estimated to generate more than $36.0 million in select state and local tax revenue.

Figure 17: Economic Impact of Coal Production in Texas

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	324.2	317.5	641.7
Employment (jobs)	1,701	3,418	5,119
Labor Income ($, millions)	140.9	230.9	371.8
State & Local Tax Revenue ($, millions)	--	--	36.4

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

3.11 Economic Impact of Coal Production in Utah

The coal mining industry in the state of Utah produced 12.3 million short tons of coal and employed 1.2 thousand workers in 2021. We estimate that this coal production generated around $440.8 million in output in 2021. This output is estimated to generate nearly $361.0 million in secondary output impacts, resulting in a total economic impact of nearly $802.0 million in output in the Utah economy (Figure 18).

We estimate that the 1.2 thousand coal mining jobs in Utah in 2021 are expected to generate 2.5 thousand additional jobs in the state economy, resulting in a total employment impact of 3.7 thousand jobs. Further, coal production generates around $247.0 million in labor income in the state. Finally, the coal production is estimated to generate nearly $37.0 million in select state and local tax revenue.

Figure 18: Economic Impact of Coal Production in Utah

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	440.8	360.9	801.7
Employment (jobs)	1,195	2,522	3,717
Labor Income ($, millions)	105.4	141.6	247.0
State & Local Tax Revenue ($, millions)	--	--	36.9

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.

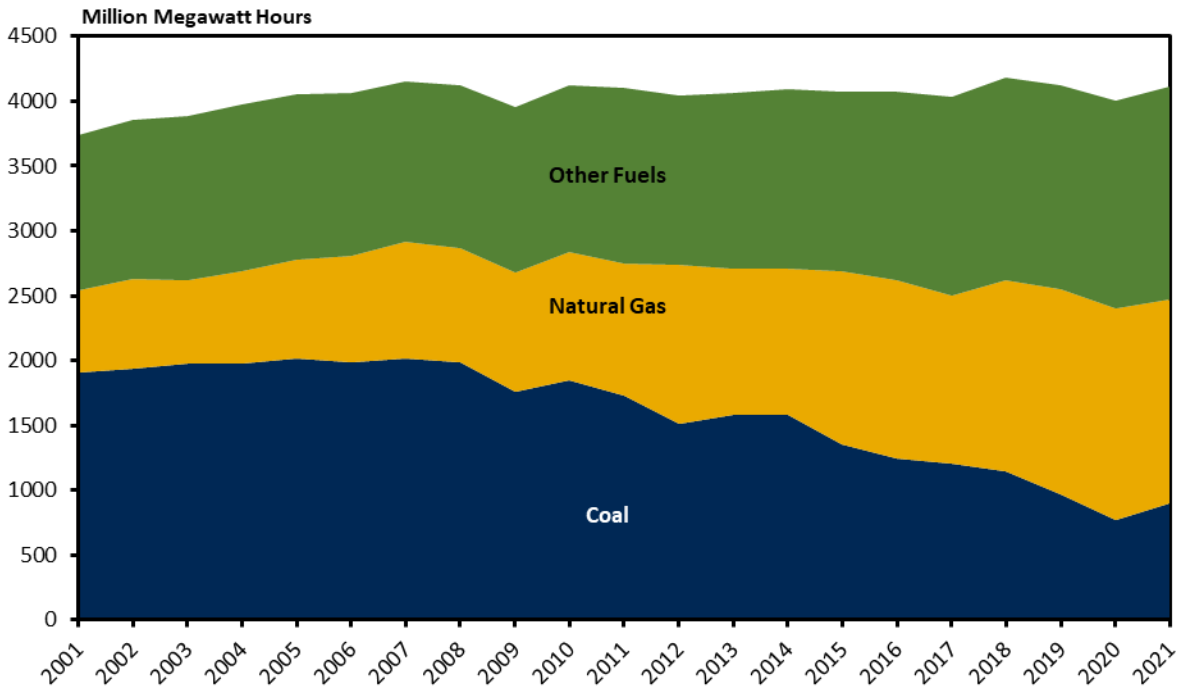
4 Economic Impact of Coal-Fired Power Generation

