



U.S. – INDIA ENERGY MONITOR

THE COAL ISSUE

*A Quarterly Snapshot
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Russia's invasion of Ukraine rocks global energy markets

This quarter, Vladimir Putin's invasion of Ukraine rattled global energy markets. Russia is one of the world's top petroleum, natural gas, and coal producers¹ and restrictions on the country's exports will have global repercussions. Western Europe is particularly susceptible² since it is heavily reliant on Russian fossil fuels. Even though the West and Europe have not officially sanctioned Russian energy, Europe continues to move away from Russian oil and gas, in part due to its relative wealth and ability to pay higher fuel prices³ on the global market. However, it faces difficulty to meet its natural gas demand with non-Russian sources, and the United States has stepped in to fill in the gap with liquefied natural gas (LNG) exports to Europe.

The Global South, on the other hand, has largely avoided imposing sanctions on Russia³, but nonetheless faces volatile energy prices from the war.

As Europe scrambles to replace its imports of Russian gas, lucrative higher prices have forced smaller, poorer countries like Bangladesh and Pakistan to compete with Europe⁴ for LNG imports. In Bangladesh, where about 80% of the electricity comes from natural gas, the government had to stop imports⁵ due to increased prices before the start of the war. Likewise in Pakistan, companies have abandoned contracts⁶ to chase profits in European markets. The crisis extends to other parts of South Asia as well. Sri Lanka for example faces a worsened economic crisis due to increased oil prices. To keep the economy afloat, it must now use its diminishing foreign reserves to pay for even more expensive oil.⁷

Roadblocks for domestic energy and climate legislation in the United States

The need for climate action in the United States has pushed Democrats in the U.S. Congress to advocate going ahead with only the climate and clean energy measures⁸ of Biden's stalled Build Back Better Act. The climate portion of the act worth \$555 billion in investments would be the largest federal investment in clean energy so far, helping Biden get halfway to his goal of reducing U.S. greenhouse gas emissions by 50% by 2030⁹ if enacted. Senator Joe Manchin's support for the package remains a stumbling block. An advocate of "energy independence"¹⁰, he expressed concern the bill risks the reliability¹¹ of the country's electric grid and an increased reliance on foreign energy supplies if passed. Manchin confirms the climate and clean energy provisions are among the few things included from Biden's original Build Back Better Act and believes that the Democrats should increase taxes on corporations and the wealthy, using the revenue to reduce the deficit and spend on new climate programs.¹²

The climate portion of the Build Back Better act would be the largest federal investment in clean energy so far.

India's power and oil crises

India faced twin energy challenges this quarter: rising energy prices and electricity supply shortfalls from soaring power demand. The real challenge for India following the Russia-Ukraine war is energy price volatility, not Russian oil, gas, or coal imports, since these comprise a small portion of the total import volume.¹³ The country is most at risk among other Asian nations from rising oil prices due to its reliance on overseas supplies to meet 85% of its oil needs.¹⁴ To safeguard the consumers, India has prepared to release more oil from its national reserves if necessary.¹⁵ Expressing her concern over the repercussions of spiraling oil rates, Indian Finance Minister Nirmala Sitharaman expressed that the current surge may disrupt India's national budget when the Indian fiscal year begins on April 1, 2022.¹⁶ Russia, isolated by economic sanctions from European and other buyers, may soon offer better prices to the Indian market: heavy oil

discounts have already attracted Indian companies to stock up on Russian oil.^{17,18}

A coal crisis in India persists, like that in September to October 2021. Reviving demand¹⁹ coupled with diminishing coal inventories²⁰ and a lack of rakes²¹ to transport coal by rail to power plants, are still the key reasons for the lack of enough electricity generation to meet demand. This pushed the country to witness the worst electricity shortage since October 2021 in the month of March.²² In March, Indian coal imports from Russia, the country's sixth largest supplier of coking and thermal coal were also the highest in two years.²³ The coal and power crisis in India, while exacerbated by rising global coal prices mainly stems from chronic challenges in the Indian coal and power sectors: lack of liquidity and proper coordination and forecasting to meet rising electricity demand.²⁴



