Notice of Intent (NOI) No. DE-FOA-0003496
Issue Date: 11/14/2024

DISCLAIMER: The "Notice of Intent to Issue" is for informational purposes only. The Department of Energy (DOE) is not seeking comments on the information in this notice. Applications are not being accepted at this time. Any information contained in this notice is subject to change.

This is a Notice of Intent to Issue
Notice of Funding Opportunity No. DE-FOA-0003495
"*Accelerating CO2 Conversion Technology Development and Deployment – Biological, Catalytic, and Mineralization Pathways*"

The DOE National Energy Technology Laboratory (NETL) intends to issue a Notice of Funding Opportunity (NOFO) on behalf of the DOE Office of Fossil Energy and Carbon Management. It is anticipated that the NOFO will be issued in 2025.

TECHNICAL OBJECTIVES

Carbon conversion is an essential element in the strategy to combat climate change. It enables carbon recycling by using anthropogenic carbon, captured from the atmosphere or sourced from utility and industrial point sources. Carbon conversion products will play a critical role in the transition to a net-zero economy by providing solutions for hard-to-abate industries or durably storing carbon in long-lived products like building materials. The Carbon Conversion Program supports various conversion technologies within biological, catalytic, and mineralization pathways. These technologies will benefit manufacturers, technology providers, and the general public by advancing commercial viability of and consumer access to more environmentally sustainable products.

Significant advancements have been made in carbon conversion technologies through research and development supported by the U.S. Department of Energy. However, there are still critical knowledge gaps and technical barriers to be addressed. Further research and development is needed to support scaling challenges, including issues affecting the economics of commercial projects, the durability of novel unit operations at scale, and barriers to adoption of these products by consumers.

The anticipated technical objective of this Notice of Funding Opportunity (NOFO) is to competitively solicit cost-shared research and development (R&D) proposals to advance the piloting of carbon conversion technologies of with high technology readiness level (TRL > 5) capable of achieving significant carbon mitigation via biological, catalytic, or mineralization pathways. DOE also seeks to support testing of product performance and characterization needed for market or consumer adoption. This may include lifecycle analysis (LCA) development for novel carbon conversion technologies and LCA development for pilot facilities using those technologies. If released, this NOFO is anticipated to focus on the following four Areas of Interest (AOI):

Biological: Two sub areas fall under this AOI; (1A) Algal routes and (1B) Non-photosynthetic routes.

For AOI 1A (Algae), research should focus on technologies at a TRL 5 or higher. Research should support pilot tests of algae based systems to operate at field conditions. The proposed research should address integration with other carbon capture and carbon removal technologies/pilots using actual flue gas, pond crashes and contamination, and downstream algae separation and/or fractionation with the intent for refining algal biomass. Efforts that target engineering high pH and temperature tolerant algae strains, research addressing the use of wastewater to provide nutrients, and advancements to lower costs will be of interest.

For AOI 1B (Non-photosynthetic), research should focus on technologies at TRL 5 or higher. Research should support pilot tests of optimized autotrophic microbial or enzymatic systems to operate at field conditions. The proposed research should address the integration/use of clean hydrogen as the source of reducing power for Carbon conversion. Power-to-gas approaches that leverage hydrogen to make synthetic natural gas as well as approaches that synthesize a wide range of products, including protein or animal feed, and chemicals or fuels will be of interest.

Catalytic: Two sub areas, (2A) Thermochemical Carbon Conversion Integrated Pilot Processes and (2B) Electrocatalytic Carbon Conversion Integrated Pilot Processes

For AOI 2A, research should focus on technologies at TRL 5 or higher. Research should support thermochemical routes that use innovative methods to generate products from carbon at a lower carbon intensity and/or efficiency than established pathways. Proposed research that addresses the performance of catalysts/reactor (at pilot scale) with respect to downstream operation, separation processes and overall plant efficiency, electrical energy efficiency, long-term stability and long-term operation will be of interest.

For AOI 2B, research should focus on technologies at TRL 5 or higher. Research should support electrochemical conversion for carbon reduction to (C1 or C2) products on complete stacks with integrated Balance of Plant (BOP). Research should address materials durability, long term performance, and selectivity while conducting medium-term tests. Achieving significant run times (>2,000 hours) under real world conditions including on/off cycling, real-world feedstocks, and integration into existing processes will be of interest.

