

Setting DAC on Track

Strategies for Hub Implementation

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In order for direct air capture (DAC) to achieve million-ton scale and be commercially viable, we need to start driving down the cost¹ learning curve by building dozens of efficient and sustainable projects.²

Fortunately, in late 2021, Congress made a down payment on early DAC projects with the passage of the bipartisan Infrastructure Investment and Jobs Act (IIJA), which provided \$3.5 billion in funding over five years for several DAC facilities through the Regional Direct Air Capture Hubs (DAC Hubs) program.³ As the first large-scale US deployments of DAC, these hubs are an opportunity to define the field with high-quality projects that create robust environmental and public health benefits, new jobs and economic opportunities, and broad community support.⁴

AUTHORS (Alphabetical)

Christopher Allen
Alayna Chunev
Courtni Holness
Rory Jacobson
Ugbaad Kosar
Vanessa Suarez

EDITOR

Tracy Yu

1. McQueen, N., Gomes, K. V., McCormick, C., Blumanthal, K., Pisciotta, M., & Wilcox, J. (2021). A review of direct air capture (DAC): scaling up commercial technologies and innovating for the future. *Progress in Energy*, 3(3). <https://doi.org/10.1088/2516-1083/abf1ce>
2. Hanna, R., Abdulla, A., Xu, Y., & Victor, D. G. (2021). Emergency deployment of direct air capture as a response to the climate crisis. *Nature Communications*, 12(1), 1-13. <https://doi.org/10.1038/s41467-020-20437-0>
3. H.R.3684 - 117th Congress (2021-2022): Infrastructure Investment and Jobs Act. (2021, November 15). <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>
4. Kosar, U. & Suarez, V. (2021). *Removing Forward: Centering Equity and Justice in a Carbon-Removing Future*. Carbon180. <https://static1.squarespace.com/static/5b9362d-89d5abb8c51d474f8/t/6115485ae47e7f00829083e1/1628784739915/Carbon180+RemovingForward.pdf>

What is a hub?

While the “hub” concept may be new to carbon removal, it has been widely demonstrated in industrial decarbonization, particularly outside of the US. Hubs allow projects and industries with common infrastructure needs to co-locate and collaborate in order to cluster employment opportunities, leverage economies of scale, and streamline permitting processes. If effectively coordinated with existing carbon management programs (see page 8), DAC hubs should be able to leverage the following:

- 1.** A cluster of DAC pathways, decarbonization technologies, and other carbon removal approaches
- 2.** Common carrier infrastructure that is available to all parties at standardized rates
- 3.** Shared geologic storage, energy resources, infrastructure, and equipment
- 4.** Infrastructure capacity beyond the initial demand to enable expansion over time
- 5.** Common input sourcing or offtake agreements for energy, feedstocks, or other inputs

What the US Department of Energy (DOE) does next with this funding will determine if the DAC Hubs program can kickstart the field at large, with enormous implications for the technology’s legitimacy, climate impact, and potential community benefits. If deployed well, DAC hubs can demonstrate the following:

- **A TRANSITION STRATEGY FOR FOSSIL JOBS.** DAC can be a reliable pathway for communities currently reliant on carbon-intensive industries to transition away from fossil fuel employment and toward a carbon removal industry that is rooted in high-road labor practices and robust environmental protection.
- **A COMMUNITY-LED EFFORT.** DAC projects can engage and consult the surrounding communities of potential hub sites so that they have a determining influence over where and how projects are developed. This increases the likelihood that projects will only be sited in places that actively want them, to the benefit of local communities.
- **A CARBON-NEGATIVE CLIMATE SOLUTION.** DAC can be deployed using zero-carbon or renewable energy resources, alongside secure geologic storage without enhanced oil recovery (EOR). DAC can and should be a means to remediate legacy carbon emissions rather than a license for emitting industries to continue business as usual.

- **A CLIMATE TOOL FOR A DIVERSITY OF STAKEHOLDERS.** DAC is a technology that can be collaboratively designed with the expertise and input of a variety of groups, including nongovernmental organizations (NGOs), universities, local, state, and federal agencies, community-based organizations (CBOs), labor organizations, and technology developers.
- **A TECHNOLOGY READY FOR MAJOR COMMERCIAL SCALE.** DAC is primed for public and private investments that are orders of magnitude greater than what we see today. Not only is the current generation of DAC technologies ready for deployment at the million-ton scale around the world, but there is an emerging set of DAC solutions at the demonstration stage with breakthrough potential.

However, this vision is far from guaranteed. Failed federal investments in early-stage technologies can quickly sour public appetite for future spending and incite social opposition, which can hinder further development of DAC.⁵ To realize DAC's potential, DOE can focus the hubs' implementation on justice, equity, and economic opportunity, alongside engineering and techno-economic efforts.

This white paper outlines four overarching recommendations for carrying out the program's statutory requirements while also realizing this vision for the DAC industry of the future:

- **OPTIMIZE PROGRAM DESIGN:** Design the funding opportunity announcement to encourage a diversity of project designs, balancing what can be executed today with where the field needs to go in the long term. DOE should effectively structure and phase funding opportunity announcements (FOAs), select proposals, and establish project milestones to maximize learning by doing, net-removal, enabling infrastructure, and technological diversity.
- **REINFORCE REGULATION:** Help project applicants navigate the regulatory landscape for building a DAC hub and work with stakeholders across the administration to improve the permitting process. Commercial DAC projects with federal funding are likely to involve a number of federal and regional permitting processes. DOE should coordinate across agencies to ensure funding recipients submit appropriate proposals and documentation in a timely manner and complete its own regulatory requirements as efficiently as possible.
- **CENTER ENVIRONMENTAL JUSTICE (EJ):** Prioritize community engagement, justice, and equity in funding decisions. DOE should ensure each DAC Hubs project supports the well-being of surrounding communities by requiring robust community consultation processes, codifying benefit agreements, and developing strong regulatory standards.

5. US Department of Energy. (2011). Key Facts: Solyndra Solar. Energy Blog. <https://www.energy.gov/key-facts-solyndra-solar>

- **BUILD THE CARBON MANAGEMENT WORKFORCE:** Include strong labor provisions in any funding awards. Cost-share agreements should stipulate high-road labor practices to ensure employment and apprenticeship opportunities are well compensated, safe, and available to communities closest to the hub site.

Beyond the near-term success of the initial four hubs, these recommendations offer a playbook to build political support, validate DAC technologies, and catalyze the momentum needed to build hundreds of projects globally.

Background

The DAC Hubs program will be implemented alongside a suite of supporting policies and administrative commitments. Its authorization closely follows the launch of the DOE's Carbon Negative Shot, which aims to advance carbon removal across land-based and technological pathways to under \$100 per ton CO₂ while ensuring durable storage, robust lifecycle accounting, and potential for gigaton-scale deployment by 2030.⁶ Since 2019, Congress has allotted \$115 million for DOE to carry out both Pre-Commercial and Commercial DAC prize competitions in addition to the tens of millions of dollars invested in R&D for promising DAC technologies.

