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Submitted Electronically

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**Re: Docket No. DOE-HQ-2024-0082, Comment Regarding the
Department of Energy's Notice of Intent to Prepare an Environmental
Impact Statement for the Appalachian Hydrogen Hub (ARCH2),
(DOE/EIS-0569)**

The Ohio River Valley Institute (ORVI) and Buckeye Environmental Network (BEN), together with Berks Gas Truth, Better Path Coalition, Bucks Environmental Action, Breathe Project, Center for Coalfield Justice, Climate Reality NEPA, Climate Reality Project: Susquehanna Valley PA Chapter, Earthworks, Environmental Health Project, Fair Shake Environmental Legal Services, Food & Water Watch, FracTracker Alliance, Freshwater Accountability Project, Mid-Ohio Valley Climate Action, Moms Clean Air Force—PA, WV, OH Chapters, Move Past Plastic, NEPA Green Coalition, No False Climate Solutions PA, North Braddock Residents for Our Future, PennFuture, People Over Petro Coalition, Save Ohio Parks, Save our Susquehanna, Third Act Ohio, Three Rivers Waterkeeper, and West Virginia Citizen Action submit the following comments on the “Notice of Intent to Prepare an Environmental Impact Statement for the Appalachian Hydrogen Hub (ARCH2), (DOE/EIS-0569)” (Notice).

The Department of Energy's (DOE) approval of the Appalachian Regional Clean Hydrogen Hub (ARCH2) continues a long tradition of funding extractive industry in Appalachia. Historically, and still, this development has burdened communities with harms to their water, air, and health while denying them meaningful involvement in the planning processes designed to evaluate these harms. DOE should take care to avoid replicating these harms in its funding of ARCH2.

ARCH2 is a risky, expensive venture that is unlikely to provide Appalachian communities with the benefits of low-emissions power or economic growth, and highly likely to increase methane emissions, hazardous air pollution, water quality issues, and disruptive industrial activity in the region. To comply with the National Environmental Policy Act (NEPA), DOE has the grave responsibility of considering a wide variety of impacts that this action would have on human health and the environment in Appalachia, as well as seriously grappling with alternatives that will better serve both

Appalachian communities and the purpose of the infrastructure law that spurred the regional hydrogen hub program.

This Comment will start by discussing the background of this Notice and the duty that DOE has to conduct an environmental impact statement (EIS) and consider a wide range of environmental impacts and alternatives to funding ARCH2. Next, this Comment explains why the Notice is overly vague and should be paused until there is more publicly available information about ARCH2. Nonetheless, if DOE proceeds with conducting an EIS at this stage, this Comment offers a range of environmental impacts and alternatives that DOE must consider to comply with NEPA.

I. Background

The 2021 Bipartisan Infrastructure Law (BIL) appropriated funds for the development of hydrogen as an energy source and directed DOE to distribute these funds among networks of hydrogen producers, consumers, and connective infrastructure known as hydrogen hubs, with the aim of mitigating climate change.¹ In July 2024, DOE announced that it would provide up to \$925 million to fund the construction of ARCH2, the Appalachian hydrogen hub.² ARCH2 consists of an undetermined and vaguely described set of projects located in Ohio, Pennsylvania, and West Virginia that would mostly produce and utilize “blue hydrogen,” or hydrogen derived from fracked methane gas using autothermal reforming with carbon capture and sequestration (CCS).³ The Hub’s project leader, Battelle Memorial Institute (Battelle), has already received \$30 million to complete planning and development activities for ARCH2.⁴

Residents of Appalachia have struggled for years to obtain information about ARCH2. To date, very little information is publicly available about the exact locations, proposed processes, and other basic aspects of these projects.⁵ In fact, Battelle is still actively soliciting new projects to be a part of the Hub.⁶

DOE published this Notice on December 18, 2024, that it would proceed with an EIS for ARCH2. The Notice contains no information about the particulars of the projects that are proposed to be part of ARCH2, such as project locations, developers, or specific processes or outputs. DOE held a virtual public meeting on January 16, 2025—very early

¹ See Infrastructure Investment and Jobs Act, H.R. 3684, 117th Cong. §§ 40311–40315 (2021).

² Office of Clean Energy Demonstrations, *Appalachian Hydrogen Hub (ARCH2) Awardee Fact Sheet*, at 2, <https://www.arch2hub.com/wp-content/uploads/2024/07/H2Hubs-Appalachian-Fact-Sheet-Booklet-FINAL-7-31-24.pdf> (hereinafter “ARCH2 Fact Sheet”) (attached as Exhibit 1).

³ ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1). Blue hydrogen may also refer to hydrogen produced from methane gas through the process of steam methane reforming with CCS. See Pinping Sun *et al.*, *Criteria Air Pollutants and Greenhouse Gas Emissions from Hydrogen Production in U.S. Steam Methane Reforming Facilities*, *Env’t Sci. & Tech.*, Vol. 53 Issue 12, 3 (2019), <https://www.osti.gov/pages/servlets/purl/1546962> (attached as Exhibit 2).

⁴ See *id.*

⁵ See Section III, *infra*.

⁶ *ARCH2 Issues new RFI for Clean Hydrogen Projects*, ARCH2 (Oct. 7, 2024), <https://www.arch2hub.com/arch2-issues-new-rfi-for-clean-hydrogen-projects/> (attached as Exhibit 3).

in the comment period—and cancelled three in-person meetings set for February days before they were to be held.⁷ At the January 16 meeting, residents of Ohio, Pennsylvania, and West Virginia voiced passionate opposition to ARCH2 and expressed concern and disappointment about the lack of information available to comment on.⁸

II. DOE properly determined that it should conduct an EIS for funding ARCH2, and NEPA requires DOE to consider direct, indirect, and cumulative impacts and reasonable alternatives for funding ARCH2.

When Congress passed NEPA in 1969, it declared a national environmental policy in the face of “industrial expansion, resource exploitation, and new and expanding technological advances” to promote harmony between people and the environment and protect the general welfare.⁹ The Department of Energy adopted a “policy to follow the letter and spirit of NEPA” in its own implementing regulations for the statute.¹⁰

The core of NEPA is the environmental review process. In particular, NEPA requires a detailed EIS for “a proposed agency action . . . that has a reasonably foreseeable significant effect on the quality of the human environment.”¹¹ DOE is obligated under NEPA to conduct an EIS for funding decisions that will have a substantial impact on the environment, such as funding new energy projects.¹²

At stake here is a total of \$925 million, which would go to Battelle to mostly distribute among ARCH2’s proposed projects existing along the spectrum of hydrogen production and use.¹³ Funding recipients would include Air Liquide, CNX, and Enbridge Gas Ohio, which are all companies in the business of emissions-heavy methane gas production and

⁷ *National Environmental Policy Act (NEPA)*, ARCH2 <https://www.arch2hub.com/national-environmental-policy-act-nepa/> (last visited Feb. 24, 2025) (attached as Exhibit 4).

⁸ *See, e.g.,* Liz Partsch, *Residents Talk Hazards of Hydrogen at ARCH2 Public Comment Meeting*, Farm and Dairy (Jan. 22, 2025), <https://www.farmanddairy.com/news/residents-talk-hazards-of-hydrogen-at-arch-2-public-comment-meeting/857006.html> (attached as Exhibit 5).

⁹ 42 U.S.C. § 4331(a).

¹⁰ 10 C.F.R. § 1021.101.

¹¹ 42 U.S.C. § 4336(b)(1); 10 C.F.R. § 1021.102(b).

¹² *See, e.g.,* 10 C.F.R. § 1021.102(b) (applying DOE’s NEPA regulations to “any DOE action affecting the quality of the environment of the United States”); 40 C.F.R. § 1508.1(q) (2020) (defining “Major Federal action” to include projects “entirely or partly financed . . . or approved by Federal agencies”); Council on Environmental Quality, *Preparation of Environmental Impact Statements: Guidelines*, 38 Fed. Reg. 20550, 20551 (Aug. 1, 1973) (hereinafter “1973 CEQ Guidelines”) (defining “actions” under NEPA as “[n]ew and continuing projects and program activities . . . supported in whole or in part through Federal contracts, grants, subsidies, loans, or other forms of funding assistance”); *see also, e.g., Sierra Club v. U.S. Dep’t of Agric.*, 777 F. Supp.2d 44, 63–64 (D.D.C. 2011) (holding that a federal agency providing “necessary approvals” and “financial assistance” to a power plant expansion project “amounted to a major federal action within the meaning of NEPA”).