Next we consider the economic impact of the primary user of coal in the United States – coal-fired electric power generation. This report estimates the economic impact of coal-fired electric power generation for the United States and for the top-10 coal producing states. We estimate the direct output impact of the coal-fired electric power generation based on the plants' revenue, which is calculated by multiplying total electricity generated by the electricity's average price. It is important to note that for the coal-fired power plants, coal mining serves as the main supporting sector. When we estimate the economic impact of power plants, we would normally include the multiplier impact that goes through all power plants' supporting sectors, including coal mining. However, since the impact of coal mining is already accounted for above, we extract this impact out of the coal-fired power generation impact to avoid double counting these impacts.

We begin by examining the trends of electricity generation in the United States. The amount of electricity generated has slowly risen in the past two decades, from 3.7 billion watthours in 2001 to 4.1 billion watthours 2021. More importantly, the amount of coal used to generate the electricity has significantly declined over time, from 1.9 billion watthours to less than 900.0 million watthours, while the amount of other fuels used, primarily natural gas coal, has increased substantially during the same period. Consequently, the share of coal among all the fuels has declined from around 51.0 percent to less than 22.0 percent during the same period.

In the rest of this section, we present the economic impact of coal-fired power generation for the United States and for the top-10 coal producing states.

Figure 19: Net Electricity Generation by Fuel Type, United States



Source: U.S. Energy Information Administration

4.1 Economic Impact of Coal-Fired Power Generation in the United States

In 2021 the coal-fired power plants across the states in the U.S. generated 899.0 million megawatt hours of electricity. We estimate this generates $95.6 billion of direct output into the U.S. economy. We further estimate that this output will generate nearly $122.0 billion in secondary output impacts, resulting in a total economic impact of $217.5 billion in output in the United States economy.

To generate the 899.0 million-megawatt hours in 2021, it is estimated that the coal-fired power plants in the nation employed around 37.6 thousand workers. We further estimate that this generates around 207.7 additional jobs in the U.S. economy, resulting in a total employment impact of 245.3 thousand jobs. We also estimate that the coal-fired power generation generates a total of $33.3 billion in labor income impact in 2021. Finally, the coal production is estimated to generate $5.8 million in tax revenue for all the states and local governments in the U.S.

Figure 20: Economic Impact of Coal-Fired Power Generation in the United States

Type of Impact	Direct	Indirect and Induced	Total
Output ($, billions)	95.6	121.9	217.5
Employment (thousand jobs)	37.6	207.7	245.3
Labor Income ($, billions)	4.9	28.4	33.3
State & Local Tax Revenue ($, billions)	--	--	5.8

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.2 Economic Impact of Coal-Fired Power Generation in Wyoming

In 2021 the coal-fired power plants in the state of Wyoming generated 32.0 million megawatt-hours of electricity. We estimate this generates $1.8 billion of direct output into the Wyoming economy. After excluding the economic impact of Wyoming's own coal used to generate the state's electricity, we estimate that this direct output will generate $552 billion in secondary output impacts, resulting in a total economic impact of nearly $2.4 billion in output in the Wyoming economy.

We estimate that to generate the 32.0 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 1.1 thousand workers. We further estimate that this will generate 2.2 thousand additional jobs in the Wyoming economy, resulting in a total employment impact of 3.4 thousand jobs. We also estimate that the coal-fired power generation generates a total of $175.8 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $44.3 million in tax revenue (see Figure 21).

