



Comments on Proposed Rule: Emissions Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Generating Units

Karen Palmer and Lucie Bioret

**Public Comment
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US Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

To whom it may concern:

On behalf of Resources for the Future (RFF), I am pleased to share the accompanying comments to the US Environmental Protection Agency (EPA) on its proposed greenhouse gas emission rate standards for different source categories of coal and natural gas plants.

RFF is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

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This comment explores announced retirement plans for coal-fired power plants, summarizing the capacity expected to retire on certain timelines and repowering plans for coal-fired generators of various sizes and types. Our analysis estimates the potential impacts of EPA's proposed standards on coal capacity if the announced plans are implemented.

The authors of these comments are:

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If you have any questions or would like additional information, please contact me at palmer@rff.org.

Sincerely,

Karen Palmer
Resources for the Future

Comments on Proposed Rule: Emissions Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Generating Units

1. Introduction

The Environmental Protection Agency's (EPA) *Emissions Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel Fired Existing Generating Units* proposes emission rate standards for different source categories of coal and natural gas plants. This proposal defines the Best System of Emissions Reductions (BSER) that undergirds the emissions rate standards for coal-fired generators based on fuel, capacity factor, and committed retirement dates. For coal plants, the most stringent requirement, installation of carbon capture and storage (CCS), is only required of plants that are still in service after 2040. Units that plan to retire before 2032 face no additional requirements to control CO₂, and plants that plan to retire between 2032 and 2039 face requirements that depend on their average capacity factor.

In this comment, we summarize the announced retirement plans for coal-fired power plants that are reflected in the EPA National Electric Energy Data System (NEEDS) data with some updates from our reviews of press announcements and other sources. Our objective is to summarize how much capacity is currently expected to retire or repower with natural gas on certain timelines for coal producing firms of various sizes and types. This analysis estimates how much coal capacity could be affected by EPA's proposed standards if these announced plans are implemented in the future. Note that history (and EPA's analysis of the proposed rule) suggests that new environmental regulations and changing economics may increase coal retirement beyond stated plans, although in some specific cases announced retirement dates have also been delayed.

At a high level we find that:

- Roughly 50 percent of total coal capacity online as of the end of 2022 plans to retire or repower using natural gas before 2032 and thus faces no requirement or else is regulated under the natural gas new source performance standard for greenhouse gas emissions.
- Roughly 37 percent of coal capacity online in 2022 has made no announcement about retirement or repowering before 2040 and thus is potentially subject to the CCS retrofit requirement included in EPA's proposal.
- The remaining 14 percent of coal-fired capacity may be subject to the gas cofiring standard if operated at a sufficiently high capacity factor and if retirements comport with existing announcements.
- The highest rate of announced retirements or repowerings is for capacity owned by investor-owned utilities, leaving only 27 percent of the investor-owned utilities' 2022 coal capacity online by 2040. This higher propensity to announce future plans may reflect their involvement in publicly vetted



integrated resource planning exercises that focus on investment needs for the future to meet both anticipated energy and reliability needs as well as state policy requirements.

- The top 10 companies in each of the four top ownership categories (IOU, independent power producers, municipals, and cooperatives) collectively account for nearly 73 percent of coal capacity in 2022 and roughly 72 percent of capacity remaining online in 2040. Retirement and repowering plans vary across categories of companies and across companies within each category.

This comment first describes the proposed BSER for existing coal capacity. The methodology used to put together our data follows. Next, we present the aggregate results for all coal plants and results for the top 10 coal-owning entities in each of four categories: investor-owned utilities (IOUs), independent power producers (IPPs), municipal utilities (munis) and rural cooperatives (coops). Then, we explore capacity and announced retirement and repowering plans by time frame by state. The final section offers concluding observations.

2. Existing Coal BSER Summary

This comment focuses on the proposed emissions standards for existing coal-fired generators. In constructing the standards, EPA created three categories of coal-fired generators as shown in Figure 1 below. The requirements for existing coal plants depend on when they will retire and whether or not the generators can commit to operating very infrequently. The requirements are as follows:

- For coal-fired generators that will retire before 2032, the emissions rate standard is the historic emissions rate.
- For coal-fired generators that will have a 20 percent or lower annual capacity factor and that will retire before 2035, the emissions rate standard is also the historic emissions rate.
- For coal-fired generators that plan to retire before 2040 and after 2032, the emissions rate standard is equivalent to what could be achieved if the plant co-fires with natural gas with 40 percent of the heat input coming from natural gas and the remainder from coal.
- For coal-fired generators that plan to remain operational in 2040 and beyond, the standard is that the generators retrofit with CCS that captures at least 90 percent of the CO₂ emissions from the operation.

For each of these source categories, the EPA proposes that compliance actions be taken in 2030, so both investments necessary to facilitate co-firing and the installation of CCS would need to occur by that date if compliance with the associated standard were to happen in lock step with the underlying technologies. Whatever the compliance strategy, the deadline for compliance is 2030 as shown in Figure 1.



