



Analysis of Facilities Impacted by EPA’s Proposed “Power Sector GHG Rule” and Co-Location with Environmental Justice Communities

**Research Brief
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Carbon capture and storage (CCS) or carbon capture, utilization, and storage (CCUS) refer to processes where CO₂ is captured and separated at the point of combustion and transported for use or storage. In its proposed *New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule* (hereinafter “EPA proposed rule”), the US Environmental Protection Agency (EPA) maintains that CCS can be used to abate the CO₂ emissions of the power sector when built at a coal-fired and natural gas power plant or in association with the fossil fuel-based production of hydrogen as an alternative fuel source.¹ However, representatives of environmental justice (EJ) communities—low-income communities and communities of color who live near polluting infrastructure, including fossil fuel-fired power plants—have voiced deep concerns about the impacts of impending carbon capture operations in their areas and how such impacts will compound the social and environmental burdens they already face.² Given that EPA’s proposed rule lacks adequate environmental justice analysis of the facilities implicated by it,³ this research brief seeks to fill a gap by offering an illustrative co-location analysis of these facilities and their co-location with EJ communities.

¹ US Environmental Protection Agency, *Proposed Rule on New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule*, Federal Register Vol. 88, No. 99 (May 23, 2023).

² Wright, Beverly et al., *Statement by Environmental Justice Organizations on the National Symposium on Climate Justice & Carbon Management, June 1-4, 2023* (June 2023), <https://www.dscej.org/the-latest/statement-by-environmental-justice-organizations-on-the-national-symposium-on-climate-justice-carbon-management>. See also, White House Environmental Justice Advisory Council, *Recommendations of the Carbon Management Workgroup* (November 17, 2023), https://www.epa.gov/system/files/documents/2023-11/final-carbon-management-recommendations-report_11.17.2023_508.pdf.

³ The Tishman Environment and Design Center at The New School, the Center for the Urban Environment of the John S. Watson Institute for Urban Policy and Research at Kean University, the New Jersey Environmental Justice Alliance, and the Center for Earth, Energy, and Democracy et al., *Submitted Comments Re: New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule* (August 8, 2023), <https://www.regulations.gov/comment/EPA-HQ-OAR-2023-0072-0527>.

I. Methods

Coal facilities

A dataset of electric generating units (EGUs) was obtained by accessing and downloading EPA's eGrid 2021 database in August 2023. The eGrid dataset included data on fuel type, nameplate capacity, and capacity factor of each EGU, among other variables. Applying the EPA proposed rule's criterion for fossil fuel-fired steam generating units (*see, e.g.*, pages 33341 and 33359-33360), we filtered for steam generating units with greater than 25 MW nameplate capacity.⁴ We included units regardless of their retirement date.⁵

A plant-level dataset was also obtained from eGrid 2021 at the same time, and we aggregated the selected coal EGUs to the plant level by matching to that dataset, to derive a final dataset of plants with at least one coal EGU implicated by the EPA proposed rule. The plant level dataset from eGrid also contained location information (latitude and longitude), which was used for spatial analysis and mapping.

Natural gas facilities

We obtained a database of natural gas EGUs from the Natural Resources Defense Council (NRDC) in August 2023. This dataset provided location information (latitude and longitude) and both the 2022 capacity factor for each EGU, as well as a projected 2035 capacity factor using S&P Global Market Intelligence's PowerForecast model. In addition to nameplate capacity, each EGU also had an apportioned capacity. EPA's proposed apportionment method for combined cycle turbines⁶ is necessary for combined cycle turbines to determine whether the capacities of the combustion turbines effectively exceed the threshold of 300 MW proposed by the rule.

The EPA's proposed rule implicates natural gas EGUs that have a capacity greater than 300 MW and a capacity factor (CF) greater than 0.5 (*see, e.g.*, pages 33245-33246 and 33362). From the NRDC dataset, we derived two lists of natural gas EGUs implicated by the proposed rule by applying those criteria to the 2022 CFs and the projected 2035 CFs. For each list of EGUs, EGUs were aggregated to the plant level using the list themselves.