¹³ Department of Energy, *Notice of Intent to Prepare an Environmental Impact Statement for the Appalachian Hydrogen Hub (ARCH2)*, 89 Fed. Reg. 102872, 102872 (Dec. 18, 2024) (hereinafter “Notice”); ARCH2 Fact Sheet, *supra* n. 2, at 2 (Exhibit 1). DOE has already awarded \$30 million to Battelle for “planning, design, and community and labor engagement activities.” *Id.* at 3.

transportation.¹⁴ The projects include hydrogen production facilities, hydrogen storage facilities, and facilities that would use hydrogen for residential heating, ammonia and urea production, transportation, and industrial production.¹⁵ As discussed further below, these components of ARCH2 would emit air and water pollution, induce methane gas production, contribute to climate change, and impose additional burdens on communities long overburdened by environmentally harmful industrial activities. Accordingly, DOE has properly determined that it must complete an EIS before providing further funding for ARCH2.¹⁶

Where a major federal action will significantly impact the environment, agencies must prepare an EIS that considers the “reasonably foreseeable environmental effects of the proposed agency action,” along with “any reasonably foreseeable adverse environmental effects which cannot be avoided should the proposal be implemented.”¹⁷ Reasonably foreseeable impacts include direct, indirect, and cumulative impacts;¹⁸ climate change impacts;¹⁹ and social economic, and cultural impacts.²⁰

Finally, NEPA requires the consideration of a “reasonable range of alternatives to the proposed agency action,” which includes the no-action alternative.²¹ Courts recognize a rule of reason that requires an agency to consider a broad range of alternatives to a proposed action, even those outside the scope of the agency’s legislative authority.²²

¹⁴ ARCH2 Fact Sheet, *supra* n. 2, at 4 (Exhibit 1).

¹⁵ *Id.* at 4–6.

¹⁶ *See, e.g.*, 1973 CEQ Guidelines, 38 Fed. Reg. at 20551 (directing agencies to prepare an EIS “if there is potential that the environment may be significantly affected,” including “[P]roposed major actions . . . the environmental impact of which is likely to be highly controversial”); 40 C.F.R. § 1501.3 (2020) (directing agencies to consider “short- and long-term effects,” “[e]ffects on public health and safety,” and “[e]ffects that would violate Federal, State, Tribal or local law protecting the environment.”); *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1185–86 (9th Cir. 2008) (recognizing significant impacts on the environment where the proposed action “affects public health or safety,” where “effects on the quality of the human environment are likely to be highly controversial,” where “possible effects on the human environment are highly uncertain or involve unknown or unique risks,” and where the action “is related to actions with individually insignificant but cumulatively significant impacts.”).

¹⁷ 42 U.S.C. § 4332.

¹⁸ *See* 42 U.S.C. § 4332(C)(i) (requiring consideration of any “reasonably foreseeable environmental effects of the proposed agency action” in an EIS); 40 C.F.R. § 1508.1(g) (2020) (“Effects or impacts means changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives.”); 1973 CEQ Guidelines, 38 Fed. Reg. at 20551–52; 40 C.F.R. § 1508.8 (2011); *Hanly v. Kleindienst*, 471 F.2d 823, 830–31 (2d Cir. 1972) (NEPA’s statutory language requires considering direct, indirect, and cumulative impacts); *City of Davis v. Coleman*, 521 F.2d 661, 676–77 (9th Cir. 1975) (statute requires considering indirect or secondary effects).

¹⁹ *See, e.g.*, *Ctr. For Biological Diversity*, 538 F.3d at 1217.

²⁰ *See* 42 U.S.C. § 4331; 40 C.F.R. § 1508.1(g) (2020); 1973 CEQ Guidelines at 20554.

²¹ *See* 42 U.S.C. § 4332(C)(iii); 1973 CEQ Guidelines at 20554; 40 C.F.R. § 1501.7 (2020); *accord id.* § 1501.9(e) (2020) (stating same).

²² *See Nat. Res. Def. Council, Inc. v. Morton*, 458 F.2d 827, 834 (D.C. Cir. 1972); 40 C.F.R. § 1508.1(z) (2020); 1973 CEQ Guidelines, 38 Fed. Reg. at 20554.

III. The Notice is overly vague, and DOE should pause the NEPA process until more information is publicly available about ARCH2.

DOE published this notice at a time when there is barely any information available to the public about basic details of ARCH2 and its constituents. The Notice itself describes at least 4 different hydrogen processes that are “being considered” for inclusion in this Hub; says that storage methods for the produced hydrogen “may include” tanks, trailers, and underground storage, and that the options for hydrogen delivery “may include” refueling stations, liquefaction, and trucking; and references a “broad variety of end-use applications” being considered for the project.²³

The Notice does not include information about any individual projects. In a fact booklet about ARCH2, DOE announced that there would be at least 11 projects in ARCH2, but neither DOE nor Battelle have disclosed the precise location or processes for these projects.²⁴ Not even Battelle knows which projects will be included in this Hub: The company published a request for information for “potential clean hydrogen projects” on October 7, 2024, and has not announced whether it has selected new projects or what those projects would consist of.²⁵

Because of the absence of fundamental information from the Notice and publicly available materials, such as the precise nature and location of hub projects; methods for hydrogen production, storage, and transport; and even which projects will be a part of this Hub, it is challenging, if not impossible, for the public to meaningfully comment on this Notice.²⁶

For these reasons, DOE should pause the NEPA process until the agency is able to provide more detailed information about the proposed action, including details about individual projects. Nonetheless, if DOE decides to move forward with this EIS as proposed, there are a variety of environmental impacts and alternatives that DOE must consider to comply with NEPA.

²³ Notice, 89 Fed. Reg. at 102873.

²⁴ ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1).

²⁵ ARCH2 Issues new RFI for Clean Hydrogen Projects, *supra* n. 6 (Exhibit 3).

²⁶ See 40 C.F.R. § 1501.9 (2020) (“Agencies shall use an early and open process to determine the scope of issues for analysis in the environmental impact statement,” including publishing notice of intent to prepare an EIS “as soon as practicable”); 1973 CEQ Guidelines, 38 Fed. Reg. at 20552 (“Agencies should give careful attention to identifying and defining the purpose and scope of the action which would most appropriately serve as the subject of the [EIS] . . .” and “[A]gencies have a responsibility to develop procedure to insure the fullest practicable provision of timely public information and understanding of Federal plans and programs with environmental impact in order to obtain the views of interested parties.”); Council on Environmental Quality, Memorandum for General Counsels, NEPA Liaisons and Participants in Scoping, at 5 (Apr. 30, 1981) (“Scoping cannot be useful until the agency knows enough about the proposed action to identify most of the affected parties, and to present a coherent proposal and a suggested initial list of environmental issues and alternatives. **Until that time there is no way to explain to the public or other agencies what you want them to get involved in.**”) (emphasis added) (attached as Exhibit 6).

IV. DOE must analyze reasonably foreseeable site-specific impacts in this EIS.

In addition to analyzing the environmental impacts of ARCH2 as a whole, DOE must assess known, site-specific impacts of funding ARCH2 in this EIS. Otherwise, DOE will violate NEPA by (1) failing to analyze reasonably foreseeable environmental impacts of the decision to fund ARCH2 as proposed by Batelle and (2) locking impacted communities out of the NEPA process for ARCH2 as a whole.

As discussed above, although DOE has included no details about the component projects of ARCH2 in the Notice, in previous materials, DOE announced at least 11 different projects that are likely to be involved in ARCH2.²⁷ DOE also required ARCH2 and the other hydrogen hub applicants to “list[] the city, state, and zip code . . . for each location where project work will be performed by the prime recipient or subrecipient(s).”²⁸ Accordingly, not only is DOE aware of at least some of the site-specific impacts of ARCH2’s constituent projects, but the particulars of these projects actually informed DOE’s decision to propose funding ARCH2. Additionally, each of the components of ARCH2 are interconnected, and have interconnected environmental impacts. The funding announcement for the regional hydrogen hubs acknowledged that a purpose of the program is “matching the scale-up of clean hydrogen production to a growing regional demand,” and accordingly funding production, end uses, and connective infrastructure.²⁹ In this vein, DOE is funding the hydrogen hubs in holistic “phases,” with go/no-go funding decisions that are not specific to individual projects.³⁰ For these reasons, failing to analyze site-specific impacts that DOE is aware of in this EIS (*in addition to* the impacts of the Hub as a whole) will necessarily lead to the exclusion of reasonably foreseeable direct, indirect, and cumulative impacts in this EIS, which would violate NEPA.³¹

Failing to discuss known site-specific impacts of this EIS may also lock impacted communities out of the public participation process that is central to NEPA.³²

²⁷ See ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1); Office of Clean Energy Demonstrations, Regional Clean Hydrogen Hubs Appalachian Regional H2Hub Community Briefing, slides 25–28 (Oct. 25, 2023) (attached as Exhibit 7).

