

Notice of Intent No.: DE-FOA-0003081

DISCLAIMER: The “Notice of Intent to Issue” is for informational purposes only; the Department of Energy is not seeking comments on the information in this notice and applications are not being accepted at this time. Any information contained in this notice is subject to change.

**This is a Notice of Intent (NOI) to Issue
Funding Opportunity Announcement (FOA) No. DE-FOA-0003082 and other
Funding Opportunities
Title: Carbon Negative Shot Pilots**

Issue Date: 08/10/2023

OVERVIEW: In this notice of intent (NOI), the United States (U.S.) Department of Energy (DOE or the Department) outlines its intent to publish a series of Carbon Negative Shot (CNS)-aligned funding opportunities focused on supporting the advancement and maturation of a suite of carbon dioxide removal (CDR) technologies. This CNS NOI outlines multiple program interests that aim to support the development and commercialization of CDR technologies and collectively enable the Department’s CNS target of gigaton-scale deployment for less than \$100 per net metric ton of CO₂-equivalent within the decade.

This NOI is intended to provide information related to the potential issuance of multiple funding opportunities and prizes associated with the CNS over the next several years, including DE-FOA-0003082 – “Carbon Negative Shot Pilots.” DOE’s National Energy Technology Laboratory (NETL) intends to issue this CNS FOA on behalf of the Office of Fossil Energy and Carbon Management (FECM) in early fiscal year 2024 (FY24). **However, this NOI describing the potential funding opportunities and prize tracks identified below does not constitute a commitment or assurance that the Department will issue or make funds available for the outlined opportunities.**

These anticipated funding opportunities may span several offices within the Department, including DOE FECM in conjunction with NETL, the Office of Clean Energy Demonstrations (OCED), and other offices within the Department.

INTENDED FUNDING OPPORTUNITIES:

1. DE-FOA-0003082 – Carbon Negative Shot Pilots *(expected release date of early FY24)*

- Includes four (4) anticipated Areas of Interest (AOIs) related to:
 - Small Biomass Pilots, Small Mineralization Pilots, Small Marine CDR Pilots, and Multi-Pathway CDR Testbeds.

2. Other intended funding opportunities and prize tracks include:

- **Direct Air Capture (DAC) Pilot Prize**
 - *(expected release date late FY23)*
- **CDR Purchase Prize**
 - *(expected release date late FY23)*
- **Regional Direct Air Capture Hubs**
 - *(expected release of additional FOA(s) in FY24/25 and beyond)*
- **Monitoring, Reporting, and Verification (MRV) for CDR**
 - *(expected release date FY24)*
- **DE-FOA-0002614 – Carbon Management: CDR Technology Research and Development**
 - *(expected release date FY24)*

See “FUNDING OPPORTUNITY DESCRIPTIONS” below for additional details regarding the funding opportunities.

BACKGROUND

In 2021, as part of DOE’s Energy Earthshot Initiative, DOE made an all-hands-on-deck call for innovation in carbon dioxide removal pathways. By 2032, these pathways will capture carbon dioxide from the atmosphere and store it at gigaton scales for less than \$100/net metric ton of carbon dioxide-equivalent, a cost that includes monitoring, reporting, verification (MRV) and durable storage. This initiative, known as “Carbon Negative Shot™” (CNS), is the **U.S. government’s first major effort in carbon dioxide removal** (CDR) and is a Department-wide call for crosscutting innovation and commercialization of a wide range of CDR pathways. Achieving this ambitious goal is essential for the U.S. to meet its goal of net-zero emissions by 2050 and to enable the clean-up of legacy emissions thereafter. This CNS NOI outlines some of the key research and development (R&D) funding activities that DOE believes are necessary over the coming years to achieve the CNS goals across a broad suite of CDR pathways.

The Bipartisan Infrastructure Law (BIL), Inflation Reduction Act (IRA), as well as annual Energy and Water Development Appropriations Acts have provided DOE with unprecedented funding to advance CNS. This NOI provides initial guidance on potential funding opportunities that may span several offices within the Department, including DOE FECM in conjunction with NETL, the Office of Clean Energy Demonstrations (OCED), and other offices within the Department. **Box 1** below provides a limited and not exhaustive list of previous and ongoing funding opportunities that support CNS.