Datasets were cleaned, filtered, analyzed and aggregated in R (code available upon request).

⁴ We excluded oil or gas-fired steam generating units because such units did not have a requirement to run CCS or co-fire with hydrogen. The steam generating units that were included were those that used the following fuel types: bituminous coal (BIT), lignite coal (LIG), refined coal (RC), subbituminous coal (SUB), and waste coal (WC).

⁵ Retirement date was not taken into consideration because of concerns about the reliability of these dates.

⁶ Guidance and examples on how to apportion some amount of the capacity of the steam turbine to the capacity of all of the combustion turbines that the steam turbine is associated with is provided in US Environmental Protection Agency, *Memorandum to Docket EPA-HQ-OAR-2023-0072. Applicability of Emission Guidelines to Existing Stationary Combustion Turbines - FAQs* (June 2023), <https://www.regulations.gov/document/EPA-HQ-OAR-2023-0072-0143>.

Spatial analysis of co-location with EJ communities

We next determined whether each coal and natural gas plant implicated by the EPA proposed rule was located within three miles of an EJ community. The distance of three miles was chosen following the literature and US Environmental Protection Agency's own Power Plants and Neighboring Communities Mapping Tool.⁷ EJ communities were considered to be those census block groups:

- Whose percentage of people of color is equal to or greater than the state's overall percentage people of color;
- Whose percentage of population living at or below twice the federal poverty level is equal to or greater than the state's percentage of population living at or below twice the federal poverty level.

These race and income-based criteria essentially track the Equitable and Just National Climate Forum (EJNCF)'s recommended criteria for defining EJ communities for purposes of targeting power sector emissions reductions.⁸ The EJNCF is a group of national environmental organizations and environmental justice organizations dedicated to advancing a national climate and environmental policy agenda that centers on environmental justice. As articulated by EJNCF, using race and income-based criteria to define EJ communities is consistent with scientific literature showing those two factors to be key predictors of environmental inequality, as well as with federal and state government policy guidance on how to identify EJ areas.⁹

The dataset of census block groups was obtained from EJSCREEN in July 2023, and the above criteria were applied to the demographic indicators contained in that dataset.¹⁰ Data cleaning and application of the criteria were done in R. The dataset of census block groups was joined to a shapefile of census block group boundaries in QGIS.¹¹ Spatial analysis and mapping were performed in QGIS.¹²

⁷ The EPA notes: "A three-mile radius is consistent with environmental justice literature and studies, including the EJ Screening Report for the Clean Power Plan. These key demographics and information about nearby power plants may help identify a community's potential vulnerability to environmental concerns." "Power Plants and Neighboring Communities," U.S. EPA, last updated May 11, 2023, <https://www.epa.gov/power-sector/power-plants-and-neighboring-communities>, citing to "Clean Power Plan, EJ Screening Report for the Clean Power Plan," U.S. EPA, accessed July 31, 2023, https://19january2017snapshot.epa.gov/cleanpowerplan/ej-screening-report-clean-power-plan_.html.

⁸ Equitable and Just National Climate Platform's Policy Development Workgroup, "Approaches to Defining Environmental Justice Community for Mandatory Emissions Reduction Policy.pdf," September 2021.

⁹ Ibid. See also Baptista, Ana et al., Defining Environmental Justice Communities for Environmental Justice Policies, April 2021, https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/6492fff8f3f9ed1c7997e02d/1687355384264/Defining+Environmental+Justice+Communities+for+EJ+Policies_Final+_June2021.pdf.

¹⁰ These criteria were applied to the demographic indicators contained in the most recent EJSCREEN national dataset of census block groups, available at <https://www.epa.gov/ejscreen/download-ejscreen-data> and downloaded July 10, 2023. The demographic indicators in this vintage of EJSCREEN are from the American Community Survey, 5-year estimates for 2017-2021. See <https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf>.

