

Policy Brief

PATHWAYS TO ACHIEVING A 2030 COAL PHASE-OUT IN THE UNITED STATES

Key Findings:

- Since 2005, about 130 GW of coal-fired capacity retired in the U.S., and 95 GW have announced retirement by 2030, leaving 132 GW of coal plants to be closed, setting the U.S. on course for a 2030 total coal phase-out.
- In 2021, the United States set two ambitious goals: a national climate target (NDC) of 50-52% emissions reductions from 2005 levels by 2030 and 100% carbon-free electricity by 2030. A 2030 coal power phase-out can help achieve both these goals and, importantly, it can contribute over 58% of the emissions reductions needed to meet the U.S. NDC.
- Coal phase-out is increasingly a regional issue in the U.S., with approximately 50% of coal-fired power generation residing in 8 states across the Southern and Midwest regions.
- Challenges to a 2030 phase-out are due to these regional differences, political feasibility, and questions over the federal government's ability to enforce emissions reductions after the Supreme Court's controversial decision on *West Virginia v. Environmental Protection Agency (EPA)*.
- Despite challenges and attempts to prolong reliance on coal power, coal's productivity in the U.S. is on a steady decline. In fact, even without strong federal government intervention, the U.S. has already passed the tipping point toward a coal-free future.

The State of Coal Phase-out in the United States

As of January 2022, the United States has the world's third-largest coal power capacity. Since U.S. coal's peak in 2008,¹ coal production and consumption levels have been steadily declining, reaching historic lows in 2020. With diminishing production and demand, the capacity of U.S. coal mines has dropped as retirements increase and productivity declines. Overall, U.S. coal plants are older, smaller, and less efficient compared to other countries. The majority of U.S. coal plants were built during the 1970s and 1980s, meaning the majority of plants will pass or approach the end of their lifetime by 2030, reducing the risk of stranded assets from a premature shutdown.

While the U.S. coal fleet is shrinking each year, the U.S. has yet to identify a specific phase-out timeline or plan for coal. However, in December 2021, President Biden signed an executive order directing the federal government to achieve 100% carbon pollution-free electricity by 2030.² Additionally, on the subnational level, Hawaii, New York, Washington, and Oregon, have all passed laws eliminating or phasing out coal-fired power plants.³

In April 2021, the U.S. set a new ambitious nationally determined target (NDC) to reduce emissions by 50-52% from 2005 levels by 2030. And a major, low-hanging fruit for the U.S. to achieve emissions reductions is in the coal sector. Yet, despite the transition away from coal power in some U.S. states, coal still provides over half of the electricity for eight states. **To help achieve the U.S. NDC, a total coal phase-out must be accomplished by 2030. This means a total of 142 GW must be shut down.**