Box 1. Carbon Negative Shot-aligned funding opportunities and prizes DOE FECM has previously published or participated in include, but are not limited to:

- Pre-Commercial DAC Technology Prize
- Pre-Commercial DAC EPIC Prize
- Regional DAC Hubs Program FOA [DE-FOA-0002735]
- Carbon Dioxide Removal Measurement, Reporting, and Verification Best Practices and Capabilities [DE-LC-000L100]
- Marine Carbon Dioxide Removal (mCDR): Research and Development for Assessing Large Scale Carbon Removal and Local Scale Ocean Acidification Mitigation [NOAA-OAR-OAP-2023-2007714]
- DAC Combined with Dedicated Long-Term Carbon Storage, Coupled to Existing Low-Carbon Energy [DE-FOA-0002560]
- Carbon Management: AOI-2. Carbon Dioxide Removal Technology [DE-FOA-0002614]
- Novel Research and Development for the Direct Capture of Carbon Dioxide from the Atmosphere [DE-FOA-0002188]
- Carbon Capture R&D: Bench-Scale Testing of Direct Air Capture Components (TRL 3) and Initial Engineering Design for Carbon Capture, Utilization and Storage Systems from Air (TRL 6) [DE-FOA-0002402]
- SBIR- FY20 Phase I Release 2- 20b Direct Air Capture
- SBIR- FY22 Phase I Release 2- 22a- Novel Carbon Capture Technologies Employing Waste Heat in Regeneration of Materials Used in Direct Air Capture
- SBIR- FY23 Phase I Release 2- C56-25b: Combined Direct Air Capture and Conversion of Carbon Dioxide to Chemical Products

The gap between the goals of CNS and the current commercial viability of some CDR technologies is substantial, especially in approaches outside DAC. This CNS NOI provides a strategy to coordinate funding opportunities that involve a variety of CDR pathways, technology readiness levels, and DOE offices and programs. The intended funding opportunities and prizes listed in this NOI will be supported through available funds under the Carbon Removal Program authorization and advanced appropriations enacted in the BIL. Specifically, this NOI announces a host of intended funding opportunities that will advance CDR technologies through coordinated R&D.

TECHNICAL OBJECTIVES

Anticipated Objectives

DOE plans to design and release a series of multi-topic, multi-year funding opportunities soliciting Energy Research, Development and Demonstration (RD&D) for CDR technologies that will be coordinated across DOE offices to achieve CNS objectives across CDR pathways. These funding opportunities are expected to focus on several topics responsive to both the CDR program authorization priorities and several CDR BIL provisions. DOE intends to issue funding opportunities tied to this NOI, collectively branded as “Carbon Negative Shot” funding. It is expected that additional funding related to the Regional Direct Air Capture Hubs program (Sec. 40308 of BIL) will also support these opportunities in pursuit of the CNS initiative.

CDR processes which capture carbon dioxide (CO₂) from ambient air differ from point source carbon capture systems (e.g., from power plants or industrial facilities) which prevent additional non-biogenic emissions from being released. For the implementation of these funding opportunities and consistent with the stated CNS goals and objectives, only projects that advance progress towards CDR will be considered. The meaning of carbon removal within this NOI is consistent with Sec. 5001 of the Energy Act of 2020 and includes a portfolio of biotic and abiotic pathways that permanently isolate CO₂ from the atmosphere. These portfolios include CO₂ captured from the atmosphere or ocean that is stored via secure geologic sequestration or equivalent storage and conversion processes. For the purpose of the FOAs and prizes included within this NOI, the meaning of “permanent” is consistent with Title 26 U.S. Code § 45Q and CNS, which entails the reliable and sustained isolation of CO₂ from the atmosphere. It is anticipated that the life cycle analysis (LCA) of the entire project will be used as the basis for evaluating the CO₂-equivalent removal potential from the atmosphere, including all mass and energy inputs and outputs required to construct, operate, monitor, close, and decommission the facility; emissions from land use change and other ecosystem perturbations; and long-term retention of the CO₂. DOE recognizes initial demonstrations of CDR technologies may not be net-negative on an LCA basis; however, eligible technologies will need to demonstrate a defensible pathway to becoming net-negative.