¹¹ The vintage of EJSCREEN that we used incorporated 2017-2021 American Community Survey 5-year estimates, which corresponds to census geography boundaries for 2021. Thus, we obtained a shapefile of CBG boundaries for 2021 here: <https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary.2021.html#list-tab-1883739534>

¹² The spatial analysis was performed in QGIS using its buffer and spatial join tools.

Analysis of social and environmental burden in EJ communities near implicated facilities

Finally, we examined the social and environmental burden in those EJ communities located within three miles of an implicated plant, relying on indicators of burden already contained in the EJSCREEN dataset. Specifically, EJSCREEN contains “supplemental indices,” which combine a five-factor demographic index (low income, unemployment, limited English, less than high school education, and low life expectancy) with each one of 13 environmental indicators (PM_{2.5}, ozone, diesel, air toxics cancer risk, air toxics respiratory hazard index, toxic releases to air, traffic proximity, lead paint, proximity to a Risk Management Plan facility, proximity to a facility managing hazardous waste, Superfund proximity, underground storage tanks, and wastewater discharge).¹³ For each census block group, EJSCREEN has an indicator which indicates the number of supplemental indices exceeding the 80th percentile relative to the rest of the country.

We tallied the number of environmental justice census block groups within three miles of an implicated facility that had at least one supplemental index exceeding the 80th percentile. This analysis was performed in QGIS and Excel.¹⁴