²⁸ DOE, Bipartisan Infrastructure Law: Additional Clean Hydrogen Programs (Section 40314): Regional Clean Hydrogen Hubs Funding Opportunity Announcement, at 80 (Sept. 22, 2022) (DE-FOA-0002779 Mod 000002) (attached as Exhibit 8).

²⁹ *Id.* at 12.

³⁰ *Id.* at 19–22.

³¹ See, e.g., *Nevada v. Dep’t of Energy*, 457 F.3d 78, 91–93 (D.C. Cir. 2006) (holding that DOE properly tiered its analysis after the agency considered known environmental impacts of proposed rail corridors within a repository for nuclear waste, and then doing further NEPA review for the corridor that it selected).

³² See 42 U.S.C. § 4336a(c) (requiring public comments on any notice of intent to prepare an EIS); *Okanogan Highlands All. v. Williams*, 236 F.3d 468, 473 (9th Cir. 2000) (explaining the purpose of preparing an EIS as “ensur[ing] that federal agencies are informed of environmental consequences before

Communities in Appalachia may not know that an ARCH2 project is proposed for their area, or that the project could have significant environmental impacts, unless the EIS raises these issues. Even if communities are able to engage further down the line in NEPA processes for individual projects, the exclusion of project-specific details in this EIS would deprive them of the opportunity to meaningfully comment on the Hub as a whole.

To the extent information about site-specific impacts is available, DOE must consider these impacts in the EIS for ARCH2.³³

V. DOE must take a hard look at the broad range of impacts on human health and the environment that will result from funding ARCH2.

NEPA requires agencies to take a “hard look” at the environmental effects of a major federal action.³⁴ The statute requires the consideration of direct, indirect, and cumulative impacts to people and the environment.³⁵ DOE has properly described a range of environmental impacts to consider in the Notice, including:³⁶

- (1) land use and infrastructure, (2) atmospheric conditions and air quality, (3) climate change and greenhouse gasses, (4) hydrologic conditions and water quality, (5) geology, seismicity and soils, (6) socioeconomic conditions, (7) environmental justice, (8) energy resources, (9) noise and vibration, (10) transportation and accidents, (11) intentional destructive acts, and (12) human health and safety.

DOE should follow through with these considerations for the Hub as a whole **and** for each known, proposed site of an ARCH2 project to comply with NEPA. In particular, DOE must take a hard look, at a minimum, at:

- Impacts of hydrogen production.

making decisions and that the information is available to the public.”); *Citizens for Better Forestry v. U.S. Dep’t of Agric.*, 341 F.3d 961, 970 (9th Cir. 2003) (holding a NEPA review process to be procedurally deficient where there were insufficient opportunities for public involvement); 1973 CEQ Guidelines, 38 Fed. Reg. at 20555 (“The procedures established by these guidelines are designed to encourage public participation in the impact statement process at the earliest possible time.”).

³³ Note that if DOE moves forward with its “tiered” NEPA process at proposed, this may also lead to the improper segmentation of the environmental analyses for ARCH2 and its components. Segmentation occurs when an agency “divides connected, cumulative, or similar federal actions into separate projects and thereby fails to address the true scope and impact of the activities that should be under consideration.” *Food & Water Watch v. FERC*, 28 F.4th 277, 291 (D.C. Cir. 2022) (quoting *Delaware Riverkeeper Network v. FERC*, 753 F.3d 1304, 1313 (D.C. Cir. 2014)). If DOE conducts this EIS without considering site-specific impacts, and later concludes that components of ARCH2 or associated infrastructure do not arise to the level of “major federal actions,” it would leave significant environmental impacts out of the review process for ARCH2.

³⁴ *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976); *Morton*, 458 F.2d at 838.

³⁵ See, 42 U.S.C. § 4336; 10 C.F.R. § 1021.102(b).

³⁶ Notice, 89 Fed. Reg. at 102873.

- Impacts of CCS.
- Impacts of hydrogen end uses.
- Induced industrial impacts.
- Climate change impacts.
- Environmental justice impacts.
- Impacts on endangered species.

Funding ARCH2 will impose these and other direct, indirect, and cumulative impacts on communities in Appalachia that DOE should include within the scope of the EIS.

A. DOE must take a hard look at the impacts of funding hydrogen production in Appalachia.

DOE must consider the direct, indirect, and cumulative impacts that hydrogen production will have on human health and the environment in Appalachia if the agency funds ARCH2. DOE should conduct these analyses for each of the proposed production processes:³⁷

- **Autothermal reforming.** CNX Resources Corp., EQT, Fidelis New Energy, Keystate Energy, and possibly Independence Hydrogen and Plug Power would convert methane gas into hydrogen using autothermal reforming (ATR) with CCS. Industry has sold ATR with CCS as a less emissions-intensive process than steam methane reforming (SMR), which is currently the most common hydrogen production process.³⁸ However, few ATR facilities have been built, so this has yet to be verified in practice.³⁹ Further, ATR processes can be energy intensive.⁴⁰ DOE must take a hard look at the environmental impacts of hydrogen production using ATR.⁴¹
- **Electrolysis.** Enbridge Gas Ohio and possibly Plug Power would produce hydrogen using electrolysis. DOE must analyze where these facilities would get their power from—for instance, whether the power would come from renewable energy, or from burning fossil fuels. Electrolytic hydrogen production at centralized facilities requires about 8 gallons of water per kilogram of hydrogen, and accordingly DOE must examine the water impacts of electrolysis as well.⁴²
- **Anaerobic digestion and pyrolysis.** Empire Diversified Energy plans to convert food waste to hydrogen by processing the waste through an anaerobic

³⁷ ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1).

³⁸ Earthjustice, *Federal Hydrogen Hub Community Guide: Glossary* (Jan. 29, 2025), <https://earthjustice.org/feature/hydrogen-hub-glossary#atr> (attached as Exhibit 11).

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ See Subsections B and D, *infra* (discussing environmental impacts of CCS and induced methane production, which both intensify the environmental impacts of hydrogen production using ATR and CCS).

⁴² David Lampert *et al.*, *Development of a Life Cycle Inventory of Water Consumption Associated with the Production of Transportation Fuels*, at 32, tbl. 22, Argonne National Laboratory, (2015), <https://www.osti.gov/biblio/1224980> (attached as Exhibit 9).

digester to generate biogas and pyrolyzing the biogas to produce hydrogen. Each of these steps presents their own safety hazards. Biogas generated from anaerobic digestion primarily consists of methane, carbon dioxide, hydrogen sulfide, ammonia, and carbon monoxide, each of which can be dangerous for workers and surrounding communities.⁴³ Further, producing hydrogen from biomethane emits significant amounts of air pollution, whether via SMR of biomethane or by burning the biomethane in electric generators to power electrolysis.⁴⁴

Hydrogen production and utilization will also require the buildout of hydrogen transportation infrastructure (by pipeline and other means), hydrogen storage infrastructure, increased energy usage, service infrastructure (*e.g.*, roads, lights, and power plants), and carbon storage and transport infrastructure. Each of these indirect impacts of hydrogen production will significantly impact the environment.

DOE must also look at cumulative impacts of hydrogen production.⁴⁵ To conduct a meaningful analysis of cumulative impacts, an EIS must identify:⁴⁶

(1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, and proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate.

By funding ARCH2, DOE proposes to fund an experimental energy source in a region that has long been impacted by extractive industry. A DOE official recognized such during the Regional Clean Hydrogen Hubs National Environmental Justice Briefing on October 16, 2023, acknowledging that funding ARCH2 and other awardees will continue to make frontline communities bear the brunt of the transition to cleaner energy.⁴⁷

In West Virginia, coal production has long contaminated air and water sources, while practices such as mountaintop removal decrease the resilience of the region's forests and watersheds, leaving communities even more prone to flooding and drinking water

⁴³ EPA, *AgSTAR Project Development Handbook: A Handbook for Developing Anaerobic Digestion/Biogas Systems on Farms in the United States*, 11-1–3 (3rd ed. 2020), <https://www.epa.gov/sites/default/files/2014-12/documents/agstar-handbook.pdf> (attached as Exhibit 10).