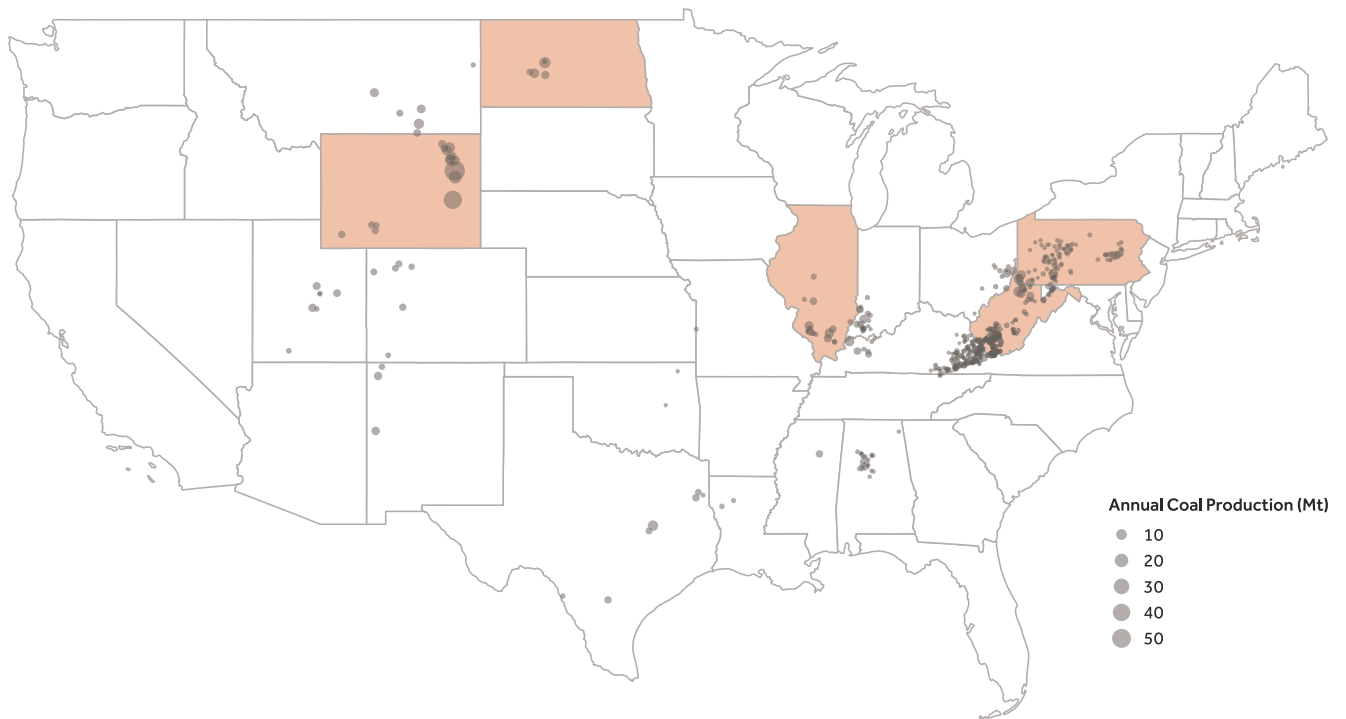
THE DECLINE OF COAL IN THE UNITED STATES

The United States is a net exporter of coal²⁵, producing approximately 490 million metric tons and consuming 430 million metric tons in 2020, ranking third in the world.²⁶ The continental United States largely has three coal-producing regions: Western over the Rocky Mountains, Interior covering the Midwest, southeast and parts of

Texas, and Appalachian over the Appalachian Mountains.²⁷ Almost three quarters of U.S. coal production comes from five states: Wyoming (41%), West Virginia (13%), Pennsylvania (7%), Illinois (6%), and North Dakota (5%) (Figure 1). Across all coal-producing states, coal mining employed approximately 42,000 people in 2020.²⁸

FIGURE 1.

Annual 2020 production of coal mines in the United States. Colored states form three-quarters of total U.S. coal production. Source: U.S. Energy Information Administration²⁹



Almost **75%** of U.S. coal production comes from **5** states

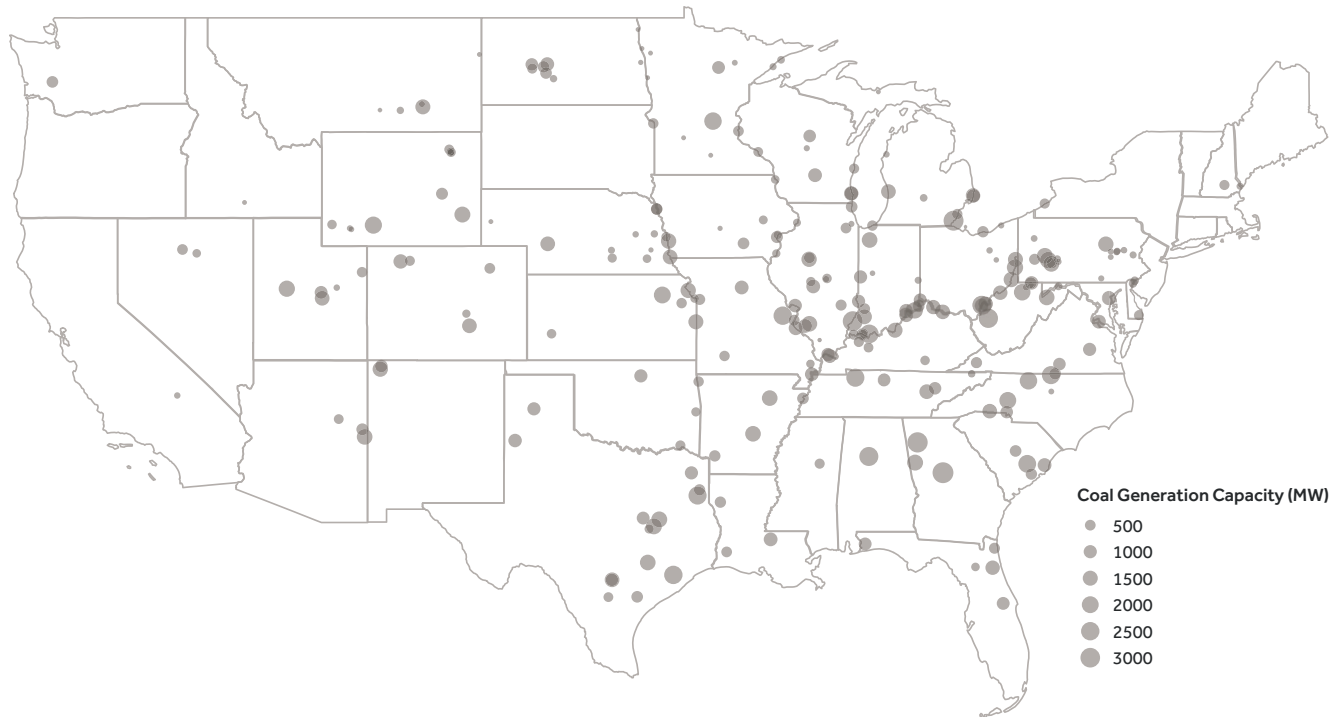
Most coal consumed is for electricity generation, where 22% of electricity generation in 2021 came from coal³⁰ from approximately 206,000 MW (206 GW) of capacity.³¹ While most coal production occurs in few states, power plants which consume mined coal sit throughout the country (Figure 2).