DOE has aligned and coordinated these potential funding opportunities and prizes across the Department with the intention of executing CDR and BIL program funding to address emergent technology, markets, and policy factors. CNS requires a DOE-wide response. The anticipated opportunities and prizes below outline programs intended to meet the needs of the current CDR field, including reliable revenue, cost-share for first-of-a-kind pilot facilities and trials, and measurement, reporting, and verification resources needed to support voluntary markets.

These expected investments are intended to catalyze the private sector to scale these technologies and build the markets and supply chains to facilitate rapid deployment.

INTENDED FUNDING OPPORTUNITIES:

FUNDING OPPORTUNITY DESCRIPTION (Carbon Negative Shot Pilots)

DE-FOA-0003082 – Carbon Negative Shot Pilots *(expected release date early FY24)*

- **Anticipated AOI-1. Small Biomass Carbon Removal and Storage (BiCRS) Pilots:**
Expected funding for up to 5 biomass carbon removal with sequestration or utilization (including electricity, liquid transportation fuels, hydrogen, pyrolysis, gasification, and/or burial, sinking, and alternative conversion or sequestration method) pilots from enacted authorities and appropriations.
- **Anticipated AOI-2. Small Mineralization Pilots:**
Expected funding for up to 10 enhanced mineralization pilots with appropriate MRV from enacted authorities and appropriations. Enhanced mineralization pilots will demonstrate the potential to leverage alkaline material and accelerated weathering techniques to hasten the rate of CO₂ sequestration in ex-situ or surficial contexts.
- **Anticipated AOI-3. Multi-Pathway CDR Testbed Facilities:**
Expected funding for up to 5 CDR testbed facilities suitable for evaluating, developing, and integrating multiple CDR pathways across different ecosystems, climates, and communities. Testbeds should demonstrate capacity to accommodate and enhance the testing of several CDR pathways with common infrastructure, interdisciplinary assessment, and commercialization support.
- **Anticipated AOI-4. Small Marine CDR Pilots:**
Expected funding for up to 5 marine CDR (mCDR) pilot projects, in lab, closed-system, and representative field pilot environments, to demonstrate the feasibility, cost, and scalability of both biotic and abiotic ocean-based approaches, including direct ocean capture of CO₂, ocean alkalinity enhancement (mineral and electrochemical), and micro- and macroalgae-based pathways.

Other intended funding opportunities and prize tracks include:

- DAC Pilot Prize – *expected release date late FY23*
- CDR Purchase Prize – *expected release date late FY23*
- Regional Direct Air Capture Hubs FOAs *expected release in FY24/25 and beyond*
- MRV for CDR – *expected release date FY24*
- DE-FOA-0002614 Carbon Management: CDR Technology Research and Development – *expected release in FY24*

OTHER FUNDING OPPORTUNITY DESCRIPTIONS

DAC Commercial Prize – DAC Pilots and CDR Purchase Prize

- **Track 1: DAC Pilots:** Funding expectation up to \$60M from BIL funds to support a prize for DAC pilots with capacity of approximately 1,000-5,000 metric tons of CO₂ capture per year.
- **Track 2: CDR Purchases:** Funding expectation up to \$35M from BIL funds to support a prize for CDR purchasing contracts for a portfolio of CDR pathways consistent with the objectives of the Carbon Negative Shot.
- **Regional Direct Air Capture Hubs FOA(s):** FECM and OCED intend to release one or more FOAs for the Regional DAC Hubs program, building on the learnings and progress made through the first FOA (DE-FOA-0002735).
- **Measurement, Reporting, and Verification (MRV) for CDR** – Expected funding for projects developing and commercializing protocols, technologies, and methods to improve MRV approaches for terrestrial or marine CDR pathways from BIL funds and other enacted appropriations.
- **DE-FOA-0002614 – Carbon Management**
 - **AOI-2. CDR Technology Research and Development** – Expected funding to support the development and commercialization of CDR technologies. These may include previously awarded subtopic areas, such as Bench-Scale Testing of Structured Material Systems, or Components Designs for Optimized Direct Air Capture (AOI-2A) or Field Validation of Abiotic Ocean-Based Carbon Removal (AOI-2F), among additional subtopics that may be added.