Figure 21: Economic Impact of Coal-Fired Power Generation in Wyoming

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	1,799.0	552.0	2,350.9
Employment (jobs)	1,102	2,248	3,350
Labor Income ($, millions)	117.5	58.3	175.8
State & Local Tax Revenue ($, millions)	--	--	44.3

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.3 Economic Impact of Coal-Fired Power Generation in West Virginia

In 2021 the coal-fired power plants in the state of West Virginia generated 59.6 million megawatt-hours of electricity. We estimate this generates nearly $4.0 billion of direct output into the West Virginia economy. After excluding the economic impact of West Virginia's own coal used to generate the state's electricity, we estimate that this direct output will generate $1.6 billion in secondary output impacts, resulting in a total economic impact of $5.6 billion in output in the West Virginia economy.

We estimate that to generate the 59.6 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 2.3 thousand workers. We further estimate that this will generate around 6.2 thousand additional jobs in the West Virginia economy, resulting in a total employment impact of nearly 8.5 thousand jobs. We also estimate that the coal-fired power generation generates a total of $682.3 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $134.7 million in tax revenue (see Figure 22).

Figure 22: Economic Impact of Coal-Fired Power Generation in West Virginia

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	3,973.7	1,613.5	5,587.2
Employment (jobs)	2,303	6,162	8,465
Labor Income ($, millions)	271.0	619.4	682.3
State & Local Tax Revenue ($, millions)	--	--	134.7

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.4 Economic Impact of Coal-Fired Power Generation in Pennsylvania

In 2021 the coal-fired power plants in the state of Pennsylvania generated around 29.3 million megawatt-hours of electricity. We estimate this generates $2.3 billion of direct output into the Pennsylvania economy. After excluding the economic impact of Pennsylvania's own coal used to generate the state's electricity, we estimate that this direct output will generate $1.4 billion in secondary output impacts, resulting in a total economic impact of nearly $3.7 billion in output in the Pennsylvania economy.

We estimate that to generate the 29.3 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 751 workers. We further estimate that this will generate 2,150 additional jobs in the Pennsylvania economy, resulting in a total employment impact of around 2,900 jobs. We also estimate that the coal-fired power generation generates a total of $194.2 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $82.8 million in tax revenue (see Figure 23).

Figure 23: Economic Impact of Coal-Fired Power Generation in Pennsylvania

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	2,332.2	1,387.0	3,719.3
Employment (jobs)	751	2,150	2,901
Labor Income ($, millions)	109.4	84.9	194.2
State & Local Tax Revenue ($, millions)	--	--	82.8

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.5 Economic Impact of Coal-Fired Power Generation in Illinois

In 2021 the coal-fired power plants in the state of Illinois generated around 43.5 million megawatt-hours of electricity. We estimate this generates $1.8 billion of direct output into the Illinois economy. After excluding the economic impact of Illinois' own coal used to generate the state's electricity, we estimate that this direct output will generate $552 billion in secondary output impacts, resulting in a total economic impact of nearly $2.4 billion in output in the Illinois economy.

We estimate that to generate the 43.5 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 1.7 thousand workers. We further estimate that this will generate around 6.2 thousand additional jobs in the Illinois economy, resulting in a total employment impact of nearly 8.0 thousand jobs. We also estimate that the coal-fired power generation generates a total of $467.5 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $173.8 million in tax revenue (see Figure 24).

Figure 24: Economic Impact of Coal-Fired Power Generation in Illinois

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	3,876.5	2,710.6	6,587.2
Employment (jobs)	1,706	6,238	7,944
Labor Income ($, millions)	209.1	258.5	467.5
State & Local Tax Revenue ($, millions)	--	--	173.8

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.6 Economic Impact of Coal-Fired Power Generation in Montana

In 2021 the coal-fired power plants in the state of Montana generated around 10.6 million megawatt-hours of electricity. We estimate this generates $811 million of direct output into the Montana economy. After excluding the economic impact of Montana's own coal used to generate the state's electricity, we estimate that this direct output will generate $321.9 million in secondary output impacts, resulting in a total economic impact of around $1.3 billion in output in the Montana economy.