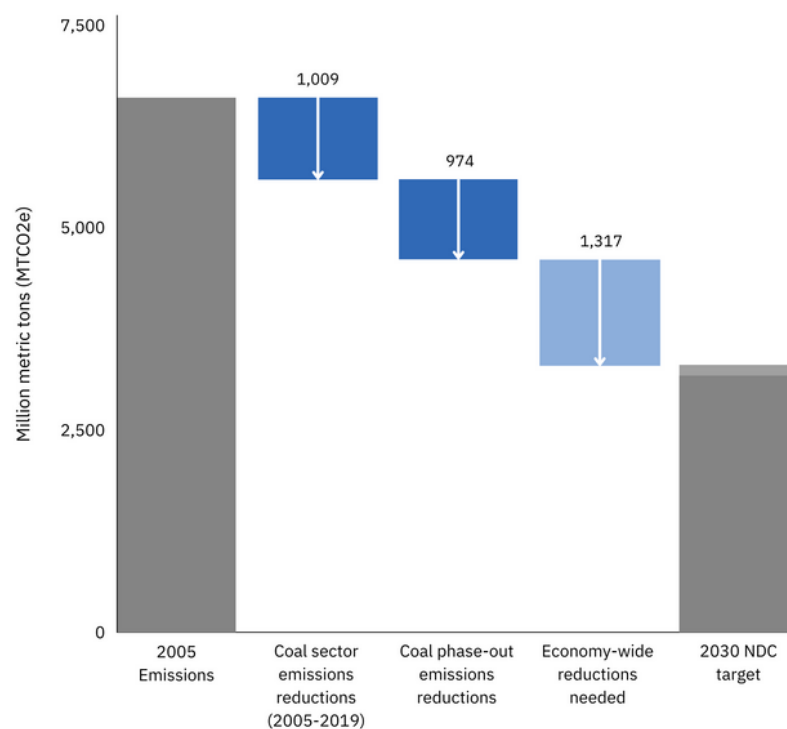


Figure 1. A 2030 coal power phase-out's contribution to the NDC target. Based on EPA inventory and the *America Is All In* report, a 2030 coal phase-out contributes to about 1,983 MMTCO₂e or about 59% of the NDC emissions reduction target. Between 2005 and 2019 (the latest inventory year), emissions have already decreased by 1,009 MMTCO₂e (equivalent to 29-31% of the NDC emission reductions). With a 2030 coal phase-out, we can achieve a further 974 MMTCO₂e reduction in emissions.

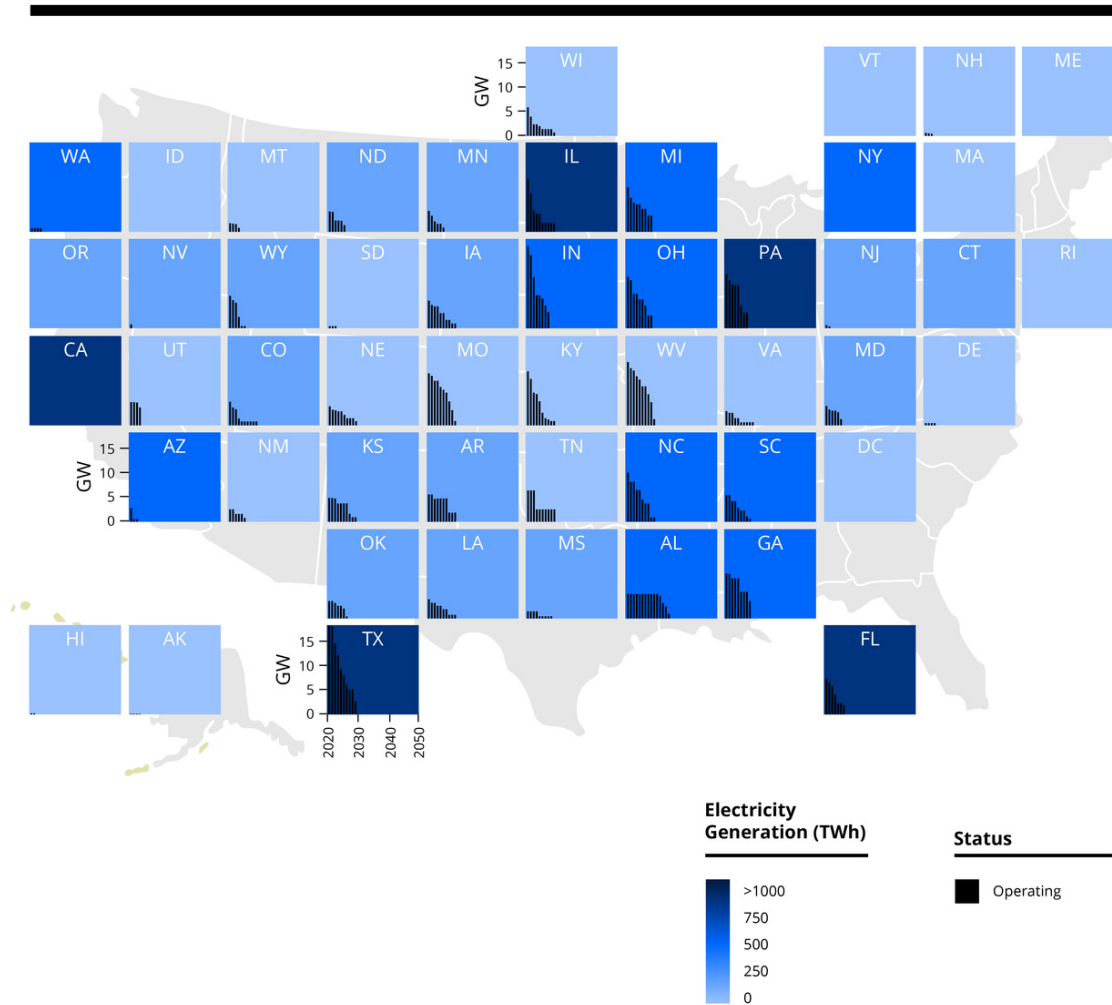
On June 30, 2022, the U.S. Supreme Court limited the U.S. Environmental Protection Agency's ability to regulate power sector greenhouse gas (GHG) emissions in the landmark case *West Virginia vs. EPA*. The ruling was predicated on the Clean Power Plan, a 2015 EPA regulation that sought to limit GHG emissions from coal power plants, but the plan never went into effect.⁴ With or without regulations, the U.S. coal industry continues to decline, as it is still too old and inefficient to survive.