⁴⁴ See Sun *et al.*, *supra* n. 3, at 3–4 (Exhibit 2).

⁴⁵ See, *e.g.*, *Nat'l Audubon Soc'y v. Dep't of Navy*, 422 F.3d 174, 197 (4th Cir. 2005) (holding the lack of a cumulative impacts analysis to be a “critical omission” from an EIS in violation of NEPA); *Kentucky Riverkeeper, Inc. v. Rowlette*, 714 F.3d 402, 411 (6th Cir. 2013) (holding an Army Corps permitting decision arbitrary and capricious because, by failing to do a proper cumulative impacts analysis, the Corps “eschews its NEPA obligation to adequately consider and disclose the environmental impact of its actions”) (internal citation and quotations omitted).

⁴⁶ *TOMAC, Taxpayers of Michigan Against Casinos v. Norton*, 433 F.3d 852, 864 (D.C. Cir. 2006).

⁴⁷ Department of Energy, *Hydrogen Hubs Selections National Environmental Justice Briefing* at 4:55, Youtube (Oct. 16, 2023), available at <https://www.youtube.com/watch?v=zrqcTz5Froc>.

contamination.⁴⁸ In western Pennsylvania, the production of methane gas using fracking has contaminated air and water, sickened communities, caused dangerous earthquakes, and peppered the landscape with infrastructure leaking methane into the atmosphere.⁴⁹ Eastern Ohio has faced the environmental harms of oil and gas production while also becoming the region’s dumping ground for fracking waste, which is radioactive and full of toxic metals and other pollutants.⁵⁰ This region is also the original home of petrochemical production,⁵¹ which has resulted in adverse health impacts in Appalachian communities and polluted the environment.⁵² DOE must take a hard look at how adding hydrogen production to this mix will further harm Appalachian communities, which have borne the brunt of the nation’s experimental energy production for decades.

B. DOE must take a hard look at the impacts of funding hydrogen production using carbon capture and sequestration.

ARCH2 is planned to include projects that use CCS to attempt to lower greenhouse gas emissions enough to qualify as “clean hydrogen” under the BIL.⁵³ CCS has not been effective at a scale necessary to prevent greenhouse gas emissions from hydrogen production using ATR, while the infrastructure necessary to capture, store, and transport carbon dioxide (CO₂) imposes health and safety threats on nearby communities.

The story of CCS has been one of billions of (often public) dollars being spent on proposals that end up being cancelled or, if they do proceed, achieve far lower levels of carbon removal than maximum utilization of the technology would allow: Projects that fail or underperform considerably outnumber successful ones.⁵⁴ In a study of “13

⁴⁸ See, e.g., James Bruggers, *Appalachia’s Strip-Mined Mountains Face a Growing Climate Risk: Flooding*, Inside Climate News (Nov. 21, 2019),

<https://insideclimatenews.org/news/21112019/appalachia-mountains-flood-risk-climate-change-coal-mining-west-virginia-extreme-rainfall-runoff-analysis/> (attached as Exhibit 12).

⁴⁹ See generally *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking and Associated Gas and Oil Infrastructure* (9th ed. 2023),

<https://concernedhealthny.org/wp-content/uploads/2023/10/CHPNY-Fracking-Science-Compendium-9.pdf> (attached as Exhibit 13).

⁵⁰ See, e.g., *id.* at 68–71; Ted Auch, Ph.D., *OH Class II Injection Wells – Waste Disposal Trends and Images from Around Ohio*, Fracktracker Alliance (July 15, 2016),

<https://www.fracktracker.org/2016/07/oh-class-ii-injection-trends-images/> (attached as Exhibit 14).

⁵¹ See, e.g., Rebecca Altman, *Upriver: A Researcher Traces the Legacy of Plastics*, Orion (June 2, 2021), <https://orionmagazine.org/article/upriver/> (attached as Exhibit 15).

⁵² See, e.g., *Petrochemicals in Appalachia: Extending Fossil Fuel Reliance and Public Health Harms*, Environmental Health Project (Nov. 21, 2024),

<https://www.environmentalhealthproject.org/post/petrochemicals-in-appalachia-extending-fossil-fuel-reliance-and-public-health-harms> (attached as Exhibit 16). The U.S. averages one petrochemical spill, fire, or explosion every three days. *Spilltracker.org*, <https://www.spilltracker.org/> (last visited Feb. 25, 2025).

⁵³ Notice, 89 Fed. Reg. at 102873; ARCH2 Fact Sheet, *supra* n. 2, at 5 (Exhibit 1).

⁵⁴ Bruce Robertson and Milad Mousavian, *The Carbon Capture Cruc: Lessons Learned*, Institute for Energy Economics and Financial Analysis, at 2 (2022), <https://ieefa.org/sites/default/files/2022-09/The%20Carbon%20Capture%20Crux.pdf> (attached as Exhibit 17).

flagship cases” of CCS “comprising about 55% of the total nominal capture capacity operating worldwide,” 10 of the projects either failed to get started or under-performed by up to 50%, including all 6 of the U.S. projects studied.⁵⁵ CCS is an energy-intensive process, which is one of the reasons so many facilities fail—any emissions captured may fail to offset the facility’s emissions due to increased energy use, including the burning of fossil fuels, to operate CCS technologies.⁵⁶ Accordingly, for all of the public dollars going into CCS, its impact on climate change is minimal at best.

CCS also requires the construction of uniquely dangerous infrastructure. Aside from being a greenhouse gas causing climate change, carbon dioxide is an asphyxiant and intoxicant.⁵⁷ Exposure to large quantities, such as those emitted via industrial processes, can cause dizziness, confusion, disorientation, and even death.⁵⁸

Deploying CCS technologies at the scale contemplated by publicly available ARCH2 plans could require a massive buildout of CO₂ pipelines. The dangers of CO₂ pipelines are well documented. CO₂ pipelines are uniquely at risk for catastrophic ductile fractures.⁵⁹ Any water entering a CO₂ stream can form carbonic acid, which is corrosive to the steel that most pipelines are made of, while hydrogen sulfide—another common contaminant in CO₂ streams—is flammable and toxic.⁶⁰ These concerns came to fruition during the 2020 rupture of a CO₂ pipeline near Satartia, Mississippi, which hospitalized 45 Satartia residents and forced more than 300 to evacuate their homes.⁶¹ DOE must consider the dangers of CO₂ pipelines to human health and the environment.

DOE must also include a discussion of the impacts from the captured CO₂ in the EIS. Captured CO₂ is either sequestered in large volumes via Class VI wells or used for enhanced oil recovery in Class II wells. Both of these methods impact human health and the environment. The operation of Class VI injection wells would expose communities near those wells to the same risks of exposure from CO₂ pipelines while endangering underground sources of drinking water.⁶² Enhanced oil recovery with Class II wells

⁵⁵ *Id.* at 2, 77–78.

⁵⁶ See *Carbon Capture: The Fossil Fuel Industry’s False Climate Solution*, Earthjustice (Sept. 19, 2023) (<https://earthjustice.org/article/carbon-capture-the-fossil-fuel-industrys-false-climate-solution> (last accessed Feb. 21, 2025)) (attached as Exhibit 18).

⁵⁷ Paul Blackburn, *Chasing a Wild Goose Egg: Understanding Computer Plume Modeling for Carbon Dioxide Pipeline Ruptures*, Pipeline Fighters Hub (Sept. 23, 2024) <https://pipelinefighters.org/news/chasing-a-wild-goose-egg-understanding-computer-plume-modeling-for-carbon-dioxide-pipeline-ruptures/> (attached as Exhibit 19).

⁵⁸ See *id.*

⁵⁹ Richard B. Kuprewicz, 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., Pipeline Safety Trust, at 6 (2022) <https://pstrust.org/wp-content/uploads/2022/03/3-23-22-Final-Accufacts-CO2-Pipeline-Report2.pdf> (attached as Exhibit 20).