We estimate that to generate the 10.6 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 402 workers. We further estimate that this will generate around 858 additional jobs in the Montana economy, resulting in a total employment impact of around 1.3 thousand jobs. We also estimate that the coal-fired power generation generates a total of $63.2 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $27.4 million in tax revenue (Figure 25).

Figure 25: Economic Impact of Coal-Fired Power Generation in Montana

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	811.1	321.9	1,133.0
Employment (jobs)	402	858	1,260
Labor Income ($, millions)	47.7	15.5	63.2
State & Local Tax Revenue ($, millions)	--	--	27.4

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.7 Economic Impact of Coal-Fired Power Generation in Kentucky

In 2021 the coal-fired power plants in the state of Kentucky generated around 49.9 million megawatt-hours of electricity. We estimate this generates $4.7 billion of direct output into the Kentucky economy. After excluding the economic impact of Kentucky's own coal used to generate the state's electricity, we estimate that this direct output will generate $2.8 billion in secondary output impacts, resulting in a total economic impact of $7.5 billion in output in the Kentucky economy.

We estimate that to generate the 49.9 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed 1.1 thousand workers. We further estimate that this will generate around 2.6 thousand additional jobs in the Kentucky economy, resulting in a total employment impact of around 3.8 thousand jobs. We also estimate that the coal-fired power generation generates a total of $164.6 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $107.4 million in tax revenue (see Figure 26).

Figure 26: Economic Impact of Coal-Fired Power Generation in Kentucky

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	4,709.9	2,808.9	7,518.9
Employment (jobs)	1,148	2,632	3,780
Labor Income ($, millions)	116.6	48.1	164.6
State & Local Tax Revenue ($, millions)	--	--	107.4

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.8 Economic Impact of Coal-Fired Power Generation in North Dakota

In 2021 the coal-fired power plants in the state of North Dakota generated around 24.4 million megawatt-hours of electricity. We estimate this generates $1.6 billion of direct output into the North Dakota economy. After excluding the economic impact of North Dakota's own coal used to generate the state's electricity, we estimate that this direct output will generate $617 million in secondary output impacts, resulting in a total economic impact of nearly $2.2 billion in output in the North Dakota economy.

We estimate that to generate the 24.4 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 951 workers. We further estimate that this will generate around 1.6 thousand additional jobs in the North Dakota economy, resulting in a total employment impact of around 2.5 thousand jobs. We also estimate that the coal-fired power generation generates a total of $164.7 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $37.9 million in tax revenue (see Figure 27).

Figure 27: Economic Impact of Coal-Fired Power Generation in North Dakota

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	1,588.6	617.0	2,205.5
Employment (jobs)	951	1,580	2,531
Labor Income ($, millions)	116.4	48.3	164.7
State & Local Tax Revenue ($, millions)	--	--	37.9

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.9 Economic Impact of Coal-Fired Power Generation in Indiana

In 2021 the coal-fired power plants in the state of Indiana generated around 54.5 million megawatt-hours of electricity. We estimate this generates $5.8 billion of direct output into the Indiana economy. After excluding the economic impact of Indiana's own coal used to generate the state's electricity, we estimate that this direct output will generate $3.2 billion in secondary output impacts, resulting in a total economic impact of around $9.0 billion in output in the Indiana economy.

We estimate that to generate the 54.5 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 2.9 thousand workers. We further estimate that this will generate around 7.7 thousand additional jobs in the Indiana economy, resulting in a total employment impact of around 10.6 thousand jobs. We also estimate that the coal-fired power generation generates a total of $175.8 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate nearly $160.0 million in tax revenue (Figure 28).