Consequently, transporting coal from mines to plants can form up to 40-50%³² of the total cost of coal delivered to plants³³, influencing the cost per unit electricity produced from coal in each U.S. state. States in the south and New England have the highest costs for coal electric power.²⁸

FIGURE 2.

Coal electricity generating capacity throughout the United States.

Source: U.S. Energy Information Administration³⁴



The production, consumption and share of electricity of coal peaked around 2008 and have decreased over the last 14 years as cheaper domestic natural gas (from hydraulic fracturing) and renewable energy have displaced coal's share of electricity in the United States.³⁵ From 2008 to 2021, all U.S. states except Alaska saw decreases in the annual share of electricity generated from

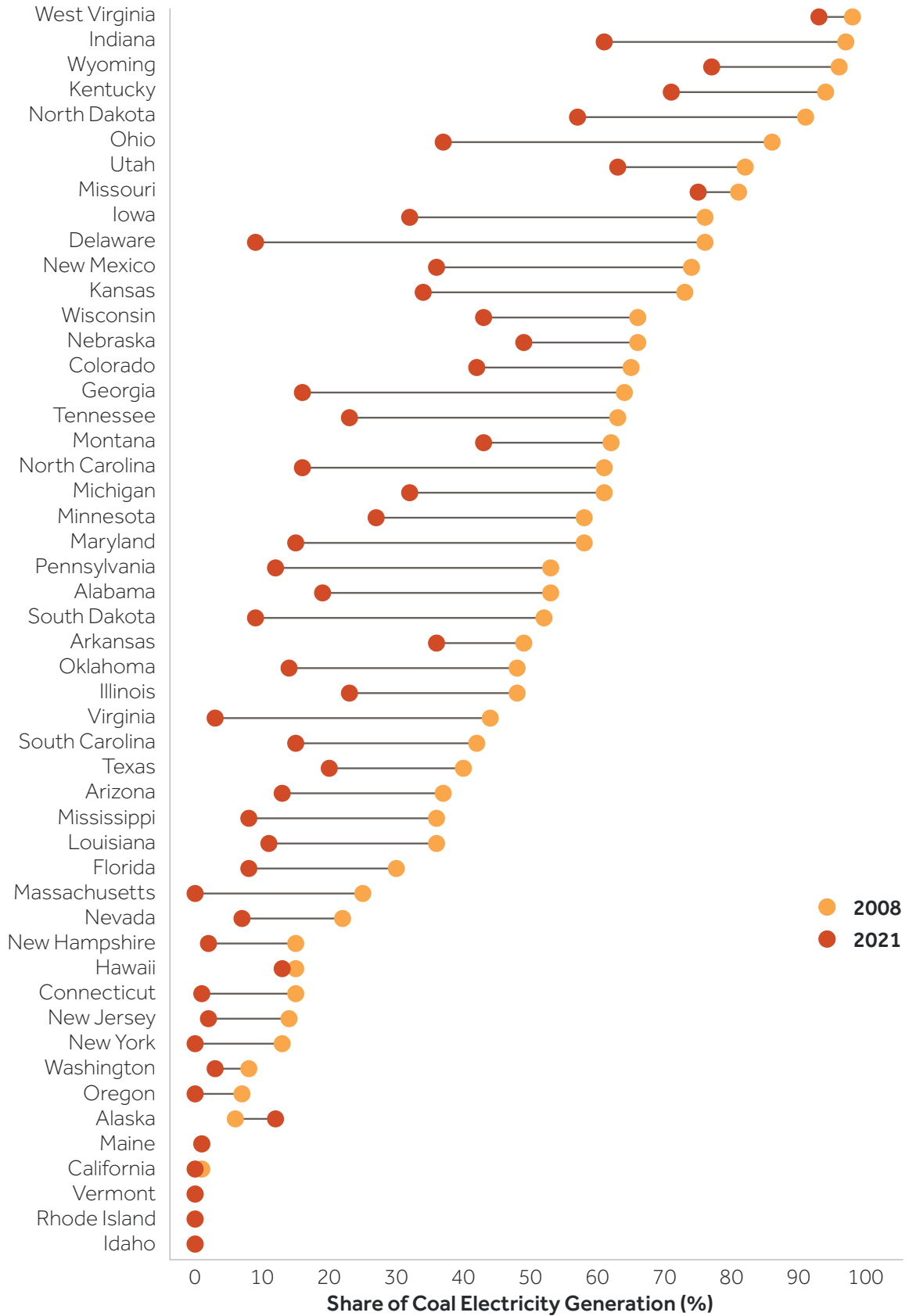
coal (Figure 3). As of 2022, the U.S. Energy Information Administration (EIA) projects coal's share of the U.S. electricity generation mix will continue to fall to 10% by 2050. While natural gas largely displaced coal in the last decade, U.S. EIA projections estimate renewables, mainly solar energy, will play a larger role in displacing coal electricity by 2050.³⁶