Beyond research and development (R&D) efforts, state and federal policies have already established incentives for deployment. The 45Q tax credit provides a \$50 per ton CO₂ tax credit for DAC facilities that permanently store CO₂ in dedicated geologic storage.⁷ California's Low Carbon Fuel Standard offers a market-based incentive by allowing DAC facilities to generate compliance credits,⁸ which traded at an average of \$185 per ton CO₂ in 2021.⁹ DOE will need to implement the DAC Hubs program in a manner that complements these existing policies, meets the technology where it is today, and prioritizes robust yet expedient regulation.

The next step for DOE will be to translate the recent Congressional mandate for DAC hubs into an FOA by the end of 2022, which will require the rapid collection of stakeholder input to develop a comprehensive vision of program success. In the months and years to come, DOE will need to translate the selection criteria and eligibility requirements established by Congress into an FOA and a comprehensive proposal evaluation rubric.

6. Energy Earthshots. (2021). *US Department of Energy's Carbon Negative Shot – An Introduction* [Fact sheet]. US Department of Energy. <https://www.energy.gov/sites/default/files/2021-11/Carbon-Negative-Shot-FactSheet.pdf>
7. Burns, E. & Jacobson, R. (2021, March 26). Enhancing and expanding the 45Q tax credit for direct air capture. *Carbon180*. <https://carbon180.medium.com/enhancing-and-expanding-the-45q-tax-credit-for-direct-air-capture-85f0f00c98c>
8. Townsend, A. & Havercraft, I. (2019). *The LCFS and CCS Protocol: An Overview for Policymakers and Project Developers*. Global CCS Institute. https://www.globalccsinstitute.com/wp-content/uploads/2019/05/LCFS-and-CCS-Protocol_digital_version.pdf
9. California Air Resources Board. (2022). *Monthly LCFS Credit Transfer Activity Report for February 2022*. California Air Resources Board. <https://ww2.arb.ca.gov/sites/default/files/2022-03/February%202022%20-%20Monthly%20Credit%20Transfer%20Activity.pdf>

The Infrastructure Investment and Jobs Act

Through the Infrastructure Investment and Jobs Act (also known as the Bipartisan Infrastructure Law), Congress has provided DOE with \$3.5 billion over five years (2022-2026) to finance the development of four DAC hubs across the US.

The statute defines a DAC hub as a network of DAC projects, carbon utilization technologies, geologic storage resources, and CO₂ transportation infrastructure. To be eligible, a hub must have the capacity to capture at least 1 million metric tons of CO₂ annually upon completion, with the ability to store CO₂ permanently in geologic formations and/or convert the CO₂ to products or commodities.

In addition to clarifying the scale and infrastructure of eligible projects, the statute also directs DOE to make project selections according to the below criteria to the maximum extent possible:

- **CARBON INTENSITY OF LOCAL INDUSTRY:** Site projects in regions with existing or recently retired carbon-intensive fuel or industrial operations.
- **GEOGRAPHIC DIVERSITY:** Select a portfolio of hubs located across different regions of the US.
- **CARBON POTENTIAL:** Develop projects in regions with high potential for carbon storage or utilization.
- **FOSSIL ECONOMY:** Locate at least two DAC hubs in economically distressed regions with high concentrations of fossil energy resources.
- **SCALABILITY:** Prioritize DAC hub proposals with the greatest initial capacity, the lowest cost of net-removal, and the ability to expand removal capacity.
- **EMPLOYMENT:** Prioritize projects that demonstrate the greatest potential to provide skilled training and long-term employment opportunities for residents of the surrounding region.
- **ADDITIONAL CRITERIA:** There may be other additional considerations the energy secretary could elect to consider that are not included in the statute.

These criteria will be a useful guide for DOE to both design the related FOA and select project submissions. Clarity on how these selection criteria will guide proposal selection would provide crucial project design and siting direction to DAC developers. DOE also has the authority to introduce additional selection criteria as needed, which provides an entry point to integrate EJ, public participation and consultation, and labor considerations. Congress has explicitly directed DOE to ensure that the DAC Hubs program is effectively coordinated with other IIJA programs, including

- the Carbon Capture Technology Program,¹⁰
- the Carbon Storage Validation and Testing Program,¹¹ and
- the Carbon Dioxide Transportation Infrastructure Finance and Innovation Program (CIFIA).¹²

With proper coordination across programs funded by the departments, DOE can make certain taxpayer dollars have greater climate, innovation, economic, and social benefits.

Figure 1 uses federal data to visualize the regions that are likely to meet many of the statute's selection criteria, while demonstrating that a single given project is unlikely to meet all criteria. Accordingly, the manner in which DOE prioritizes and interprets these criteria will determine where and how projects are built. As communities, states, and project developers assess regional opportunities and co-design project concepts, it's likely that no two hubs will look the same.¹³ The most effective hubs will meet a variety of place-based social, environmental, and technical constraints.

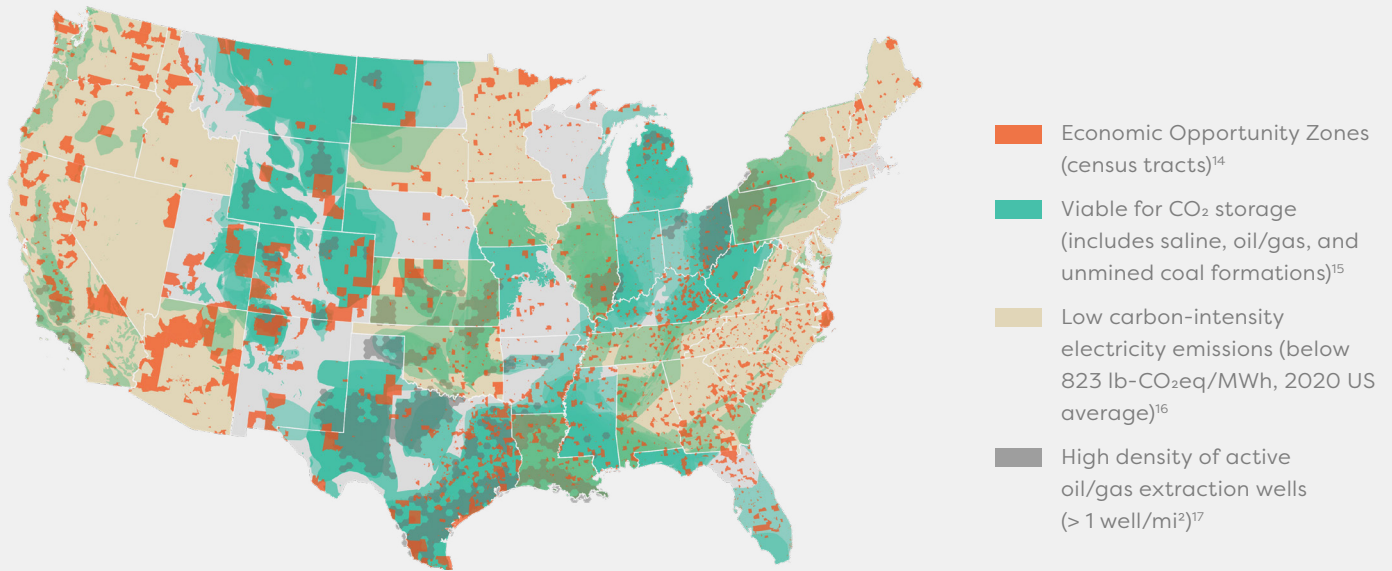
By engaging with project developers, communities, and other agencies early and often, DOE can help guide prospective applicants in submitting projects that meet criteria for technical, economic, and EJ concerns. DAC developers need a clear understanding of how DOE will interpret and apply these criteria to project selection in order to tailor their project design and siting directions. The sections that follow outline a vision for successful DAC hub development that DOE can actualize through strategic FOA design, rigorous regulatory compliance, high-road labor practices, and robust community engagement efforts.