With increased economic pressures from the competition with renewable energy and natural gas,⁵ coal phase-out is already underway, with 124 GW of coal plants being retired since 2005, replaced by cost-competitive gas and renewables, and another 81 GW have been announced to retire by 2030. To eliminate the remaining 152 GW of coal capacity, the U.S. should pull many policy levers while also focusing on the transition of coal communities to green jobs, better health, and economic development.

Plant-by-plant phase-out pathways

In our analysis, we applied a multi-dimensional analytical framework to structure the plant-by-plant pathways to phase-out unabated coal power generation by 2030 in support of the global 1.5°C goal and the U.S.'s 2050 net-zero goal. We combined plant-level data and analysis with long-term decarbonization scenarios from a globally integrated assessment model. The retirement pathways are developed based on the bottom-up plant-by-plant retirement priority scoring system and the top-down 1.5°C-compatible national pathways (learn more about our framework and modelling scenarios in the [overview brief](#)). State pathways vary by near-term trend and retirement speed. Coal capacity in most states immediately declines (e.g. Florida and Michigan) but in a few states, it stays almost flat in the near term (e.g. Alabama and Arkansas), where retirements do not offset new builds. Based on the plant retirement ranking, faster retirements will happen in states with lower-score coal plants—those that have worse technical, economic, and environmental performance.

Coal Power Phaseout Pathways by U.S. State



Policy Challenges

Advancing plant retirements is not just crucial for a 2030 coal phase-out but also for the Biden Administration’s 2050 net-zero goal and 2030 NDC goal. The Biden Administration’s *The Long-Term Strategy of the United States* (LTS) outlines its plan to meet the U.S.’s climate goals with a focus on clean energy development. The LTS calculated that zero-carbon technologies (including small amounts of fossil fuels with carbon capture and storage (CCS) need to increase by roughly 60-70 GW each year to reach net-zero emissions in 2050.⁵ In our own analysis, we calculated necessary solar and wind capacity additions in low,⁷ medium,⁸ and high⁹ electricity demand scenarios to meet the new 100% carbon-free electricity in 2030 goal. If the U.S. is going to push towards this ambitious goal, the yearly build-out rate may need to ramp up to 71-89 GW of wind capacity and 71-88 GW of solar capacity if held constant over 10 years. Unlike the LTS, we held nuclear power constant and did not account for CCS technology. And in other reports, Biden’s previous federal mandate/incentive of 80% carbon-free electricity by 2030 and 100% carbon-free electricity by 2035 would reduce CO₂ emissions by 2,008 million metric tons, delivering an 83% reduction in CO₂ emissions by 2030.¹⁰

Despite significant progress made towards achieving a coal phase-out, many states in the Southern and Midwest regions still heavily rely on coal for power generation. By the end of 2021, 31 states have enacted a Renewable Portfolio Standard (RPS) or a renewable goal.¹¹ The states with no RPS and a heavy reliance on coal are Alabama, Arkansas, Georgia, Kansas, Kentucky, and West Virginia. An RPS provides an opportunity to push renewable energy production to reach its potential. Many coastal states, such as Alabama, Georgia, Florida, and Texas, have enough offshore wind potential to power all or a significant share of their electricity.¹² Pennsylvania and West Virginia, two coal-dependent states, have enough solar potential to meet their 2020 electricity needs nearly five times and two times over, respectively.¹³ Both wind and solar energy are crucial and often untapped alternative power sources for every state, making it possible to meet carbon-free electricity goals with increased renewable investment.