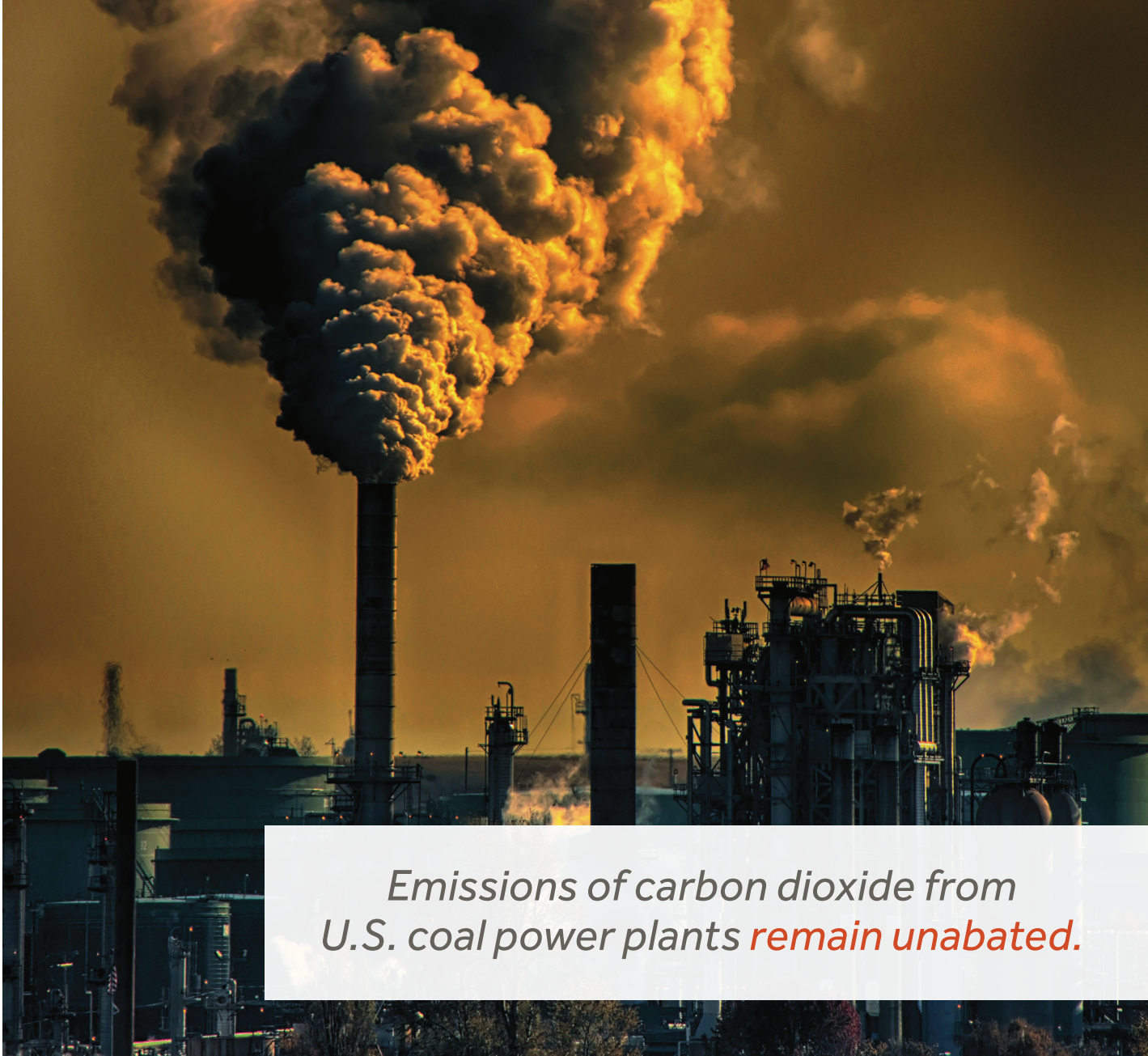
*The production, consumption and share of electricity of coal peaked around 2008 and have **decreased over the last 14 years.***

FIGURE 3.

Almost all U.S. states saw large decreases in share of electricity generation from coal since 2008.

