August 8, 2023

Attn: Docket ID No. EPA-HQ-OAR-2023-0072

U.S. Environmental Protection Agency
1200 Pennsylvania Avenue N.W.
Washington, D.C. 20460

Submitted via email to a-and-r-docket@epa.gov and at http://www.regulations.gov

Re: New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel–Fired Electric Generating Units; Emissions Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel–Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule

Introduction

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, along with the co-signed environmental justice, allied organizations, and individuals, submit the following comments in reference to EPA's proposed "New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel–Fired Electric Generating Units; Emissions Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel–Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule."

Environmental justice (EJ) communities are host to a wide range of polluting industries, including a majority of the nation's fossil fuel–derived power sector.[1] Many of these disadvantaged communities are co-located with existing fossil fuel infrastructure of coal plants, natural gas plants, and pipelines. EJ

[1] Richmond-Bryant, Jennifer et al., "Disparities in distribution of particulate matter emissions from US coal-fired power plants by race and poverty status after accounting for reductions in operations between 2015 and 2017," *American Journal of Public Health* 110, no. 5 (2020): 655-661; Boyce, James K. and Manuel Pastor, "Clearing the air: incorporating air quality and environmental justice into climate policy," *Climatic Change* 120 (2013): 801-814; 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.

communities also face the greatest risks from climate change.[2] Climate risks combine with existing environmental exposures and social vulnerability to compound the impacts from the power sector.

The authors of these comments, and the co-signed environmental justice and allied organizations, believe that the only real solution to climate change is the rapid and complete transition of the power sector away from all types of fossil fuels to renewable energy in the form of wind and solar power. This transition must be coupled with ambitious energy efficiency measures and the build-out of renewable battery storage and distributed transmission infrastructure that can support a more reliable, just, and truly clean power sector. The introduction of carbon capture and sequestration (CCS) mechanisms and hydrogen co-firing in the power sector will further harm EJ communities that are already overburdened, and these technologies should not be incentivized or built out in power plants co-located in EJ communities.

We call attention to critical EJ concerns related to the proposed rule. First, the proposed rule is anticipated to increase co-pollutant air emissions at existing power plants and new power plants that adopt CCS and hydrogen co-firing. Any increase of pollution in EJ communities will contribute to cumulative burdens. Second, the proposed rule poses several additional environmental, safety, and regulatory risks for already vulnerable EJ communities. These include threats from harmful chemicals, pipeline explosions, storage leaks, and water scarcity, among others. Compounding these risks are a deficient regulatory environment to protect EJ communities and significant uncertainty in state compliance. Third, the Environmental Justice Analysis accompanying the rule is grossly insufficient. Its proximity analysis and its distributional analysis of $PM_{2.5}$ and ozone exposures focus on the 140 existing coal plants with units subject to the rule and do not consider the EJ impacts deriving from the rule's proposed standards for existing natural gas–fired electric generating units (EGUs) and the third-phase standard (based on co-firing 96 percent low-GHG hydrogen by 2038) for new base load natural gas–fired EGUs. Moreover, the EJ Analysis does not provide any answers as to how levels of co-pollutants (i.e., non-GHG pollutants) around plants will change as a result of their operating CCS or co-firing hydrogen. The analysis also fails to incorporate cumulative impacts in any way.

Finally, we believe that the rule's reliance on "meaningful engagement" with communities in reference to EJ concerns misrepresents the principle of and dilutes the agency's commitment to EJ. In line with the agency's existing commitments[3] to EJ, including federal Executive Order (EO) 14096, *Revitalizing Our*

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[2] *Climate change and social vulnerability in the United States: A focus on six impacts* (U.S. EPA, 2021, EPA 430-R-21-003), https://www.epa.gov/cira/social-vulnerability-report.

[3] *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* (U.S. EPA, 2016), https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf; *Attachment to Memorandum from the EPA on Principles for Addressing Environmental Justice Concerns in Air Permitting to Air and Radiation* (U.S. EPA, 2022), https://www.epa.gov/system/files/documents/2022-12/Attachment%20-%20EJ%20in%20Air%20Permitting%20Principles%20.pdf; *E.O. 13985 Equity Action Plan: U.S. Environmental Protection Agency* (U.S. EPA, 2022), https://www.epa.gov/system/files/documents/2022-04/epa_equityactionplan_april2022_508.pdf; *EJ Scorecard and EPA* (U.S. EPA, 2021) https://www.epa.gov/environmentaljustice/ej-scorecard-and-epa; *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (U.S. EPA Office of Federal Activities, 1998, 2251A), www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf; *Guidance on Considering Environmental Justice During the Development of Regulatory Actions* (U.S. EPA, 2015), https://www.epa.gov/sites/default/files/2015-06/documents/considering-ej-in-rulemaking-guide-final.pdf; ***FY 2022-FY 2026***

Nation's Commitment to Environmental Justice for All, the rule should adopt a more affirmative approach toward EJ and cumulative impacts. EPA's conception of "meaningful engagement" under this rule should explicitly include the ability of EJ communities to intervene in the regulatory process to deny a proposed state implementation plan or facility permit when there are risks that may be detrimental to human health and/or risks that will make absolute contributions to cumulative impacts.

In the sections below, we discuss the EJ concerns named above in detail and present our recommendations on power sector mitigation strategies that advance EJ.

I. Increased Air Co-Pollutant Emissions Due to CCS and Hydrogen Co-Firing

The EJ advocacy community has argued for years that, in addition to fighting climate change, climate change mitigation policy should be used to address the disproportionate pollution loads frequently found in residential EJ communities.[4] The mandatory emissions reduction policy developed by the EJ advocacy community reflects this perspective.[5] This policy seeks to reduce the emissions of locally harmful GHG co-pollutants that are emitted along with carbon dioxide (CO_2) by power plants. These co-pollutants, including criteria air pollutants such as fine particulate matter ($PM_{2.5}$) and nitrogen oxides (NO_x), contribute to disproportionate pollution levels and elevated levels of cumulative impacts in Communities of Color and low-income communities, i.e., EJ communities.[6]

Consistent with the mandatory emissions reductions policy, an important part of EJ concerns with the power plant rule being proposed by EPA is its potential to result in additional co-pollutant emissions in

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EPA Strategic Plan (U.S. EPA, 2022), p. 33, https://www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan.pdf

[4] *See, e.g.,* the following three very influential investigations related to disproportionate siting: *Toxic Wastes and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites*, United Church of Christ (1987); Bullard, Robert D. et al., *Toxic Wastes and Race at Twenty 1987–2007: Grassroots Struggles to Dismantle Environmental Racism in the United States,* United Church of Christ (2007); Mohai, Paul, and Robin Saha, "Racial inequality in the distribution of hazardous waste: A national-level reassessment," *Social Problems* 54, no. 3 (2007): 343-370. ***See, e.g.,*** the following studies related to disproportionate exposure to air pollution: Tessum, Christopher W. et al., "$PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States," *Science Advances*, 7, no. 18 (2021); Tessum, Christopher W. et al., "Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure," *Proceedings of the National Academy of Sciences of the US* (2019); Reichmuth, David, "Air pollution from cars, trucks, and buses in the US: everyone is exposed, but the burdens are not equally shared," *Union of Concerned Scientists*, October 16, 2019, https://blog.ucsusa.org/dave-reichmuth/air-pollution-from-cars-trucks-and-buses-in-the-u-s-everyone-is-exposed-but-the-burdens-are-not-equally-shared/. Ash, Michael et al., *Justice in the Air: Tracking Toxic Pollution from America's Industries and Companies to Our States, Cities, and Neighborhoods* (Political Economy Research Institute, University of Massachusetts Amherst, 2009); Pastor Jr., Manuel et al., "The air is always cleaner on the other side: Race, space, and ambient air toxics exposures in California," *Journal of Urban Affairs* 27, no. 2 (2005): 127-148; Houston, Douglas et al., "Structural disparities of urban traffic in Southern California: implications for vehicle-related air pollution exposure in minority and high-poverty neighborhoods," *Journal of Urban Affairs* 26, no. 5 (2004): 565-592; Pastor Jr, Manuel, James L. Sadd, and Rachel Morello-Frosch, "Waiting to inhale: the demographics of toxic air release facilities in 21st-century California," *Social Science Quarterly* 85, no. 2 (2004): 420-440; Jerrett, Michael et al., "A GIS–environmental justice analysis of particulate air pollution in Hamilton, Canada," *Environment and Planning A* 33, no. 6 (2001): 955-973; Wennette, D. R., and Leslie A. Nieves, "Breathing polluted air," *EPA J* 18, no. 1 (1992): 16-17.

[5] Sheats, Nicky, "Achieving emissions reductions for environmental justice communities through climate change mitigation policy," *Wm. & Mary Envtl. L. & Pol'y Rev.* 41 (2016): 377; Sheats, Nicky et al., *Mandatory emissions reductions for climate mitigation in the power sector* (Tishman Environment and Design Center, forthcoming).

[6] *See supra* note 4 and citations therein regarding disproportionate siting and exposure to air pollution. *See infra* note 36 for discussion on the definition of cumulative impacts.

already overburdened EJ communities. The proposed rule strongly promotes the use of CCS and hydrogen co-firing despite evidence that the use of either of these methodologies could increase power plant co-pollutant emissions.[7] The concern with additional co-pollutant emissions connected to CCS pertains to all co-pollutants including criteria air pollutants, hazardous air pollutants, and volatile organic compounds, with perhaps a special concern regarding NO_x.[8] Hydrogen co-firing co-pollutant concerns focus on NO_x.[9] Not only could the use of CCS and hydrogen co-firing increase co-pollutant emissions, but to the degree that use of these two methodologies also results in the increased use of the power plants that employ them, it could result in even higher levels of additional co-pollutant emissions. The impact of these increased co-pollutant emissions on EJ communities is one of the key factors that render CCS and hydrogen co-firing unacceptable as BSER.

In the proposed rule preamble (also hereinafter referred to as "proposed rule" for brevity), EPA all but concedes that the use of CCS and hydrogen co-firing will result in increased levels of co-pollutant emissions. However, at least from an EJ perspective, the agency fails to adequately address the issue. Instead, EPA acknowledges the potential of increased co-pollutant emissions but then uses vague and innocuous language when discussing whether the additional emissions will actually occur and what quantities might be expected if they do occur. Below, we provide direct quotations from the proposed rule preamble and discuss them in the text and footnotes to illustrate how EPA discusses potential increases in co-pollutant emissions connected to the use of CCS and hydrogen co-firing.

A. CCS Co-Pollutant Increases

The primary reason CCS can result in the emissions of more co-pollutants when used on a power plant is because of the additional energy utilized by the plant to operate the CCS equipment.[10] The process of capturing CO_2, which most often relies on an amine-based solvent,[11] is by EPA's own admission "an energy-intensive process" requiring "substantial amounts" of heat and electricity.[12] In the proposed rule, EPA admits there can be increased co-pollutant emissions when, in a discussion regarding new and reconstructed base load combustion turbines adopting the CCS pathway, it states: "Scaling a unit larger

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[7] Jacobson, Mark Z, "The health and climate impacts of carbon capture and direct air capture," *Energy & Environmental Science* 12, no. 12 (2019): 3567-3574; Saadat, Sasan and Sara Gersen, *Reclaiming Hydrogen For A Renewable Future* (Earthjustice, 2021); van Harmelen, Toon et al., *Air Pollution Impacts from Carbon Capture and Storage (CCS)* (Copenhagen, Denmark: European Environment Agency, EEA-TR-14/2011, 2011), https://www.eea.europa.eu/publications/carbon-capture-and-storage; Cellek, Mehmet Salih and Ali Pınarbaşı, "Investigations on performance and emission characteristics of an industrial low swirl burner while burning natural gas, methane, hydrogen-enriched natural gas and hydrogen as fuels," *International Journal of Hydrogen Energy* 43, no. 2 (2018): 1194-1207; *Department of Energy Hydrogen Program Plan* (U.S. DOE, 2020), https://www.hydrogen.energy.gov/pdfs/hydrogen-program-plan-2020.pdf.
[8] Jacobson (2019).
[9] Saadat and Gersen (2021).
[10] Jacobson (2019).
[11] US Environmental Protection Agency (EPA), 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" (hereinafter "Proposed rule"), Federal Register Vol. 88, No. 99 (May 23, 2023), Section VII.F.3.b.iii.(A).(1), p. 33291.
[12] Proposed rule, Section X.D.1.iii.(A), p. 33349.

to provide heat and power to the CO_2 capture equipment would have the potential to increase non-GHG air emissions."[13]

But the proposed rule goes on to say: "However, most of them would be mitigated or adequately controlled by equipment needed to meet other [Clean Air Act] requirements."[14]

Notably, EPA says that *"most"* of the increased emissions would be mitigated, implying that at least some would not. Or if not mitigated, EPA states that the increases would be "adequately controlled." However, it is not clear exactly what "adequately controlled" means. What is the quantity of co-pollutants that can be emitted and still be considered "adequately controlled" by EPA?