Despite high renewable energy potential in all coal-dependent states, the U.S. faces many barriers from significant political polarization regarding climate change. Another challenge for phasing out the final coal plants is the recent *West Virginia v. EPA* decision which impacts the ability of the federal government to apply emissions reduction policies. The Supreme Court ruled that federal agencies, like the Environmental Protection Agency (EPA), are restricted in how they apply federal laws. While the targets of the Clean Power Plan—an Obama Administration-era comprehensive climate plan—were met without federal regulation, the decision may impact future phase-outs. With congressional deadlock, regulatory responsibilities will fall on states, and many of the more conservative states with the remaining coal power plants may choose to protect coal plants rather than follow the economic and social trends toward renewables.¹⁴ So how does the U.S. ensure a path to total phase-out in time to reach its' goals?

Policy Strategies & Opportunities

To phase-out coal power and help achieve the U.S. NDC, we identify four important strategies:

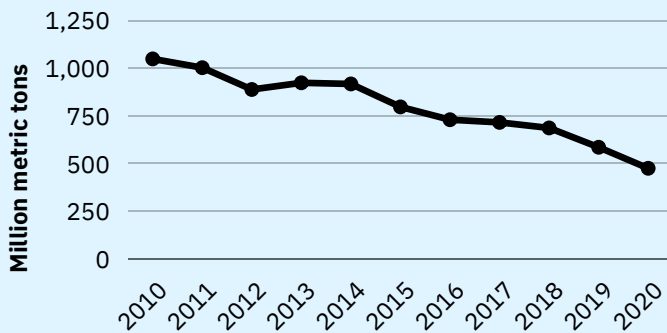
- 1. Focus on phasing out older fleets.** The U.S. coal fleet is older, smaller, and less efficient, making rapid phase-out easier. Over half of the U.S. coal fleet is 40 years or older, and 85% of the coal fleet is 30 years or older. Compared to the other countries, the U.S. has the second oldest median plant vintage year, about 40 years older than other major coal emitting countries—China, India, and Indonesia. The older age of the coal fleets means the risk of stranded assets is low as most plants will reach or approach retirement age by the time they shut down.
- 2. Retire 66.5% (109.9 GW) of plants by 2025 to guarantee a 2030 phase-out.** Of the 66.5% coal plants, about 17% (17.3 GW) of the current U.S. coal fleet are identified as low-hanging fruit, which have low costs and large environmental benefits for rapid retirement. Currently, about 48% of plants (46.5 GW) have announced retirement by 2025, so with an extra push of about 46 plant retirements, the U.S. would meet the 2025 target.
- 3. Integrate a coal power phase-out into strategies to achieve the 100% carbon-free electricity target in 2030.** The U.S. needs to accelerate plant retirements, especially in the 13 states (mainly concentrated in Midwest and Southern regions) that are having difficulty transitioning away from coal and towards alternative energy sources.
- 4. Target policies in states with the highest reliance on coal power with a focus on a just transition for local communities.** A transition to renewable energy sources comes with its own problems in terms of the impact on employment and local communities. A 2020 study in *Science* found that a 2035 deadline for retiring all fossil-based electricity generators would strand about 15% of fossil fuel-fired capacity and about 20% of direct power plant and fuel extraction jobs. A switch from coal to alternative renewable energy sources will require a transition framework to stabilize jobs and local communities and prevent excess job losses.

Suggested Citation: C. Dahl, R. Cui, D. Cui, C. Squire, S. Kennedy (2022). Pathways to achieving a 2030 coal phase-out in the United States. Center for Global Sustainability, 7 pp.