10. Originally authorized through the Energy Act of 2020 and augmented through the IIJA, the program provides grant funding for point-source carbon capture and storage demonstrations, pilots, and front-end engineering and design studies. [https://uscode.house.gov/view.xhtml?req=\(title:42%20section:16292%20edition:prelim\)](https://uscode.house.gov/view.xhtml?req=(title:42%20section:16292%20edition:prelim))
11. A \$2.5 billion cost-share program to finance secure geologic storage wells across the US. <https://www.energy.gov/bil/carbon-storage-validation-and-testing>
12. A \$2.1 billion grant and low-interest loan program directed to finance CO₂ transportation infrastructure, including pipelines, freight rail, barges, and other transport networks. <https://www.energy.gov/bil/carbon-dioxide-transportation-infrastructure-finance-and-innovation-program>
13. Batres, M., Wang, F.M., Buck, H., Kapila, R., Kosar, U., Licker, R., Nagabhushan, D., Rekhelman, E., & Suarez, V. (2021) Environmental and climate justice and technological carbon removal. *The Electricity Journal*, 34(7), Article 107002. <https://doi.org/10.1016/j.tej.2021.107002>

FIGURE 1

Mapping Congress's Criteria.

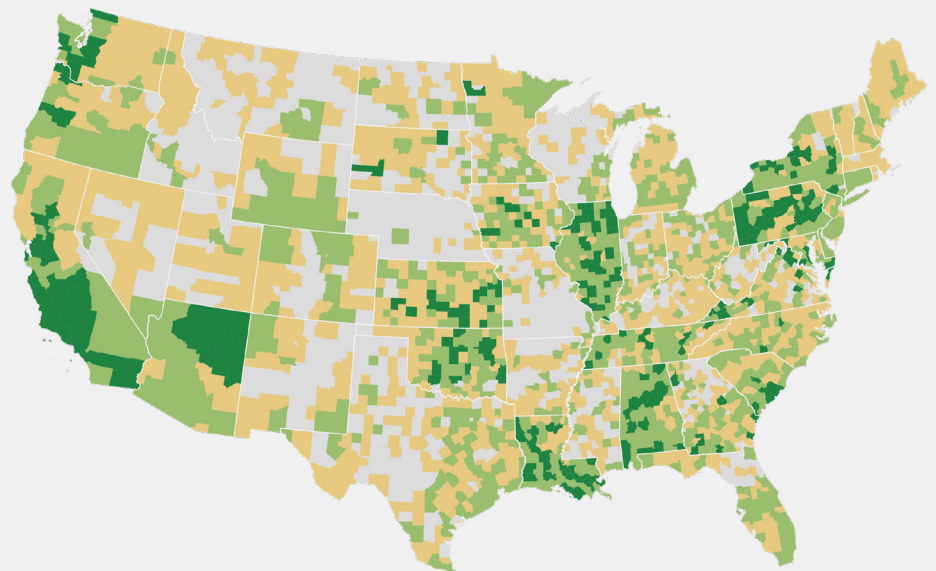
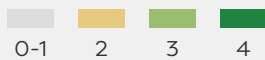
How DOE will interpret and implement the selection criteria dictated by Congress remains uncertain. Scalability (geologic storage capacity), carbon-intensive industry (oil and gas wells and large emitting facilities), low-carbon energy resources (grid carbon intensity below the national average), and economically disadvantaged regions (IRS Qualified Opportunity Zones) are mapped below.



COUNTY-LEVEL CRITERIA

- At least one census tract defined as an Economic Opportunity Zone¹⁸
- At least 25% of county intersects with potential CO₂ storage formations^{19, 20}
- Low carbon-intensity electricity emissions (below 823 lb-CO₂eq/MWh, 2020 US average)²¹
- Contains at least one fossil fuel-fired power plant (coal, gas, or petroleum) or large GHG emitting facility (> 100 kilotons CO₂eq/year)^{22, 23}

NO. CRITERIA SATISFIED



14. US Department of Housing and Urban Development (HUD), Opportunity Zones: <https://hudgis-hud.opendata.arcgis.com/datasets/HUD::opportunity-zones/>

15. DOE, Saline and coal formations - NETL-NATCARB v1502: <https://edx.netl.doe.gov/dataset/natcarb-alldata-v1502>

16. US EPA eGRID: <https://www.epa.gov/egrid/data-explorer>

17. Homeland Infrastructure Foundation-Level Data (HIFLD), Oil and Natural Gas Wells: <https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::oil-and-natural-gas-wells/>

18. HUD QOZs: <https://hudgis-hud.opendata.arcgis.com/datasets/HUD::opportunity-zones/>

19. DOE, Saline and coal formations - NETL-NATCARB v1502: <https://edx.netl.doe.gov/dataset/natcarb-alldata-v1502>

20. HIFLD, Oil and Gas Formations - Oil and Natural Gas Fields: <https://hifld-geoplatform.opendata.arcgis.com/datasets/oil-and-natural-gas-fields/>

21. US EPA eGRID: <https://www.epa.gov/egrid/data-explorer>

22. US EPA GHGRP (2019): https://www.epa.gov/system/files/documents/2021-10/ghgp_data_2019_8_7_2021.xlsx

23. US Energy Information Administration (EIA) State Level Maps (Power Plants): https://www.eia.gov/maps/layer_info-m.php

SECTION 1:

Optimizing Program Design

DOE can serve as a matchmaker for DAC companies, carbon storage and utilization developers, and local communities of potential hub sites. This section identifies strategies for FOA design, project selection, and interagency coordination to maximize the success of initial and future projects.

RECOMMENDATION 1:

Coordinate and facilitate collaboration across a portfolio of carbon management and clean energy programs.

Given the nascency of DAC technologies, DOE will likely need to apply a hands-on approach to setting funding milestones, identifying potential project partnerships, and aligning funding across multiple overlapping programs to effectively leverage the benefits of clustered infrastructure.