EPA also acknowledges that the parasitic nature of CCS is, of course, a problem not only with natural gas combustion turbines but also with coal plants. In Section X on coal-fired units, the proposed rule notes that retrofitting a coal-fired EGU with CO_2 capture can lead to decreased efficiency due to the energy penalty, resulting in more coal combusted per unit of electricity generated and therefore increased co-pollutant emissions.[15] However, it similarly claims that "most of the impacts would be mitigated by the flue gas conditioning required by the CO_2 capture process and by other control equipment that the units already have or may need to install to meet other CAA requirements."[16]

Once again, it is implied that at least some of the increased co-pollutant emissions would not be mitigated. While it is not clear how much extra co-pollutants would be left unchecked, any additional pollution burden in an already overburdened community is concerning from an EJ perspective, as discussed below in Part I.E. There is at least one example of carbon capture equipment requiring enough energy to operate that it justified the construction of an entire new facility to provide the power. In the case of the Petra Nova CCS facility installed at the WA Parish coal plant in Texas, a separate natural gas cogeneration facility was constructed to provide process steam and power for the carbon capture equipment.[17] The Energy Information Administration estimated substantial NO_x emissions not only for the CCS facility (908 to 1,184 tons for the three years it was operational), but also for the natural gas cogeneration facility (on the order of 467 to 750 tons per year for those years).[18]

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[13] Proposed rule, Section VII.F.3.b.iii.(C), p. 33302. EPA also discusses the "parasitic" nature of CCS in the context of CO_2 emissions when it states: "However, due to the auxiliary/parasitic energy requirements of the carbon capture system, capturing 90 percent of the CO_2 does not result in a corresponding 90 percent reduction in CO_2 emissions." Proposed rule, Section VII.F.3.b.iii.(E), p. 33303.

[14] Proposed rule, Section VII.F.3.b.iii.(C), p. 33302. This quote pertains to new and reconstructed combustion turbines, but EPA makes the same statement about existing combustion turbines: "Regarding non-air quality health and environmental impact, criteria or hazardous air pollutant emissions would in general be mitigated or adequately controlled by equipment needed to meet other CAA requirements…" Proposed rule, Section XI.C.3.d, p. 33369.

[15] Proposed rule, Section X.D.1.iii.(B), p. 33349.

[16] Proposed rule, Section X.D.1.iii.(B), p. 33349.

[17] *W.A. Parish Post-Combustion CO_2 Capture and Sequestration Demonstration Project* (U.S. DOE, 2020, DOE-PNPH-03311), p. 7, https://www.osti.gov/servlets/purl/1608572.

[18] "Emissions by plant and by region," EIA, accessed June 15, 2023, https://www.eia.gov/electricity/data/emissions/.

B. Hydrogen Co-Firing Co-Pollutant Increases

In the proposed rule preamble EPA also concedes that combusting hydrogen can increase co-pollutant emissions and that this possibility has concerned people across the nation:

> The combustion characteristics of hydrogen can lead to localized higher temperatures during the combustion process. These ''hotspots'' can increase emissions of the criteria pollutant NO_x. NO_x emissions resulting from the combustion of high percentage by volume blends of hydrogen are also of concern in many regions of the country.[19]

However, while affirming the potential of hydrogen co-firing to increase co-pollutant emissions, EPA also uses language similar to the statements it makes regarding increased CCS-related co-pollutant emissions to effectively dismiss these concerns:

> The co-firing of hydrogen in combustion turbines in the amounts that the EPA proposes as the BSER would not have adverse non-air quality health and environmental impacts. It would potentially result in increased production of NO_x, but those NO_x emissions can be controlled, as described in sections VII.F.3.c.vii.(A) and XI.C.2.b.i of this preamble.[20]

and:

> Moreover, the major combustion turbine manufacturers are designing combustion turbines that will be capable of combusting 100 percent hydrogen by approximately 2030, with [dry low NO_x] designs that assure acceptable levels of NO_x emissions.[21]

But once again, neither in these quoted sentences or elsewhere in the proposed rule does EPA explain or specify what amounts of co-pollutants will be released in "controlled emissions" or what amounts constitute an "acceptable" quantity of emissions, especially when they are being emitted into an EJ community, or even worse, into an already overburdened EJ community.

Even the Department of Energy (DOE) acknowledges in its 2020 Hydrogen Program Plan that hydrogen combustion needs further research to address the control that is needed for NO_x emissions. It states that for blends with low levels of hydrogen these emissions might be controlled, but for blends with high levels of hydrogen they are difficult to control. It also states that the technologies that attempt to control these emissions are not yet proven.[22]

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[19] Proposed rule, Section VII.F.3.c.vii.(A), p. 33312.
[20] Proposed rule, Section XI.C.2.d, p. 33366.
[21] Proposed rule, Section XI.C.2.b.i, p. 33364.
[22] *Department of Energy Hydrogen Program Plan* (U.S. DOE, 2020), pp. 28-29, https://www.hydrogen.energy.gov/pdfs/hydrogen-program-plan-2020.pdf#page=28; Mullendore, Seth, Lewis Milford, Abbe Ramanan, "Hydrogen hype in the air," *Clean Energy Group*, December 14, 2020, https://www.cleanegroup.org/hydrogen-hype-in-the-air/#_ednref21.

C. Increased Utilization of Plants and of CCS

There are additional reasons why this rule will likely result in more co-pollutant emissions: 1) More plants will probably use CCS than otherwise would have, due to available tax credits and the requirements of this proposed rule; and 2) Plants that utilize CCS may operate more. The proposed rule makes several statements conceding these points in discussing the costs associated with applying the CCS standard to existing fossil fuel-fired steam generating units:

> Increases in utilization are likely to occur for units that apply CCS due to the incentives provided by the IRC section 45Q tax credit.[23]

and:

> *Despite decreases in efficiency*, IRC section 45Q tax credits provide an incentive for increased generation with full operation of CCS because the credits are proportional to the amount of captured and sequestered CO_2 emissions and not to the amount of electricity generated [emphasis added].[24]

and:

> Absent the requirements defined in this action, the EPA projects that 9 GW of coal-fired steam generating units would apply CCS by 2030 and 35 GW of coal-fired steam generating units, some without controls, would remain in operation in 2040. Designating CCS to be the BSER for existing long-term coal-fired steam generating units would likely result in more of the coal-fired steam generating unit capacity applying CCS.[25]

EPA also seems to indicate that equipping a coal plant with CCS may prolong the amount of time a baseload unit maintains that status: "While the IRC 45Q tax credit is available, long-term coal-fired steam generating units are anticipated to run at base load conditions."[26] Prolonging the amount of time a power plant spends as a baseload unit would, of course, result in an increase of its co-pollutant emissions.

The proposed rule makes similar statements conceding the aforementioned points with regard to fossil fuel–fired stationary combustion turbines. With respect to new and reconstructed stationary combustion turbines, the proposed rule notes:

[23] Proposed rule, Section X.D.1.a.ii.(C), p. 33348.
[24] Proposed rule, Section X.D.1.a.iii.(A), p. at 33349.
[25] Proposed rule, Section X.D.1.a.iii.(A), p. at 33349.
[26] Proposed rule, Section X.D.1.a.iii.(A), p. at 33349.

> A standard of performance based on highly efficient generation in combination with the use of CCS—combined with the availability of 45Q tax credits and investments in supporting CCS infrastructure from the IIJA—should incentivize additional use of CCS . . .[27]

And with respect to existing fossil fuel-fired stationary combustion turbines, the proposed rules makes the same observation as for coal-fired EGUs:

> Despite decreases in efficiency, IRC section 45Q tax credits provide an incentive for increased generation with full operation of CCS because the credits are proportional to the amount of captured and sequestered CO2 emissions and not to the amount of electricity generated.[28]

D. New Source Review (NSR)

The solution EPA consistently offers in the proposed rule to potential increases in co-pollutant emissions due to the use of CCS and hydrogen co-firing is existing regulations, despite the fact that these regulations have never sufficiently protected EJ communities from pollution. EPA's NSR program is identified numerous times as an example of a regulatory scheme that will protect EJ communities. The NSR program sets air emission control requirements and creates permits for new major sources, or major modifications to existing sources, in areas that do and do not meet the National Ambient Air Quality Standards (NAAQS). From an EJ perspective, a major shortcoming of NSR is that it probably will not actually *prevent* higher levels of co-pollutant emissions. EPA seems to concede this point given the manner in which it discusses NSR and co-pollutant emissions in the proposed rule. For example, EPA makes the following statements that seem to demonstrate an awareness of emissions increases connected to the proposed rule:

> Under the NSR program, undertaking a physical or operational change may require the source to obtain a preconstruction permit for the proposed change, with the type of NSR permit (i.e., [Non-Attainment New Source Review, Prevention of Significant Deterioration, or minor NSR]), depending on the amount of the emissions increase resulting from the change and the air quality designation at the location of the source for its emitted pollutants.[29]

and:

> [A] CCS retrofit may trigger requirements under the major NSR program because of the potential for an emissions increase of one or more pollutants due to the additional energy production by the EGU to power the CO_2 capture system.[30]

and:

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[27] Proposed rule, Section VII.F.3.b.iii.(F), p. 33303.
[28] Proposed rule, Section XI.C.3.d, p. 33368.
[29] Proposed rule, Section XIII.A.2, p. 33408.
[30] Proposed rule, Section XIV.E.3, p. 33413-33414.

> While new combustion turbines that co-fire with hydrogen may trigger major NSR, there are cases in which they are less likely to trigger major NSR, such as: (1) If the new combustion turbine is proposed at an existing facility and the facility is able to reduce its emissions more than the emissions increase from the combustion turbine (e.g., if the combustion turbine replaces an existing coal-fired EGU and the facility has emission reduction credits from the shutdown unit), or (2) if the emissions from the new combustion turbine are low enough to not trigger major NSR.[31]

The proposed rule creates a strong impression that EPA understands using CCS and hydrogen co-firing will likely increase co-pollutant emissions and that NSR and the existing regulatory system will probably not prevent these increases.[32] However, EPA appears to believe that NSR and other regulations will control increased co-pollutant emissions so they occur at "acceptable" levels. The proposed rule has been quoted extensively in the foregoing subsections to illustrate the message EPA is conveying on the issue of co-pollutant emissions increases.

EPA does not specify exactly what amount of increased co-pollutant emissions it deems acceptable. However, it is important to note that NSR is not triggered until a certain emissions threshold is reached, and these thresholds are measured in tons as opposed to pounds.[33] The thresholds differ under varying circumstances; a frequent threshold is 100 tons per year, but the threshold amount can be as high as 250 tons per year.[34] Therefore, in absolute terms, there can be a significant amount of co-pollutant emissions before NSR even comes into play. But as discussed in the next subsection, the concept of cumulative impacts tells us that for already overburdened communities, no increase in co-pollutant emissions is acceptable. The approach used by EPA—approving "acceptable" levels of increased co-pollutant emissions without expressing any restrictive circumstances—is itself unacceptable, and even disturbing, to most members of the EJ community. The reasons for this are explored below.

E. The EJ Context for Increases in Co-pollutant Emissions

One reason increased levels of co-pollutant emissions due to CCS and hydrogen co-firing are unacceptable is because a significant number of these increases will almost certainly occur in or impact overburdened EJ communities. This is evident due to the disproportionate number of power plants located in or near EJ communities.[35] Any increase in co-pollutant emissions that would increase the

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[31] Proposed rule, Section XIV.E.3, p. 33414.
[32] Note that the quote above from p. 33408 of the proposed rule (*supra* note 29) references three types of permits that can be issued under NSR. In an EPA primer on NSR, EPA states explicitly that the prevention of significant deterioration (PSD) type of permit does not prevent increased emissions, *see Prevention of Significant Deterioration Basic Information,* https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information (last visited Jul. 31, 2023).
[33] 40 C.F.R. § 52.21(b)(1)(i) (2023)
[34] *Ibid*.
[35] 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

pollution load in communities that already have disproportionate levels of pollution, disease, or risk of either is unacceptable from an EJ perspective because it perpetuates and probably exacerbates existing environmental injustices. It also ignores the idea of cumulative impacts, which has been, and arguably still is, the most pressing EJ issue in our nation today.

The concept of cumulative impacts considers any increase in the total amount of pollution in an already overburdened or vulnerable community unacceptable.[36] Indeed, in these communities the goal should be to *decrease* the total amount of pollution and it certainly should not be allowed to increase under any circumstances. The idea that an increase in the emissions of co-pollutants in a community already suffering from a disproportionate pollution load is acceptable is antithetical to the concept of cumulative impacts, no matter how small that increase happens to be.[37] In fact, allowing "acceptable" levels of air pollution emissions in EJ communities is one the primary reasons there are longstanding and recalcitrant EJ issues in our country. It is easy to understand how multiple decisions that allow "acceptable" levels of air pollution emissions in certain neighborhoods result in vulnerable and overburdened EJ communities, especially as previous reports from EPA on criteria pollutants have acknowledged that there is no threshold below which some of these pollutants have no adverse health impacts.[38] The decision to allow these emissions through a rule that will affect hundreds of power plants is particularly problematic.

As discussed in the introduction to these comments, the most recent version of the federal EJ order signed by President Biden charges EPA, along with all other federal agencies, with the obligation to recognize cumulative impacts and implement actual actions and policies to address the problem. EO

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associated with fossil fuel power plant siting and present-day inequalities in air pollutant emissions," *Nature Energy* 8, no. 1 (2023): 52-61.