⁶⁰ *Id.* at 10–11; Paul W. Parfomak, Carbon Dioxide Pipelines: Safety Issues, Cong. Rsch. Serv., IN11944, at 1 (2022), <https://crsreports.congress.gov/product/pdf/IN/IN11944> (attached as Exhibit 21).

⁶¹ Parfomak, *supra* n. 60, at 1 (Exhibit 21).

⁶² Angela C. Jones, Injection and Geologic Sequestration of Carbon Dioxide: Federal Role and Issues for Congress, Cong. Rsch. Serv., R46192, at 21–23 (2022), <https://crsreports.congress.gov/product/pdf/R/R46192> (attached as Exhibit 22).

imposes on communities the dangers of both deep underground injection of CO₂ and oil or methane gas production.⁶³ Any environmental impact statement must evaluate how the carbon will be used or stored and examine those site-specific impacts.

CCS infrastructure will endanger human health and the environment if DOE approves further funding for ARCH2, and accordingly DOE must consider the environmental impacts of CCS.

C. DOE must take a hard look at the impacts of the proposed end uses for the hydrogen produced in ARCH2.

As of the date of this Comment, the proposed end uses for the hydrogen produced in ARCH2 include hydrogen blending for residential use and for ammonia production. These are some of the least safe or cost-effective uses for hydrogen.

At least one ARCH2 project, developed by Hope Gas and WATT Fuel Cell, proposes to blend hydrogen with methane gas for residential use.⁶⁴ Hydrogen blending for residential use is a poor pathway to decarbonize residential heating and appliances and has negative health impacts. Hydrogen blending is an expensive strategy for heating that has been demonstrated to increase emissions as a result of higher compression needs and leakage.⁶⁵ Hydrogen blending risks increases in indoor and localized ambient air pollution, such as nitrogen oxides, risking negative health impacts from poor indoor air quality.⁶⁶ Introducing hydrogen into pipes or fuel cells within or near peoples' homes is hazardous due to its flammability and heightened risk of leaking.⁶⁷ Finally, hydrogen blending will likely increase heating costs for energy consumers.

At least two ARCH2 projects, developed by CNX and KeyState Energy, propose to produce hydrogen to produce ammonia.⁶⁸ Ammonia is listed as a "hazardous substance" under the Comprehensive Environmental Response, Compensation, and Liability Act and an "extremely hazardous substance" under the Emergency Planning and Community Right-to-Know Act.⁶⁹ Exposure to airborne ammonia can cause both short-term and chronic respiratory health effects, and the chemical can be lethal in high concentrations.⁷⁰ The small particles ammonia forms in the air in combination with

⁶³ *Id.*; *Compendium*, *supra* n. 49, at 61–64 (Exhibit 13).

⁶⁴ ARCH2 Fact Sheet, *supra* n. 2, at 5 (Exhibit 1).

⁶⁵ Suzanne Mattei, *Hydrogen Gas Does Not Belong in Your Home: Hydrogen Faces a Diminishing Future as a Heating and Cooking Fuel*, Institute for Energy Economics and Financial Analysis, at 10 (Jan. 2025), <https://ieefa.org/sites/default/files/2025-01/2%20UPDATED%20AUTHOR%20TITLE-Hydrogen%20Gas%20Does%20Not%20Belong%20in%20Your%20Home%20January%202025%20%281%29.pdf> (attached as Exhibit 23).

⁶⁶ *See id.* at 10–11.

⁶⁷ *Id.* at 4–8,

⁶⁸ ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1).

⁶⁹ 40 C.F.R. § 302.4; *id.* part 355 Appendices A and B.

⁷⁰ U.S. Dep't of Health & Human Services, Agency for Toxic Substances & Disease Registry, Toxicology Profile for Ammonia, at 16 (2004), <https://www.atsdr.cdc.gov/toxprofiles/tp126.pdf> (attached as Exhibit 24).

other pollutants contribute to regional haze and further threaten public health, while ammonia's odor adversely affects quality of life and property values.⁷¹ Accidents and leaks at ammonia plants can be catastrophic.⁷²

Other end uses that have been proposed for ARCH2 include powering data centers, regional transportation fueling, and industrial use.⁷³ Any environmental and human health impacts of these end uses will also be reasonably foreseeable impacts from funding ARCH2.

DOE must take a hard look at the environmental and human health impacts of these and any other known end uses of hydrogen proposed for ARCH2.

D. DOE must take a hard look at the induced industrial impacts of funding ARCH2.

Agencies and courts have long recognized induced impacts from a funding decision to be reasonably foreseeable environmental impacts for the purposes of NEPA review.⁷⁴ To comply with NEPA, DOE must consider the environmental and human health effects of both the upstream and downstream induced impacts of ARCH2.

In terms of upstream impacts, DOE must examine the extent to which funding ARCH2 will increase methane gas production in Appalachia, and the environmental impacts from this increased production. Countless studies demonstrate negative health and environmental impacts throughout the lifecycle of fracked methane gas, including at well sites, along pipelines, at processing locations such as compressor stations, and near Class II injection wells and landfills where fracking waste is disposed.⁷⁵ Methane leaks are known to occur throughout this lifecycle as well, impairing air quality and contributing to climate change.⁷⁶ Fracking produces millions of gallons of toxic,

⁷¹ See *id.*

⁷² For instance, a woman was killed after being exposed to vapors while driving near an ammonia plant near Swansea, South Carolina in 2009. See *Woman Killed in Ammonia Cloud Leak*, Live 5 WCSC (July 16, 2009) <https://www.live5news.com/story/10734979/woman-killed-in-ammonia-cloud-leak/> (attached as Exhibit 25). In another example, an ammonia plant near Houston, Texas exploded twice, sending residents and first responders to the hospital from ammonia exposure. Julia Bagg, Alex Johnson, and Jason Cumming, *Crosby, Texas, Chemical Plant Explodes Twice, Arkema Group Says*, NBC News (Aug. 30, 2027), <https://www.nbcnews.com/storyline/hurricane-harvey/harvey-danger-major-chemical-plant-near-houston-likely-explode-facility-n797581> (attached as Exhibit 26).

⁷³ ARCH2 Fact Sheet, *supra* n. 2, at 4–6 (Exhibit 1).

⁷⁴ See, e.g., *City of Davis v. Coleman*, 521 F.2d 661, 676–77 (9th Cir. 1975); *Northern Plains Resource Council v. Surface Transp. Bd.*, 668 F.3d 1067, 1081–82 (9th Cir. 2011) (holding that, where the Board was considering a proposal to expand a railway line which would enable increased coal production at several mines, NEPA required the Board to consider the impacts of increased mining); 1973 CEQ Guidelines, 38 Fed. Reg. at 20553.

⁷⁵ See generally Compendium, *supra* n. 49 (Exhibit 13).

⁷⁶ *Id.* at 49–56.

radioactive wastewater, which has created a public health crisis of its own in Appalachia.⁷⁷

In terms of downstream impacts, DOE must consider the environmental impacts of hub-related industrial development. DOE has been open about the purpose of ARCH2 being to jumpstart a “hydrogen economy” in the region.⁷⁸ For instance, Fidelis New Energy intends to produce hydrogen for end-use in new data centers, which run 24 hours a day, require massive amounts of energy to operate, and strain utilities.⁷⁹ The EIS must examine any reasonably foreseeable environmental harms from new facilities and industries that it would draw to Ohio, Pennsylvania, and West Virginia by funding ARCH2.

DOE must examine the impacts of induced methane gas production and industrial expansion, as well as any other reasonably foreseeable upstream and downstream induced impacts, from funding ARCH2.

E. DOE must take a hard look at the climate change impacts of funding ARCH2.

An EIS must consider greenhouse gas emissions, as well as the climate change impacts that are the “reasonably foreseeable adverse environmental effects” of increased greenhouse gas emissions.⁸⁰ Accordingly, DOE must follow through with its commitment in the Notice to take a hard look at the climate change impacts of funding ARCH2.

Hydrogen is an indirect greenhouse gas. It has over 32 times the global warming potential of CO₂ over a 20-year period due to its interaction with other gases and vapors in the atmosphere.⁸¹ Hydrogen is also the smallest molecule on the periodic table, and therefore leaks or emissions throughout the hydrogen lifecycle will contribute to climate change.⁸² DOE must examine the impacts of hydrogen as a greenhouse gas itself.