Figure 28: Economic Impact of Coal-Fired Power Generation in Indiana

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	5,839.7	3,182.9	9,022.6
Employment (jobs)	2,911	7,726	10,637
Labor Income ($, millions)	332.2	290.1	622.3
State & Local Tax Revenue ($, millions)	--	--	159.9

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.10 Economic Impact of Coal-Fired Power Generation in Texas

In 2021 the coal-fired power plants in the state of Texas generated around 88.8 million megawatt-hours of electricity. We estimate this generates around $7.8 billion of direct output into the Texas economy. After excluding the economic impact of Texas' own coal used to generate the state's electricity, we estimate that this direct output will generate $6.9 billion in secondary output impacts, resulting in a total economic impact of around $14.7 billion in output in the Texas economy.

We estimate that to generate the 88.8 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 2.1 thousand workers. We further estimate that this will generate around 6.5 thousand additional jobs in the Texas economy, resulting in a total employment impact of around 8.6 thousand jobs. We also estimate that the coal-fired power generation generates a total of $445.3 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $305.6 million in tax revenue (see Figure 29).

Figure 29: Economic Impact of Coal-Fired Power Generation in Texas

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	7,778.5	6,931.3	14,709.8
Employment (jobs)	2,098	6,518	8,616
Labor Income ($, millions)	284.0	161.3	445.3
State & Local Tax Revenue ($, millions)	--	--	305.6

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

4.11 Economic Impact of Coal-Fired Power Generation in Utah

In 2021 the coal-fired power plants in the state of Utah generated around 26.4 million megawatt-hours of electricity. We estimate this generates around $1.9 billion of direct output into the Utah economy. After excluding the economic impact of Utah's own coal used to generate the state's electricity, we estimate that this direct output will generate $1.1 billion in secondary output impacts, resulting in a total economic impact of nearly $3.1 billion in output in the Utah economy.

We estimate that to generate the 26.4 million megawatt-hours of electricity in 2021, the coal-fired power plants in the state employed around 750 workers. We further estimate that this will generate around 2.6 thousand additional jobs in the Utah economy, resulting in a total employment impact of around 3.3 thousand jobs. We also estimate that the coal-fired power generation generates a total of $127.4 million in labor income impact in 2021. Finally, the coal-fired power generation in the state is estimated to generate $48.3 million in tax revenue (Figure 30).

Figure 30: Economic Impact of All Coal-Fired Power Generation in Utah

Type of Impact	Direct	Indirect and Induced	Total
Output ($, millions)	1,948.6	1,137.8	3,086.4
Employment (jobs)	752	2,558	3,310
Labor Income ($, millions)	89.4	38.0	127.4
State & Local Tax Revenue ($, millions)	--	--	48.3

Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, and corporation net income taxes.

5 Total Economic Impact of Coal Production and Coal-Fired Power Generation in the United States

Finally, we recap the economic impact of both coal production and all coal-fired power generation in all states in the U.S. We estimate that coal production and coal-fired power generation combined generate a direct output impact of $115.7 billion in 2021. We further estimate that this direct output impact generates $145.3 billion in secondary output impacts, resulting in a total economic impact of nearly $261 billion output in the United States economy.

We estimate that both coal production and all coal-fired power generation in the nation employed directly nearly 75.0 thousand workers. They are expected to generate around 306.7 thousand additional jobs in the U.S. economy, resulting in a total employment impact of more around 381.6 thousand jobs. Further, coal production and coal-fired power generation generate around $43.8 billion in total labor income. Finally, coal production and coal-fired power generation are estimated to generate more than $8.0 billion revenue from coal severance tax and select state and local taxes for all the states and local government in the United States.

Figure 31: Economic Impact of Coal Production and Coal-Fired Power Generation in the United States

Type of Impact	Direct	Indirect and Induced	Total
Output ($, billions)	115.7	145.3	261.0
Employment (thousand jobs)	74.9	306.7	381.6
Labor Income ($, billions)	8.0	35.8	43.8
State & Local Tax Revenue ($, billions)	--	--	8.1
Notes: Output, Income, and Taxes are measured in 2021 dollars. Tax impact includes sales, personal income, property, corporation net income, and when applicable, coal severance taxes.			

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