[36] There are many similar but varying definitions for cumulative impacts and one that has frequently been used by the New Jersey EJ community is: "The impacts and risks caused by multiple pollutants both individually and by their interactions with each other and with any social vulnerabilities that exist in a community. The pollutants are usually emitted by multiple sources located in a community." For example, *see* New Jersey Environmental Justice Alliance, *Comments submitted on National Environmental Policy Act Implementing Regulations Revisions,* Docket No. CEQ-2021-002, prepared by Nicky Sheats (November 22, 2021). The EPA's Office of Research and Development recaps the history of cumulative impacts before offering their own definition that combines the concepts contained in several preceding definitions in Julius, Susan et al., *Cumulative impacts research: Recommendations for EPA's Office of Research and Development* (Washington DC: US EPA, EPA/600/R-22/014a, 2022), https://www.epa.gov/system/files/documents/2023-05/CUMULATIVE%20IMPACTS%20RESEARCH-FINAL%20REPORT-EPA%20600-R-22-014A%20%2812%29.PDF. The definition in the National Environmental Policy Act (NEPA) may be particularly relevant to the current discussion and states that cumulative effects are "...effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." National Environmental Policy Act Regulations, 40 CFR Part 1508.7. Note that this definition from another federal agency explicitly states the effects can be minor. These comments argue that in the current situation it would be incorrect to characterize the increase in co-pollutant emissions as "minor" but even if they are they would still be increasing cumulative impacts in communities. It should also be noted that the previous administration removed consideration of cumulative impacts from NEPA regulations, and the current administration is restoring it. National Environmental Policy Act Implementing Regulations Revisions, 87 Fed. Reg. 23453 (2022) (revising 40 C.F.R. §§ 1502, 1507, and 1508). For other definitions, see *Cumulative Impacts: Building a Scientific Foundation* (California Environmental Protection Agency, 2010), p. 3; *Ensuring Risk Reduction In Communities With Multiple Stressors: Environmental Justice and Cumulative, Risks/Impacts* (National Environmental Justice Advisory Council, 2004), p. 5.

[37] *See supra* note 36 National Environmental Policy Act Regulations, 40 CFR Part 1508.7, for definition of cumulative impacts in NEPA regulations.

[38] *See, e.g*., *Integrated Science Assessment (ISA) for Particulate Matter* (Washington, DC: U.S. EPA, Office of Research and Development, National Center for Environmental Assessment, 2019, EPA/600/R–19/188).

14096, Sections 3(a)(ii) and 3(a)(vi), specifically direct agencies to use their legal authority to address disproportionate impacts, including contributions to cumulative impacts, related to their activities and to avoid, minimize, or mitigate those impacts to the greatest extent practicable.

However, this proposed rule almost completely ignores this concept, and when it does acknowledge cumulative impacts, EPA offers no substantive policy to address the issue but instead relegates its solution to community participation conducted by the states.[39] In a similar fashion, EPA offers community participation as at least a partial solution at several points in the proposed rule preamble when it acknowledges community concerns over the increased co-pollutant emissions that will be connected to the use of CCS and hydrogen co-firing.[40] Community participation does not replace substantive policies that protect communities and does not necessarily result in such policies, as we highlight in Part V. In Part V of these comments we suggest that EPA incorporate a cumulative impacts policy into this proposed rule—a policy that, under certain circumstances, can result in the mandatory denial of a request by a plant to utilize CCS or hydrogen co-firing. EPA's disregard for cumulative impacts in measures to address issues like co-pollutant emissions is also seen in its EJ analysis, as we will detail in Part IV.E.

II. Other Environmental RIsks

In the proposed rule, EPA recognizes that a system for emissions reduction should not be deemed the *best* system of emissions reduction without considering the damage that the system causes to the environment as a whole. Quoting D.C. Circuit case law, EPA notes that the "standard of the best system is comprehensive."[41] As argued in Part I above, the increased co-pollutant impacts alone warrant concern about EPA's designation of CCS and hydrogen co-firing as the best system of emissions reduction (BSER). Consideration of the other environmental impacts that CCS and hydrogen co-firing will bring only heightens our concern, as they will pose even more risk to the communities who live at the fence line of fossil fuel facilities and infrastructure. These additional environmental risks further undermine the designation of CCS and hydrogen co-firing as BSER. We do not exhaustively list all of the environmental risks at play, but highlight several of the most salient ones here:

A. Chemical By-products From Carbon Capture

The method most widely used for post-combustion carbon capture depends on a chemical solvent, usually an amine. CO_2 from the flue gas reacts with this solvent and is absorbed into the amine solution in an absorption column.[42] There are significant environmental impacts associated with the use of these chemicals to capture CO_2. EPA recognizes this, noting the energy-intensive nature of capturing CO_2 using an amine-based solvent[43] as well as the problem of solvent degradation and nitrosamine formation when

[39] Proposed rule, Section XII.F.1.b, p. 33399.
[40] Proposed rule, Section X.D.1.iii.(B), pp. 33348-33349; Proposed rule, Section XII.F.1.b, p. 33399.
[41] Proposed rule, Section VII.F.3.c.vii.(F).(1), 33315.
[42] Proposed rule, Section VII.F.3.b.iii.(A).(1), p. 33291.
[43] Proposed rule, Section X.D.1.iii.(A), p. 33349.

amine solvents and NO_x in the post-combustion flue gas react in the CO_2 scrubber.[44] Nitrosamines, which are toxic chemicals, can enter the environment via stack emissions or disposal of spent solvents.[45] They have long been considered carcinogenic[46] and can cause groundwater contamination or increased toxicity of aquatic ecosystems.[47]

EPA relies on two studies to claim that there are methods that can be effective at removing gaseous amine and amine degradation products such as ammonia and nitrosamine.[48] However, these studies themselves describe the drawbacks of the methods being proposed—including the fact that they have impacts on water usage—and require more research and testing.[49] Other challenges include the additional energy associated with facilitating nitrosamine decomposition via high-temperature desorption, the added cost of removing NO_x prior to CO_2 capture to reduce formation of these by-products in the first place, and the difficulty of even measuring nitrosamines levels.[50] In the face of these challenges, EPA does not explain how handling and disposal of these chemicals might be performed in a way that avoids risk to the surrounding communities and environment. While it cites a DOE report for the assertion that controlling by-products is "standard operating procedure," the report cited offers no additional information on this issue.[51]

Though it does not reference any other relatively recent research, EPA expresses confidence that there will be some future advancement in the development of solvents and other methods for capturing CO_2, like membrane separation and cryogenic distillation.[52] However, such advancement does not seem to be

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[44] Proposed rule, Section VII.F.3.b.iii.(C), 33302; Section X.D.1.iii.(B), 33349.

[45] Yu, Kun, William A. Mitch, and Ning Dai, "Nitrosamines and nitramines in amine-based carbon dioxide capture systems: fundamentals, engineering implications, and knowledge gaps," *Environmental Science & Technology* 51, no. 20 (2017): 11522-11536.

[46] Li, Kate et al., "Estimated cancer risks associated with nitrosamine contamination in commonly used medications," *International Journal of Environmental Research and Public Health* 18, no. 18 (2021): 9465; *Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1–42* (Lyon, France: International Agency for Research on Cancer, 1987), https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-Supplements/Overall-Evaluations-Of-Carcinogenicity-An-Updating-Of-IARC-Monographs-Volumes-1%E2%80%9342-1987.

[47] Chen, Xiujuan et al., "Emerging N-nitrosamines and N-nitramines from amine-based post-combustion CO_2 capture–a review," *Chemical Engineering Journal* 335 (2018): 921-935.

[48] *See* footnotes 364 and 365 in the Proposed rule, Section VII.F.3.b.iii.(C), 33302, which are repeated as footnotes 551 and 552, Section X.D.1.iii.(B), 33350.

[49] Sharma, Sunil D. and Merched Azzi, "A critical review of existing strategies for emission control in the monoethanolamine-based carbon capture process and some recommendations for improved strategies," *Fuel* 121 (2014): 178-188; Mertens, Jan et al., "Understanding ethanolamine (MEA) and ammonia emissions from amine based post combustion carbon capture: Lessons learned from field tests," *International Journal of Greenhouse Gas Control* 13 (2013): 72-77.

[50] Yu, Kun, William A. Mitch, and Ning Dai, "Nitrosamines and nitramines in amine-based carbon dioxide capture systems: fundamentals, engineering implications, and knowledge gaps," *Environmental Science & Technology* 51, no. 20 (2017): 11522-11536; Fraboulet, Isaline et al., "Octavius: Establishment of guidelines and standard operating procedures (SOPs) regarding sampling and analyses for the monitoring of pollutants emitted in CCS process liquid and atmospheric matrices," *Energy Procedia* 63 (2014): 848-862.

[51] Proposed rule Section X.D.1.iii.(B), 33349; *Pathways to commercial liftoff: Carbon Management* (U.S. DOE, April 2023), https://liftoff.energy.gov/wp-content/uploads/2023/04/20230424-Liftoff-Carbon-Management-vPUB_update.pdf. A 2022 DOE report that discusses testing of methods for removing nitrosamines reveals the small pilot-scale nature of this work. *Carbon Capture Program R&D Compendium of Carbon Capture Technology* (U.S. DOE/NETL, 2022), https://netl.doe.gov/sites/default/files/2022-09/0919-Carbon-Capture-Technology-Compendium-2022.pdf.

[52] Proposed rule Section VII.F.3.iii.(B).(1), 33299.

imminent. In fact, a 2022 review of carbon capture absorbents noted that across the numerous substances that are supposed candidates for chemical absorption, none are ready to be deployed at a large scale.[53] The trade-offs among the chemicals' properties of interest—volatility, toxicity, flammability, absorption capacity, energy requirements for regenerating the chemical, etc.—have yet to be overcome.[54] Although absorbents (including amine-based solvents) are already the most researched and developed method for capturing CO_2, they still have shortcomings, and the other methods (including the ones cited by EPA) are farther behind.[55] EPA's hope in future advancement places the present-day hazards of these dangerous chemicals on the communities living near the build-out of carbon capture infrastructure.

B. CO_2 Transport and Sequestration

The environmental impacts and risks to communities inherent in the transport and sequestration of CO_2 cast further doubt on CCS as the best system of emissions reduction. In the first place, reliance on CCS will require an extensive build-out of pipeline infrastructure to transport the CO_2, when existing pipeline infrastructure already disproportionately impacts areas of higher social vulnerability.[56] EPA notes that there were 5,339 miles of CO_2 pipelines in operation in 2021, a 13 percent increase from 2011.[57] This pales in comparison with the extensive pipeline build-out that would be yet to come. According to Princeton's Net-Zero America study, more than 60,000 miles of new CO_2 pipelines may be needed to meet 2050 climate targets, a more than tenfold increase over existing CO_2 pipeline infrastructure.[58] The impacts on communities as these extensive pipelines are built and operated and the risks from pipeline leaks and explosions are significant. CO_2 in high concentrations can cause health impacts including asphyxiation, respiratory complications, altered mental state, and seizures.[59] It can also affect emergency response and evacuations, as the displacement of oxygen by CO_2 can stop vehicles from running.[60]

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[53] Chai, Slyvester Yew Wang, Lock Hei Ngu, and Bing Shen How, "Review of carbon capture absorbents for CO_2 utilization," *Greenhouse Gases: Science and Technology* 12, no. 3 (2022): 394-427.
[54] *Ibid*.
[55] *Ibid*.
[56] Emanuel, Ryan E. et al., "Natural gas gathering and transmission pipelines and social vulnerability in the United States," *GeoHealth* 5, no. 6 (2021): e2021GH000442; Strube, Johann, Brian C. Thiede, and Walter E. "Ted" Auch, "Proposed pipelines and environmental justice: Exploring the association between race, socioeconomic status, and pipeline proposals in the United States," *Rural Sociology* 86, no. 4 (2021): 647-672; Weller, Zachary D. et al., "Environmental injustices of leaks from urban natural gas distribution systems: Patterns among and within 13 U.S. metro areas," *Environmental Science & Technology* 56, no. 12 (2022): 8599-8609.
[57] Proposed rule, Section XI.C.3.b, p. 33368.
[58] Larson, Eric, *Net-Zero America: Potential pathways, infrastructure, and impacts* (Princeton University, 2020), https://netzeroamerica.princeton.edu/the-report.
[59] Fogarty, John and Michael McCally, "Health and safety risks of carbon capture and storage," *JAMA* 303, no. 1 (2010): 67-68; Patel, Shivani and Sandeep Sharma, "Respiratory Acidosis," (2018), In: StatPearls. StatPearls Publishing, Treasure Island (FL); Simon, Julia, "The U.S. is expanding CO_2 pipelines. One poisoned town wants you to know its story," *NPR*, May 21, 2023, https://www.npr.org/2023/05/21/1172679786/carbon-capture-carbon-dioxide-pipeline.
[60] Zegart, Dan, "The gassing of Satartia," *HuffPost*, August 26, 2021, https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f; Physicians for Social Responsibility and the Science and Environmental Health Network, "Examining Carbon Capture Through a Public Health & Environmental Justice Lens," streamed live on April 8, 2022, Youtube video, https://www.youtube.com/watch?v=rFmAU7VxtZw.

Disconcertingly, the proposed rule does not even attempt to describe or characterize these risks. Each time the topic of CO_2 transport is raised in the proposed rule, EPA simply refers to measures that have yet to be developed by the Pipeline and Hazardous Materials Safety Administration (PHMSA) and claims that PHMSA oversight of supercritical CO_2 is enough to guarantee safety of CO_2 during transport.[61] EPA's inattention to the risks and its overconfidence in PHMSA are very concerning, as will be discussed in Part III.