While DOE is presumably funding hydrogen hubs across the U.S. to prevent climate change, blue hydrogen that would be produced by the ARCH2 hub would emit climate

⁷⁷ Justin Nobel, *America’s Radioactive Secret*, Rolling Stone (Jan. 21, 2020), <https://www.rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/> (attached as Exhibit 27).

⁷⁸ ARCH2 Fact Sheet, *supra* n. 2, at 3 (Exhibit 1).

⁷⁹ *Id.* at 5; *see, e.g.*, Mandy Deroche, *Managing the Growing Energy Demands of Datacenters and Crypto Mining*, Earthjustice (Dec. 20, 2024), <https://earthjustice.org/experts/mandy-deroche/managing-the-growing-energy-demands-of-datacenters-and-crypto-mining> (attached as Exhibit 28).

⁸⁰ *See* 42 U.S.C. § 4332(C); *see also, e.g.*, *WildEarth Guardians v. U.S. Bureau of Land Mgmt.*, 870 F.3d 1222, 1226 (10th Cir. 2017); *Sierra Club v. FERC*, 867 F.3d 1357, 1371–73 (D.C. Cir. 2017); *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 548 (8th Cir. 2003).

⁸¹ Hannah Story Brown and Emma Marsano, *The Industry Agenda: Hydrogen*, Revolving Door Project, at 4 (Sep. 6, 2023), <https://therevolvingdoorproject.org/wp-content/uploads/2023/09/RDP-Hydrogen-Industry-Agenda-9-6-23.pdf> (attached as Exhibit 29).

⁸² *See id.*

change-causing pollution throughout the lifecycle of hydrogen production. It takes more energy to produce hydrogen in a usable form than hydrogen provides as an energy source.⁸³ Due in large part to the energy intensity of CCS, one study has shown that the total CO₂-equivalent emissions for blue hydrogen are only 9-12% less than that for gray hydrogen, the production of hydrogen using fossil fuels (through SMR or coal gasification) without CCS.⁸⁴

Hydrogen is also known to contribute to climate change for certain end uses, including those that are proposed for ARCH2. For hydrogen blending to heat homes and businesses, the greenhouse gas footprint of hydrogen is more than 20% greater than just burning methane gas or coal for heating, and 60% greater than burning diesel oil for heating.⁸⁵

As discussed above, methane emissions occur throughout the methane gas production cycle. According to the Environmental Protection Agency, Methane is the “second most abundant anthropogenic [greenhouse gas] after [CO₂], accounting for about 11 percent of global emissions.”⁸⁶ Further, methane “is more than 28 times as potent as carbon dioxide at trapping heat in the atmosphere.”⁸⁷ Accordingly, the EIS must examine the impacts of upstream production increases of methane gas on climate change.

In its analysis of the climate change impacts of ARCH2, DOE must set realistic standards regarding the use of CCS. As discussed above in Subsection B, CCS has never worked to a scale that has been proposed by the projects in ARCH2, CCS itself is an energy-intensive process that often requires burning fossil fuels, and CCS is an extremely expensive process to attempt to decarbonize industries. DOE cannot move forward on the assumption that greenhouse gas emissions will be offset by proposed CCS at any ARCH2 project and must consider climate change impacts accordingly.

Finally, DOE must consider how ARCH2’s greenhouse gas emissions will exacerbate the impacts of climate change in Appalachia. Residents of eastern Ohio, western Pennsylvania, and West Virginia have experienced rising temperatures, increased flooding, drought periods, shifting plant and animal life, forest health impacts (including increased wildfire risks), and water quality impacts due to climate change.⁸⁸ DOE must consider these impacts, including how climate change could impact ARCH2 infrastructure in ways that endanger workers and communities.

⁸³ *Id.*

⁸⁴ *Id.* at 5.

⁸⁵ *Id.*

⁸⁶ EPA, *Importance of Methane*, <https://www.epa.gov/gmi/importance-methane> (last visited Feb. 23, 2025) (attached as Exhibit 30).

⁸⁷ *Id.*

⁸⁸ *See, e.g.*, Forest Adaption, Climate Impacts—Central Appalachians, <https://forestadaptation.org/sites/default/files/2019-06/Central-Appalachians-Climate-Impacts.pdf>. (last visited Feb. 23, 2025).

F. DOE must take a hard look at the environmental justice impacts of funding ARCH2.

DOE must follow through on its commitment in the Notice to take a hard look at the environmental justice impacts of funding ARCH2.⁸⁹

Title VI of the Civil Rights Act of 1964 prohibits the use of federal funds in a manner that is discriminatory “on the ground of race, color, or national origin.”⁹⁰ DOE’s implementing regulations also prohibit discrimination “in connection with any program or activity receiving Federal financial assistance” from DOE.⁹¹ In the vein of federal antidiscrimination laws, as well as its obligations to consider environmental impacts of major federal actions, DOE defines environmental justice as:⁹²

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no population bears a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or from the execution of federal, state, and local laws, regulations; and policies. Meaningful involvement requires effective access to decision makers for all, and the ability in all communities to make informed decisions and take positive actions to produce environmental justice for themselves.

ARCH2 will disproportionately impact environmental justice communities, as DOE acknowledged in its environmental justice briefing.⁹³ Environmental justice communities have long experienced the disproportionate burdens of fossil fuel infrastructure, including criteria air and water pollutants such as fine particulate matter, nitrogen oxides, sulfur dioxide, and mercury, as well as other hazardous air pollutants and volatile organic compounds.⁹⁴ Most hydrogen plants in the U.S. are proposed near

⁸⁹ Notice, 89 Fed. Reg. at 102873.

⁹⁰ 42 U.S.C. § 2000d.

⁹¹ 10 C.F.R. § 1040.1(a); *see generally* 10 C.F.R. part 1041 (“Enforcement of Nondiscrimination on the Basis of Handicap in Programs or Activities Conducted by the Department of Energy”); *id.* part 1042 (“Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Assistance”).

⁹² Department of Energy, *Environmental Justice* (Apr. 25, 2023),

https://www.directives.doe.gov/terms_definitions/environmental-justice (attached as Exhibit 32).

⁹³ *Hydrogen Hubs Selections National Environmental Justice Briefing*, *supra* n. 47, at 4:55. Potential ARCH2 funding recipients have also acknowledged that ARCH2’s projects are essentially targeting environmental justice communities for experimental hydrogen production processes and end-uses. For instance, WATT Fuel Cell, which is developing fuel cells that would blend methane gas and hydrogen, intends to install 40% of these fuel cells in “disadvantaged communities.” *Watt Fuel Cell Handout*, <https://wattfuelcell.com/wp-content/uploads/WATT-and-Hope-Gas-Case-Study.pdf> (last accessed Feb. 26, 2025) (attached as Exhibit 33).

⁹⁴ Dr. Yukyan Lam, et al., *Environmental Justice Concerns with Carbon Capture and Hydrogen Co-Firing in the Power Sector*, at 5 (2024), <https://njeja.org/wp-content/uploads/2024/07/CCS-EJ-White-Paper.pdf> (attached as Exhibit 34).

disadvantaged communities, with 90% being in or near low-income neighborhoods and communities of color.⁹⁵ Communities in Appalachian Ohio have higher health burdens than the rest of the state, including mortality rates due to heart disease, stroke, cancer, chronic obstructive pulmonary disease, injury, and diabetes being significantly higher than both the national average and the Ohio average in non-Appalachian counties.⁹⁶ In Pennsylvania, fracking wells and power plants are disproportionately located in environmental justice communities.⁹⁷ West Virginia communities suffer from poverty at a disproportionate rate and contain a “sizeable” elder population, indicating greater vulnerability to environmental hazards.⁹⁸ The state’s coal production and industrial chemical hub have already disproportionately subjected minority and low-income communities to toxic and carcinogenic chemicals.⁹⁹ Accordingly, funding ARCH2 raises a variety of environmental justice issues.

CCS is also an environmental justice issue. The former White House Environmental Justice Advisory Council raised concerns about the environmental justice implications of “carbon management technologies” and called for ceasing or slowing down the implementation of these programs, including CCS and hydrogen co-firing, until the impacts of these technologies on environmental justice communities could be fully realized.¹⁰⁰

ARCH2 raises further environmental justice issues because it will be developed in a region of the country where communities have been denied meaningful decision-making power. None of these three states mandate environmental justice analyses in permitting or enforcement, leaving considerations of vulnerable communities out of most environmental decisions.¹⁰¹ The 2022 derailment of a Norfolk Southern train containing vinyl chloride, and controlled burning of its contents, is a case study in these failures: an environmental disaster determined to be “100% preventable” by the National

⁹⁵ Griffin Bird, *Most Hydrogen Plants Proposed Near Disadvantaged Communities*, Oil & Gas Watch (July 11, 2024), <https://news.oilandgaswatch.org/post/most-hydrogen-fuel-plants-proposed-near-disadvantaged-communities> (attached as Exhibit 35).