- A.** DOE should maximize the impact of federal dollars by coordinating DAC hub proposals with other enabling infrastructure projects such as geologic storage wells and CO₂ transportation projects funded by the Large-Scale Carbon Storage Commercialization and CIFIA programs, respectively. DOE should prioritize funding for proposals that establish carbon removal clusters across the entire value chain from capture to end use by requesting program applicants to specify energy, geologic storage, and CO₂ transportation needs in funding proposals. Within the initial FOA, DOE should ask DAC Hubs program applicants whether their proposal also includes applications to other DOE funding opportunities and if the project is contingent upon successful solicitation of funding from these additional proposals. Award selections should be coordinated and prioritized across cost-share programs accordingly to prevent delays or stranded investments.
- B.** DOE should serve as a matchmaker by connecting DAC technology applicants with developers for geologic storage, renewable energy, and carbon utilization who are seeking to access complementary federal funding. Much like the H2 Matchmaker program, DOE can support coordination across varying components of hub infrastructure.²⁴ Similarly, DOE can help DAC Hubs program applicants identify CO₂ buyers through the Carbon Utilization Program and low-carbon energy procurement opportunities through the Regional Clean Hydrogen Hubs and Clean Energy Demonstration Program on Current and Former Mine Land programs. With so few eligible projects, DOE should connect DAC developers with CO₂ off-takers, storage opportunities, and energy providers to ensure that enabling infrastructure syncs with capture facilities.

24. Hydrogen and Fuel Cell Technologies Office. (2022). *H2 Matchmaker*. Office of Energy Efficiency and Renewable Energy, US Department of Energy. <https://www.energy.gov/eere/fuelcells/h2-matchmaker>

C. Initial DAC Hubs program funding awards should be made exclusively to technologies with demonstration- or pilot-scale experience and a credible design to achieve 1 million metric tons of capture per year. Concurrently with the DAC Hubs program, DOE should implement the Commercial and Pre-Commercial DAC Prize programs, which will help commercialize and demonstrate more nascent, smaller-scale DAC pathways. DOE should maximize the impact of the Commercial DAC Prize by encouraging co-location and strategic partnerships with DAC Hubs program awardees to defray the cost of enabling infrastructure and enhance collaboration across technology developers. DOE should assess how existing and funded facilities, including the National Carbon Capture Center and the DAC facility within the National Energy Technology Laboratory,²⁵ could be used to support prize competition participants. Pairing lab and pilot-scale projects within test facilities or larger hubs will establish partnerships across DAC companies, off-takers, and energy providers, while also encouraging the dissemination of learning across federal funding recipients.

25. In the Energy and Water Development and Related Agencies Appropriations Act of 2022, Congress provided \$25 million to establish a DAC facility within the National Energy Technology Laboratory. S. Rept. 117-36 - Energy and Water Development Appropriations Bill, 2022. (2022, March 21). <https://www.congress.gov/congressional-report/117th-congress/senate-report/36/1>

RECOMMENDATION 2:

Limit initial awards and establish clear milestones for project development so that initial experience can inform future FOAs.

- A. Currently, there are less than a handful of commercial DAC companies with the capability to submit credible proposals meeting the DAC Hubs program eligibility criteria. DOE should publish the initial FOA as an information-gathering exercise to understand likely sites for DAC hubs, identify potential couplings with other DOE-sponsored projects, and assess the landscape of credible commercial projects and technologies. Accordingly, DOE should initially limit the number of initial solicitation awards to at most two hubs and strongly emphasize collaborative submissions that seek to co-locate more than one DAC technology within an individual hub. This will give DOE early experience in administering the program and reserve additional funds for technologies that succeed in the Commercial DAC Prize program.
- B. To mitigate the risk of allocating taxpayer dollars to unsuccessful projects, DOE should set funding milestones over the three- to five-year construction period. Technical funding milestones, such as key validation and design studies or construction and operation metrics, should be prerequisites for additional funding. Initial awards should facilitate feasibility, pre-FEED, and FEED studies to demonstrate technical viability, from which DOE may determine whether a

complete award is merited. Awards should scale over time as projects are constructed and technical milestones are achieved. As outlined in Sections 3 and 4, funding milestones should also require the successful completion of public engagement, community benefit determination, and permitting processes.

- C.** Initial awards should provide a maximum share of 50% of total project costs and require a private project finance guarantee upon initial funding for engineering, procurement, and construction work to ensure that awarded projects can appropriately mitigate and compensate for cost overrun or unforeseen project hurdles. Since so few technologies currently meet the DAC Hubs program eligibility criteria with regard to scale, a traditional downselect process is likely infeasible. To account for this, DOE should set unwavering technical and regulatory milestones. DOE should not publish additional DAC Hubs program FOAs until initial awards attain key project construction and permitting milestones in order to carry over learnings to future solicitation and selection processes.
- D.** Due to the varied technological readiness, current scale, and demonstration experience of existing DAC technologies, DOE should intentionally avoid picking winners; instead, DOE should diversify risk by ensuring that no more than 50% of program funds are awarded to one DAC company or technological approach. The brief funding timeline of the DAC Hubs program could allow a few project developers, technology licensees, and project financiers to secure the bulk of programmatic funding, which would hinder innovation and collaboration. For this reason, DOE should award no more than \$875 million (25% of total program appropriation) to one hub.
- E.** In alignment with the Office of Fossil Energy and Carbon Management's (FECM) commitment to reducing reliance on fossil fuels, DOE should give additional weight to proposals that demonstrate a commitment and technological ability to leverage carbon-free or renewable energy resources for both thermal energy and electricity needs.²⁶ In addition to reducing demand for fossil energy, DAC projects that rely on low-carbon energy encourage the deployment of additional renewable resources and remove more CO₂ on a ton-captured basis.²⁷ DOE should ensure that the procurement or build-out of low carbon energy resources is reflected in funding milestones and, to the greatest extent possible, discourage the use of unbundled renewable energy credits.

26. Wilcox, J. & Talati, S. (2021, July 8). *Our New Name Is Also a New Vision*. Office of Fossil Energy and Carbon Management, US Department of Energy. <https://www.energy.gov/fecm/articles/our-new-name-also-new-vision#:~:text=The%20Office%20of%20Fossil%20Energy,continued%20use%20of%20fossil%20fuels>

27. Bistline, J. E. T., & Blanford, G. J. (2021). Impact of carbon dioxide removal technologies on deep decarbonization of the electric power sector. *Nature Communications*, 12(1), 1-12. <https://doi.org/10.1038/s41467-021-23554-6>

GLOSSARY

Front-end engineering and design (FEED) and pre-FEED studies

Occurring after feasibility and basic engineering studies, they serve to produce all technical documentation and project specifications and establish the project scope.

Unbundled renewable energy credits (RECs)

Virtual renewable generation credits sold to power purchasers without being tied to the underlying energy source.

SECTION 2:

Reinforcing Regulation

To make effective and expedient use of DAC Hubs program funding, state and federal agencies will need to quickly and rigorously permit first-of-its-kind infrastructure. In some instances, DOE may need to provide technical assistance to regulatory agencies to adapt and apply frameworks initially created for emitting facilities or carbon management technologies. This section introduces some of the most important regulatory and permitting requirements that will govern the implementation of the DAC Hubs program awards and outlines recommendations for the timely and scientifically sound permitting of hub infrastructure.²⁸

RECOMMENDATION 3:

Comply thoroughly with the National Environmental Policy Act (NEPA) to protect the surrounding environment and build public trust, especially with disadvantaged communities.