Source: U.S. Energy Information Administration^{37,38}





*Emissions of carbon dioxide from U.S. coal power plants **remain unabated.***

Coal is the dirtiest fossil fuel with the highest emissions of carbon dioxide³⁹, the main greenhouse gas responsible for climate change. Likewise, emissions of sulfur and nitrogen oxides make coal power plants in the United States large sources of air pollution. Since the passage of the Clean Air Act amendments in the 1990s which tightened air pollution emission standards at coal power plants, emissions of sulfur dioxide and nitrogen oxides have decreased by factors of 16 and six, respectively, through installation of control technologies that scrub emissions before they are released into the atmosphere.⁴⁰ Emissions of carbon dioxide from U.S. coal power plants remain unabated;

displacement of coal power with cheaper natural gas power (which emits less carbon dioxide) and renewables (which emit no carbon dioxide) have decreased electricity sector emissions since 2007 by approximately 30%, with projections by U.S. EIA staying relatively constant by 2050.³⁶ This decrease has caused electricity generation to fall from the largest source of greenhouse gas emissions to the second-largest source. Coal plants in the United States will likely continue to retire due to age and cheaper alternatives, but U.S. EIA projections assume no new laws or regulations such as carbon taxes, electricity standards, or tax credits past 2022 to lower emissions.³⁶

THE RISE OF COAL IN INDIA

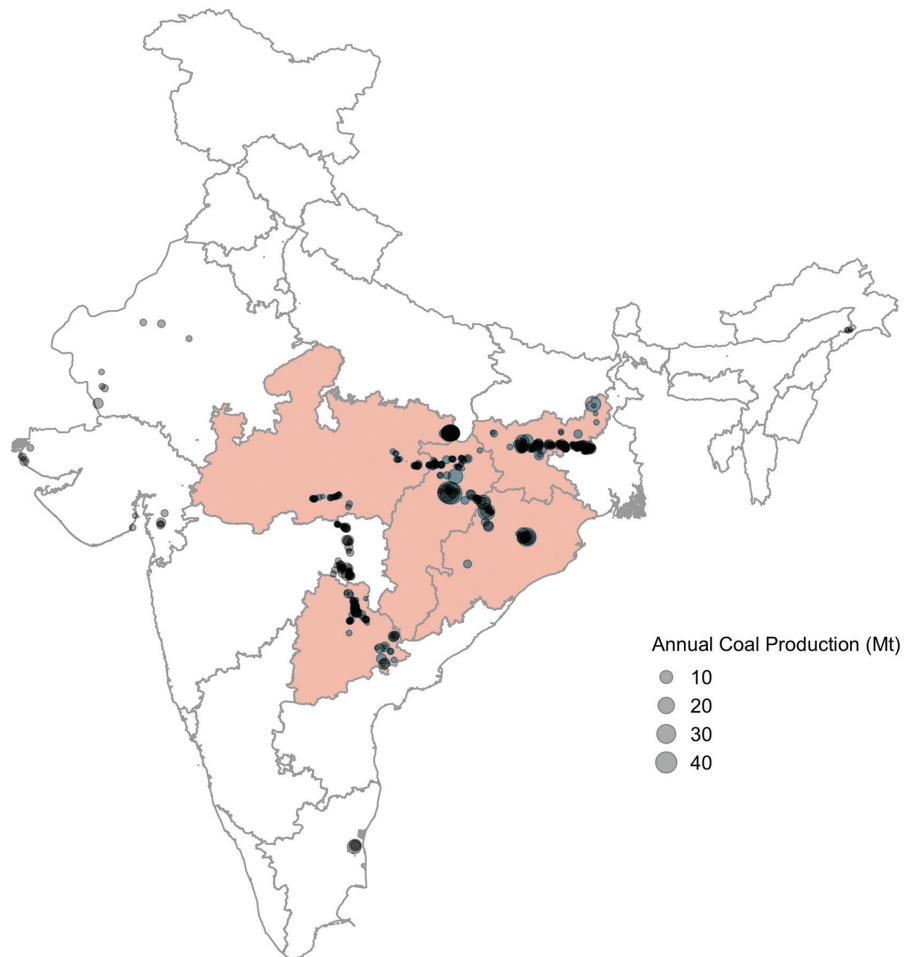
As a net importer of coal, India produced about 720 million metric tons of coal and consumed approximately 930 million metric tons in 2020⁴¹, the second largest in the world²⁶.

Like the United States, coal production in India is disproportionately concentrated.^{42,43}

Most coal mined in India is in eastern India with smaller deposits in western and southern India (Figure 4). Five states in India form the bulk of coal production: Chhattisgarh (20%), Odisha (18%), Jharkhand (17%), Madhya Pradesh (13%), and Telangana (8%). In India, coal mining employed approximately 740,000 people in 2020.⁴³

FIGURE 4.

Annual 2020 production of coal mines in India. Colored states form about three-quarters of total Indian coal production. Source: Pai et al. (2021).⁴²

