



Analysis of Proposed Carbon Capture Projects in the US Power Sector and Co-Location with Environmental Justice Communities

**Research Brief
September 2023**

Yukyan Lam, Jennifer Ventrella, Juan David Rodriguez Castellanos, Ana Baptista

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. Proponents of CCS maintain that it 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 There has been a lack of adequate environmental justice analysis of proposed CCS buildout in the power sector. The results we present here are an illustration of just how feasible and important it is to conduct an analysis of the co-location of proposed CCS facilities in 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); US Department of Energy, *Pathways to Commercial Liftoff: Clean Hydrogen* (March 2023) <https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf>; US Department of Energy, *Pathways to Commercial Liftoff: Carbon Management* (April 2023) https://liftoff.energy.gov/wp-content/uploads/2023/04/20230424-Liftoff-Carbon-Management-vPUB_update.pdf.

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>; 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://ceed.org/wp-content/uploads/2023/08/EPA-New-Source-GHG-Comments-Tishman_CEED_NJEJA_Watson.pdf.

Methods

To begin, we compiled a list of planned CCS projects in the US power sector from the following CCS databases: 1) DOE Energy Technology Laboratory (NETL),³ 2) Global CCS Institute,⁴ 3) International Energy Agency (IEA),⁵ and 4) Clean Air Task Force (CATF).⁶ Two additional facilities were included based on information provided by participants at the National Symposium on Climate Justice and Carbon Management at the Wingspread Center in Wisconsin from June 1-4, 2023. The final list of 35 planned facilities appears at the end of this brief on page 5.

We next determined whether each proposed project was located within three miles of an EJ community.⁷ The distance of three miles was chosen following the literature and US Environmental Protection Agency's own Power Plants and Neighboring Communities Mapping Tool.⁸ 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.⁹

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.¹⁰ 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

³ <https://netl.doe.gov/carbon-management/carbon-storage/worldwide-ccs-database>, accessed April 11, 2023.

⁴ <https://co2re.co/FacilityData>, accessed May 2, 2023.

⁵ <https://www.iea.org/data-and-statistics/data-product/ccus-projects-database>, accessed May 2, 2023.

⁶ <https://www.catf.us/ccstableus/>, accessed May 2, 2023.

⁷ Latitude and longitude coordinates were provided for projects appearing in the DOE database. For projects not included in the DOE database, we estimated their location based on publicly available data about the power plant at which they would be installed or at an approximate location. The spatial analysis was performed in ArcGIS using its buffer and spatial join tools, and in QGIS using its buffer and spatial join tools, with the same result. See "Spatial Join," ArcGIS, accessed September 1, 2023, <https://desktop.arcgis.com/en/arcmap/latest/tools/analysis-toolbox/spatial-join.htm>. The tool used in QGIS was the 'Join attributes by location (summary)' tool.

⁸ 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>.

⁹ 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>.

¹⁰ Equitable and Just National Climate Platform's Policy Development Workgroup, "Approaches to Defining Environmental Justice Community for Mandatory Emissions Reduction Policy.pdf," September 2021.

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.¹¹

Finally, to broaden the analysis beyond EJ communities defined by race and income, we examined whether the proposed projects were located within three miles¹² of a census block group already facing a heightened environmental stressor, as indicated by whether the block group exceeds the 80th percentile (based on a nationwide comparison) for one or more US EPA EJSCREEN supplemental indices. The EJSCREEN supplemental indices 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 (PM2.5, 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

Results

Following these methods, we find that of the planned CCS projects, 33 of the 35 (94.3%) are located within 3 miles of an EJ community, and only 2 of them (or 5.7%) are not. (See Table 1 and Figure 1 below.) Moreover, 29 of the 35 proposed CCS projects (82.9%) are located within 3 miles of a census block group that has at least one heightened environmental stressor, as indicated by EJSCREEN's supplemental indices.

These results illustrate both the importance and feasibility of conducting analysis that can begin to elucidate the disproportionate impacts that EJ communities will face from CCS buildout in the US power sector. Our findings align with previous research that has shown that fossil fuel power plants are disproportionately sited in EJ communities.¹⁴

¹¹ 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.