Figure 1. Existing Coal Standards: Timing and Subcategories



Source: Carrie Jenks of the Harvard Environmental and Energy Law Program, see figure on [page 7](#).

When utilities chose to repower the facility to run on natural gas rather than retire or co-fire with gas, the facility moves from being an existing coal plant to a new gas plant and is thus subject to the New Source Performance Standard (NSPS) for gas generators. EPA’s proposal also includes a new NSPS for natural gas plants that depends on how the plants will be operated and their technology type.¹

The proposal defines three categories of operation: base load, intermediate, and peaking. For peaking plants (those that operate at no more than a 20 percent capacity factor), the standard is based on the carbon content of the fuel and can be met with existing natural gas supplies. For intermediate load plants (those that operate at above 20 percent capacity factor but below a site-specific value depending on design efficiency), the proposal requires hydrogen blending of 30 percent beginning in 2032. For baseload plants (where the relevant operating parameters are also defined specifically for each plant), the requirement between 2023 and 2032 depends on the size of the plant (how much fuel is used). These plants have two pathways for compliance, one involving hydrogen blending with an uptick in the hydrogen blending requirement taking effect in 2038 and the other involving installation of CCS capable of capturing 90 percent of the carbon emission by 2035. The proposed NSPS for new gas-fired generators will be relevant to coal-fired generators that plan to repower with natural gas in 2023 or later.

¹ [See here](#) for a concise description of the bases for the BSER for new gas generators.



3. Methodology

Our analysis of company announcements related to retirement and repowering dates for coal-fired generating units is based largely on the information in EPA’s NEEDs database as revised on February 14, 2023.² Starting from this data, we searched for updated information on retirement announcements, largely from the trade press or press releases related to information in integrated resource plans, where that information pointed to a single date.³ We also contacted several utilities and IPPs to ask them to review our information and received feedback from a few. We do not focus on company-level information here, but instead on announced plans for the full set of coal-fired generators online as of the end of 2022 by category of ownership type, including IOUs, IPPs, munis or generating companies that are owned by munis, coops, federally owned, state-owned, and other. We also look at the retirement and repowering plans for the 10 largest coal-firing unit owning companies in each of the major categories⁴ and what their announcements reveal about coal capacity remaining online (and fired by coal) after 2032 and then in 2040 and beyond to provide a sense of how these different types of coal plant owners are likely to be affected by the rules.

The information we have focuses on retirement and repowering plans, which are subject to change but, when taken as given, are possible to align with three of the four subcategories of existing coal generators that have specific BSER proposals. The subcategory we don’t address in this comment includes coal plants with capacity factors no greater than 20 percent on average in a year. Those generators face no additional requirements if they commit to retire by 2035. This comment excludes low-capacity-factor plants because we lack information on future operations. We segment the information we have into (1) retire or repower with gas before 2032, (2) retire or repower with gas between 2032 and 2039, inclusive, and (3) remain online in 2040.

4. Aggregate Results

Announced retirement plans reflected in NEEDs and augmented by our research suggest that close to half of the existing coal-fired capacity online at the end of 2022 will either be retired or repowered with natural gas by 2032. Most of that capacity will be retired, with only about 11 GW of the 96 GW scheduled to come off-line by 2032 being repowered with natural gas. The amount of capacity scheduled to retire or repower after 2032 is much smaller at nearly 27 GW, leaving about 73 GW of coal-fired capacity remaining in operation in 2040, which is roughly 37 percent of the 195 GW in operation at the end of 2022. Retirements and repowering by time buckets and categories of plant owners are detailed in Table 1.

² See [here](#) for the NEEDs database.

³ For cases where a generating unit is co-owned by multiple owners, we assign it to a single entity as assigned in the EPA NEEDs database.

⁴ Note that for both IOUs and IPPs, the companies that we evaluate are the holding companies that may own multiple IOUs such as Southern Company, Duke Energy, and Berkshire Hathaway, to pick a few examples. We categorize these holding companies as IOUs or IPPs based on information from EEI on membership and internet research on other companies.