NEPA requires that agencies disclose information about the environmental risks of actions taken directly by the federal government, or actions with a “federal nexus,” e.g., those receiving federal funds.^{29, 30} There are multiple steps that DOE can take to make this process as efficient as possible.

- A.** DOE should explore the possibility of preparing a single or small number of “programmatic” environmental impact statements (EIS) for the DAC Hubs program, with “tiers” of analysis that address the unique features of each project or class of projects.³¹
- B.** DOE should proactively collect information about the potential environmental impacts of the DAC Hubs program. Specifically, DOE can identify knowledge gaps left by FECM’s recent request for information (RFI) on carbon removal,³² and address these gaps through additional research, community engagement, and application questions for prospective project developers.³³
- C.** DOE should also take advantage of NEPA’s core provisions for the identification of alternative project plans.³⁴ Given the novelty of DAC facilities, seriously considering alternatives during the environmental impact process can generate valuable best practices information for facility structure and siting.

- 28. This is by no means an exhaustive discussion; stakeholders are encouraged to consult the external resources compiled here and gather additional information on relevant state and local regulations.
- 29. House of Representatives, Congress. (2010, December 30). *42 U.S.C. 4332 - Cooperation of agencies; reports; availability of information; recommendations; international and national coordination of efforts*. US Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2010-title42/USCODE-2010-title42-chap55-sub-chap1-sec4332>
- 30. Revesz et al. (2019), *Environmental Law and Policy*. 986. For the practical distinction between an EIS and an EA, see, for example, *Anderson v. Evans*, 371 F.3d 475 (9th Cir. 2004): “[A]n EIS serves different purposes from an EA. An EA simply assesses whether there will be a significant impact on the environment. An EIS weighs any significant negative impacts of the proposed action against the positive objectives of the project. . . .”
- 31. See, for example, CEQ CCUS Report (2021), <https://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf>, 40; CEQ regulations at 40 C.F.R. §§ 1500.4 and 1502.20, and; Revesz et al. (2019), *Environmental Law and Policy*. 980-81.
- 32. US Department of Energy. (2021). DOE Seeks Information on Deployment-Ready Carbon Reduction and Removal Technologies. <https://www.energy.gov/articles/doe-seeks-information-deployment-ready-carbon-reduction-and-removal-technologies>
- 33. DE-FOA-0002660, Deployment and Demonstration Opportunities for Carbon Reduction and Removal Technologies (Dec 6, 2021). See also CEQ’s recent CCUS guidance, 87 FR 8808 (Feb 16, 2022). www.federalregister.gov/d/2022-03205. 8810.
- 34. House of Representatives, Congress. (2010). *42 U.S.C. 4332 - Cooperation of agencies; reports; availability of information; recommendations; international and national coordination of efforts*. US Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2010-title42/USCODE-2010-title42-chap55-sub-chap1-sec4332>

NEPA requires that facilitating agencies (in this case, DOE) prepare an environmental impact statement (EIS) for “actions significantly affecting the quality of the human environment.” If there is uncertainty about whether a project will have a “significant” environmental impact, NEPA directs the agency to prepare a threshold “environmental assessment” (EA) to establish whether a full EIS is required. While the facilitating agency is responsible for compiling NEPA disclosures, NEPA regulations and guidance are promulgated by the Council on Environmental Quality (CEQ) within the Executive Office of the President.

RECOMMENDATION 4:

Contact the Fish and Wildlife Service (FWS) about the risk a proposed DAC hub may pose to species listed under the the Endangered Species Act (ESA) as early as possible.³⁵

ESA requires a substantial consultation process between a project’s facilitating agency and FWS. If FWS confirms the project presents a risk, ESA requires the preparation of a “biological assessment”³⁶ as a first step. This assessment can be prepared as part of DOE’s NEPA analysis, so time coordination between the two processes is recommended to enable this.³⁷

The Endangered Species Act (ESA) requires that federal actions be “not likely to jeopardize” species listed as “threatened” or “endangered” by either the Secretaries of Commerce or the Interior (§ 7(a)(2); 16 U.S.C. § 1532(15)). While the DAC Hubs program likely does not implicate the ESA in the same way that, say, a major infrastructure project would, the ESA contains potent substantive provisions that can lead to project delays or even cancellations when agencies fail to comply with them.

35. House of Representatives, Congress. (2020). *16 U.S.C. 1536 - Interagency cooperation*. US Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2020-title16/USCODE-2020-title16-chap35-sec1536>
36. House of Representatives, Congress. (2020). *16 U.S.C. 1536 - Interagency cooperation*. US Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2020-title16/USCODE-2020-title16-chap35-sec1536>
37. For an overview of the process, including further steps, see Revesz et al. (2019), *Environmental Law and Policy*. 1107-1110 (summarizing the findings in *Thomas v. Peterson*, 753 F.2d 754 (9th Cir. 1985)).

RECOMMENDATION 5:

Gather information from potential project developers as soon as possible to assess if proposed DAC hubs will trigger the Clean Air Act (CAA).

The core processes of DAC with secure geologic storage likely do not require air pollution regulations under the CAA (although whether or not particular DAC technologies would produce co-products in sufficient quantities at scale to trigger either CAA or Clean Water Act (CWA) regulations requires further study). However, projects that propose natural gas combustion for either electricity or thermal energy will, at the million metric ton scale, require CAA New Source Review and Title V operating permits. These requirements are detailed in CEQ’s recent Report to Congress on Carbon Capture, Utilization, and Sequestration (CCUS).³⁸

- A.** DOE should include project application questions about proposed facilities’ sources of onsite electricity and thermal energy, including expected emissions of methane and CAA criteria pollutants.³⁹
- B.** DOE should consider developing a distinct track within NEPA analysis for DAC hubs intending to combust fossil energy resources onsite, which would therefore require regulation under CAA, using tiering or a distinct programmatic analysis.

RECOMMENDATION 6:

Provide technical assistance and coordinate with the US Environmental Protection Agency (EPA) and state agencies to ensure timely and effective Class VI permitting of geologic storage through the Underground Injection Control (UIC) Program.⁴⁰

- A.** To the greatest extent possible, DOE should leverage the capacities of FECM’s Carbon Storage Program to pair DAC hubs with Carbon Storage Assurance Facility Enterprise Initiative projects, to facilitate timely permitting and technical assistance.
- B.** DOE should coordinate with EPA to ensure a timely and thorough Class VI review for DAC Hubs projects in order to appropriately schedule project milestones and support application development.

38. White House Council on Environmental Quality. (2021). *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration*, Appendix A. [whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf](https://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf)

39. US Environmental Protection Agency. (2021). *Criteria Air Pollutants*. <https://www.epa.gov/criteria-air-pollutants>

40. US Environmental Protection Agency. (2021). *Greenhouse Gas Reporting Program (GHGRP)*. <https://www.epa.gov/ghgreporting/subpart-rr-geologic-sequestration-carbon-dioxide>

GLOSSARY

Underground Injection Control (UIC)

EPA administers UIC as part of its implementation of the Safe Drinking Water Act. UIC requires permits for any facility operating an injection well, with different permits corresponding to different injection substances and purposes.