Mineralization: Three sub areas, (3A) Synthetic Aggregates Production; (3B) Non-Traditional Concrete and Masonry Binders, e.g., Supplementary Cementitious Materials (SCMs), development; and (3C) Point Source and Process Integration

For AOI 3A, research should focus on technologies at TRL 5 or higher. Research should support the production of synthetic aggregates with at least 10 % (preferably > 25 %) reduction in Greenhouse Gases (GHGs) compared to incumbents. Proposed research should identify specific end-uses, performance specifications, and relevant performance testing for the synthetic aggregate. Increasing the carbonation efficiency, using alkaline industrial wastes to produce synthetic aggregates, validating aggregates via performance testing, and reducing the costs of production are of interest.

For AOI 3B, research should focus on technologies at TRL 5 or higher. Research should support the development of alternative, environmentally friendly, and economically sustainable binders

which incorporate carbon for concrete or masonry production. Proposed research should yield performance equivalent to incumbent concretes (e.g., strength development and durability) produced with Ordinary Portland Cement. Increasing carbon uptake in concrete, improving carbon diffusion, and long-term durability and mechanical performance evaluation are of interest.

For AOI 3C, research should focus on technologies at TRL 5 or higher. Research should address systems integration to optimize the carbon mineralization process with different sources of carbon. Research should investigate reaction conditions that lead to optimized process parameters, ensuring the product's performance meets end-use requirements from scaled-up operations. Integrating industrial solid waste recycling, mineralizing technologies, and abating high emission carbon sources are of interest.

Other Testing and LCA Development Required for Commercialization: Two sub areas, (4A) Testing & Product Performance and Characterization and (4B) LCA Development and Support

For AOI 4A, research should address specific product testing regimes, outcomes, or scenarios needed for market or customer adoption. Research should support testing to meet performance requirements prescribed by a particular use case, project, or customer; performance testing which requires specialized equipment, location, relevant environment, or technical expertise unique to the product being tested or a project's proposed use case; and characterizing minimum product quantities or volumes needed for testing.

For AOI 4B, research should address LCA pathways for novel technologies, specific LCA development for pilot facilities exhibiting carbon conversion technologies; and LCA work to aid in novel carbon conversion technology applications for Environmental Product Declarations (EPDs) under the Environmental Protection Agency's (EPA's) Label Program for Low Embodied Carbon Construction Materials. All efforts should conform with "NETL CO2U LCA toolkit" best practices.

Research under AOIs 1-3 is expected to accelerate the technology maturation of technologies towards demonstration and commercialization. Research under AOI 4 is expected to address market and environmental needs by supporting testing needed for market or consumer adoption, compliance with performance standards for a particular use case, and development of LCA pathways for innovative technologies and for pilot and demonstration facilities.

DOE will **not** entertain questions at this time regarding issuance of the NOFO. Details on how to submit questions and comments would be provided in the NOFO, if and when issued.

SUBMISSION AND REGISTRATION REQUIREMENTS

If the NOFO is released, it will be posted at Grants.gov (https://www.grants.gov) and at FedConnect (https://www.fedconnect.net/). Entities interested in applying for awards under the NOFO are strongly encouraged to register at these sites to receive notification of announcements regarding the NOFO. If DOE decides to issue the NOFO, applications can only be submitted through Grants.gov.

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 in 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 a UEI number from the SAM to uniquely identify the entity. The UEI is available in the SAM entity registration record.

- **SAM** – Each applicant must (1) be registered in SAM.gov at https://www.sam.gov/ before submitting a Full Application in response to a NOFO, (2) provide a valid unique entity identifier in its application, and (3) continue to maintain an active registration in SAM.gov with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal agency. Failure to register in the SAM will prevent an organization from applying through Grants.gov.

- **Grants.gov** - Applicants must register with Grants.gov at https://www.grants.gov/register to set up a WorkSpace. An applicant cannot submit a Full Application through Grants.gov unless an applicant is registered. Please read the registration requirements carefully and start the process immediately.

  1) The Authorized Organizational Representative (AOR) must register at: https://www.grants.gov/register
  2) An email is sent to the E-Business (E-Biz) POC listed in SAM.

More information about the registration steps for Grants.gov is provided at:
https://www.grants.gov/web/grants/applicants/registration.htmlhttps://apply07.grants.gov/help/html/help/index.htm?callingApp=custom#callingApp=custom&t=Register%2FRegister.html.

- **FedConnect.net -** Applicants must register with FedConnect to submit questions to a NOFO. FedConnect website: https://www.fedconnect.net/.

DISCLAIMER
This NOI is issued so that interested parties are aware that DOE may issue a NOFO on this topic. Any information contained in this NOI is subject to change.

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