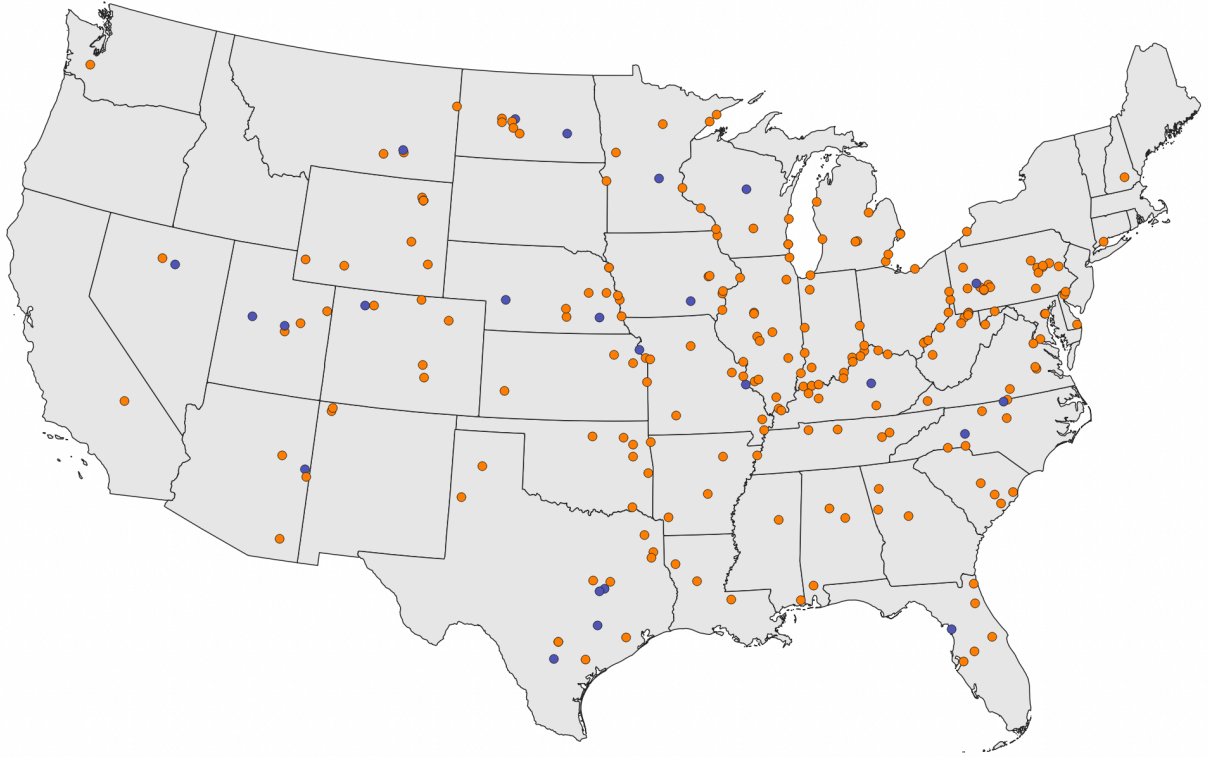
II. Results

Following these methods, we find that there are 243 plants that have at least one coal-fired EGU implicated by the proposed EPA rule, and 219 of them (or 90%) are located within 3 miles of an EJ community. (See Figure 1.) Of the census block groups falling in whole or partially within the 3-mile fenceline areas of an implicated coal plant, 1,698 meet the criteria for being considered an EJ census block group, while 1,041 do not. These 1,698 EJ census block groups are particularly vulnerable. A majority of them (74%) already face heightened burden, as indicated by having one or more supplemental EJSCREEN indices exceeding the 80th percentile.

Figure 1. Map of coal plants affected by EPA’s proposed rule and co-location with EJ communities, orange = EJ, blue = not EJ.

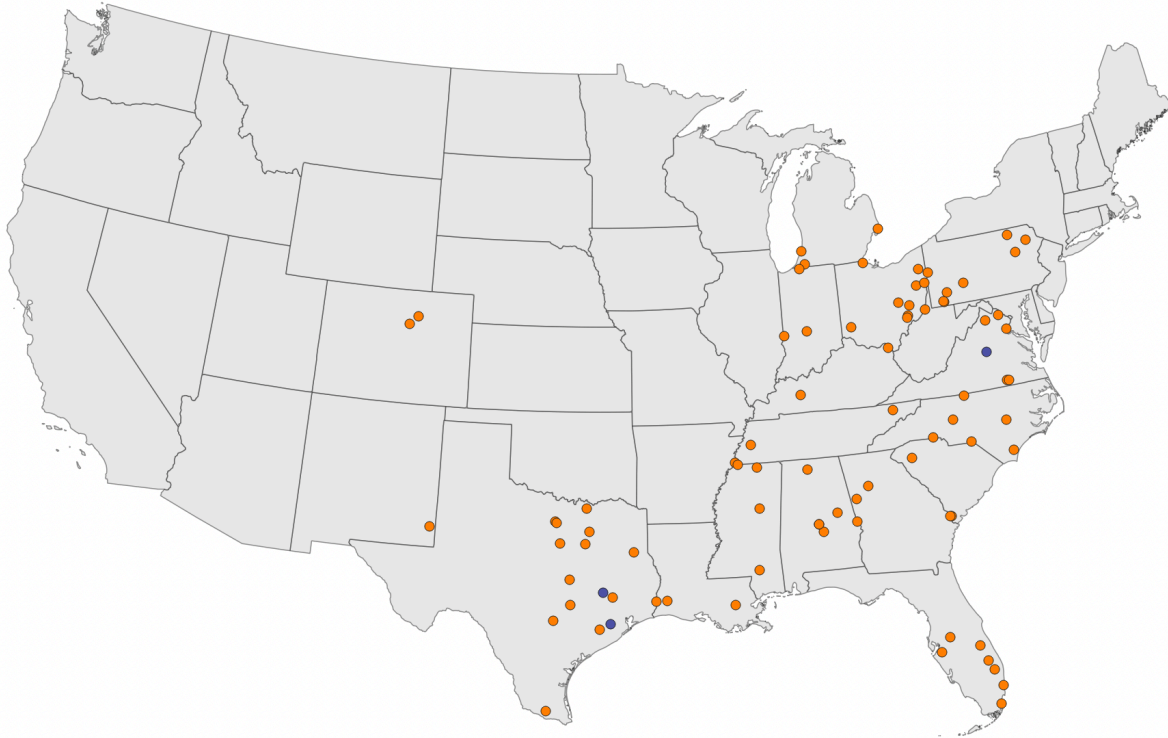
¹³ “EJ and Supplemental Indexes in EJScreen,” US Environmental Protection Agency, June 26, 2023, <https://www.epa.gov/ejscreen/ej-and-supplemental-indexes-ejscreen>.