RECOMMENDATION 7:

Facilitate the FAST-41 program application process once the first DAC hub projects have been selected.

Project sponsors – in this case, DAC hub project developers in coordination with DOE – can apply to participate in the program and, if accepted, have access to a coordinated, multiagency review process with firm, transparent timelines. According to CEQ’s recent CCUS report, DAC projects qualify as FAST-41 eligible (“covered”) projects.⁴¹ The FAST-41 process begins with the submission of a project initiation notice (FIN), to which the Permitting Council must respond within 14 days.⁴² Prior to project FIN submissions, DOE should notify the Permitting Council and prepare a review of relevant permits and application materials to establish estimated timelines for DAC projects participating in FAST-41 review.⁴³

RECOMMENDATION 8:

Create resources for DAC-specific permitting guidance.

- A. DOE, in consultation with staff experts at CEQ, EPA, the Federal Permitting Improvement Steering Council (FPISC), and other appropriate agencies, should consider producing an informal guidance document that deals specifically with DAC projects. Such guidance would focus on the specific issues likely to arise during the permitting and oversight of DAC facilities with secure geologic storage. These issues include greenfield development, the differences between fossil and renewable energy sources, and the diversity of novel DAC technologies.
- B. In light of DAC Hubs program learnings, DOE should coordinate with CEQ and FPISC to publish a comprehensive public guidance document for future DAC projects. This guidance should also be developed in partnership with the National Environmental Justice Advisory Council to ensure recommendations are in line with justice objectives and outcomes.

41. White House Council on Environmental Quality. (2021). *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration* (p. 31). [whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf](https://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf)

42. Federal Infrastructure Permitting Dashboard. (2021). *The FAST-41 Process*. US Department of Transportation. <https://www.permits.performance.gov/fpisc-content/fast-41-process>

43. See also the recent CEQ CCUS guidance, 87 FR 8808 (2022), 8810. <https://www.federalregister.gov/documents/2022/02/16/2022-03205/carbon-capture-utilization-and-sequestration-guidance>

GLOSSARY

FAST-41

Title 41 of the Fixing America’s Surface Transportation Act (2015) established a program, known as “FAST-41,” for consolidating federal regulatory and permitting requirements.

SECTION 3:

Centering Environmental Justice

The DAC Hubs program provides a unique opportunity to build a transparent and equitable decision-making process for how future DAC projects get developed. Successful execution of this program will require incorporating robust public engagement, environmental and public health protections, and justice-centered funding structures. Our Removing Forward report outlines a set of guiding principles and recommendations to better integrate EJ into the research, development, and deployment of DAC.⁴⁴ Notably, the White House Environmental Justice Advisory Council (WHEJAC) listed DAC as a project that will likely not benefit a community.⁴⁵ We believe that DOE can demonstrate the opposite: DAC, developed with EJ leaders and robust community consultation, can provide myriad local economic and social benefits. The program must work to address considerations raised by WHEJAC, such as long-term local wealth and ownership, institutional racism, and accountability, by tying funding to local community organizations. This section provides a set of recommendations to ensure EJ is a central tenet of the DAC Hubs program.

RECOMMENDATION 9:

Establish and publish robust minimum public engagement standards for DAC hubs and future DAC projects that receive federal funding, in collaboration with EPA.

Key offices that can support include DOE's Office of Economic Impact and Diversity and EPA's Office of Public Engagement and Environmental Education.

A. To date, no best practices exist for public engagement in DAC implementation; DOE should draw from the Office of NEPA Policy and Compliance's Community Guide to Environmental Justice and NEPA Methods⁴⁶ as a starting point for developing its own best practice guides for DAC. For DAC to build trust within civil society, DOE will need to draft and mandate minimum public engagement standards for projects that receive federal funds. DOE and EPA's National Environmental Justice Advisory Council should co-develop and publish best practice guides for developers on public engagement in DAC implementation, with recommendations on how to meet the robust standards ([Appendix: Table A](#)). In the past, DOE and EPA have released best practice guides meant to build on minimum public engagement requirements in geologic storage implementation for developers and program directors.^{47, 48} While promising starting points, these guides are ultimately not comprehensive, standardized, or rigorous.

44. Kosar, U. & Suarez, V. (2021). *Removing Forward: Centering Equity and Justice in a Carbon-Removing Future*. Carbon180. <https://static1.squarespace.com/static/5b9362d-89d5abb8c51d474f8/t/6115485ae47e7f00829083e1/1628784739915/Carbon180+RemovingForward.pdf>
45. White House Environmental Justice Advisory Council. (2021). *Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions*. Council on Environmental Quality. https://www.epa.gov/sites/production/files/2021-05/documents/whejac_interim_final_recommendations_0.pdf
46. Office of NEPA Policy and Compliance. (2019). *Community Guide to Environmental Justice and NEPA Methods*. US Department of Energy. <https://www.energy.gov/sites/default/files/2019/05/f63/NEPA%20Community%20Guide%202019.pdf>
47. National Energy Technology Laboratory. (2017). *Best Practices: Public Outreach and Education for Geologic Storage Projects*. US Department of Energy. https://www.netl.doe.gov/sites/default/files/2018-10/BPM_PublicOutreach.pdf
48. US EPA Office of Water. (2011). *Geologic Sequestration of Carbon Dioxide - UIC Quick Reference Guide*. US Environmental Protection Agency. https://www.epa.gov/sites/default/files/2015-07/documents/uic-quick-reference-guide_public-participation_final-508.pdf

RECOMMENDATION 10:

Work with other agencies and private sector actors to invest in community education and public engagement efforts.

A well-conducted public engagement process requires dedicated funding, time, and capacity building. Timelines for milestones throughout the DAC Hubs program (e.g., feasibility, basic engineering, and the commencement of construction) should factor into public engagement needs, including potentially time-intensive educational and input processes.

- A.** DOE should work with other agencies, including the EPA Office of Public Engagement and Environmental Education and the Federal Energy Regulatory Commission Office of Public Participation, to compensate local organizations and CBOs for community outreach.
- B.** DOE should also collaborate with private sector actors such as philanthropies and corporations to fund public engagement efforts relevant to, but ultimately outside of, their funding authority.
- C.** DOE should consider establishing an independent advisory board composed of EJ experts, CBOs, science communication professionals, youth leaders, and community organizers to verify the appropriate and satisfactory implementation of public engagement plans, including the attainment of key community consultation milestones.

RECOMMENDATION 11:

Facilitate agency coordination to establish monitoring and permitting requirements for each DAC hub designed to protect communities.