Table 1. Capacity Retirement and Repower Announcements by Ownership Type

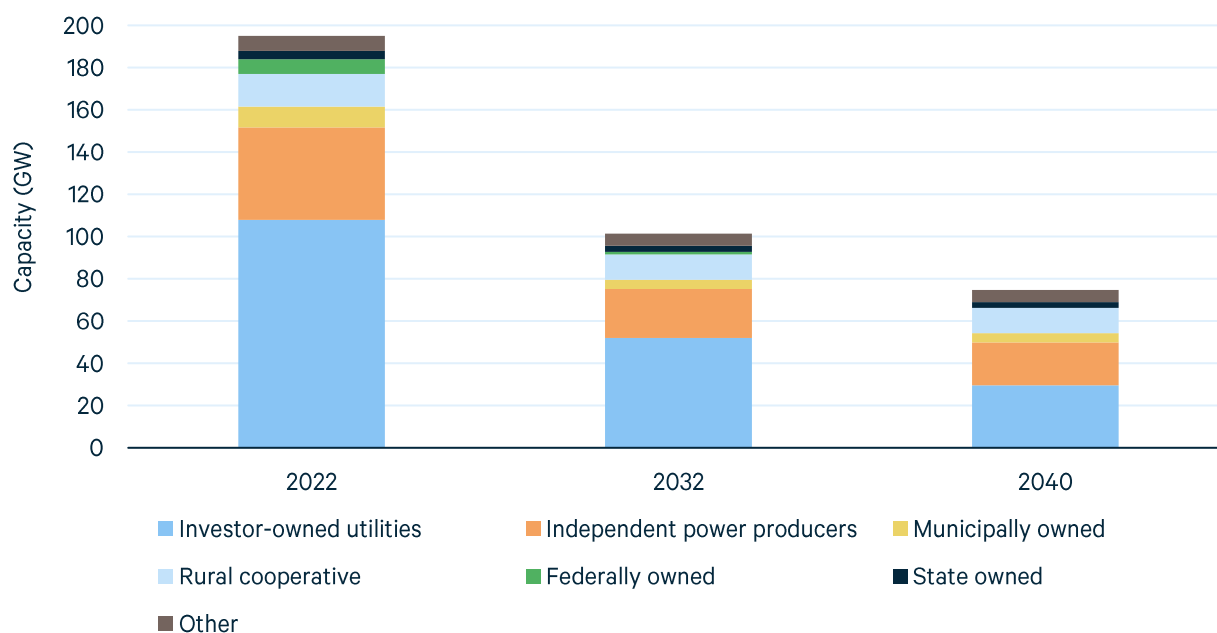
Type of utility	Total Coal Capacity at end of 2022 (MW)	Planned retirements before 2032 (MW)	Planned repowering by 2032 (MW)	Planned retirements between 2032 & 2039 (MW)	Planned repowering between 2032 & 2039 (MW)	Capacity remaining after 2040 (MW)
IOUs	107,854	47,617	8,287	19,636	2,694	28,763
IPPs	43,830	20,271	270	3,052	0	19,157
Municipally owned	9,794	4,165	1,251	0	0	4,378
Rural cooperative	15,542	3,600	0	0	0	11,942
Federally owned	6,920	5,714	0	1,206	0	0
State owned	3,972	1,130	0	0	0	2,842
Other	7,139	1,042	336	0	0	5,761
Total	195,051	84,954	10,666	23,894	2,694	72,844

As shown in Figure 2, the impacts of retirement and repowering announcements on surviving coal-fired capacity vary across categories of owners. All the currently existing federally owned coal-fired capacity, which is owned by the Tennessee Valley Authority, is scheduled to come offline before 2032. IOUs account for the lion’s share of the existing fleet of coal generators and their announced reductions in coal-fired capacity are disproportionately high, causing remaining IOU-owned coal-fired generation to fall to 48 percent of 2022 levels by 2032 and to 27 percent of 2022 levels by 2040. Municipal utilities, shown in yellow in Figure 2, have also announced both retirements and repowering prior to 2032, with less than 50 percent of the roughly 9.8 GW coal capacity currently operating expected to still be in operation and burning coal by 2040. IPPs, shown in orange in the figure, see a smaller drop in capacity by 2032, with hardly any announced changes in capacity beyond 2032. Rural cooperatives, shown in light blue, see the smallest amount of coal capacity loss of all the categories of owners, with roughly 77 percent of total existing coal capacity having no publicly announced plans to repower or retire prior to 2040.



Thus, while IPPs and rural cooperatives combined make up 30 percent of total coal capacity in 2022, if retirements and repowerings happen according to plan, they could make up as much as 43 percent of total coal capacity in 2040. Both rural cooperatives and IPPs may be less likely to make advanced announcements of plant retirements because they are less likely to be involved in regulatory public planning processes focused on meeting future electricity needs, such as utility integrated resource plan processes, or they may serve constituents who exert less pressure on the owners to move away from coal as a source of power supply, or both. Across all categories of ownership, most of the announced declines in capacity are happening in the next decade, with fewer announcements targeting retirement or repowering after 2032, which is not surprising given the greater uncertainties that affect planning further into the future.