The way the proposed rule addresses the dangers associated with CO_2 sequestration similarly disregards the risks to communities and the environment. It is almost incomprehensible that the EPA does not point to a single risk in relation to the long-term storage of CO_2. Instead, it states that DOE's Regional Carbon Sequestration Partnerships have demonstrated geologic sequestration through a series of field research projects, "injecting more than 11 million tons of CO_2 with no indications of negative impacts to either human health or the environment."[62]

While EPA fails to do so, even DOE acknowledges that failures can occur, and the 2020 DOE NETL report *Overview of Potential Failure Modes and Effects Associated With CO_2 Injection and Storage Operations in Saline Formations* is intended to bring "awareness of the potential failure modes that could occur and the possible adverse effects to human health or the environment associated with injection and geologic storage of CO_2 in onshore, saline-bearing formations as part of carbon capture, storage, and utilization (CCUS) efforts."[63] The report suggests that CO_2 storage can be conducted safely with less likelihood of failure "if storage sites are properly selected, characterized, operated, monitored, and closed."[64]

However, even a rigorous geologic assessment may not be enough to mitigate leakage problems. The amount of CO_2 that could escape through slow, continuous leakage or a well blowout is significant, so much so that, as noted by the International Council on Clean Transportation, "the risk of *generating* emissions from a strategy designed to reduce them is far from negligible [emphasis added]."[65] In the case of two storage projects in Norway, CO_2 migrated away from the original storage site in one project, and in the other, storage lifetime decreased from 18 to 2 years once the project started operation.[66] Yet these are the same two projects EPA references as examples of "successful and safe" geologic CO_2 sequestration.[67]

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[61] *See, e.g.*, Proposed rule, Section VII.F.3.b.iii.(A).(5).(b), p. 33294; Proposed rule, Section X.D.1.a.i.(B), p. 33347; Proposed rule, Section X.D.1.b.iii.(D), p. 33350.

[62] Proposed rule, Section VII.F.3.b.iii.(6).(a).(i), p. 33295.

[63] *Overview of potential failure modes and effects associated with CO_2 injection and storage operations in saline formations* (U.S. DOE, December 18, 2020, DOE/NETL-2020/2634), https://www.energy.gov/sites/prod/files/2021/01/f82/DOE-LPO_Carbon_Storage_Report_Final_December_2020.pdf.

[64] *Overview of potential failure modes and effects associated with CO_2 injection and storage operations in saline formations* (U.S. DOE, December 18, 2020, DOE/NETL-2020/2634), https://www.energy.gov/sites/prod/files/2021/01/f82/DOE-LPO_Carbon_Storage_Report_Final_December_2020.pdf.

[65] Zhou, Y.,"Carbon capture and storage: A lot of eggs in a potentially leaky basket," *ICCT Staff Blog*, January 17, 2020, https://theicct.org/carbon-capture-and-storage-a-lot-of-eggs-in-a-potentially-leaky-basket/.

[66] Williamson, Rachel, "Problems at two CCS "success stories" cast fresh doubt on the technology," *Renew Economy*, June 16, 2023, https://reneweconomy.com.au/problems-at-two-ccs-success-stories-cast-fresh-doubt-on-the-technology/.

[67] Proposed rule, Section VII.F.3.b.iii.(A).(6).(a).(i.), p. 33295.

In EPA's view, CO_2 sequestration will be adequately regulated by the Safe Drinking Water Act's Underground Injection Control (UIC) Class VI geologic sequestration well permitting scheme and by the Clean Air Act's Greenhouse Gas Reporting Program (GHGRP) Subpart RR requirements.[68] However, neither SDWA Class VI permitting nor GHGRP reporting requirements sufficiently address the actual risks that communities on the ground face, as will be described in further detail in Part III.

C. Resource Impacts of Hydrogen Production

We appreciate that EPA does not consider co-firing petrochemical-derived hydrogen to be BSER in light of the GHG emissions its production entails.[69] However, even the co-firing of low-GHG hydrogen should not be considered a BSER due to the burdens and risks it will place on communities. These derive both from the co-pollutants generated when fuel mixed with any type of hydrogen is combusted (as described in Part I) and from the substantial inputs required to produce low-GHG hydrogen, a topic to which we now turn.

With "low-GHG hydrogen," EPA is referring primarily to hydrogen produced by electrolysis.[70] The production of hydrogen via electrolysis requires substantial water and energy inputs, as documented in the scientific literature. EPA partially acknowledges the water footprint of producing hydrogen by electrolysis, noting that it requires more water to produce than other forms of hydrogen[71] and citing a figure of 9 kg of purified water consumed per kg of hydrogen produced.[72] The 9 kg figure, however, is the conversion rate in theory, i.e., based on a purely stoichiometric calculation. In reality the direct water footprint is higher.[73] One group of researchers points to the rate being typically 25 percent higher.[74] Another group, cited in the proposed rule, observes that with varying electrolyzer performances and manufacturer specifications, the rate can range from 10.0 kg to as much as 22.4 kg of water per kg of hydrogen.[75] More important, the figure accounts only for water used directly in the electrolysis phase, whereas the indirect water consumption added by the energy and equipment used for electrolysis can drive the rate up many times. Even when they have yielded a wide range of estimates, life-cycle analyses point toward the same general conclusion: that the 9 kg figure relied on by EPA (and pro-industry commentary[76]) underestimates the footprint by at least an order of magnitude, and that there are

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[68] Proposed rule, Section VII.F.3.b.iii.(6).(a).(iii), p. 33296; Proposed rule, Section X.D.1.b.iii.(D), p. 33350.
[69] Proposed rule, Section VII.F.3.c.v, p. 33307; Proposed rule, Section VII.F.3.c.vii.(F).(1), p. 33315. Petrochemical-derived hydrogen may be referred to as "grey hydrogen" whereas low-GHG hydrogen, primarily hydrogen produced from the electrolysis of water, may be referred to as "green hydrogen" in industry terms.
[70] Proposed rule, Section VII.F.3.c.v, p. 33307. In this section, the EPA briefly suggests, without further detail or citation, that naturally occurring hydrogen stored in geologic formations could potentially be another source of low-GHG hydrogen.
[71] Proposed rule, Section VII.F.3.c.vii.(F).(1), p. 33315.
[72] Proposed rule, Section VII.F.3.c.v, p. 33307, fn. 401.
[73] Shi, Xunpeng, Xun Liao and Yanfei Li, "Quantification of fresh water consumption and scarcity footprints of hydrogen from water electrolysis: A methodology framework," *Renewable Energy* 154 (2020): 786-796.
[74] Shi, Xunpeng, Xun Liao, and Yanfei Li, "Quantification of fresh water consumption and scarcity footprints of hydrogen from water electrolysis: A methodology framework," *Renewable Energy* 154 (2020): 786-796.
[75] Simoes, Sofia G. et al., "Water availability and water usage solutions for electrolysis in hydrogen production," *Journal of Cleaner Production* 315 (2021): 128124.
[76] Beswick, Rebecca R., Alexandra M. Oliveira, and Yushan Yan, "Does the green hydrogen economy have a water problem?," *ACS Energy Letters* 6, no. 9 (2021): 3167-3169.

significant water consumption and water scarcity issues even with hydrogen produced using electrolysis powered by wind or solar.[77]

Throughout the proposed rule and with reference to hydrogen specifically, it seems that EPA places little weight on water usage in determining the BSER. Yet from an equity and environmental justice perspective, water scarcity is a critical issue because it causes life-threatening, localized impacts. Such water scarcity impacts are likely to be heightened if large-scale deployment of hydrogen production happens alongside climate change, resource depletion, population growth, and agricultural intensification. EPA acknowledges this challenge to some extent when it states: "New combustion turbine models designed to combust hydrogen, and those potentially being retrofit to combust hydrogen, may be co-located with electrolyzers that produce the hydrogen the facility will use. In such instances, water scarcity could be exacerbated in some areas by the freshwater demands of electrolytic hydrogen production, which could pose a particular challenge for vulnerable communities."[78]

EPA goes on to say that electrolyzer siting will need to take water availability into account, and offers European examples of electrolyzer siting that has applied "Sustainable Value Methodology, designed to be sensitive to water access and availability and includes 'decision-making support, combining economic, environmental and social criteria.' "[79] However, it is hard to see how these vague procedural assurances are going to protect the "vulnerable communities" that EPA has named, especially when the whole of government has failed to adequately stand up for those communities and allowed DOE to run an opaque process, devoid of public information and meaningful community engagement,[80] while it spends $7 billion on hydrogen hubs that will likely include siting electrolytic hydrogen production in water-stressed areas.[81]

EPA appears to rely on future technological advances to address water usage, contending that there have been new studies on ways to produce low-GHG electrolytic hydrogen.[82] The proposed rule cites two

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[77] Mehmeti, Andi et al., "Life cycle assessment and water footprint of hydrogen production methods: from conventional to emerging technologies," *Environments* 5, no. 2 (2018): 24; Shi, Xunpeng, Xun Liao, and Yanfei Li, "Quantification of fresh water consumption and scarcity footprints of hydrogen from water electrolysis: A methodology framework," *Renewable Energy* 154 (2020): 786-796.

[78] Proposed rule, Section XIV.E.3, p. 33414.

[79] Proposed rule, Section XIV.E.3, p. 33414.

[80] "California EJ and climate advocates urge greater transparency and community engagement in the state's Hydrogen Hub process," Sierra Club, March 21, 2023, https://www.sierraclub.org/press-releases/2023/03/california-ej-and-climate-advocates-urge-greater-transparency-and-community; Bioret, Lucy, Yuqi Zhu, and Alan Krupnick, "Hydrogen Hubs: How Is the US Department of Energy picking winners (and losers)?," *Resources*, February 9, 2023, https://www.resources.org/common-resources/hydrogen-hubs-how-is-the-us-department-of-energy-picking-winners-and-losers/.

[81] According to Rystad Energy, an energy consulting research firm, 9 of the 33 hydrogen hub proposals shortlisted by the DOE are in water-stressed areas, including Southern California, Colorado, Kansas, New Mexico, and Texas. Volcovici, Valerie, "Biden's green hydrogen plan hits climate obstacle: Water shortage," *Reuters*, July 3, 2023, https://www.reuters.com/sustainability/climate-energy/bidens-green-hydrogen-plan-hits-climate-obstacle-water-shortage-2023-07-03/. The hubs in the named areas are proposing to produce electrolytic hydrogen either partially or exclusively. *See* Bioret, Lucy, Yuqi Zhu, and Alan Krupnick, "Hydrogen Hubs: Get to know the encouraged applicants," *Resources*, February 7, 2023, https://www.resources.org/common-resources/hydrogen-hubs-get-to-know-the-encouraged-applicants/.

[82] Proposed rule, Section VII.F.3.c.vii, p. 33311.

lab-based studies that test the use of seawater rather than freshwater to conduct electrolysis.[83] The studies cited in the proposed rule reveal the technical challenges of the problem as well as the immaturity of the methods and the highly specific conditions required for them to work. Moreover, the methods have not been tested even at demonstration or pilot scale.[84] This is not for lack of research, as the 2023 study notes: "The performance of seawater electrolysis lags far behind that of freshwater electrolysis. . . . Direct seawater electrolysis without the purification process and chemical additives is highly attractive and has been investigated for about 40 years, but the key challenges of this technology remain in both catalyst engineering and device design."[85]

Aside from the water footprint, the production of hydrogen by electrolysis requires substantial energy inputs that would need to be drawn from low-GHG sources, largely wind and solar energy, per the proposed rule.[86] Renewable energy should go directly to the grid instead of being diverted for hydrogen production, given the efficiency losses of converting renewables to electricity and then using that electricity to produce hydrogen.[87] Electrolytic hydrogen production has an energy requirement of around 50–60 kWh/kg H_2, and this high energy expenditure is the main reason for the high cost of electrolysis.[88] Electricity generated by renewables that is taken from the grid for electrolysis may be replaced by fossil fuel generation, contributing to additional GHG and co-pollutant emissions, which will particularly harm EJ communities that host this infrastructure.[89] One analysis found that producing the amount of green hydrogen needed, based on estimates from the International Renewable Energy Agency, would require a minimum of 6,690 TWh of electricity annually, which is about a quarter of the current total electricity generated globally.[90]

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[83] Proposed rule, Section VII.F.3.C.vii, p. 33311, fn 435; Proposed rule, Section XIV.E.3, p. 33414, fn. 715.

[84] Sun, Fu et al., "Energy-saving hydrogen production by chlorine-free hybrid seawater splitting coupling hydrazine degradation," *Nature Communications* 12, no. 1 (2021): 4182; Guo, Jiaxin et al., "Direct seawater electrolysis by adjusting the local reaction environment of a catalyst," *Nature Energy* 8, no. 3 (2023): 264-272.

[85] Guo, Jiaxin et al., "Direct seawater electrolysis by adjusting the local reaction environment of a catalyst," *Nature Energy* 8, no. 3 (2023): 264-272.

[86] Proposed rule, Section VII.F.3.c.vi, p. 33310.