- A.** DOE should work with EPA to require minimum reporting requirements for DAC hubs similar to those of a major stationary source located in a nonattainment area. Major stationary sources in nonattainment areas can only be constructed if there is no net increase in criteria pollution and there are more stringent permitting requirements that address siting, construction, operation, monitoring and testing, closure, and corrective actions thoroughly and frequently. DAC hubs that will use onsite power generation from emitting sources should be required to apply for a permit before beginning construction and demonstrate that the new facility will meet the lowest achievable emission rate.

RECOMMENDATION 12:

Require a comprehensive assessment from project developers when selecting projects that combine an impact analysis, risk assessment, and elements from the EJScreen tool.

These assessments can help identify and protect communities in which DAC could exacerbate existing public health inequities and environmental injustices.

- A. Rather than mandating that developers sum up risks from multiple agents or stressors as one aggregate, current risk assessment practices only suggest that they be combined. Additionally, the only required stressors are chemical.⁴⁹ DAC hub assessments should add the risks of chemical and non-chemical stressors, community vulnerability, multiple pollution sources, and environmental stressors. This will help to better understand the aggregation of risks from multiple environmental stressors when determining where to place a DAC hub.
- B. DOE should require the conduction of a cumulative impacts analysis to inform siting considerations at the initial phase of a project. Cumulative impacts would include the public health or environmental effects from the combined emissions and discharges in a geographic region. DOE should adopt California's EPA definition of cumulative impacts to include exposures, public health, or environmental effects from the combined emissions and discharges in a geographic area, spanning environmental pollution from all sources, whether single or multimedia, routinely or accidentally, or otherwise released.⁵⁰
- C. Through the initial FOA, DOE should require DAC Hubs program applicants to develop and submit an EJScreen assessment of the proposed project site. During proposal review, DOE should use EJScreen results to determine whether a project may pose an immediate and inequitable burden on a disadvantaged community.⁵¹ This can inform DOE and project developers about existing burdens in a community, if a community is considered an EJ community, and if DAC hubs will potentially create more harm.

WHEJAC recently released a beta version of the Climate and Economic Justice Screening Tool.⁵² It identifies disadvantaged communities that are overburdened by pollution by providing socioeconomic, environmental, health, and climate information. This tool is considered EJScreen 2.0 and provides additional indices and updated demographic data.

- 49. US EPA Office of Water. (2011). *Geologic Sequestration of Carbon Dioxide – UIC Quick Reference Guide*. US Environmental Protection Agency. https://www.epa.gov/sites/default/files/2015-07/documents/uic-quick-reference-guide_public-participation_final-508.pdf
- 50. California Environmental Protection Agency. (2014, February). California Environmental Protection Agency Environmental Justice Program Update. State of California. <https://calepa.ca.gov/wp-content/uploads/sites/6/2016/10/Publications-Reports-2014yr-EJUpdateRpt.pdf>
- 51. US Environmental Protection Agency. (2022). *EJScreen: Environmental Justice Screening and Mapping Tool*. <https://www.epa.gov/ejscreen>
- 52. Council on Environmental Quality. (2022, February). *Climate and Economic Justice Screening Tool*. <https://screeningtool.geoplatform.gov/>

GLOSSARY

EJScreen

A tool that provides a nationally consistent dataset that combines environmental and demographic indicators to determine the approximate locations of underserved communities.

RECOMMENDATION 13:

Establish a community oversight board for each DAC Hubs project.

- A. DOE should establish a community oversight board that includes representatives from EJ organizations, local CBOs, environmental NGOs, local universities or colleges, and independent technical and legal experts. These individuals will bring the community closer to the decision-making process and provide people with a greater say in the matters that affect their neighborhoods. DOE should authorize the oversight board to create a set of criteria establishing minimum community consultation and input standards, in coordination with the project developer. DOE should work with local DAC hub oversight boards to confirm that projects are honoring agreed-upon criteria. In instances where projects fail to meet criteria for public engagement, labor, community benefit, or environmental standards, DOE should encourage the oversight board to submit a report documenting violations. DOE should then determine whether the project developer has deviated from or failed to meet funding milestones.

RECOMMENDATION 14:

Do not fund any projects that utilize captured CO₂ for EOR.

It is crucial that the DAC Hubs program lays the groundwork for high-quality DAC, untethered to the extraction of fossil fuels. Additional public investment in this technology risks further expanding fossil fuel infrastructure and reinforcing many of the environmental injustices that underserved communities face today.⁵³ Instead, DOE should prioritize projects that pair DAC with dedicated geologic storage and carbon utilization, leading with the climate imperative to remove and store millions of metric tons of CO₂ per year.

53. Underground Injection Control (UIC). (2022). *Class II Oil and Gas Related Injection Wells*. US Environmental Protection Agency. <https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells>

RECOMMENDATION 15:

Prioritize awards for DAC Hubs projects with commitments to develop community benefits agreements (CBAs) or other contractually binding agreements.

A. DOE should work with EPA to expand on current resources for CBAs and establish best practices documentation, including templates for developers and step-by-step assistance for community stakeholders.⁵⁴ Guided by these resources, the community groups and project developers associated with each DAC hub should be required to create a CBA during the hub's inception phase. Potential community benefits for consideration include local hire commitments, additional labor standards, educational and workforce development opportunities, special community funds, emissions reductions initiatives, and community repair projects.

RECOMMENDATION 16:

Make funding contingent on meeting public engagement milestones.

A. DOE should prioritize the selection of proposals that incorporate comprehensive and detailed public engagement strategies. To ensure that social and environmental agreements are met, public engagement and consultation milestones should be scheduled upon receiving initial funding and completed within three years. These milestones should

- assess the level of transparent and thorough community engagement,
- detail how community input and feedback are integrated into project design,
- outline the progress of CBAs or other contractually binding agreements between host communities and project developers, and
- solicit direct input from local partners.

54. Office of Economic Impact and Diversity (2017). *Community Benefit Agreement (CBA) Toolkit*. US Department of Energy. <https://www.energy.gov/diversity/community-benefit-agreement-cba-toolkit>

GLOSSARY

Community benefits agreement (CBA)

Legal, enforceable agreements co-created by community groups and project developers that require a developer to provide specific amenities and/or mitigations to the local community.

SECTION 4:

Building the Carbon Management Workforce

The IIJA directs the administration to prioritize DAC Hubs projects that create high-quality employment opportunities, with a particular focus on economically disadvantaged communities reliant on fossil energy extraction and heavy industry. Those who build the initial DAC hubs will define the future and potential of the carbon removal workforce in the US. Employment and apprenticeship, especially within communities with strong ties to fossil energy production, can help chart a path for regionally tailored and just transition opportunities through carbon removal. DAC hub developers should prioritize sourcing from local businesses and contractors, pay at or above the prevailing wage, and commit to codifying long-term project labor and CBAs.

RECOMMENDATION 17:

Establish clear geographic and quantitative definitions of “economically distressed,” “regions of the US with high levels of coal, oil, or natural gas resources,” and “carbon-intensive fuel production or industrial capacity.”