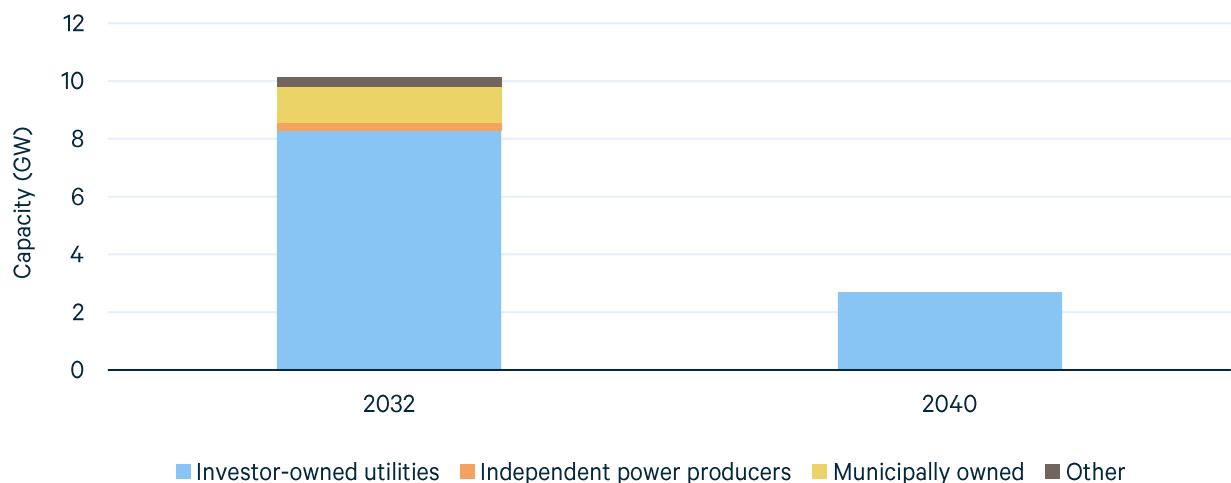
Figure 2. Ownership of Remaining Coal Capacity by Utility Type



Repowering of coal-fired capacity with natural gas is an option that gets little play in announcements related to moving away from using coal to generate electricity. As shown in Figure 3, only a little over 10 GWs of coal-fired capacity from 2022 are planned to be converted to natural gas by 2032. Most of that capacity is owned by IOUs with a smaller share owned by municipal utilities. No rural cooperatives have announced plans to repower their coal generators with natural gas. Slightly more than 2 GWs of additional capacity, all of which is owned by IOUs, are slated to be repowered with gas by 2040. Note that these comments do not discuss co-firing with natural gas, which is a compliance option allowed for generators that plan to retire after 2032 and before 2040. What we tend to see in practice is virtually no partial use of natural gas (mixed with coal) but instead a full conversion from coal to gas, accompanied by a change from a simple boiler to a combined cycle technology.



Figure 3: Announced Repowering Plans by Category of Owner



5. Results for the Coal Owing “Top 10’s”

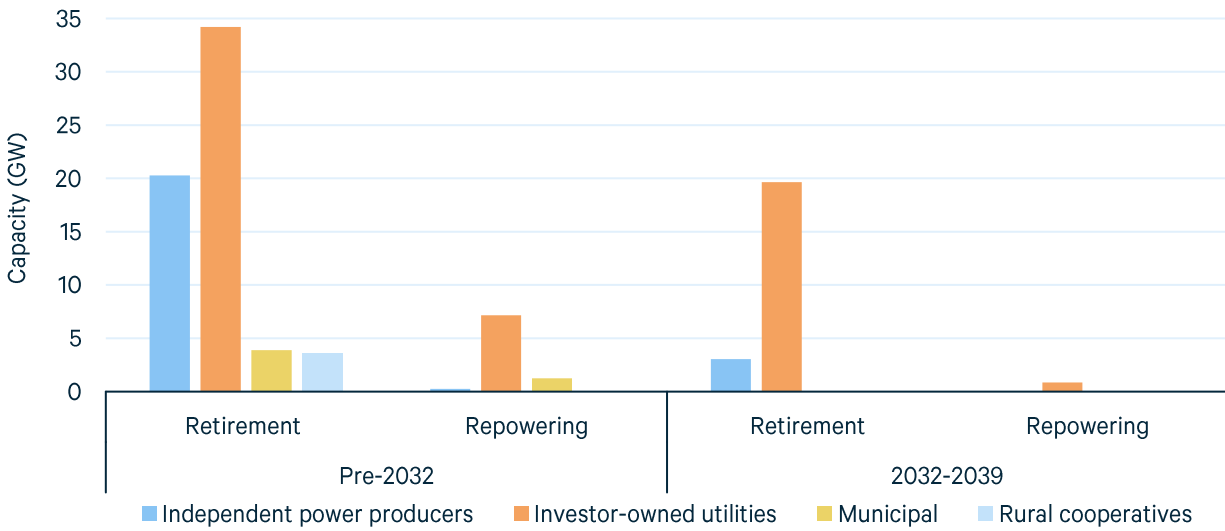
In addition to looking across the entire sector, we focus on outcomes at the top 10 entities that own coal-fired capacity within each of the four main categories of coal generator owners:

1. **IOUs** and, where relevant, associated holding companies (for example, all the coal capacity owned by utilities that are owned by Southern Company are classified as being owned by Southern Company; similar treatment applies to other IOUs owned by holding companies),
2. **IPPs**,
3. **Rural cooperatives** (including primarily, generation and transmission companies, such as Basin Electric Power Coop and Tri-State G&T Association, that are collectively owned by groups of rural cooperatives), and
4. **Municipal-owned utilities** (or generating companies, such as Prairie State Generating Company, that are collectively owned by a group of municipal utilities).