[87] Walsh, Jim and Mia DiFelice, "How much of this hype for hydrogen "energy" is just smoke and mirrors?," *Food and Water Watch*, December 13, 2022, https://www.foodandwaterwatch.org/2022/12/13/hydrogen-energy-hype/. Bear in mind that the proposed BSER entails using the hydrogen in hydrogen-mixing and combustion, bringing along co-pollutant impacts described in Part I. We focus our critique here on the wasted energy.

[88] Ivy, Johanna, *Summary of electrolytic hydrogen production: Milestone completion report* (U.S. DOE, September 2004, NREL/MP-560-36734), p. 11, https://www.nrel.gov/docs/fy04osti/36734.pdf; Buttler, Alexander, and Hartmut Spliethoff, "Current status of water electrolysis for energy storage, grid balancing and sector coupling via power-to-gas and power-to-liquids: A review," *Renewable and Sustainable Energy Reviews* 82 (2018): 2440-2454; Aulakh, Deepinder Jot Singh, Kiari Goni Boulama, and Jon G. Pharoah, "On the reduction of electric energy consumption in electrolysis: A thermodynamic study," *International Journal of Hydrogen Energy* 46, no. 33 (2021): 17084-17096; *Green Hydrogen Cost Reduction: Scaling Up Electrolysers to Meet the 1.5°C Climate Goal* (Abu Dhabi: International Renewable Energy Agency (IRENA), 2020), https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_Green_hydrogen_cost_2020.pdf.

[89] DiElsi, Gary J., "Should we really use renewable electricity to make green hydrogen? Not always," *POWER Magazine,* January 3, 2023, https://www.powermag.com/should-we-really-use-renewable-electricity-to-make-green-hydrogen-not-always/.

[90] Collins, Leigh, "A wake-up call on green hydrogen: the amount of wind and solar needed is immense," *Recharge*, March 19, 2020, https://www.rechargenews.com/transition/a-wake-up-call-on-green-hydrogen-the-amount-of-wind-and-solar-needed-is-immense/2-1-776481; "Electricity," U.S. EIA, accessed July 25, 2023, https://www.eia.gov/international/data/world/electricity/electricity-generation.

In addition to the overall energy requirement, using renewables to produce hydrogen is 20–40 percent less efficient than using renewables directly for electrification.[91] Again, the EPA references the existence of research to improve the efficiency of electrolytic hydrogen production, but it is restricted to methods explored in a laboratory that have not yet been tried or scaled in a real-world setting.[92] Despite decades of investigation into electrolysis for its application in hydrogen production, it still represents a small fraction (estimates are in the range of less than 0.1 percent to 2 percent) of total hydrogen production due to its high costs.[93] Currently, total hydrogen production from all production methods amounts to only 3 percent of the overall global energy demand.[94] Scaling of any type of hydrogen production, low-GHG or not, will result in increased co-pollutant emissions that are harmful to fence-line communities and should not be considered as part of a BSER.

III. Deficient Regulatory Environment to Protect EJ Communities

In the proposed rule, EPA repeatedly suggests that existing regulations are adequate to deal with any potential increases in co-pollutant emissions or other environmental risks posed by this rulemaking. This does not sufficiently address the concerns of environmental justice advocates who have for decades pointed to patterns of disproportionate pollution burden exposure by race and income, disparities in the ways in which current laws are enforced, and the ways in which the current regulatory system fails to take into account the cumulative impacts of pollution that affect environmental justice communities.

A. Power Plant Air Pollutant Emissions Regulations

As discussed in more detail in Part I, in the proposed rule itself EPA recognizes that application of CCS technology that captures CO_2 will reduce net output because of the energy penalty, which may lead units to scale larger and could have the potential to increase non-GHG air emissions (such as mercury, particulate matter, SO_2, NO_x, and Hazardous Air Pollutant emissions). EPA also recognizes that co-firing hydrogen in gas plants would result in additional NO_x emissions. EPA speculates that pollution from these emissions would be abated by other CAA rules, which may trigger sources to install emission control technologies. However, EPA's current NO_x standards for new gas plants have not been reviewed in 16 years and do not provide sufficiently protective emission limits. Therefore, new gas plants are currently not required to install the most updated NO_x emission control technology. While EPA recently advanced rules that target air pollution from the power sector, some of these new rule proposals are not stringent enough to abate the full extent of air pollution and the impact that incremental emissions have on the

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[91] Wagner, Andreas et al., *Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy* (Energy Transitions Commission, April 2021, Version 1.2), p. 16, https://energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Hydrogen-Report.pdf.

[92] Proposed rule, Section VII.F.3.C.vii, p. 33311, fn 434; Ehrnst, Yemima et al., "Acoustically-Induced water frustration for enhanced hydrogen evolution reaction in neutral electrolytes," *Advanced Energy Materials* 13, no. 7 (2023): 2203164.

[93] *The Future of Hydrogen: Seizing Today's Opportunities* (International Energy Agency (IEA), 2019), https://iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf; Sun, Fu et al., "Energy-saving hydrogen production by chlorine-free hybrid seawater splitting coupling hydrazine degradation," *Nature Communications* 12, no. 1 (2021): 4182.

[94] "Hydrogen overview," International Renewable Energy Agency, https://www.irena.org/Energy-Transition/Technology/Hydrogen.

overall health and well-being of overburdened communities.[95] In 2022, 38 percent of coal-burning power plants nationwide still lacked modern NO_x controls, and even power plants equipped with controls are not required to operate the control consistently and effectively.[96] Part I.D also discusses major shortcomings of the NSR program that may fail to prevent higher levels of co-pollutant emissions.

Additionally, the current regulatory framework does not sufficiently address the impacts on a community from the totality of incremental increases in exposures to multiple pollutants from multiple sources. EPA recently released various guidance documents that recognize the need to address the cumulative impacts of pollution and highlight the importance of cumulative impacts assessment to inform agency decision-making. In January 2023, the EPA issued a document[97] that provides guidance on the extent of EPA's legal authority to address cumulative impacts through the agency's various programs including air permitting programs. However, most permitting programs across the country are administered by states and local governments, and EPA has not required states to consider cumulative impacts assessment in all permitting decisions. The guidance document also notes that even in regions where EPA has permitting authority, EPA might not utilize its legal authorities to address cumulative impacts in every context. As discussed in Part I.E, community advocates and EJ scholars have widely established that in communities that experience cumulative impacts of pollution, any incremental increase in exposure in the pollution burden is unacceptable. The current regulatory framework's lack of enforcement of cumulative impacts assessment in air permitting decisions leaves behind environmental justice communities at risk of increasing long-term adverse health impacts.

B. Permitting Carbon Capture Air Emissions in Isolation

As discussed in Part I.D, the proposed rule recognizes that some CCS projects may require pre construction air emissions permitting under the NSR program. Part I.D discusses some of the shortcomings of the NSR program in preventing additional pollution burden in environmental justice communities. EPA's air permitting regulatory scheme also lacks the transparency that is needed to adequately assess and disclose to the public the net co-pollutant emissions that can result from installing CC equipment in an existing host facility. Under current regulation, developers are motivated to seek permits for the carbon capture unit in isolation from the host facility to avoid reopening currently applicable permits for the original host facility.[98] If the NSR process examines only the emissions from the CC equipment, the potential increase in air emissions from the original host facility are left unexamined. Limiting the permitting process to the CC equipment alone also limits the regulatory requirements that may be placed on the host facility. This was the case with the Petra Nova CCS facility installed at the WA

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[95] *EPA Moves to Cut Toxic Air Pollution from Coal Plants*. (n.d.). Retrieved July 31, 2023, from https://www.nrdc.org/press-releases/epa-moves-cut-toxic-air-pollution-coal-plants

[96] Filonchyk, M., & Peterson, M. P. (2023). An integrated analysis of air pollution from US coal-fired power plants. *Geoscience Frontiers*, *14*(2), 101498. https://doi.org/10.1016/J.GSF.2022.101498

[97] Environmental Protection Agency, U., & of General Council, O. (2023). *EPA Legal Tools to Advance Environmental Justice: Cumulative Impacts Addendum*.

[98] Brown, Jeffrey D. et al., "Turning CCS Projects in Heavy Industry & Power into Blue Chip Financial Investments." Energy Futures Initiative, February 2023. https://energyfuturesinitiative.org/wp-content/uploads/sites/2/2023/02/20230212-CCS-Final_Full-copy.pdf.

Parish coal plant in Texas. Prior to construction, Petra Nova filed an air permit application with the Texas Commission on Environmental Quality on September 16, 2011, for the CC facility alone. Because the location of the construction was in severe non-attainment for ozone, the CC facility was able to receive an air permit by providing enough offsets of volatile organic compound (VOC) and nitrogen oxide (NO_x) emissions.[99] As such the air permits for the original host plant were left unopened and any resulting emissions due to an energy penalty were left unaddressed.

C. Under-Regulation of Transportation and Sequestration Infrastructure

As described in Part II, there are safety and public health risks associated with both transportation and sequestration of CO_2, as well as risks and dangers associated with using gas distribution and transportation systems for hydrogen. The proposed rule points to PHMSA as a sufficient regulatory tool to address the risk a major pipeline build-out poses to the public.[100] However, PHMSA has made no real progress on pipeline safety over the past decade; in fact, between 2010 and 2022, there was a slight increase in the number of pipeline incidents deemed "significant" by PHMSA.[101] According to reports by Pipeline Safety Trust, PHMSA does not include specific standards for pipelines transporting CO_2 or hydrogen.[102]

The proposed rule points to the SDWA's Underground Injection Control (UIC) Class VI geologic sequestration well-permitting scheme and the CAA's Greenhouse Gas Reporting Program (GHGRP) Subpart RR requirement as protective mechanisms to sufficiently address environmental and public health risks associated with geologic sequestration of CO_2. With respect to Class VI permitting, EPA has indicated its intention to grant primacy to states that have not proved that they can adequately protect communities from environmental injustice and health threats. For example, EPA has been considering granting primacy to Louisiana, a decision strongly opposed by environmental justice communities and advocates given the state's poor track record of environmental protection generally, and its existing

[99] Kennedy, Greg. W.A. Parish Post-Combustion CO_2 Capture and Sequestration Demonstration Project (Final Technical Report). United States. https://doi.org/10.2172/1608572

[100] Proposed rule, Section VII.F.3.b.iii.(A).(5).(b), p. 33294; Proposed rule, Section X.D.1.a.i.(B), p. 33347; Proposed rule, Section X.D.1.b.iii.(D), p. 33350.

[101] *Testimony of the Pipeline Safety Trust before the Subcommittee on Railroads, Pipelines, and Hazardous Materials of the Committee on Transportation and Infrastructure, US House of Representatives,* Hearing on Pipeline Safety: Reviewing Implementation of the PIPES Act of 2020 and Examining Future Safety Needs (2023, March 8). https://pstrust.org/wp-content/uploads/2023/03/Pipeline-Safety-Trust-House-TI-Testimony-3-8-23.pdf

[102] Kuprewicz, R. B. (2022, March 23). Accufacts' Perspectives on the State of Federal Carbon Dioxide Transmission Pipeline Safety Regulations as it Relates to Carbon Capture, Utilization, and Sequestration within the U.S. https://pstrust.org/wp-content/uploads/2022/03/3-23-22-Final-Accufacts-CO2-Pipeline-Report2.pdf; Kuprewicz, R. B. (2022, November 28). Safety of Hydrogen Transportation by Gas Pipelines. https://pstrust.org/wp-content/uploads/2022/11/11-28-22-Final-Accufacts-Hydrogen-Pipeline-Report.pdf

problems with orphan and leaking wells specifically.[103] Other states pursuing Class VI primacy and in the pre-application phase include Texas, West Virginia, and Arizona.[104]

An additional concern that has yet to be addressed is the fact that well operators may not even go through the Class VI permitting process. Many states, including those named above, already have primacy over Class II oil and gas well permitting, and Class VI rules allow Class II wells to be used for long-term CO_2 storage. Class II regulations are even less protective than Class VI regulations,[105] and a Class II well can be used for long-term CO_2 storage without the need to acquire a Class VI permit if the primary purpose of the well is something else or if there are no increased risks to underground sources of drinking water.[106] Concerningly, it is the well owner or operator who is supposed to assess whether a Class VI permit is needed, and there is no requirement to notify regulators of the determination.[107] With this system, it is eminently likely that the application of Class VI rules to CO_2 storage in Class II wells will be extremely inconsistent and will not happen until after harm to communities and the environment has occurred.[108] Further, even if the well owner or operator decides that Class VI rules apply to a Class II well, full compliance is not required of Class II wells, which are used largely for enhanced oil or gas recovery and have different engineering and construction.[109]

With respect to the GHGRP Subpart RR reporting requirement, facilities injecting CO_2 for long-term storage are supposed to verify the amount of CO_2 sequestered and collect data on any CO_2 surface emissions through a monitoring, reporting, and verification (MRV) plan to be approved by EPA. According to EPA, the "GHGRP requirements complement and build on UIC regulations through air-side monitoring and reporting requirements that provide the EPA and communities with a transparent means of evaluating the effectiveness of geologic sequestration."[110] This is a dubious claim. In the first place, the process by which companies design their MRVs and then obtain approval by EPA does not at any point require community participation.[111] Second, compliance with Subpart RR reporting requirements has been imperfect, to say the least. An egregious indication of this was an analysis by NRDC and Greenpeace finding that companies were claiming millions of dollars' worth of Section 45Q tax credits without complying with Subpart RR, even though compliance is required for qualifying for the tax