Anticipated Engagement

Meaningful community engagement will be central to the successful development and implementation of all projects funded from these CNS funding opportunities. Engagement is continuous throughout the lifecycle of a project, and the types of engagement will change depending on project type. Projects funded through the BIL provisions and base appropriations will include Equity, Environmental, and Energy Justice (EEEJ) principles and priorities. In keeping with the Administration's goals, and as an agency whose mission includes strengthening our country's energy prosperity and advancing just and sustainable decarbonization, DOE intends to use this program to support the creation of well-paying jobs with the free and fair choice to join a union, the incorporation of strong labor standards, high-road workforce development especially including registered apprenticeships, and quality pre-apprenticeships. In alignment with the Department's commitment to equity, justice, and community consultation, these funding opportunities incorporate Community Benefits Plan requirements to ensure projects support workforce development and environmental protection.

Anticipated Requirements (DE-FOA-0003082)

The anticipated requirements below apply only to intended issuance of DE-FOA-0003082. Potential applicants are hereby informed that one or more AOIs associated with this NOI will require host site participation. Additionally, potential applicants are hereby put on notice that a minimum of 20% non-Federal cost sharing is expected to be required for all funding opportunities associated with this NOI, and non-Federal cost share may be higher for certain funding opportunities. This advanced notice of the non-Federal cost sharing requirement is intended to give prospective applicants ample time to obtain the required non-Federal resources and to adequately address their anticipated cost share in any potential application(s) submitted in response to the intended funding opportunities.

SUBMISSION AND REGISTRATION REQUIREMENTS

1. If DE-FOA-0003082 "Carbon Negative Shot Pilots" is released, it will be posted at: Grants.gov (<http://www.grants.gov>) and at FedConnect (<http://www.fedconnect.net>).
2. Other funding opportunities mentioned in this NOI may be posted at (but not limited to): Grants.gov, FedConnect, and OCED, S3, or OTT eXCHANGE.

Entities interested in applying are strongly encouraged to register at these sites to receive notification of announcements regarding the funding opportunities. Applications can only be submitted through Grants.gov or an eXCHANGE system.

There are several one-time actions an applicant must complete to submit a Full Application in Grants.gov (e.g., obtain a Unique Entity Identifier (UEI) number, register with the System for Award Management (SAM), register with Grants.gov, and register in FedConnect.net to submit questions). Applicants who are not registered with SAM and Grants.gov, should allow at least 44 days to complete these requirements. It is suggested that the process be started as soon as possible.

- **UEI** - Applicants must obtain an UEI from the SAM to uniquely identify the entity. The UEI is available in the SAM entity registration record.

NOTE: Subawardees/subrecipients at all tiers must also obtain an UEI from SAM and provide the UEI to the Prime Recipient before the subaward can be issued.

- **SAM** - Applicants must register with SAM at <http://www.sam.gov/> prior to submitting a Full Application in response to an FOA. NOTE: Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Failure to register with SAM will prevent an organization from applying through Grants.gov. **The SAM registration must be updated annually.** More information about SAM registration for applicants is found at:

https://www.fsd.gov/gsafsd_sp?id=gsafsd_kb_articles&sys_id=650d493e1bab7c105465eaccac4bcacb.

- **Grants.gov** - Applicants must register with Grants.gov and set up a Workspace. An applicant cannot submit a Full Application through Grants.gov unless it is registered. Please read the registration requirements carefully and start the process immediately.

1. The Authorized Organizational Representative (AOR) must register at: <https://apply07.grants.gov/apply/OrcRegister>
2. An email is sent to the E-Business (E-Biz) POC listed in SAM. The E-Biz POC must approve the AOR registration using their MPIN from their SAM registration.

More information about the registration steps for Grants.gov is provided at:

<https://www.grants.gov/web/grants/applicants/registration.html>

- **FedConnect.net** - Applicants must register with FedConnect to submit questions to an FOA. FedConnect website: www.fedconnect.net.

DISCLAIMER

This is a Notice of Intent (NOI) only. DOE may issue funding opportunities as described herein, may issue funding opportunities that are significantly different than the funding opportunities described herein, or may not issue any funding opportunities at all.

This NOI is issued so that interested parties are aware that DOE may issue funding opportunities as described herein. Any information contained in this NOI is subject to change without notice.

No Concept Papers or Full Applications are being accepted at this time.