Upon release of an FOA for the programs outlined within DOE's 2021 RFI on carbon removal, DOE should publish a map of regions meeting the economic and energy criteria of the program.⁵⁵

- A.** DOE should use relevant demographic data to specifically identify economically distressed areas of the US, including sources such as the Internal Revenue Service's map of distressed counties⁵⁶ drawn from census tract data.⁵⁷ DOE should cross-reference external data with its own mapping of regional fossil fuel production and industrial intensity. To the greatest extent possible, DOE should provide public geospatial tools to identify or specify regions that meet the Secretary's interpretation of the statute's selection criteria.
- B.** DOE should disclose data on energy, employment, and demographics used to identify the regions targeted by the statute. In identifying these regions, DOE should coordinate closely with the documentation and guidance provided by the WHEJAC Justice40 recommendations to appropriately define and identify disadvantaged communities.⁵⁸

- 55. US Department of Energy. (2021, December 6). DOE Seeks Information on Deployment-Ready Carbon Reduction and Removal Technologies. <https://www.energy.gov/articles/doe-seeks-information-deployment-ready-carbon-reduction-and-removal-technologies>
- 56. US Department of Housing and Urban Development. (2022). Opportunity Zones. <https://opportunityzones.hud.gov/resources/map>
- 57. Internal Revenue Service. (2021). Opportunity Zones. <https://www.irs.gov/credits-deductions/businesses/opportunity-zones>
- 58. White House Environmental Justice Advisory Council. (2021, May 13). Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions. Council on Environmental Quality. https://www.epa.gov/sites/default/files/2021-05/documents/whejac_interim_final_recommendations_0.pdf

RECOMMENDATION 18:

Ensure that project developers and contractors coordinate with and support regional job training and registered apprenticeship programs to enable lasting economic opportunities.

- A.** DOE will need to ensure that employment opportunities associated with publicly funded carbon management projects are accessible to and prioritize residents of the surrounding community. DOE’s Office of Economic Impact and Diversity and the Department of Labor (DOL) should provide program applicants with a list of recognized apprenticeship programs to encourage local economic development and skilled training opportunities.⁵⁹
- B.** As DOE has done in recent FOAs for industrial and power sector carbon capture and storage, calls for funding submission proposals should provide guidance to applicants on methodologies for estimating direct and indirect job creation (both long- and short-term) resulting from the project and its associated supply chains.

RECOMMENDATION 19:

Encourage and reward project proposals with strong labor standards.

- A.** DOE should ensure that projects meet existing labor and manufacturing laws and work with DAC hub developers to oversee the development of the following:
 - **PROJECT LABOR AGREEMENTS (PLAs):** DOE should require all projects seeking public funding for carbon management infrastructure to develop PLAs to protect contractors and employees.
 - **PREVAILING WAGE COMMITMENTS:** Consistent with federal law⁶⁰ and PLA requirements, DOE should specify that design, construction, and operation contracts must meet (and are encouraged to exceed) prevailing wage standards, as defined by DOL.
 - **COMPLIANCE WITH “MADE IN AMERICA” STANDARDS:** DOE should coordinate with the newly established Made in America Office and its director to ensure that funded projects are compliant with “Made in America” laws and associated executive orders.⁶¹

59. Employment and Training Administration. (2021). *Data and Statistics: Registered Apprenticeship National Results Fiscal Year 2020*. US Department of Labor. <https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2020>

60. House of Representatives, Congress. (2001, December 30). *40 U.S.C. 276a - Rate of wages for laborers and mechanics*. US Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2001-title40/USCODE-2001-title40-chap3-sec276a>

61. Exec. Order No. 14005, 86 Fed. Reg. 7475 (January 25, 2021).

- B.** DOE should also encourage commitment to additional labor development measures by prioritizing or awarding additional scoring points to projects that do the following:
- Employ contractors and subcontractors represented by labor unions. As the Fair Labor Standards Act makes clear, unionized labor promotes “efficiency” and “safety” in production, as well as stable wages.⁶² While an explicit mandate of union labor for federal contracts would require an executive order or congressional legislation,⁶³ the language and purpose of the DAC Hubs program put DOE on firm ground to account for unionized labor commitments in evaluating project proposals.
 - Adopt CBAs that codify and formalize agreed-upon flows and distributions of revenues and employment opportunities within the community or county surrounding the project.⁶⁴

62. House of Representatives, Congress. (2011, December 30). *29 U.S.C. 151 - Findings and declaration of policy*. vUS Government Publishing Office. <https://www.govinfo.gov/app/details/USCODE-2011-title29/USCODE-2011-title29-chap7-sub-chap11-sec151>
63. See, for example, *Chamber of Commerce of US v. Reich*, 74 F.3d 1322 (DC Cir. 1996).
64. Office of Economic Impact and Diversity. (2017). *Community Benefit Agreement (CBA) Resource Guide*. US Department of Energy. <https://www.energy.gov/diversity/downloads/community-benefit-agreement-cba-resource-guide>

Conclusion

The DAC Hubs program is an unprecedented investment in direct air capture with the potential to set the technology on the path toward full-scale deployment by 2050. How this program is implemented will impact the DAC field and the communities and ecosystems in which projects are developed for decades to come. With thoughtful program design, effective regulations, an equitable and just approach, and a growing carbon management workforce, DOE can implement these hubs in a way that builds widespread faith in the government’s ability to responsibly shepherd new technologies to maturity. Additionally, these hubs can dramatically increase our capacity to remove legacy emissions in service of a livable climate in which current and future generations can thrive.

To learn more about any of the recommendations in this report, email policy@carbon180.org.

APPENDIX

Public engagement standards to integrate fair decision-making into the DAC Hubs program

Meeting requirements

- Convened at every project stage (i.e., feasibility, basic engineering, inception, early deployment, construction, operation and maintenance, and closure)
- Accessible based on local needs and contexts (e.g., transportation services, childcare needs, and language access)
- Information on meeting times, locations, topics, and other details made widely available through local media and government website(s) with a minimum 30 days notice
- Representation of DOE officials, developers, and local stakeholders, including EJ and labor advocates, at every meeting
- Public record of all feedback from stakeholder and community oversight committees
- Identification of local minority demographic groups for proactive, targeted outreach efforts
- Community education on climate, carbon removal, and DAC as an integrated component
- Democratic process used to capture community and stakeholder sentiments and approval of project implementation

Information requirements

- Including only impartial and objective resources, project information, and data provided by developers and DOE
- Transparent and honest about potential risks and benefits and any gaps in data
- Project data frequently and directly shared with local stakeholders and the community oversight committee, as well as made widely accessible to the general public
- Project information, resources, and data provided in all regional languages in print and online
- Project data and information collection done in collaboration with local researchers

Oversight requirements

- Establishment of a community oversight committee made up of local leaders representative of various community demographic and issue-led groups, with reporting power to DOE
- The community oversight committee will ensure proper handling of stakeholder feedback, fair representation of local stakeholders and community priorities, and the fulfillment of other necessary components
- Public record of feedback from all stakeholders, particularly from environmental justice groups, and community oversight committee in meetings and other public engagement activities
- A minimum turnaround time of 60 days for developers and/or DOE to respond and provide submission of proof of how they incorporated or addressed stakeholder feedback throughout the public engagement process