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[103] "Help stop the buildout of harmful carbon capture and storage projects," Earthjustice, 2023, https://earthjustice.org/action/help-stop-the-buildout-of-harmful-carbon-capture-and-storage-projects; *NAACP Comment Regarding Docket ID No. EPA–HQ–OW–2023–0073*, U.S. EPA (2023) (submitted by Abre' Conner, Director, Center for Environmental and Climate Justice, NAACP and Michael McClanahan, President, Louisiana NAACP State Conference), https://naacp.org/sites/default/files/documents/NAACP%20comments%20re%20LA%20Primacy%20and%20CCS%20EPAHQOW20230073.pdf.
[104] "Primary Enforcement Authority for the Underground Injection Control Program," U.S. EPA, accessed July 20, 2023, https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0.
[105] *Strengthening the Regulation of Enhanced Oil Recovery to Align it with the Objectives of Geologic Carbon Dioxide Sequestration* (NRDC, 2017), https://www.nrdc.org/sites/default/files/regulation-eor-carbon-dioxide-sequestration-report.pdf.
[106] Powell, Keri, *Use of Class II Underground Injection Control (UIC) Wells for Long-Term CO_2 Geologic Sequestration/Storage* (Carbon Capture Facts, June 7, 2023), https://drive.google.com/file/d/1jpdqmstzzRsp_t1AdoAPi091BmwstKQS/view.
[107] *Ibid*.
[108] *Ibid*.
[109] *Ibid*.
[110] Proposed rule, Section VIX.E.3, p. 33414.
[111] GHGRP 40 CFR Part 98 Subpart RR, https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-RR.

credit.[112] In fact, the NGOs noted that, according to reporting to the Internal Revenue Service, operators claimed tax credits for 62.7 million metric tons of CO_2 while the EPA had knowledge of only 6 million metric tons of CO_2 sequestered—a tenfold difference in numbers that should be roughly the same if facilities are complying with Subpart RR.[113]

D. State Compliance Flexibilities

In the proposed rule, EPA would allow trading and averaging for state plans that establish emissions standards for existing sources. Trading and averaging mechanisms in regions where they exist have the potential to maintain or worsen disparities in emissions burdens by race and ethnicity. A growing body of research has shown that carbon trading programs maintain or worsen environmental disparities by allowing polluting facilities to buy allowances or emission reduction credits and continue to operate and create local pollution even while overall GHG emissions may be reduced. A 2018 study on California's cap-and-trade program has found that most regulated facilities reported higher annual average local (in-state) GHG emissions after the initiation of trading, even though total emissions remained well under the cap established by the program.[114] Since California's cap-and-trade program began, neighborhoods that experienced increases in annual average GHG and co-pollutant emissions from regulated facilities nearby had higher proportions of People of Color and poor, less educated, and linguistically isolated residents than did neighborhoods that experienced decreases in GHGs. Trading and averaging mechanisms in regions where they exist have the potential to maintain or worsen disparities in emissions burdens by race and ethnicity. Neither a rate-based nor a mass-based trading scheme can ensure that local air pollutant emissions will not increase in certain locations.

We believe that EPA should not allow trading and averaging schemes as appropriate compliance mechanisms in state plans. In states where trading schemes exist, EPA should encourage such states to meet emissions standards through early retirements of power plants located in environmental justice communities. Below in Part VI we explain in more detail an approach environmental justice advocates have proposed to target power plants in environmental justice communities for emissions reductions.

IV. Lack of Sufficient EJ Analysis or Cumulative Impacts Analysis

One of the most glaring deficiencies of the proposed rule is its environmental justice analysis, which is wholly insufficient to substantively answer the three questions in EPA's Technical Guidance for Assessing Environmental Justice in Regulatory Analysis: (1) Are there potential EJ concerns associated with environmental stressors affected by the regulatory actions for population groups of concern in the baseline? (2) Are there potential EJ concerns associated with environmental stressors affected by the

[112] *NRDC and Greenpeace Comment Regarding IRS Request for Comments on Credit for Carbon Oxide Sequestration, Notice 2019-32*, IRS (2019) (submitted by Briana Mordick, Senior Scientist, Natural Resources Defense Council and John Noël, Senior Climate Campaigner, Greenpeace), https://www.regulations.gov/comment/IRS-2019-0026-0076.
[113] *Ibid*.
[114] Cushing, L., Blaustein-Rejto, D., Wander, M., Pastor, M., Sadd, J., Zhu, A., & Morello-Frosch, R. (2018). Carbon trading, co-pollutants, and environmental equity: Evidence from California's cap-and-trade program (2011–2015). *PLOS Medicine*, *15*(7), e1002604. https://doi.org/10.1371/JOURNAL.PMED.1002604

regulatory actions for population groups of concern for the regulatory option(s) under consideration? (3) For the regulatory option(s) under consideration, are potential EJ concerns created[, exacerbated,] or mitigated compared to the baseline?

The inability of the environmental justice analysis to answer the above questions is rooted in several key areas of deficiency: (1) its failure to consider natural gas–fired EGUs affected by this rule, both in its proximity analysis and in its distributional analysis of $PM_{2.5}$ and ozone; (2) use of inappropriate radii to understand the demographics of communities around plants; (3) its failure to answer the question of how levels of co-pollutants are expected to change around plants as a result of CCS and hydrogen co-firing; (4) additional significant limitations in its distributional analysis of $PM_{2.5}$ and ozone exposures, and EPA's problematic interpretation of results; and (5) the complete absence of analysis on cumulative impact burdens, contrary to EPA's mandate to consider cumulative impacts in its decision-making.

A. Exclusion of Natural Gas Plants

One of the most significant omissions rendering the environmental justice analysis insufficient is the exclusion of the natural gas–fired EGUs that are subject to the rule. To begin with, in its proximity analysis, only 140 plants with at least one coal-fired EGU, including a subset of 22 coal plants assumed to close, were assessed in relation to their proximity to EJ communities,[115] despite the fact that most of the EGUs subject to this rule are existing or proposed new natural gas plants. In fact, around 165 existing natural gas plants have a capacity factor of 50 percent or more and a size of 300 MW or greater and would therefore be subject to the rule under EPA's proposal.[116] The exclusion of natural gas plants from this analysis is striking given their relevance for environmental justice. Studies have shown that the fleet of natural gas plants has a high coincidence with Communities of Color and low-income communities.[117]

Further, the modeling that formed the basis of the EJ distributional analysis of $PM_{2.5}$ and ozone exposure also excluded natural gas–fired EGUs impacted by the rule. As explained in the regulatory impact analysis:

> This RIA evaluates the benefits, costs and certain impacts of compliance with three illustrative scenarios: the proposal, a less stringent scenario, and a more stringent scenario. The modeling of the illustrative proposal scenario that is discussed in Sections 3 through 7 of this RIA includes all aspects of the proposed 111(d) requirements for existing fossil fuel–fired steam generating units and most aspects of the proposed 111(b) requirements for new and reconstructed stationary combustion turbines. However, it does not reflect the proposed 111(d) requirements for existing stationary combustion turbines or one additional component of the 111(b) requirements (for

[115] Regulatory Impact Analysis, Section 6-4.
[116] "Power plants and neighboring communities mapping tool," U.S. EPA, accessed July 26, 2023, https://experience.arcgis.com/experience/2e3610d731cb4cfcbcec9e2dcb83fc94?views=Legend.
[117] 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.

new base load combustion turbines in the hydrogen co-firing subcategory, the third phase standard based on co-firing 96 percent low-GHG hydrogen by 2038). For these additional measures, EPA performed a spreadsheet-based analysis of regulatory impacts that is discussed in Section 8 of this RIA.[118]

The EJ air pollution exposure analysis relied on air quality surfaces generated in the illustrative scenario model, which did not account for all EGUs affected by the rule, and therefore the analysis is flawed and incomplete.[119] It is worth noting that while EPA's original RIA excluded the aforementioned components of the rule from its modeling of air quality, health benefits, and economic impacts, the new analysis released by EPA midway through the comment period updated the modeling of those impacts based on the integrated proposal.[120] **However, the new analysis did not include any updated environmental justice assessment.** In other words, there is a continuing lack of information on the environmental justice impacts deriving from the totality of EGUs affected by the proposed rule. The modeling used for the environmental justice analysis continues to only factor in the predicted impacts to the coal sector under the pre- and post-policy scenarios, which include closures of plants, and only partial aspects of new gas EGUs. If the rule's potential impact on natural gas–fired EGUs were to be fully included (existing gas and all aspects of new gas EGUs), the resulting proximity and distributional analyses would likely yield very different results, especially given that there are expected to be new natural gas plants added and fewer natural gas plant retirements relative to coal. ***The EPA should conduct a complete EJ analysis that is inclusive of all facilities subject to the rule.***

B. Inappropriate Radii Used to Characterize Communities Impacted by Plants

Even under the coal-only scenario, the EJ analysis has several critical limitations. One key limitation is that in Section 6-4 of the RIA, "Demographic Proximity Analyses of Existing [Coal] Facilities," the proximity analysis used to assess the demographics of impacted areas includes very large radii around coal plants of 10 km (6 miles) and 50 km (30 miles): "The current analysis identified all census blocks with centroids within a 10 km and 50 km radius of the latitude/longitude location of each facility, and then linked each block with census-based demographic data."[121]

It is suggested that the 10 km radius is the *minimum* radius needed "to avoid excessive demographic uncertainty."[122] However, in empirical studies of environmental justice that include proximity analysis, much shorter distances are used to gauge the impact area of point sources, often at 1-mile, 3-mile, and 5-mile radii around facilities; the distance of 10 km or 6 miles, if used at all, is often seen as an *upper* bound.[123]

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[118] Regulatory Impact Analysis, p. 1-13.
[119] Regulatory Impact Analysis, p. 6-11.
[120] Integrated Modeling Proposal and Updated Baseline Analysis.
[121] Regulatory Impact Analysis, p. 6-7.
[122] Regulatory Impact Analysis, p. 6-7, fn. 141.
[123] Pastor Jr., Manuel, Rachel Morello-Frosch, and James L. Sadd, "The air is always cleaner on the other side: Race, space, and ambient air toxics exposures in California," *Journal of Urban Affairs* 27, no. 2 (2005): 127-148; Mohai, Paul, and Robin Saha, "Which came first, people or pollution? A review of theory and evidence from longitudinal environmental justice studies,"

While the proposed rule focuses on CO_2 emissions from the power sector, the EJ analysis should take into consideration the concomitant co-pollutant emissions profiles and their relative impact areas. EPA's own Power Plants and Neighboring Communities Mapping Tool suggests:

> 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.[124]

Elsewhere, EPA's Enforcement and Compliance History Online tool provides demographic analysis based on a 3-mile radius around a facility and EJScreen index analysis based on a 1-mile maximum.[125] **The EJ analysis should use a smaller, 1- to 3-mile radius for the proximity of demographic groups.**

C. Failure to Adequately Assess Changes in Co-Pollutants and EJ Implications at Plants Affected by the Rule

A critical component of the RIA is to answer EJ question 2 delineated above, which asks if there are potential EJ concerns (i.e., disproportionate burdens across population groups) associated with environmental stressors affected by the regulatory action for population groups of concern for the regulatory options under consideration.[126] EPA fails to do this in its EJ analysis. It offers essentially two lines of reasoning, which we will critique in turn.

First, EPA alleges that it did not assess the EJ implications of changes in co-pollutant emissions at EGUs because such an analysis was infeasible. In RIA Section 8, the EPA conducts a spreadsheet-based analysis on the impacts of the rule with respect to new and existing natural gas plants.[127] At the end of this analysis, EPA notes that conducting an EJ analysis as part of this assessment was not feasible, stating:

> EPA also is unable to estimate changes in pollutants other than CO_2 in the analysis presented in this section. As a result, we are unable to quantify or monetize impacts associated with $PM_{2.5}$ or ozone-related concentration changes due to changes in $PM_{2.5}$, NO_x, and SO_2 emissions. Similarly,

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Environmental Research Letters 10, no. 12 (2015): 125011; 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; Casey, Joan A. et al., "Climate justice and California's methane superemitters: Environmental equity assessment of community proximity and exposure intensity," *Environmental Science & Technology* 55, no. 21 (2021): 14746-14757; Zhang, Charlie H. et al., "Proximity to coal-fired power plants and neurobehavioral symptoms in children," *Journal of Exposure Science & Environmental Epidemiology* 32, no. 1 (2022): 124-134.

[124] "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.

[125] "Enforcement and Compliance History Online - Facility Search," U.S. EPA, accessed July 31, 2023, https://echo.epa.gov/facilities/facility-search.

[126] Regulatory Impact Analysis, p. 6-3.

[127] Regulatory Impact Analysis, Section 8.

> we are unable to analyze potential environmental justice impact that may be associated with changes in emissions of these pollutants.[128]

However, there is no technical limitation to conducting such an analysis, and in fact the IPM model used to assess CO_2 emissions also has data on criteria pollutants at the EGU level.[129] Thus, the failure to consider these critical emissions that have localized, detrimental impacts on already vulnerable communities is in clear disregard of EJ concerns. This is especially true for existing plants, as we know where they are located (disproportionately in EJ communities[130]) and do not need to speculate about their locations.