¹⁴ In order to ensure that census block groups located near more than one implicated facility were not double-counted, it was necessary to merge three mile buffers around the implicated facilities, intersect that with the EJ census blockgroups, and then tally the number of block groups with one or more supplemental index exceeding the 80th percentile.



The picture is similar for plants having one or more natural gas EGUs affected by EPA's proposed rule. Our initial analysis was done using the EPA criteria applied to the EGUs' projected 2035 capacity factors. As shown in Figure 2, we see that there are 84 such plants, 81 of which (or 96%) are located within 3 miles of an EJ community. Of the census block groups falling in whole or partly within the 3-mile fenceline areas of these plants, 705 are considered EJ, while 373 are not. Again, these EJ communities are particularly vulnerable. The majority (79%) of these fenceline EJ census block groups already face heightened burden, with one or more of the EJSCREEN supplemental indices exceeding the 80th percentile.

Figure 2. Map of natural gas plants affected by EPA's proposed rule (projected 2035 CFs) and co-location with EJ communities, orange = EJ, blue = not EJ.



As shown in Figure 2, the projected 2035 capacity factors indicate that many natural gas EGUs will be running less by 2035. Concerned with the reliability of this forecast, we conducted additional analysis based on the 2022 capacity factors. We found that there are 153 plants with at least one natural gas EGU meeting EPA’s proposed criteria, and 148 of them (or 97%) are located within 3 miles of an EJ community, as shown in Figure 3. Within the 3-mile fenceline areas of the plants, there are 2,666 census block groups that we considered to be EJ block groups. The vast majority of them already face heightened burden, as 82% of them have one or more EJSCREEN supplemental indices that exceed the 80th percentile.

Figure 3. Map of natural gas plants affected by EPA’s proposed rule (2022 CFs) and co-location with EJ communities, orange = EJ, blue = not EJ.