This collection of “top 10” entities owns 73 percent of total coal capacity online at the end of 2022 and 72 percent of the coal capacity with no announced retirement or repowering plans before 2040. The breakdown of capacity retirement and repowering by category in each of the two relevant time buckets is shown in Figure 4.

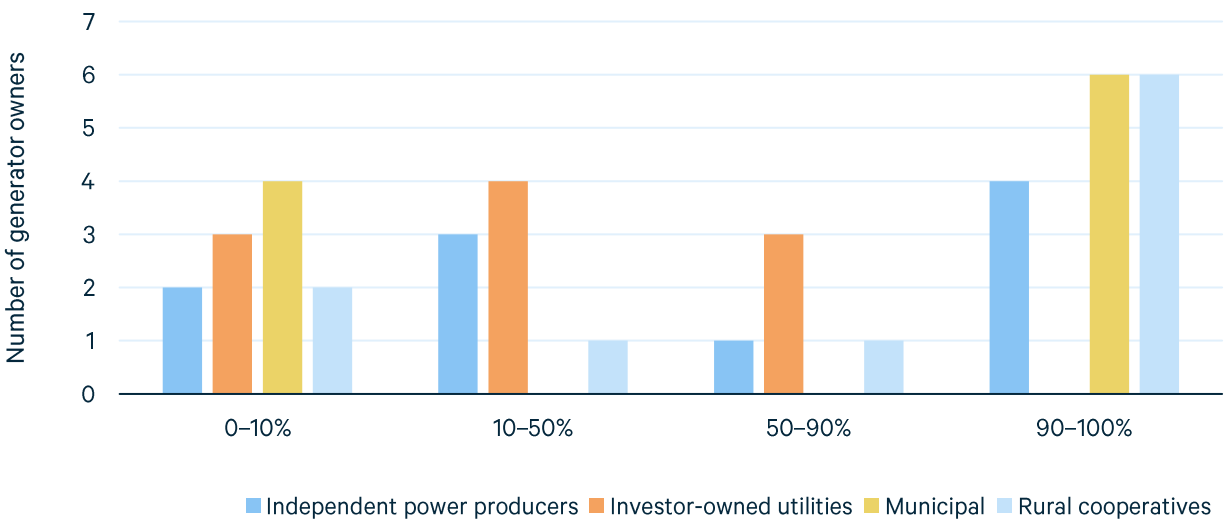


Figure 4. Retirement and Repowering Announcements in the Top 10 Companies by Category



In 2022 the top 10 coal-owning IOUs account for 75 percent of total IOU-owned capacity. By 2040 this collection of companies plans to retire or repower roughly 72 percent of its coal-fired capacity with the remaining capacity accounting for 80 percent of all remaining IOU-owned coal capacity. As shown in Figure 4, most of the planned reduction in coal-fired capacity among top IOUs is from retirement although there is some repowering planned before 2032. About half as much capacity as retires by 2032 is slated to retire between 2032 and 2039, perhaps reflecting the difficulty of announcing plans so far in advance. As shown in Figure 5, public announcements indicate that 7 of the 10 largest coal-owning IOUs will retain less than 50 percent of their current coal capacity by 2040.

Figure 5: Coal Capacity Survival Rate Analysis for Top Coal-Owning Entities by Type of Owner



The top 10 coal-owning IPPs account for 89 percent of total IPP-owned coal capacity in 2022, and by 2040, nearly 60 percent of the coal-fired capacity owned by these 10 companies plans to be retired or repowered. Most of the anticipated coal capacity retirements among the companies in this cohort happen by 2032 with a very small number of MWs of retirements scheduled to happen after 2032. Of the top 10 current coal-owning IPPs, only 2 have announced plans to no longer produce power with coal after 2040 and 4 have not announced plans to retire or repower any of their current coal-fired capacity. The other four plan to maintain only a portion of their coal-fired capacity.

The top 10 municipal utilities account for 88 percent of total municipally owned coal capacity in 2022 and 60 percent of coal-fired capacity currently owned by this collection of municipally owned utilities has no announced plans to retire by 2040. As shown in Figure 4, all the announced municipal retirements happen before 2032. These municipal utilities tend to own only one or two coal plants and, as individual entities, they fall into one extreme or the other, either retiring or repowering all their coal capacity by 2040 (true for 4 out of 10 munis) or retiring none (6 out of 10).