Second, in describing its distributional analysis of $PM_{2.5}$ and ozone exposures in RIA Section 6.5, EPA claims that it is essentially unnecessary to conduct an analysis that would specifically address EJ question 2. It states:

> EJ question 2, which asks if there are potential EJ concerns (i.e., disproportionate burdens across population groups) associated with environmental stressors affected by the regulatory action for population groups of concern for the regulatory options under consideration, was not focused on for several reasons. Importantly, the total magnitude of differential exposure burdens with respect to ozone and $PM_{2.5}$ among population groups at the national scale has been fairly consistent pre- and post-policy implementation across recent rulemakings. As such, differences in nationally aggregated exposure burden averages between population groups before and after the rulemaking tend to be very similar. Therefore, as disparities in pre- and post-policy burden results appear virtually indistinguishable, the difference attributable to the rulemaking can be more easily observed when viewing the change in exposure impacts, and as we had limited available time and resources, we chose to provide quantitative results on the pre-policy baseline and policy-specific impacts only, which related to EJ questions 1 and 3. We do however use the results from questions 1 and 3 to gain insight into the answer to EJ question 2 in the summary (Section 6.8).[131]

This rationale is problematic for various reasons. As explained above, the modeling that went into the distributional analyses of ozone and $PM_{2.5}$ exposures excluded key components of the proposed rule pertaining to natural gas–fired EGUs. Moreover, EPA's logic has very concerning implications. In essence,

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[128] Regulatory Impact Analysis, p. 8-25.

[129] *See* "Results using Post-IRA 2022 Reference Case," U.S. EPA, last updated June 26, 2023, https://www.epa.gov/power-sector-modeling/results-using-post-ira-2022-reference-case. As explained in the RIA's Appendix A on air quality modeling, EPA had calculated EGU-level emissions estimates of NO_x, SO_2, and $PM_{2.5}$ using IPM and its outputs in modeling the baseline and illustrative scenarios. Regulatory Impact Analysis, p. A-1.

[130] 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.

[131] Regulatory Impact Analysis, p. 6-11, fn. 146.

EPA's logic is that if the magnitudes of the disparities before and after the rule are similar, and the changes caused by the rule are small in comparison, then this obviates the need to analyze whether the changes themselves have a disproportionate impact. This reasoning is highly problematic. If agencies always followed this logic, it would mean that EJ considerations would never be able to influence any regulatory action, unless that action had a substantial effect on EJ for better or worse. More troubling still, it also means that *perpetuating* disparities—even significant ones—is not a concern.

In any case, applying this logic, EPA subsequently makes inferences about EJ question 2. Section 6.8 of the RIA summarizes the inferences as follows:

> We infer that baseline disparities in ozone and $PM_{2.5}$ concentration burdens are likely to remain after implementation of any of the regulatory options under consideration due to the small magnitude of the concentration changes associated with this rulemaking across demographic populations, relative to baseline burden disparities (EJ question 2). Also, due to the very small differences in the distributional analyses of post-policy exposure impacts across demographic populations, we do not find evidence that disparities in populations of potential EJ concerns will be meaningfully exacerbated or mitigated by the regulatory alternatives under consideration regarding $PM_{2.5}$ exposures in all future years evaluated and ozone exposures in 2028, 2035, and 2040. However, in 2030, Asian populations, Hispanic populations, and those linguistically isolated may experience a slight exacerbation of ozone exposure disparities at the national level (EJ question 3). At the state level, ozone exposure disparities may be either mitigated or exacerbated for certain demographic groups analyzed in 2030, also to a small degree.[132]

This way of identifying EJ impacts on the basis of changes in nationally or state aggregated exposure burdens by demographic group renders the analysis very incomplete, as it assumes that trends are spatially homogeneous across incredibly large areas. There are also only two pollutants considered, $PM_{2.5}$ and ozone. Even just these two pollutants diverge in their national trends, underscoring that the assessment is incomplete without considering other key pollutants such as NO_x.

The EPA should conduct a thorough EJ analysis that responds to this critical question about the associated environmental stressors that result from all the power plants subject to this rule and the addition of stressors from the adoption of CCS and hydrogen co-firing at plants. That the EJ analysis currently fails to adequately consider the co-pollutant impacts that can result from the addition of CCS units and hydrogen co-firing could have a significant impact on the local air quality and public health of proximate EJ communities. Our preliminary analysis suggests that many of the proposed or planned CCS projects across the fossil fuel sector are co-located in proximity to EJ communities. In fact, in assessing

[132] Regulatory Impact Analysis, p. 6-30.

the locations of planned CCS projects listed in various CCS databases,[133] we observe that more than 91 percent are located in or within three miles of an EJ community.[134]

D. Additional Limitations in $PM_{2.5}$ and Ozone Exposure Distributional Analysis and Problematic Interpretation of Results

It is also important to call attention to the significant limitations in the analysis that EPA did conduct. In the distributional analysis of $PM_{2.5}$ and ozone exposures, the analysis uses air quality surfaces to estimate exposures from ozone and $PM_{2.5}$. These surfaces are based on 12 km grids, which are extremely large, rendering the evaluations less relevant for near-source exposure impacts to fence-line or downwind communities. Further, the post-policy scenario air modeling only reflects all in-state sources in unison with even less granular application of results for EJ communities living in close proximity to EGUs:

> While the baseline spatial patterns represent 12 km grid resolution ozone and $PM_{2.5}$ concentrations associated with the facility level emissions described above, the post-policy air quality surfaces will capture expected ozone and $PM_{2.5}$ changes that result from state-to-state emissions changes but will not capture heterogenous changes in emissions from multiple facilities within a single state (i.e. all sources within each state are assumed to increase or decrease in unison for the purpose of creating air quality surfaces).[135]

In addition, findings from the national assessments of $PM_{2.5}$ and ozone exposure before and after implementation of the rule are limited (they exclude anticipated changes to natural gas EGUs, as explained above), and the uncertainties are not quantified at any point. This is despite EPA's recognition that uncertainties are even more relevant when anticipated changes are small, as is the case with $PM_{2.5}$ exposures.[136] Furthermore, the EJ analysis does not examine the impacts of hazardous air pollutants and other criteria pollutants besides $PM_{2.5}$ and ozone in its pre- and post-policy scenario modeling of the rule.

Last but not least, the distributional analysis for $PM_{2.5}$ and ozone fails to account for any differences in underlying susceptibility, vulnerability, or risk factors across populations exposed to $PM_{2.5}$ and ozone.[137] Yet such an analysis is eminently feasible. **The EJ analysis should account for the underlying differences in vulnerability and risk factors using indicators and datasets embedded in many of the available federal agency tools**, including, but not limited to, EPA's EJScreen, the White House Council on Environmental Quality's Climate and Economic Justice Screening Tool, the CDC's Social Vulnerability Index, or the CDC/ATSDR Environmental Justice Index.

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[133] "CCUS project database," IEA, accessed May 2, 2023, https://www.iea.org/data-and-statistics/data-product/ccus-projects-database; "Carbon capture and storage database," DOE NETL, accessed April 22, 2023, https://netl.doe.gov/carbon-management/carbon-storage/worldwide-ccs-database; "Facilities database," Global CCS Institute, accessed May 2, 2023, https://co2re.co/FacilityData; "U.S. carbon capture activity and project table," Clean Air Task Force (CATF), accessed May 2, 2023, https://www.catf.us/ccstableus/.

[134] EJ designation was determined by census block group (CBG) using the Equitable & Just National Climate Platform definition for an EJ community based on income or race.

[135] Regulatory Impact Analysis, p. 6-12.

[136] Regulatory Impact Analysis, p. 6-15.

[137] Regulatory Impact Analysis, p. 6-20; Regulatory Impact Analysis, p. 6-28.

Notably, even under these limitations, EPA finds adverse EJ impacts related to ozone for segments of the population. As detailed in Section 6.5.3.1. on National Aggregated Results, ozone exposure disparities will be exacerbated in 2030 for Asian, Hispanic, and linguistically isolated populations under all of the modeled regulatory scenarios.[138] Section 6.5.3.2. on State Aggregated Results shows that in all of the modeled scenarios *and* in all of the evaluated years, there will be states where the demographic subgroups analyzed will experience ozone increases.[139] Specifically, "The maximum ozone increases are observed with the 'Most Stringent' policy option in 2030 with a maximum state-level population-weighted average of 0.18 ppb experienced by Asian populations in Delaware (DE) and by Asians, American Indians, Blacks, Hispanics, the linguistically isolated, the less educated, and uninsured populations in Maryland (MD)."[140]

It seems that EPA's interpretation is that these increases are not of particular concern, based on its reasoning, first, that "ozone increases are . . . of smaller magnitude than that of predicted ozone decreases,"[141] and second, that "demographic groups within most states are predicted to experience very similar exposure impacts as the state reference populations, with a few potential exceptions (e.g., Pennsylvania [PA] in 2030 and Virginia [VA] in 2030 and 2035)."[142] Besides discounting those exceptions, we find EPA's interpretation problematic for several reasons. In the first place, the comparison with reference populations to conclude that exposure impacts are similar ignores the differences in vulnerability and susceptibility among populations. Factors like race and social vulnerability are linked to greater impact from a given amount of pollution, as EPA well knows.[143] Given that EPA has not incorporated any of these additional risk factors into its EJ analysis, as noted earlier, it should be interpreting its results as a likely underestimate of the impact on EJ communities. (The importance of doing an analysis that accounts for cumulative impacts and existing burdens in EJ communities is explained in more detail in Part V.E below.)

We also note that the comparisons are conducted between a given demographic subgroup of concern, on the one hand, and the reference population that the analysis defines as the total population— i.e.,

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[138] Regulatory Impact Analysis, pp. 6-23 & 6-24.
[139] Regulatory Impact Analysis, p. 6-27, fig. 6-8.
[140] Regulatory Impact Analysis, p. 6-26.
[141] Regulatory Impact Analysis, pp. 6-25 & 6-26.
[142] Regulatory Impact Analysis, p. 6-26.
[143] *See*, *e.g.*, EPA's own Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, which notes: "Minority populations, low-income populations, and indigenous peoples often experience greater exposure and disease burdens than the general population as a whole, which can increase the risk of adverse health effects from environmental stressors among these populations…. [D]ue to a range of existing physical, chemical, biological, social, and cultural factors, population groups of concern may be more exposed to environmental toxins, or may suffer greater ill effects from exposures of similar magnitude, because they may have a compromised ability to cope with and/or recover from such exposures. Both high exposures and increased individual susceptibility to environmental stressors may lead to a predisposition to higher health risks among minority populations, low-income populations, or indigenous peoples. As a result, in an assessment of potential EJ concerns, it is important to assess both the potential for higher exposures to a given environmental stressor and the potential for higher susceptibility to adverse effects of the stressor for population groups of concern." U.S. EPA, Technical guidance for assessing environmental justice in regulatory analysis (2016), p. 15, [l]https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf. Citations removed.

including all of those sub-groups of concern.[144] However, EPA's technical guidance states that for regulatory impact analysis, "ideally, the comparison group for an across-group comparison is as similar as possible to the population group of concern, but *without* the socioeconomic characteristics defining the group of concern [emphasis added]."[145] EPA did not adhere to this, and its choice of reference group is another reason why its results should be interpreted as an underestimate of differential impact.

Finally, it is worth recalling that the limited EJ analysis is focused on the rule's impact on 140 coal plants, and already demonstrates that the rule will have detrimental effects. The EPA characterizes these impacts as "slight" and "small."[146] However, the addition of the rule's impact on natural gas plants and the related introduction of co-pollutant emissions from the application of hydrogen co-firing and CCS at these plants would likely affect the results. There would likely be greater EJ impact, as there will be co-pollutant increases due to the introduction of hydrogen fuel-fixing and CCS at fossil fuel plants (as demonstrated in Part I) and the fact that fossil fuel plants are disproportionately sited in EJ communities.[147] EPA also did not analyze new source EJ impacts as explained in RIA Section 6.7,[148] and it is likewise reasonable to assume that the inclusion of new sources in the analysis would reveal a greater impact on EJ communities, again because of disproportionate siting in those communities.

E. Absence of Analysis on Cumulative Impacts

The critiques outlined in Parts V.A through V.D already demonstrate the insufficiencies of EPA's EJ analysis. However, the absence of any analysis of cumulative impacts is another glaring deficiency in the RIA and warrants its own discussion. **The EJ analysis outright fails to consider any indicators related to existing cumulative impact burden in areas next to or near power plants subject to the rule.** The concept is not even mentioned as a cause for concern, disregarding the agency's own technical guidance on assessing environmental justice in regulatory actions, which warns:

> Additionally, exposure to a stressor may occur across several sources (e.g., air emissions from several facilities in different industries). An analysis that considers risks from only one source can inaccurately characterize the potential for health risks if the populations for which risk is being estimated are also exposed to a stressor from the other sources. For example, a single source

[144] Regulatory Impact Analysis, p. 6-20.

[145] *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* (U.S. EPA, 2016), p. 54, https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.

[146] "In 2030, Asian populations, Hispanic populations, and those linguistically isolated may experience a slight exacerbation of ozone exposure disparities at the national level (EJ question 3). At the state level, ozone exposure disparities may be either mitigated or exacerbated for certain demographic groups analyzed in 2030, also to a small degree." Regulatory Impact Analysis, p. 6-33.

[147] 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.