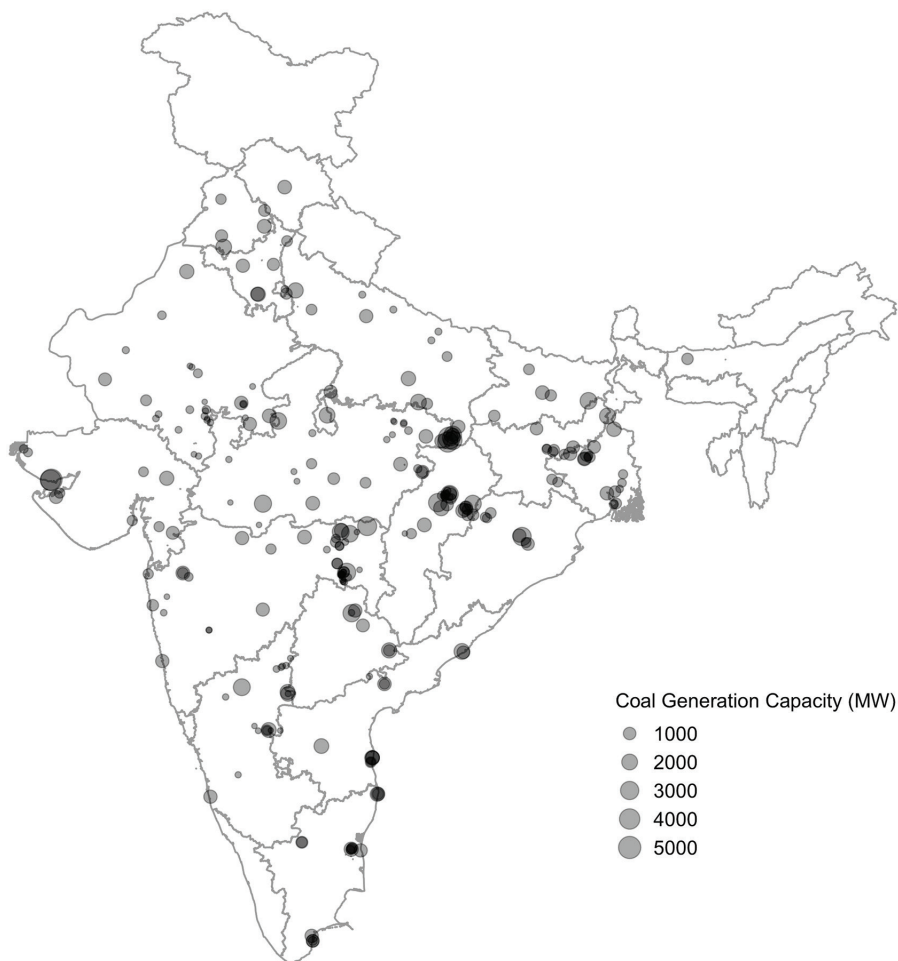


India uses over 80% of its coal for electricity generation. Approximately 70% of all electricity generated in 2021 came from coal.⁴⁴ India's coal electricity generating capacity stood at approximately 205,000 MW in 2021⁴⁵, and like the United States, locations of plants influence⁴⁶ cost of electricity generated at each plant (Figure 5). Transportation through railways in India forms on average 35%

of the cost of coal delivered to plants, but plants furthest away from mines in southern, western, and northern India can have transportation costs three times those of plants closer to mines in eastern India. Moreover, to subsidize passenger fares Indian Railways overcharges for its freight fares for coal, further increasing the cost of power from plants furthest away from mines.⁴⁶

FIGURE 5.

Coal electricity generating capacity throughout India. Source: World Resources Institute⁴⁷



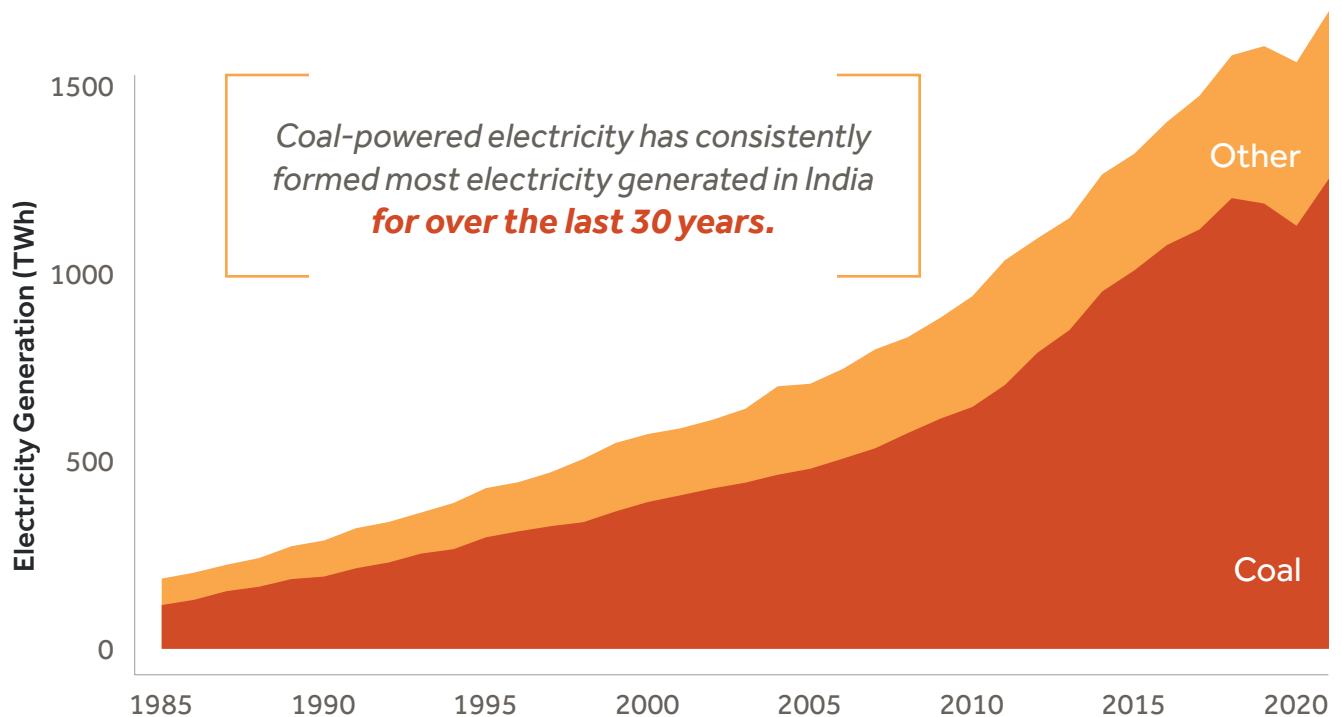
Coal-powered electricity has consistently formed most electricity generated in India for over the last 30 years (Figure 6). Total electricity generation since 1985 in India has grown nine times and continues to grow.⁴⁸ Coal has formed at least 60-70% of total generation through regular growth in coal generating capacity.⁴⁴ **Currently India has an overcapacity of coal power plants with installed capacity exceeding peak electricity demand.** On average how often coal power plants in India operate to meet demand has fallen as supply of plants increased.⁴⁹