⁹⁶ Robert Wood Johnson Found. *et al.*, *Key Findings: Appalachian Ohio*, at 1 (2020), <https://www.arc.gov/wp-content/uploads/2020/07/OHHealthDisparitiesKeyFindings8-17.pdf> (attached as Exhibit 36).

⁹⁷ John Ukenye, *More than Skin-Deep: Environmental Racism, Justice, and Pennsylvania*, PennFuture (July 7, 2021), <https://www.pennfuture.org/Blog-Item-More-than-Skin-Deep-Environmental-Racism-Justice-and-Pennsylvania> (attached as Exhibit 37).

⁹⁸ Debra Hunt Young, Samantha Teixeira & Helen Hartnett, *Social Action Meets Social Media: Environmental Justice in West Virginia*, 7 *Contemporary Rural Social Work Journal*, no. 1, 2015, at 2–3, available at <https://digitalcommons.murraystate.edu/crsw/vol7/iss1/3/> (attached as Exhibit 38).

⁹⁹ *Id.*; Ken Ward Jr., *How Black Communities Become ‘Sacrifice Zones’ for Industrial Air Pollution*, PROPUBLICA, (Dec. 21, 2021), <https://www.propublica.org/article/how-black-communities-become-sacrifice-zones-for-industrial-air-pollution> (attached as Exhibit 39).

¹⁰⁰ *See generally* White House Environmental Justice Advisory Council, *White House Environmental Justice Advisory Council Recommendations: Carbon Management* (Oct. 4, 2024), <https://www.epa.gov/system/files/documents/2024-10/whejac-carbon-management-recommendations-october-2024.pdf> (attached as Exhibit 40).

¹⁰¹ *See* Environmental Justice State by State, *Environmental Justice State by State Directory*, <https://ejstatebystate.org/directory> (last visited Feb. 23, 2025).

Transportation Safety Board was made worse by inconsistent messaging about safety measures and incomplete remediation.¹⁰² The derailment took place about an hour's drive away from the proposed pyrolysis facility in Follansbee, West Virginia, which is proposed to be part of the ARCH2 hub.

The public engagement process for this Notice so far has continued to deny meaningful involvement by Appalachian communities. Commenters are being forced to comment on the scope of an EIS despite having very limited information about ARCH2. Throughout the lifecycle of ARCH2, DOE has failed to provide opportunities for concerned community members to ask questions and get helpful answers about how ARCH2 will impact them.¹⁰³ DOE promised three in-person meetings in the Notice, but no such meeting has taken place.¹⁰⁴ DOE had initially scheduled three in-person meetings in Washington, PA, North Canton, OH, and Institute, WV, none of which are locations of the proposed projects.¹⁰⁵ TRC cancelled each of those meetings with only a few days' notice and with no explanation.¹⁰⁶

Overall, to comprehensively account for the direct, indirect, and cumulative impacts of ARCH2, as well as to fulfill its obligations under federal antidiscrimination law, DOE should conduct environmental justice analyses for each of the known projects that will be a part of ARCH2, as well as an environmental justice analysis of the Hub as a whole.

G. DOE must comply with its consultation obligations under the Endangered Species Act prior to funding ARCH2.

Appalachia and the Ohio River Valley are the homes of breathtaking wildlife and unique ecosystems. ARCH2 may impact the habitats of at least 39 endangered or threatened species.¹⁰⁷ Impacts include the project components of ARCH2, its associated methane gas production, and induced development.

In the Endangered Species Act (ESA), Congress recognized that certain species “have been so depleted in numbers that they are in danger of or threatened with extinction.”¹⁰⁸ A primary purpose of the ESA is “to provide a means whereby the ecosystems upon

¹⁰² Zahra Ahmad, *A Train Full of Toxic Chemicals Derailed in Her Town. Here's What Her Community Needs Now.*, Earthjustice (Feb. 15, 2024), <https://earthjustice.org/article/a-train-full-of-toxic-chemicals-derailed-in-her-town-heres-what-her-community-needs-now> (attached as Exhibit 41).

¹⁰³ Liz Partsch, *Environmental Activists Hold Rally at ARCH2 Open House*, Farm and Dairy (Nov. 13, 2024), <https://www.farmanddairy.com/news/environmental-activists-hold-rally-at-arch-2-open-house/849299.html> (attached as Exhibit 42).

¹⁰⁴ Notice, 89 Fed. Reg. at 102872.

¹⁰⁵ *National Environmental Policy Act (NEPA)*, *supra* n. 7 (Exhibit 4).

¹⁰⁶ *Id.*

¹⁰⁷ Center for Biological Diversity, *Map: U.S. Threatened and Endangered Species by County* https://www.biologicaldiversity.org/programs/population_and_sustainability/T_and_E_map/ (last visited Feb. 23, 2025). To reach this figure, data was compiled from Ashtabula, Cuyahoga, Licking, and Stark Counties in Ohio; Clinton and Fayette Counties in Pennsylvania; Brooke, Doddridge, Hancock, Harrison, Mason, Marion, Marshall, McDowell, Mercer, Mingo, Monongalia, Ohio, Preston, Taylor, Tyler, Wetzel, and Wayne Counties in West Virginia.

¹⁰⁸ 16 U.S.C. § 1531(a)(2).

which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such . . . species.”¹⁰⁹ To reach these goals, Section 9 of the ESA prohibits any person from “taking” any endangered species without proper authorization through a valid incidental take permit.¹¹⁰ “Take” is defined broadly and includes significant habitat modification or degradation.¹¹¹ Courts have found federal agencies liable for take of listed species where agency-authorized activities resulted in the killing or harming of ESA-listed species.¹¹²

Additionally, Section 7(a)(2) of the ESA requires federal agencies to “insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of [the critical] habitat of such species.”¹¹³ “Action” is broadly defined to include “all activities or programs of any kind authorized, funded, or carried out, in whole or in part” by federal agencies.¹¹⁴

To facilitate compliance with Section 7(a)(2), an “agency shall . . . request” from the U.S. Fish and Wildlife Service or National Marine Fisheries Service information regarding whether any listed species “may be present” in a proposed action area, and if so, the “agency shall conduct a biological assessment” to identify species likely to be affected.¹¹⁵ The agency must then initiate formal consultation with the Services if a proposed action “may affect” any of those listed species.¹¹⁶

DOE must conduct an analysis of endangered species impacted by ARCH2 and engage in Section 7 consultation under the Endangered Species Act. A failure to consult would violate the ESA and could result in unauthorized takings of endangered species.¹¹⁷

¹⁰⁹ *Id.* § 1531(b).

¹¹⁰ *Id.* § 1538(a)(1)(B); *see also* 50 C.F.R. § 17.31(a) (extending the “take” prohibition to threatened species managed by the U.S. Fish and Wildlife Service).

¹¹¹ 16 U.S.C. § 1532(19); 50 C.F.R. § 17.3; *see also Babbitt v. Sweet Home Ch. Of Communities for a Great Oregon*, 515 U.S. 687 (1995).

¹¹² *See, e.g., Defenders of Wildlife v. Adm’r, Env’tl. Prot. Agency*, 882 F.2d 1294, 1300-01 (8th Cir. 1989); *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997).

¹¹³ 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a).

¹¹⁴ 50 C.F.R. § 402.02.

¹¹⁵ 16 U.S.C. § 1536(c).

¹¹⁶ 50 C.F.R. § 402.14(a); Department of Interior and Department of Commerce, Interagency Cooperation—Endangered Species Act of 1973, as Amended; Final Rule, 51 Fed. Reg. 19926, 19949–50 (June 3, 1986) (“may affect” broadly includes “[a]ny possible effect, whether beneficial, benign, adverse or of an undetermined character”).

¹¹⁷ 16 U.S.C. § 1536(a); *Strahan*, 127 F.3d 155, 163 (1st Cir. 1997) (“a governmental third party pursuant to whose authority an actor directly exacts a taking of an endangered species may be deemed to have violated the provisions of the ESA”); *id.* at 165 (“a single injury to one whale is a taking under the ESA”).