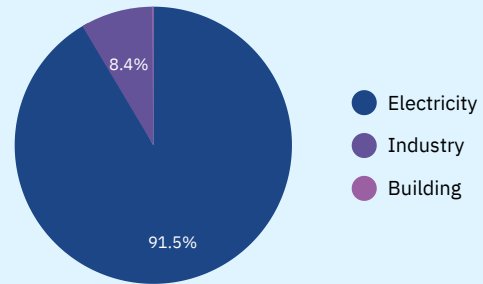
Fact Sheet

Production (2020): 485.7 million metric tons; Global ranking: 5
 Consumption (2020): 433.1 million metric tons; Global ranking: 3
 Exports (2020): 62.7 million metric tons; Global ranking: 6
 Imports (2020): 4.6 million metric tons; Global ranking: 27¹⁵

United States Total Coal Consumption (2010–2020)



United States Coal Consumption by Sector (2020)



Coal power generation (2020): 805,675 GWh, 20% of total electricity
 Coal power installed capacity (2022): 227.0 GW; Global ranking: 3
 Coal power plants (2022): 240 plants in operation, of which 175 units (85.5 GW) have announced retirement by 2030, 1 plant (.3 GW) at early development stages. There are no plants under construction.¹⁶

Coal power capacity by vintage group:



Age group	> 40 years	30~40 years	20~30 years	10~20 years	< 10 years
Capacity (% of total)	148.7 GW 65.5 %	49.5 GW 21.8 %	6.0 GW 2.6 %	20.8 GW 9.2 %	2.0 GW 0.9 %

POLICY SUMMARY

- No new coal: n/a
- Coal power phase-out target: n/a (Hawaii: 2022, New York: 2020, Washington: 2025, Oregon: 2035¹⁷)
- Net-zero target: 2050¹⁸

REFERENCES

1. EIA, 2020. Almost all U.S. coal production is consumed for electric power.
2. The White House, 2021, FACT SHEET: President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability.
3. Energy News Network, 2020. States are banning coal. Will it change the electricity mix?
4. Supreme Court of the United States, 2022. West Virginia v. Environmental Protection Agency.
5. EIA, 2019. More U.S. coal plants are decommissioning as retirements continue.
6. United States Department of State and the United States Executive Office of the President, 2021. The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050.
7. Hultman, N., Clarke, L., McJeon, H., Cui, R., Hansel P., McGlynn, E., O'Keefe, K., O'Neill, J., Wanner, C., Zhao, A., 2021. Charting an Ambitious U.S. NDC of 51% Reductions by 2030. Published by Center for Global Sustainability.
8. America Is All In. 2021. An All-In Climate Strategy Can Cut U.S. Emissions by 2030. By H. Hultman, K. Kennedy, L. Clarke, H. McJeon, T. Cyr, J. O'Neill, A. Zhao, J. Behrendt, W. Jaglom, T. McGarvey, J. Feldmann, R. Cui, K. O'Keefe. Published by America is All In.
9. America Is All In. 2021. Stronger Together: An All-In Climate Strategy for Faster, More Durable Emissions Reductions. By K. Kennedy, W. Jaglom, N. Hultman, E. Bridgwater, R. Mendell, H. Leslie-Bole, L. Rowland, E. McGlynn, T. Massey-Green, T. Cyr, L. Clarke, H. McJeon, A. Zhao, J. O'Neill, R. Gasper, J. Feldmann, K. O'Keefe, S. Kennedy, J. Zhao, and H. Kazanecki. Published by America Is All In.
10. Ibid.
11. EIA, n.d. Renewable energy explained.
12. Frontier Group and Environment America Research & Policy Center, 2021. Offshore Wind for America: The promise and potential of clean energy off our coasts.
13. Frontier Group and Environment America Research & Policy Center, 2021. We Have the Power: Realizing clean, renewable energy's potential to power America.
14. JDSupra, 2022. West Virginia v. EPA Limits the Federal Government's Power to Promote Clean Energy and Combat Climate Change.
15. EIA, 2022. Coal consumption by sector.
16. Global Energy Monitor, 2022. Summary Tables.
17. Energy News Network, 2020. States are banning coal. Will it change the electricity mix?
18. United States, Office of Press Secretary, 2021. President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target.