The top 10 coal owning cooperative utilities account for 90 percent of the cooperatively owned coal capacity in 2022 and 87 percent of cooperative owned coal capacity remaining online in 2040, so really the bulk of the coal capacity in this category. Between 2022 and 2040, only 25 percent of coal-fired capacity owned by these entities has plans to retire and all these retirements happen before 2032, as shown in Figure 4. Across the top 10 rural cooperative owned coal-fired generating companies, none have announced plans to repower their capacity, 2 have announced plans to retire all their coal-fired capacity, and 6 have announced no plans to retire any of their coal capacity. Two plan to retire only a portion of their coal capacity by 2040. This category of generators is the most impacted in terms of number of companies and amount of capacity within the category that is expected to remain online past the deadline for CCS installation in the proposed rule.

6. Coal Capacity and Retirement/Repowering Announcements by State

Currently, coal-fired generating units are present in all but 12 states in the US as shown in panel (a) of Figure 6, not accounting for industrial coal power plants which represented a total of 0.7 GW in 2022. The three biggest coal states are Texas (18.2 GW), Indiana (13.5 GW), and West Virginia (12.5 GW). Other states in the top 10 include Missouri (9.7 GW), North Carolina (9.3 GW), Kentucky (8.9 GW), Ohio (8.2 GW), Pennsylvania (8.0 GW), Illinois (6.4 GW), and Wyoming (6.3 GW). By 2032, as shown in panel (b) of Figure 6, most of these states are expected to reduce their coal capacity substantially, with Texas falling to 9.9 GW, Indiana falling to 5.7 GW, and seven (Colorado, Delaware, Michigan, Nevada, New Mexico, Tennessee, Washington) completely retiring all their coal-fired generators in that time frame.

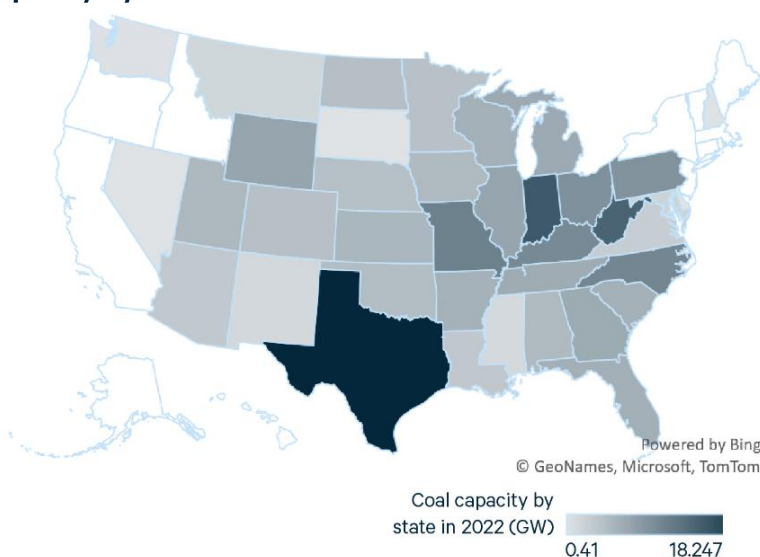
The states with the highest levels of announced coal capacity retirements or repowerings between 2022 and 2032 overlap substantially with those with the most coal-fired capacity. Panel (a) of Figure 7 shows that the largest amounts of announced coal-retirements are found in Texas, Indiana, and Pennsylvania, followed by Michigan, Tennessee, and North Carolina. States with substantial existing coal capacity that are expected to maintain most of it in 2032 include West Virginia and Missouri, which are respectively keeping 90 percent and 78 percent of their 2022 capacity online in 2032, as shown in panel (b) of Figure 6. North Dakota has roughly 3.9 GW of coal capacity in 2022, and there have been no announced retirement plans by 2032 for capacity in that state.



By 2040, if announced retirements come to fruition, North Carolina is also expected to join the ranks of the coal-free states. In addition, a substantial fraction of the remaining coal in West Virginia and Kansas is expected to retire, with respectively more than 80 percent and 87 percent of their 2022 coal capacity slated for retirement. And Georgia, Wisconsin, Missouri, Indiana, Kentucky, and Florida each see between 1 and 2 GW of additional coal retirement by 2040.

Thirty states are expected to have some remaining coal capacity in 2040, so, if currently announced plans remain unchanged, there could be coal-fired capacity in most states that would need to install CCS to comply with the proposed standards for existing coal plants. The states that would bear the biggest compliance obligation, again, under current plans, include Texas, Kentucky, Missouri, Ohio, and Indiana, all states *without* substantial decarbonization goals. With the exceptions of Tennessee, Nevada, Alaska, and Idaho, the states that announced plans suggest will no longer have coal-fired power generation producing electricity for the grid by 2040 overlap substantially with the membership of the US Climate Alliance.⁵ Other states within the Alliance could be reasonably expected to adopt policies down the line that lead to coal retirement beyond current plans. Those states which are members of the US Climate Alliance but have yet to see announced retirement plans for all their coal-fired generators before 2040 include Arizona, Wisconsin, Illinois, Louisiana, Maryland, and Minnesota. Of those Climate Alliance states with potential remaining coal capacity in 2040, Maryland is requiring 100 percent clean electricity by 2035; Minnesota has adopted a 100 percent clean electricity goal by 2040; and Illinois requires all coal plants to reach zero emissions by 2045 or retire. In addition, Wisconsin has a goal of achieving 100 percent carbon-free electricity by 2050. Given these goals and timelines, it may be reasonable to expect accelerated retirement plans for coal generation within their borders, although decarbonization policies in some states could potentially include retrofits of existing capacity with CCS for strong performing coal plants, especially given the subsidies provided in the Inflation Reduction Act.