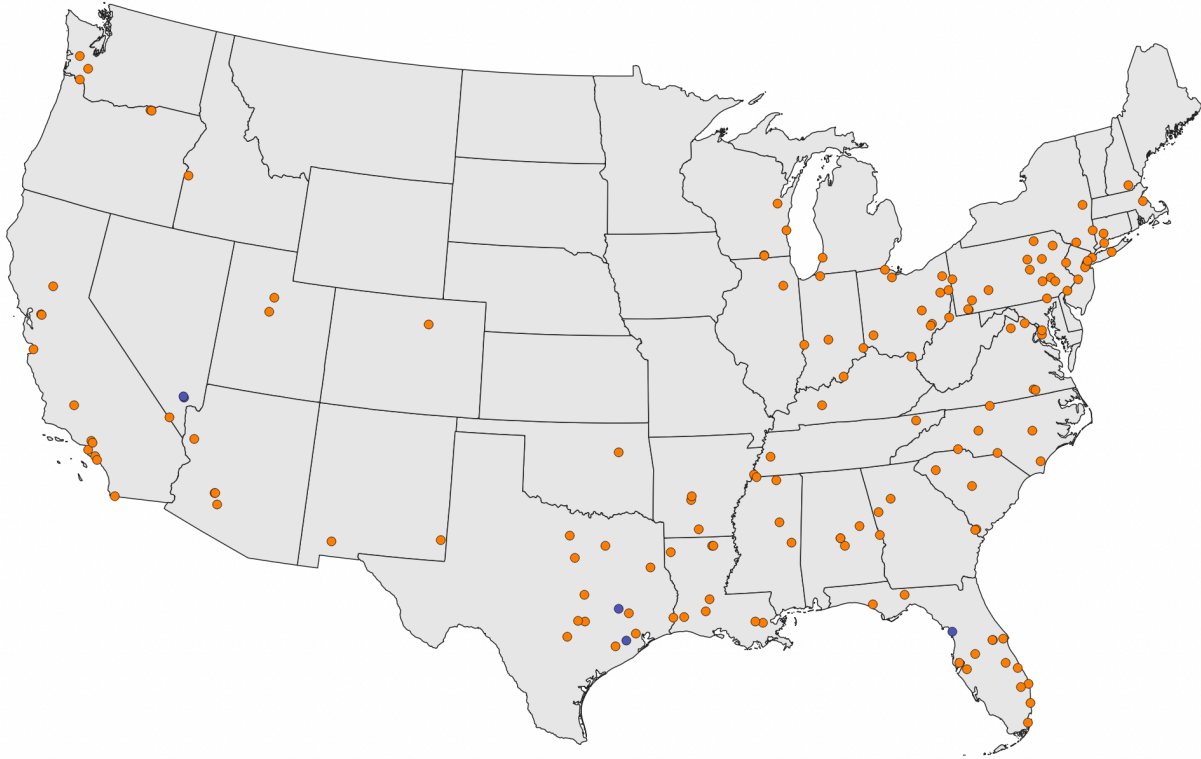


Table 1 below summarizes the results of the co-location analysis, revealing that for each set of facilities analyzed, no fewer than 90% are located within three miles of an EJ community.

Table 1. Facilities implicated by EPA’s proposed rule and co-location with EJ communities

Plants with at least one EGU of this type implicated by the EPA’s proposed rule	Coal	Natural Gas (2035 CFs)	Natural Gas (2022 CFs)
Total	243	84	153
Number within 3 miles of an EJ community (%)	219 (90%)	81 (96%)	148 (97%)

Table 2 summarizes the examination of burden in EJ census block groups that are located within 3 miles of a plant implicated by the EPA proposed rule.

Table 2. EJ census block groups near plants implicated by the EPA proposed rule

EJ CBGs near a plant with at least one EGU of this type implicated by	Coal	Natural Gas (2035 CFs)	Natural Gas (2022 CFs)
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the EPA’s proposed rule			
Total number of EJ CBGs	1,698	705	2,666
Number with heightened burden (%)	1,259 (74%)	557 (79%)	2,178 (82%)

III. Takeaways

These results illustrate both the importance and feasibility of conducting analysis that can begin to elucidate the impacts that EJ communities will face from CCS buildout in the US power sector. Most plants that are affected by the EPA’s proposed rule are near EJ communities. These results align with previous research that has shown that fossil fuel power plants are disproportionately sited in EJ communities.¹⁵ Moreover, the vast majority of the EJ communities living close to plants implicated by the rule already face heightened burden.

Additionally, our results show that caution is needed when projecting that natural gas EGUs will run less by 2035, as making an erroneous forecast will greatly underestimate the number of communities affected. However, our general conclusions, whether using the forecasted 2035 CFs or the 2022 CFs, remain the same.

¹⁵ Delet-Barreto, Juan and Andrew A. Rosenberg, "Environmental justice and power plant emissions in the Regional Greenhouse Gas Initiative states," *PLoS ONE* 17, no. 7 (2022): e0271026; Diana, Bridget, Michael Ash, and James K. Boyce, *Green for All: Integrating Air Quality and Environmental Justice into the Clean Energy Transition* (Political Economy Research Institute, UMass Amherst, March 9, 2021), <https://peri.umass.edu/images/GreenForAll.pdf>; Cushing, Lara J. et al., "Historical red-lining is associated with fossil fuel power plant siting and present-day inequalities in air pollutant emissions," *Nature Energy* 8, no. 1 (2023): 52-61.