VI. DOE should select the no-action alternative, consider alternatives that are truly “clean,” and specify what types of expansion or reduction in funding it is considering.

To comply with its duty to consider a “reasonable range of alternatives” to the proposed action of funding ARCH2 as proposed by Battelle, DOE must consider the no-action alternative and an emissions-free alternative.¹¹⁸ DOE must also expand on the funding alternatives presented in the Notice.

A. DOE should recommend the no-action alternative.

NEPA requires DOE to fully examine the no-action alternative to the proposed action of funding ARCH2.¹¹⁹ DOE should recommend the no-action alternative because the ARCH2 hub cannot practicably produce clean hydrogen, and because funding the ARCH2 hub will be harmful to human health and the environment.

DOE defined the purpose and need of its proposed action—fully funding ARCH2 as proposed by Battelle—as “to comply with its statutory mandate in BIL to catalyze investment in the production, processing, delivery, storage, and end-use of clean hydrogen; and contribute to the development of a national clean hydrogen network.”¹²⁰ DOE also discussed meeting “certain BIL criteria,” including funding a hub producing “clean hydrogen” from fossil fuels, “demonstrating end use diversity,” meeting geographic diversity criterion, locating a hub in a region with the most methane gas resources, and creating opportunities for skilled training and long-term employment.¹²¹

This broad directive does not compel DOE to fund ARCH2. Sections 40311–40315 of the BIL,¹²² pertaining to “Hydrogen Research and Development,” are meant to contribute funding to “clean hydrogen,” which is limited to 2 kg of CO₂-equivalent produced at the site of production per kg of hydrogen produced.¹²³ The statute goes on to require, “to the maximum extent practicable,” the selection of a clean hydrogen hub that produces hydrogen from fossil fuels; at least one hub using “clean hydrogen” in electric power generation, industry, residential and commercial heating, and transportation; and the location of a hub in a region with the greatest methane gas resources. Furthermore, the BIL only mandates that, to the maximum extent practicable, DOE fund four hubs.

One study demonstrates that meeting the clean hydrogen standard in the BIL depends on 4 assumptions: ignoring the short-term global warming potential of methane, very low methane emissions, nearly complete CO₂ capture in the production process, and not

¹¹⁸ See 42 U.S.C. § 4332(C)(iii).

¹¹⁹ See generally *id.* §§ 4332(C)(iii), (E) (requiring study of alternatives); 1973 CEQ Guidelines, 38 Fed. Reg. at 20553.

¹²⁰ Notice, 89 Fed. Reg. at 102873.

¹²¹ *Id.*

¹²² Infrastructure Investment and Jobs Act, H.R. 3684, 117th Cong. (2021).

¹²³ See 42 U.S.C. §§ 16152(1), 16166(b).

accounting for any global warming potential for hydrogen emissions.¹²⁴ As discussed in more detail above, hydrogen production from methane gas (as well as induced methane gas production) will likely lead to high methane emissions; CCS is unlikely to work at a scale conceived of by the applicants in ARCH2; and hydrogen emissions are likely to occur and contribute to climate change.

Furthermore, the “letter and spirit” of NEPA that DOE is compelled to follow by its own regulations should preclude the funding of ARCH2, which will impose a variety of environmental and human health harms to a region already plagued by a legacy of industrial contamination.

For these reasons, DOE must seriously consider and should also recommend the no-action alternative of declining to fund ARCH2.

B. DOE should consider alternatives that reduce environmental and human health harms and do not emit greenhouse gases.

Because of its pollution impacts, intense water usage, climate change impacts, and expense, it is unlikely that hydrogen production in any form would serve the purpose of kickstarting a clean hydrogen economy that is protective of human health and the environment in Appalachia. Regardless, DOE should consider an alternative in which ARCH2 (1) only supports green hydrogen production, **and** (2) does not deploy hydrogen for end uses that can be decarbonized more safely or economically through direct electrification using existing technology.

Green hydrogen is produced via electrolysis powered by renewable energy.¹²⁵ This hydrogen production technology avoids many of the significant air quality, ecosystem, safety, and other impacts associated with blue hydrogen production.¹²⁶ Reliance on zero-emissions technologies for hydrogen production would allow DOE to pursue its stated purpose and need for this project while reducing its environmental impact.

However, funding green hydrogen would only be a preferable alternative if DOE also solely supports end-uses that cannot be decarbonized through direct electrification and/or increased efficiency. Green hydrogen and direct electrification represent two different strategies for bringing energy from renewable electricity generation resources to equipment that currently relies on fossil fuels, but green hydrogen would require the development of far more renewable generation resources because it uses them less efficiently. For instance, we already have the technologies to power vehicles (directly

¹²⁴ David Schlissel and Anika Juhn, *Blue Hydrogen: Not Clean, Not Low Carbon, Not a Solution*, at 9 (2023), <https://ieefa.org/media/3953/download?attachment> (attached as Exhibit 45).

¹²⁵ Brown & Marsano, *supra* n. 81, at 7 (Exhibit 29).

¹²⁶ *See id.*

charging batteries) and heat homes (heat pumps) that are much more efficient than involving hydrogen in these processes.¹²⁷

Accordingly, DOE should consider an alternative that (1) only funds green hydrogen production, and (2) only funds end uses where hydrogen may be the most effective, safe, and economical decarbonization strategy, such as long-haul shipping, aviation, and certain high-heat industrial processes.¹²⁸

C. DOE should specify the conditions under which it would expand or reduce funding.

In addition to fully funding ARCH2 as proposed by Battelle, DOE set forth two other action alternatives in the Notice:¹²⁹

- DOE funding for an expanded Appalachian Hydrogen Hub: An action alternative that considers the hydrogen technologies and infrastructure in the proposed action plus reasonably foreseeable clean hydrogen technologies and infrastructure that, while not currently considered in the proposed action, could be proposed for DOE funding.
- DOE funding for a reduced Appalachian Hydrogen Hub: An action alternative that is smaller in scope wherein DOE would fund only a portion of the proposed action.

In order to meaningfully comment on these proposed alternatives, DOE must specify (1) what sort of additional “hydrogen technologies and infrastructure” it would consider to expand funding, (2) which circumstances it would reduce funding in, and (3) the quantity of funding that it would consider expanding or reducing.

VII. Conclusion

For the reasons discussed in this Comment, DOE should pause the EIS process for ARCH2 until more information is available about the specific projects that will comprise the Hub. In the alternative, if DOE moves forward with this EIS, it should take a hard look at ARCH2’s extensive potential environmental impacts, including site-specific environmental impacts, such as (A) impacts of hydrogen production, (B) impacts of CCS, (C) impacts of hydrogen end uses, (D) induced impacts, (E) climate change impacts, and (F) environmental justice impacts. DOE must also fulfill its consultation duties under the Endangered Species Act. Finally, DOE must seriously consider the no-action alternative to funding ARCH2 as proposed by Battelle. DOE must also specify the

¹²⁷ *E.g.*, Jasper Jolly, *Will Hydrogen Overtake Batteries in the Race for Zero-Emission Cars?*, THE GUARDIAN (Feb. 13, 2024), <https://www.theguardian.com/business/2024/feb/13/will-hydrogen-overtake-batteries-in-the-race-for-zero-emission-cars> (attached as Exhibit 43); Mattei, *supra* n. 65, at 13–17 (Exhibit 23).

¹²⁸ See Sasan Saadat and Sara Gersen, *Reclaiming Hydrogen for a Renewable Future*, Earthjustice, 21–24 (Aug. 2021), <https://s3.documentcloud.org/documents/21063573/reclaiming-hydrogen-for-a-renewable-future.pdf> (attached as Exhibit 44).

¹²⁹ Notice, 89 Fed. Reg. at 102873.

circumstances under which it would expand or reduce funding and seriously consider more environmentally protective alternatives to funding a blue hydrogen hub in Appalachia.

Sincerely,



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Table of Exhibits

Exhibit No.	Attachment No.	Exhibit Description
1	1	Office of Clean Energy Demonstrations, Appalachian Hydrogen Hub (ARCH2) Awardee Fact Sheet, https://www.arch2hub.com/wp-content/uploads/2024/07/H2Hubs-Appalachian-Fact-Sheet-Booklet-FINAL-7-31-24.pdf
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