¹² "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

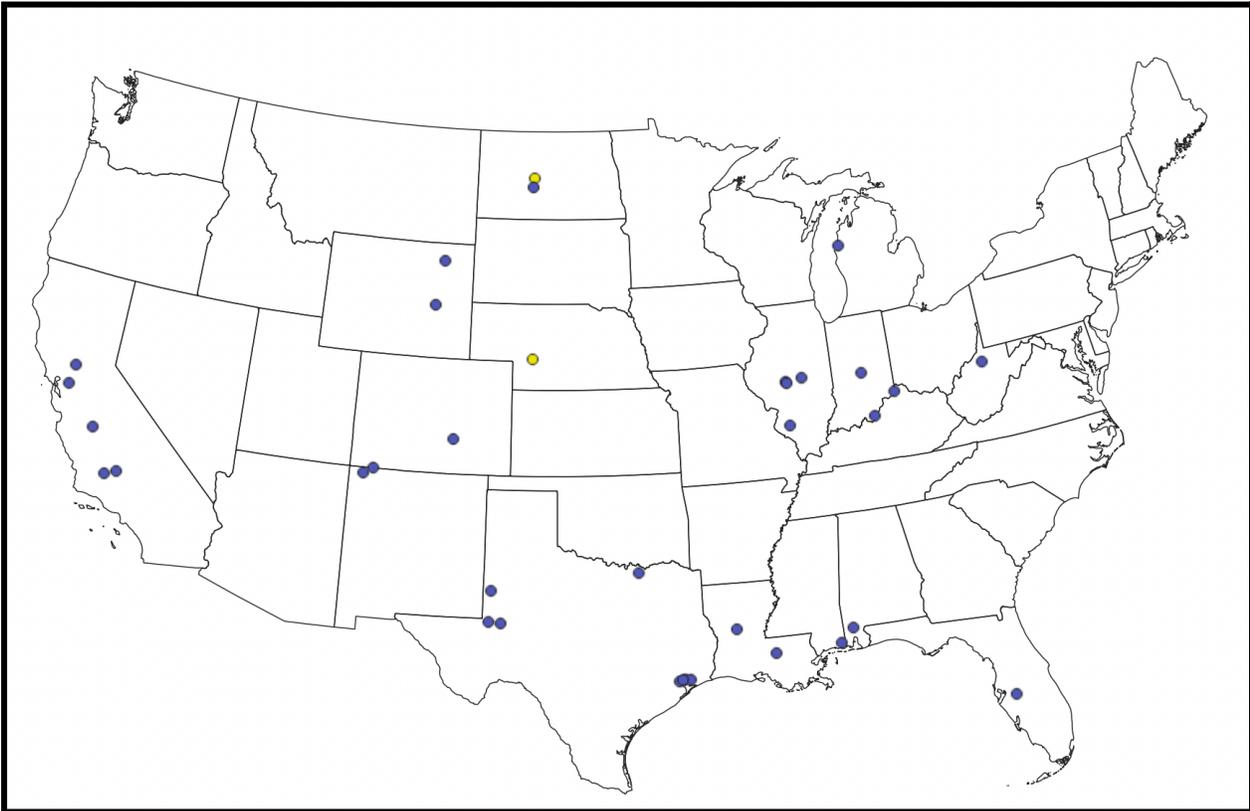
¹³ "EJ and Supplemental Indexes in EJScreen," US Environmental Protection Agency, June 26, 2023, <https://www.epa.gov/ejscreen/ej-and-supplemental-indexes-ejscreen>.

¹⁴ Declet-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.

Table 1. EJ analysis of planned CCS projects

	Number of projects	% of projects
EJ	33	94.3
Not EJ	2	5.7
Total	35	

Figure 1. Map of planned CCS projects in the US power generation sector*



*Blue = located within 3 miles of an EJ community, yellow = not located within 3 miles of an EJ community

List of Planned CCS Facilities

- Broadwing Clean Energy Complex / Illinois Allam-Fetvedt cycle power plant (IL)
- CalCapture CCS+ Elk Hills power plant (CA)
- Calpine Baytown Energy Center (TX)
- Calpine Deer Park Energy Center (TX)
- Calpine Delta Energy Center (CA)
- Carbon Capture Retrofit at Sherman Generating Station (TX)
- CO2 capture at Coal Creek** (ND)
- CO2 capture at Duke Energy's East Bend Station (KY)
- Competitive Power Ventures CCGT CPV Shay Energy Center (WV)
- Coyote Clean Power Project (CO)
- Dry Fork Integrated Commercial CCS (WY)
- Fidelis Project Cyclus Baton Rouge (LA)
- Gerald Gentleman Station Carbon Capture** (NE)
- James M Barry Electric Generating Plant CCUS (AL)
- Kern River Eastridge cogeneration plant San Joaquin Valley (CA)
- LG&E Cane Run NGCC CR7 (KY)
- Mendota BECCS power project (Clean Energy Systems Carbon Negative Energy Plant - Central Valley) (CA)
- Mustang Station Carbon Capture (TX)
- Net Power Odessa gas plant (TX)
- Plant Daniel Carbon Capture (MS)
- Prairie State Generating Station Carbon Capture (IL)
- Project Tundra at Milton R Young Station (ND)
- Tampa Electric Company Polk Power station NGCC (FL)
- The ZEROS project Chambers & Liberty County (Jefferson) (TX)
- Clean Energy Systems Delano Bioenergy with Carbon Removal & Storage (BiCRS) Plant - Madera County (CA)
- Dave Johnston Plant Carbon Capture (WY)
- Diamond Vault CCS (LA)
- San Juan Generating Station Carbon Capture (NM)
- CWLP Carbon Capture Project (IL)
- Quail Run Carbon Capture Project (TX)
- Covanta (IN)
- Baytown Low Carbon Hydrogen Project (TX)
- Filer City Biomass CCS Project (MI)
- CarbonSAFE Eos (CO)
- Illinois Basin West CarbonSAFE (IL)

** Facilities that are not within 3 miles of an EJ community