As India pushes to meet ambitious renewable energy targets by 2030 and electricity demand continues to grow, this overcapacity is likely to go away and growth in coal capacity additions will also taper.⁵⁰

Solar and wind generation will play a greater role to meet electricity demand. However, several projections estimate coal forming about 50% of total electricity generation by 2030 down from the current 70%.⁵⁰⁻⁵³

FIGURE 6.

Total electricity generation and generation from coal since 1985 in India. Source: Our World in Data⁴⁴



Coal power is also responsible for greenhouse gas emissions and air pollution in India. Coal-fired power plants are the largest source of greenhouse gas emissions in India⁵⁴ at 40% of the country's total. Likewise, sulfur dioxide and nitrogen oxide emissions from **coal plants contribute to approximately ~100,000 deaths of the total ~1 million deaths from air pollution in India.**⁵⁵ While India has had emission regulations to install pollution control technology at plants since 2015, these regulations have repeatedly been delayed

through litigation and consultation between the government and power plant operators.⁵⁶ Few plants operate with pollution control, and current government statements indicate revised deadlines for pollution control installation in ~2030s from original deadlines of ~2017.⁵⁷ Consequently, it may be more feasible to shut down some plants entirely to meet climate goals by 2040; however, between now and when plants may retire in 15-20 years, they will continue to contribute to air pollution deaths.⁵⁸

While the coal sector in the United States and India show some similarities, their respective trajectories are diverging. Most coal in both countries goes to electricity generation and geography determines where coal mines are and the cost of electricity from plants. However, in the United States, cheaper natural gas has largely decreased the share and use of coal electricity.

Even absent aggressive climate policy in the United States, coal's role will likely diminish due to market forces.

In India on the other hand, coal prices are regulated, and natural gas remains expensive in the power sector. Renewable power attracts most investment for new power capacity to meet growing electricity in demand, but without concerted policy to reduce coal use in electricity generation and industry, coal use will likely level off, but not decrease substantially in India. Consequently, alternatives such as solar, wind, and hydrogen for industrial decarbonization and adequate finance to deploy these alternatives will be key to reducing coal use in India.^{59,60}



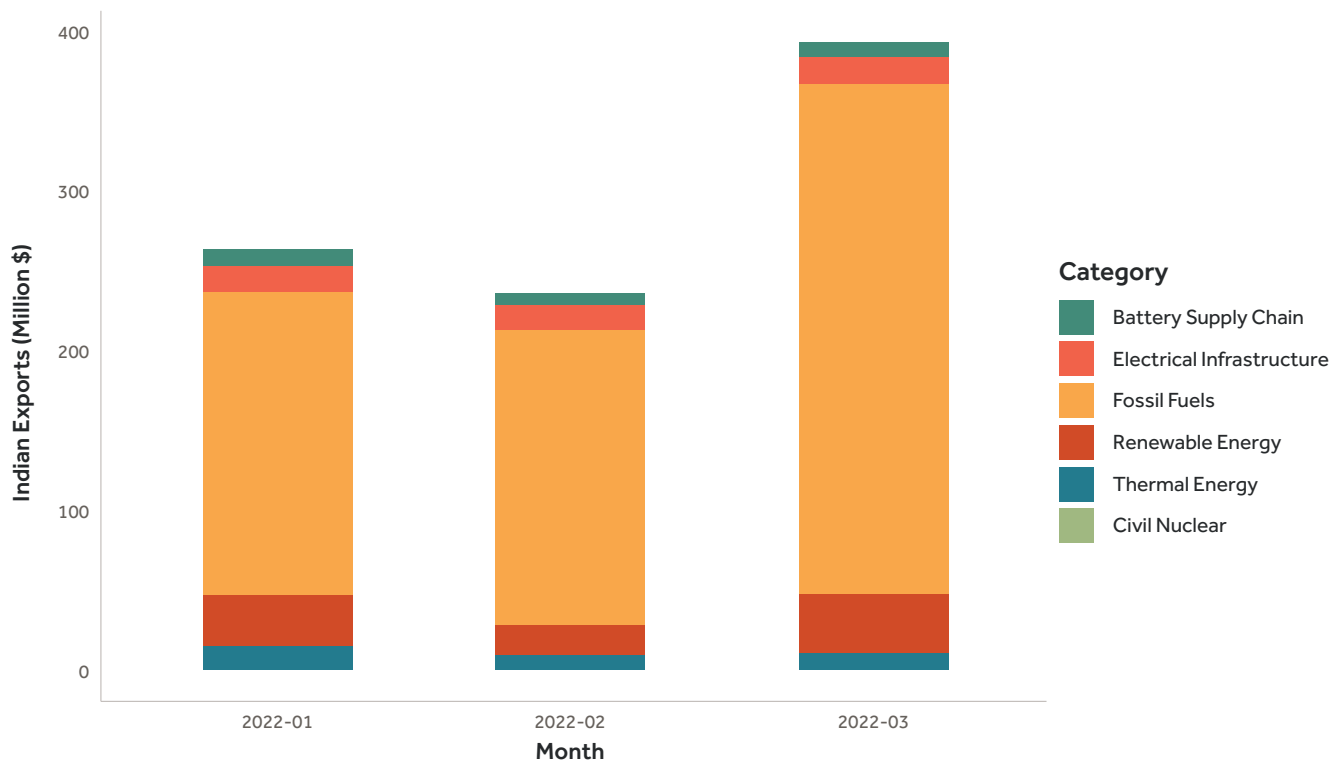
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INDIA-U.S. ENERGY TRADE