[148] "EJ impacts of new sources subject to 111(b) are highly uncertain as the location of new sources is unknown. Therefore, we do not make predictions regarding potential EJ impacts from new sources." Regulatory Impact Analysis, p. 6-30.

might emit low levels of a stressor, but when considered across all sources to which a population is exposed, the exposure may be sufficient to result in a health risk or concern.[149]

The agency's failure to substantively evaluate environmental justice concerns including cumulative impacts is also in direct contradiction of federal Executive Order (EO) 14096 of 2023*, Revitalizing Our Nation's Commitment to Environmental Justice for All.* Section 3(a) of EO 14096 clearly sets out a mandate to federal agencies to identify, analyze, and address cumulative impacts, as follows:

> Each agency shall, as appropriate and consistent with applicable law: (i) identify, analyze, and *address disproportionate and adverse human health and environmental effects* (including risks) and hazards of Federal activities, *including those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns*; (ii) evaluate relevant legal authorities and, as available and appropriate, *take steps to address disproportionate and adverse human health and environmental effects (including risks)* and hazards unrelated to Federal activities, including those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns [emphasis added].[150]

Thus, in line with EO 14096, the proposed rule should include an analysis of its disproportionate effects including those related to climate change and cumulative impacts. The proposed rule has, by its own admission, not carried out this mandate. Section XV on Statutory and Executive Order Reviews in the proposed rule includes a subsection dedicated to EO 12898 of 1994, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, but makes no mention of the more recent EO.[151] Further, not only does EPA fail to acknowledge EO 14096 and its directives around cumulative impacts, but it also claims that it is impractical to carry out even the obligations of EO 12898. Under EO 12898, federal agencies are tasked with "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations."[152] But EPA shirks this responsibility, stating in the rule's final paragraph, "EPA believes that it is not practicable to assess whether the GHG impacts associated with this action are likely to result in a change in disproportionate and adverse effects on people of color, low-income populations and/or Indigenous peoples."[153]

The EPA should comply with EO 12898 and EO 14096 and conduct a comprehensive assessment of the adverse and disproportionate impacts of the proposed rule, including contributions to cumulative impacts, and take appropriate action to reduce or eliminate those impacts. It should include a review of its adherence to the latest executive order (14096) on environmental justice, especially in light of the serious concerns that EJ communities have raised and that are cited throughout the rule. The concerns

[149] *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* (EPA, 2016), p. 18, https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.
[150] Exec. Order No. 14096, 88 Fed. Reg. 25,251 §§ 3a-3b. (2023).
[151] Proposed rule, Section XV.J, p. 33420.
[152] Exec. Order No. 12898, 3 C.F.R. §§ 1-101 (1994).
[153] Proposed rule, Section XV.J, p. 33420.

of EJ communities should be addressed directly, rather than relegated to public engagement processes devoid of any regulatory relief or decision-making powers. As we explain in Part V, what makes engagement actually meaningful is the affirmative opportunity not only to raise concerns but to have those concerns be taken seriously and implemented into decision-making processes.

It is worth highlighting that while the proposed rule and EJ analysis fail to conduct anything that approximates a cumulative impacts assessment, it is both feasible and practical to do so, as evidenced by the existence of several methodologies in use today by state governments and researchers.[154] There are more than a dozen states that have developed cumulative impacts assessment tools or policies.[155] Two states, New Jersey[156] and New York,[157] have enacted laws to address cumulative impacts in their regulatory processes. California has codified a methodology for assessing cumulative impacts using the CalEnviroScreen tool, now in its fourth iteration, which was developed with community consultation and has been extensively peer reviewed.[158] Furthermore, EPA's Office of Research and Development released a report in 2022, *Cumulative Impacts Research: Recommendations for EPA's Office of Research and Development* , which defines cumulative impacts and shows the various research areas that can use this evolving concept.[159] As outlined in EPA's 2022 to 2026 Strategic Plan, the agency has set an FY 2022–2023 Agency Priority Goal to "develop and implement a cumulative impacts framework" by September 30, 2023.[160]

In short, there are more than three decades of research, policy, and empirical evidence of cumulative impacts in EJ communities. **The proposed rule should reflect this extensive body of research and the substantive concerns of EJ communities with respect to cumulative impacts by conducting a thorough analysis of these impacts. Furthermore, as analysis alone is not sufficient, EPA should use cumulative impact analysis as a basis for denying permits for CCS and hydrogen co-firing, when warranted, as a mechanism to protect EJ communities from further harm.** This is consistent with EPA's obligations under

[154] Baptista et al., *Understanding the Evolution of Cumulative Impacts: Definitions and Policies in the U.S.* (Tishman Environment and Design Center, The New School, August 2022), https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/630637a79481bf24cac9f19e/1661351847644/CumulativeImpacts_REPORT_FINAL_Aug2022.pdf; "Cumulative impacts definitions, indicators and thresholds in the US," Tishman Environment and Design Center at The New School, May 24, 2022, https://tishmancenter.github.io/CumulativeImpacts/cumulative_impacts.html.

[155] Baptista et al., *Understanding the Evolution of Cumulative Impacts: Definitions and Policies in the U.S.* (Tishman Environment and Design Center, The New School, 2022), https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/630637a79481bf24cac9f19e/1661351847644/CumulativeImpacts_REPORT_FINAL_Aug2022.pdf; "Cumulative impacts definitions, indicators and thresholds in the US," Tishman Environment and Design Center at The New School, May 24, 2022, https://tishmancenter.github.io/CumulativeImpacts/cumulative_impacts.html.

[156] S.232, 219th Leg., Reg. Sess. (N.J. 2020); N.J. Admin. Code § 7:1C (2023).

[157] S.1317, 2023 Leg., Reg. Sess. (N.Y. 2023).

[158] "CalEnviroScreen," California Office of Environmental Health Hazard Assessment (OEHHA), accessed July 28, 2023, https://oehha.ca.gov/calenviroscreen.

[159] Julius, Susan et al., *Cumulative Impacts Research: Recommendations for EPA's Office of Research and Development* (Washington, DC: U.S. EPA, EPA/600/R-22/014a, 2022), https://www.epa.gov/system/files/documents/2023-05/CUMULATIVE%20IMPACTS%20RESEARCH-FINAL%20REPORT-EPA%20600-R-22-014A%20%2812%29.PDF.

[160] *FY 2022-FY 2026 EPA Strategic Plan* (U.S. EPA, 2022), p. 33, https://www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan.pdf.

EO 14096, Section 3(a)(ii) and Section 3(a)(vi), which direct agencies to use their legal authority to address disproportionate impacts, including contributions to cumulative impacts, related to their activities and to avoid, minimize, or mitigate those impacts to the maximum extent practicable. Therefore, as we have argued in Part III, EPA should implement a cumulative impacts analysis and decision-making framework for permits and state implementation plans. If for whatever reason EPA does not, then the agency should delegate this responsibility to the states so that states can include a cumulative impacts policy in their own plans.

V. “Meaningful Engagement,” and Inadequate Engagement in the Rule-Making Process Thus Far

The rule relies heavily on the mention of “meaningful engagement” with communities when referencing environmental justice concerns raised by communities with respect to CCS and hydrogen co-firing, state implementation plans, and safety issues related to pipelines and other sequestration mechanisms.[161] However, meaningful engagement cannot substitute for substantive protections against additional pollution or tangible decision-making powers, nor should it be used to deflect or diminish the real concerns that communities present with respect to material impacts on their environment, health, and well-being. No amount of public engagement processes can mitigate or eliminate these demonstrable impacts unless those engaged have the ability to impact the deliberations of decision-makers and the respective regulatory processes implicated by the proposed rule.

Thus, rather than referencing the general notion of community engagement, EPA’s conception of “meaningful engagement” under this rule should explicitly include the ability of EJ communities to intervene in the regulatory process to deny a proposed state implementation plan or a permit related to a facility using CCS or hydrogen co-firing when there are risks that may be detrimental to human health and/or will make absolute contributions to cumulative impacts.

With respect to the rule-making process thus far, we wish to call attention to how engagement has *not* been meaningful. Section 3(vii.) of EO 14096 describes some of the components of the obligation, as follows:

> . . . provid[ing] opportunities for the meaningful engagement of persons and communities with environmental justice concerns who are potentially affected by Federal activities, including by:
>
> (A) providing timely opportunities for members of the public to share information or concerns and participate in decision-making processes;
>
> (B) fully considering public input provided as part of decision-making processes;

[161] See, e.g., Proposed rule, Section I.D, p. 33247; Proposed rule, Section VII.F.3.b.iii.(C), p. 33302; Proposed rule, Section X.D.1.iii, p. 33349; Proposed rule, Section XIV.E.3, p. 33414

(C) seeking out and encouraging the involvement of persons and communities potentially affected by Federal activities by: (1) ensuring that agencies offer or provide information on a Federal activity in a manner that provides meaningful access to individuals with limited English proficiency and is accessible to individuals with disabilities; (2) providing notice of and engaging in outreach to communities or groups of people who are potentially affected and who are not regular participants in Federal decision-making; and (3) addressing, to the extent practicable and appropriate, other barriers to participation that individuals may face; and

(D) providing technical assistance, tools, and resources to assist in facilitating meaningful and informed public participation, whenever practicable and appropriate.

As the agency well knows, the proposed rule and the no fewer than 64 supplemental documents, including 9 technical support documents, are an enormous amount of material to digest. The public was given only 2.5 months to provide comments. Moreover, EPA released additional analysis more than halfway through the comment period, with only one month left before the deadline. Under these circumstances, it is wholly unreasonable to expect most environmental justice communities and organizations to have time to understand the information to the extent that they can meaningfully engage in the process.

VI. Conclusion: Power Sector Climate Mitigation That Centers Environmental Justice

These comments have detailed how this proposed rule can actively harm EJ communities and how it fails to protect these communities from the harm it can inflict. One of the active harms comes in the form of increased GHG co-pollutant emissions from the use of CCS and hydrogen co-firing, which are both promoted by the proposed rule. Other active harms could include dangerous CO_2 leaks from pipelines or underground storage areas, and water scarcity exacerbated by the use of water to produce low-GHG hydrogen on site at a power plant. Alarmingly, the proposed rule contains no added protections for the communities it will place in harm's way. Instead, it relies on an existing regulatory scheme that has already proved to be insufficient to protect EJ communities and on public participation, which—although a necessary part of protecting EJ communities—is insufficient to accomplish the task by itself.

The reasoning EPA uses to justify this rulemaking may also pose a threat to EJ communities that extends beyond the scope of this particular proposed rule. Through the proposed rule, EPA not only promotes CCS and hydrogen co-firing but also the idea that increased co-pollutant emissions associated with these methodologies are not a concern if they are "controlled" or occur at "acceptable" levels. EPA also seems to indicate that a rule that perpetuates, or even modestly increases, environmental disparities rooted in race and income is acceptable as long as it doesn't severely increase such disparities. This type of logic is disappointing and one reason why these environmentally unjust disparities occur and persist.

Because of the harm it poses to EJ communities, the four authoring organizations and the co-signatories to these comments cannot in good conscience support the proposed rule. An important element in this lack of support is the harm CCS and hydrogen co-firing causes to EJ communities, which makes it inappropriate for them to be designated as the best systems of emissions reductions. It is also important to note that although incorporating a cumulative impacts policy into the proposed rule would partially lessen the harm it would cause to EJ communities, it would still not make the proposed rule worthy of support.

What we do support is a massive and rapid transition to the use of energy efficiency and renewable energy to meet U.S. energy needs. This effort should center equity and EJ as it moves the nation away from CCS, hydrogen co-firing, and fossil fuel utilization in general. A critical element of a justice-oriented climate change mitigation program would be the mandatory emissions reductions policy introduced earlier in these comments. Such a policy would help reduce disproportionate pollution loads and cumulative impacts in EJ communities by requiring power plants that significantly impact these communities to shut down or otherwise reduce their co-pollutant emissions. This type of policy would not be limited to power plants but would also be developed for the transportation, chemical, and industrial sectors. A justice-centered climate change mitigation policy would also not use CCS and hydrogen co-firing to satisfy a GHG standard at the state level, even if these methodologies are used to establish such a standard by some version of this proposed rule. Instead, energy efficiency, renewable energy, and a mandatory emissions reduction policy applied to any existing plants would be utilized.

Developing and implementing a climate change policy based on renewable energy and energy efficiency would allow our nation to win the fight against climate change and to create new economic, political, and physical infrastructures that would sustain the victory. Centering the policy on justice will also help build a fairer and more equitable society.

We would welcome the opportunity to discuss any of the ideas contained in these comments with EPA. The authors can be reached through the following email address: lamy@newschool.edu

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CleanAirNow_EJ
Clean Power Lake County
Climate Justice Alliance
Concerned Citizens of Wagon Mound and Mora County
Connecticut Coalition for Economic and Environmental Justice

Deep South Center for Environmental Justice
Delaware Concern Residents for Environmental Justice
Environmental Justice Health Alliance for Chemical Policy Reform
Harambee House Inc/ Citizens for Environmental Justice
Ironbound Community Corporation
Just Transition Alliance
Los Jardines Institute
Michigan Environmental Justice Coalition
PODER
South Ward Environmental Alliance
WE ACT for Environmental Justice

With the co-signed allied organizations:

Alliance of Nurses for Healthy Environments
American Sustainable Business Network
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Clean+Healthy
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