Figure 6a. Coal Capacity by State in 2022



Note: The states shaded in white have no online coal capacity.

⁵ See a [list of current members here](#). See here for a [climate policy database](#) that outlines all climate-related policies for Climate Alliance states.



Figure 6b. Coal Capacity by State in 2032

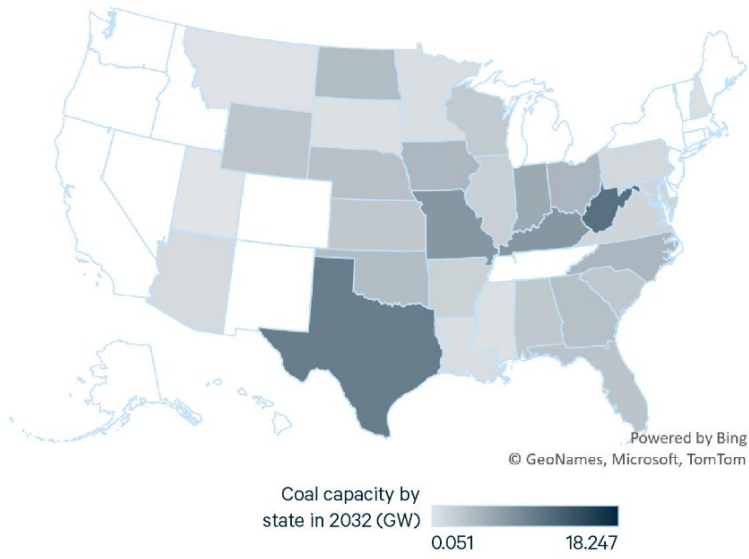
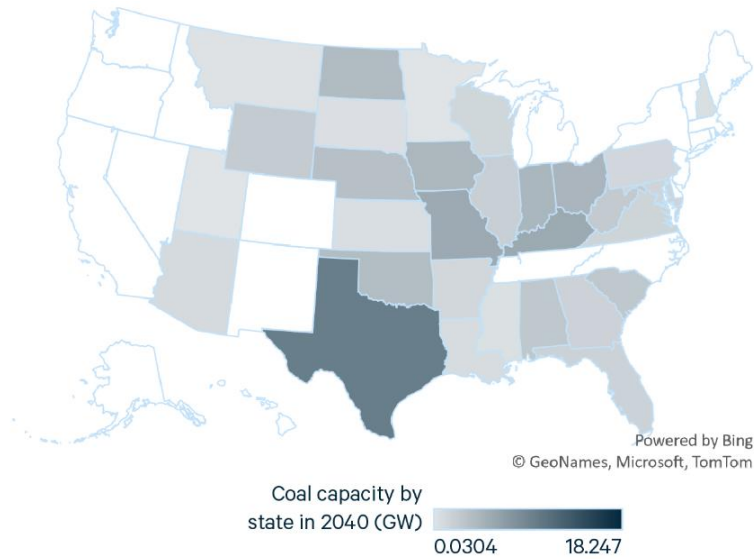


Figure 6c. Coal Capacity by State in 2040



Note: These graphs show the online coal capacity by state in 2022, 2032, and 2040 not including coal power plants owned by industry. The states shaded in white have no online coal capacity.