INDIAN EXPORTS TO THE UNITED STATES (MILLION \$)



CATEGORY	JANUARY 2022	FEBRUARY 2022	MARCH 2022
Fossil Energy	190	184	319
Renewable Energy	32	19	37
Electrical Infrastructure	17	16	17
Thermal Power	15	9	10
Battery Supply Chain	10	8	9
Civil Nuclear	-	-	-



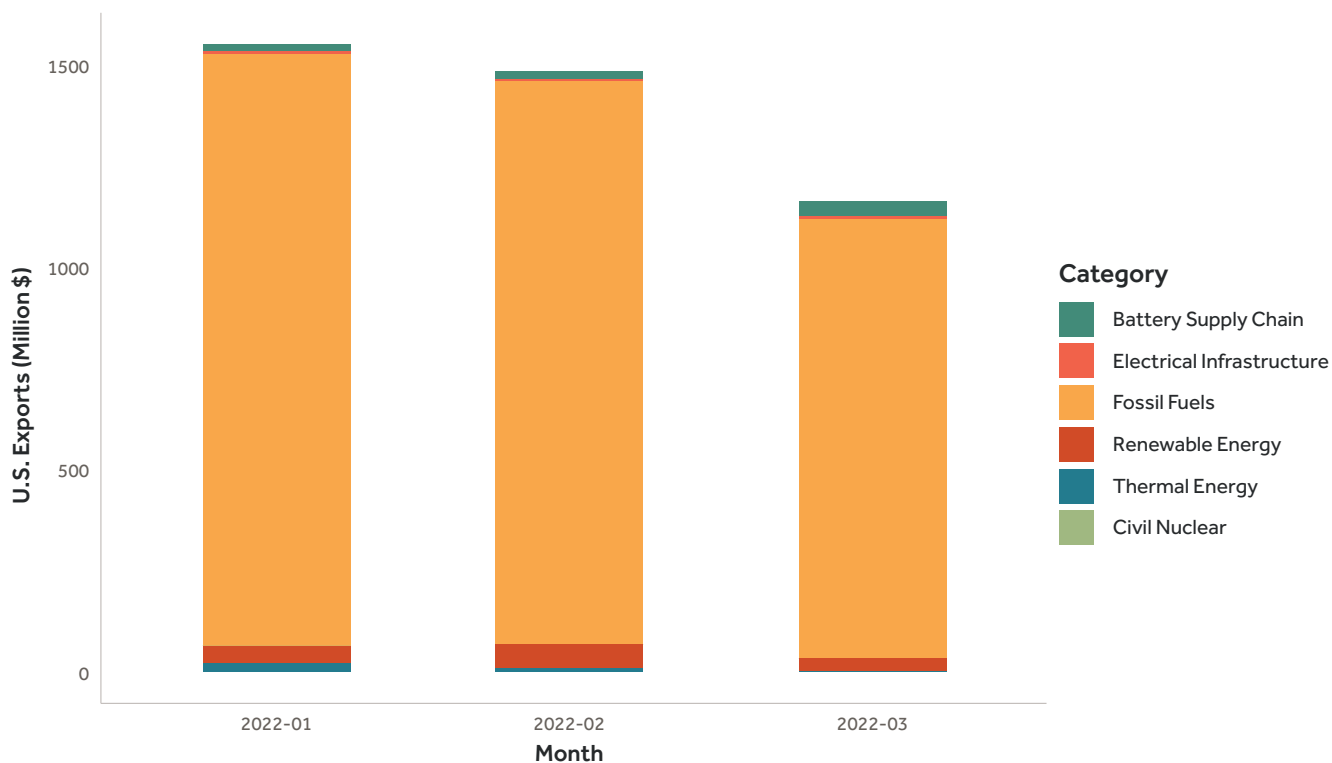
Source: U.S. Census Bureau⁶¹, U.S. International Trade Administration⁶²

U.S.-INDIA ENERGY TRADE

U.S. EXPORTS TO INDIA (MILLION \$)



CATEGORY	JANUARY 2022	FEBRUARY 2022	MARCH 2022
Fossil Energy	1,478	1,406	1,099
Renewable Energy	44	61	31
Electrical Infrastructure	8	7	7
Thermal Power	21	9	2
Battery Supply Chain	17	20	36
Civil Nuclear	0.03	0.06	0.04



Source: U.S. Census Bureau⁶¹, U.S. International Trade Administration⁶²

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