Figure 7a. Announced Coal Generator Retirements and Repowerings by 2032 by State

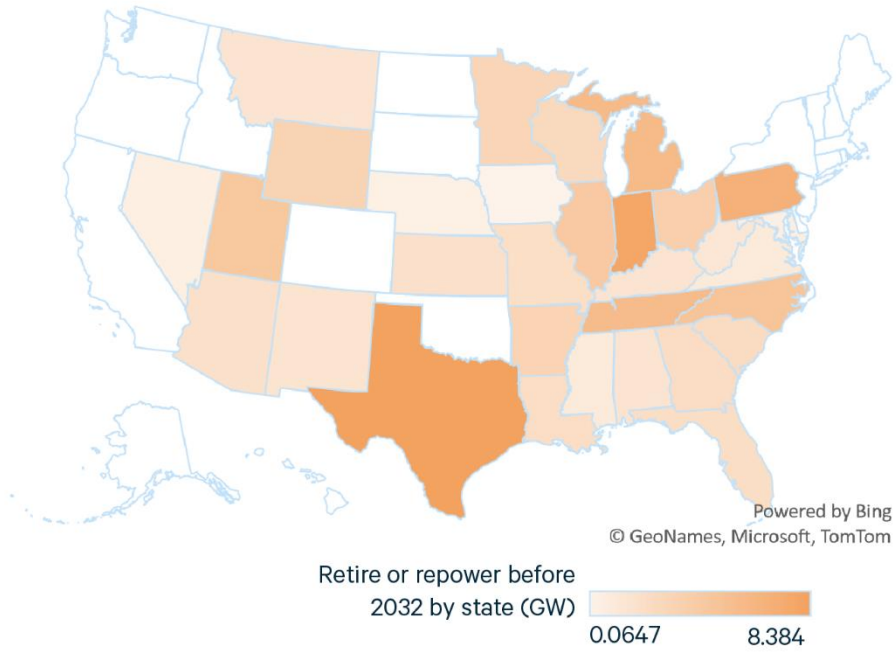
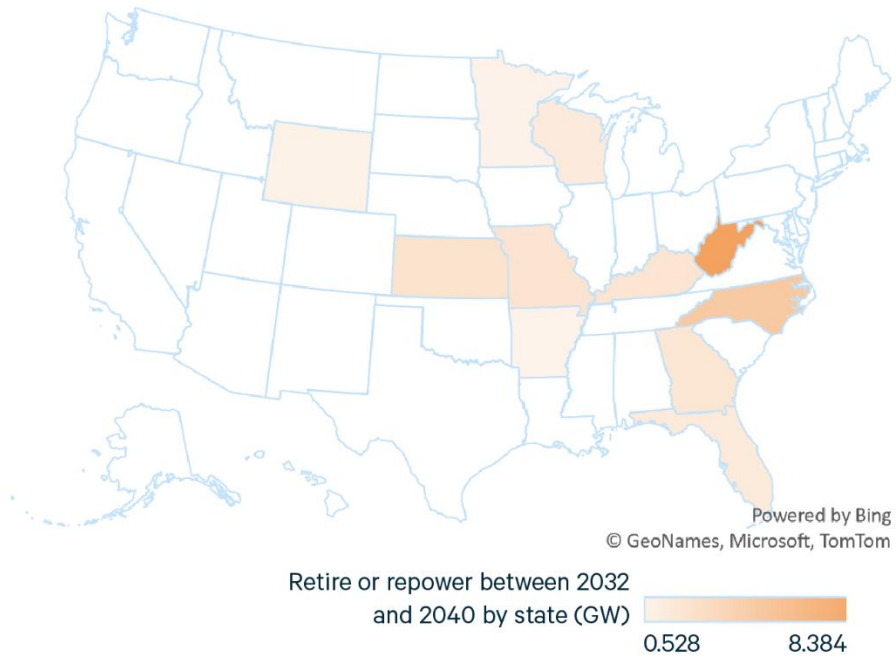


Figure 7b. Announced Coal Generator Retirements and Repowerings between 2032 and 2040 by State



Notes: The states shaded in white are planning no repowerings nor retirements for the indicated time periods.



7. Conclusion

This comment focuses on utility announcements regarding coal generator retirements and repowering and what they suggest about the number of generators that are likely to be required to either co-fire with natural gas or install CCS to comply with EPA's proposed rules. Taken at face value, these numbers suggest that roughly 50 percent of existing coal-fired generating capacity will retire or repower with natural gas in the next decade and thus face no requirement for co-firing or other carbon controls under the proposed emissions standard for existing coal plants. Fourteen percent of capacity is planning to retire or repower between 2032 and 2039 and, thus, is potentially subject to EPA's gas co-firing standard for existing power plants, although that might be avoidable if that capacity is operated infrequently and retires before 2035. Further, these collective announcements include no plan to retire or repower 37 percent of existing coal capacity by 2040, which would be required to install CCS under the proposed rules.

Retirement announcements are not necessarily commitments and can often change. Research has shown that actual coal plant retirements tend to happen more quickly than reflected in advanced announcements of future plans for numerous reasons.⁶ EPA's own modeling analysis of its proposed rule suggests further coal retirements will be prompted by the proposed rule as some coal-fired generators won't find it profitable to make an investment in CCS given anticipated electricity market conditions (which affect prices) and future unit operations (which affect revenues). So, there is no question that actual retirement or repowering dates for coal generators will vary from what is reflected in the data presented here. However, this analysis does give a broad picture of what classes of companies and what states are likely most impacted by the proposed rules for existing coal facilities.

⁶ See Figure 5 in Celibi, Metin, Long Lam, Jadon Grove and Natalie Northrup, A Review of Coal-Fired Electricity Generation in the US, The Brattle Group, prepared for the Center of Applied Environmental Law and Policy, April 27, 2023, <https://www.brattle.com/wp-content/uploads/2023/04/A-Review-of-Coal-Fired-Electricity-Generation-in-the-U.S..pdf>.

