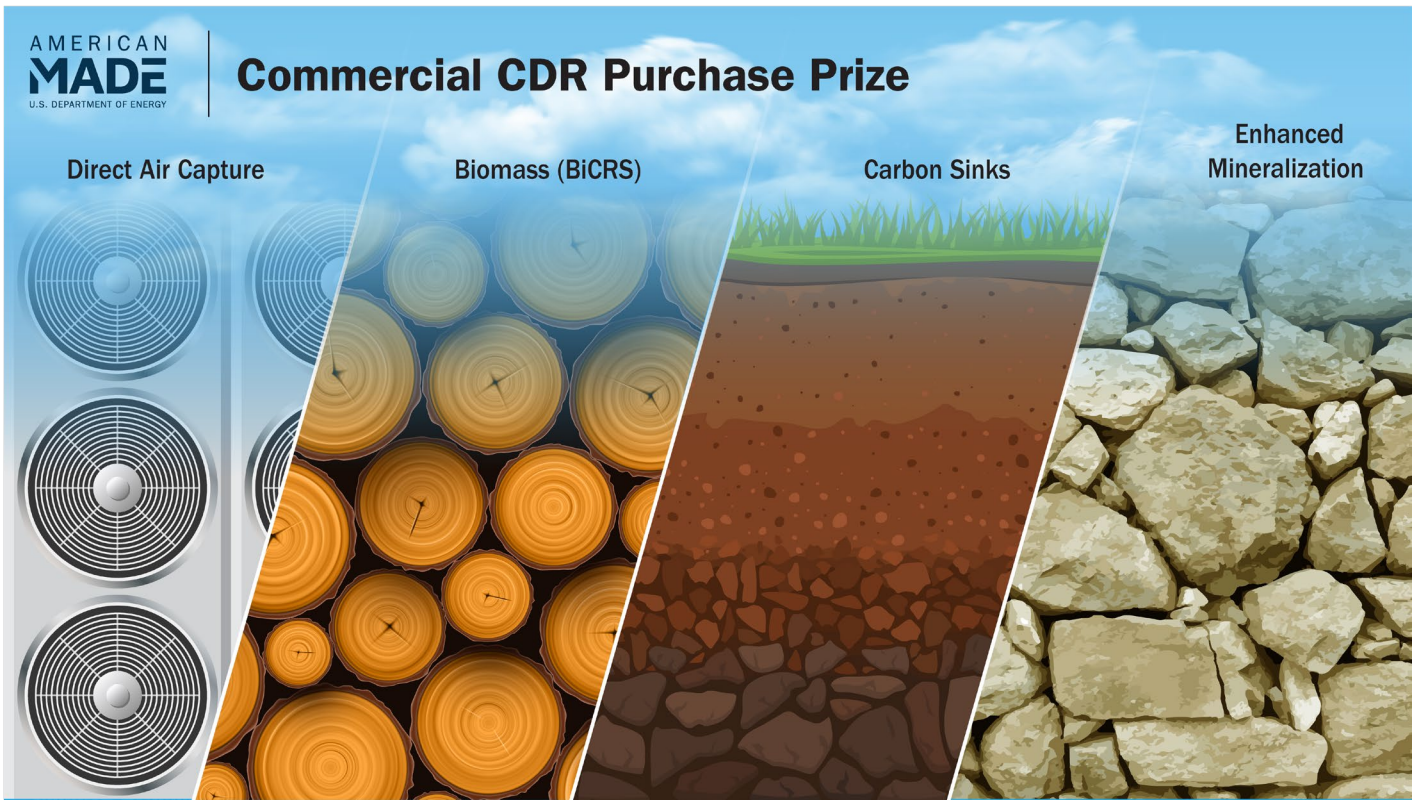

Commercial Direct Air Capture Prize

Carbon Dioxide Removal Purchase Pilot Prize

Modification3

11/22/23

Modification 1 included the following

- Clarification about the number of images, graphs, and figures allowed in Phase 1 submissions
- Clarification about the LCA / TEA requirements in Phase 1

Modification 2 included the following

- Information about the Foreign Entity Participation Waiver added to the eligibility section
- Addition of Appendix 13: Waiver for Foreign Entity Participation

Modification 3 includes the following (highlighted in yellow throughout the document):

- Removal of 1,000 tonne per year delivery requirement
- Clarification of Phase 2 and Phase 3 timelines
- Clarification of Phase 1 TEA requirements
- Implicit CDR credit price may be lower than levelized cost per tonne
- Clarification that the Phase 1 Cover Letter will be made public

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This document only contains the rules for the Commercial DAC Prize: CDR Purchase Pilot Prize

1 Carbon Dioxide Removal Purchase Pilot Prize Executive Summary

DOE's Carbon Dioxide Removal (CDR) Purchase Pilot will provide up to $35 million in awards to private entities and academic institutions over three (3) phases that will innovate and evaluate how governments can structure offtake agreements with CDR project developers in a robust, transparent, and competitive manner. The three phases will include CDR credit concept proposal, sample purchase contracts, and finalist awards for CDR successfully delivered and verified.

The American-Made CDR Purchase Pilot Prize ("CDR Purchase Pilot" or "Purchase Pilot Prize") will be the first U.S. government initiative to purchase CDR credits directly from domestic technology providers. CDR approaches, which remove historic carbon dioxide (CO_2) directly from the atmosphere are a critical aspect of meeting climate goals, as acknowledged by global analyses such as the Intergovernmental Panel on Climate Change (IPCC) 1.5°C Special Report. To address this challenge, the U.S. Department of Energy (DOE) launched the Carbon Negative Shot (CNS) in 2021 as part of DOE's Energy Earthshot initiative. By 2032, the initiative aims to develop and advance pathways and technologies that remove CO_2 from the atmosphere and securely store it at gigaton scales for less than $100/net metric ton (tonne) of carbon dioxide-equivalent (CO_2e), a cost that includes monitoring, reporting, verification (MRV) and secure storage. The CNS is the U.S. government's first major effort in CDR and is a Department-wide call for crosscutting innovation and commercialization of a wide range of CDR pathways. CDR is a CO_2 waste management service, and it will be important to assess and pilot demand-side policy mechanisms, such as government purchasing. This CDR Purchase Pilot Prize initiates a competition to grow the domestic CDR economy and workforce, improve market efficiency and transparency, and establish best practices to advance and improve the most effective CDR technologies. The CDR Purchase Pilot Prize will characterize and help to shape a domestic market for CDR credits and evaluate the potential role of the US government in participating in this market. In August of 2023, DOE issued a Notice of Intent titled "Carbon Negative Shot Pilots" (DE-FOA-3081) which announced an intention to establish and administer a CDR Purchase Prize as one of two tracks within the Commercial Direct Air Capture (DAC) Prize (Section 41005(b) of BIL).[1] The CDR Purchase Pilot Prize will advance and accelerate the commercial deployment of DAC, and CDR more broadly, by piloting a competitive purchasing program. In the latter phases of the prize, DOE will develop purchasing contracts with carbon removal credit suppliers, or competitors,[2] as defined below in Sections 1.1 and 3.2. In the final phase of the CDR Purchase Pilot Prize, winners will be scored and selected on the basis of carbon removal credits successfully delivered, as well as other scoring criteria described in Section 6.

The CDR Purchase Pilot will include support for a portfolio of CDR technologies that will qualify for specific categories (i.e., technological areas of interest) and eligibility criteria outlined in this document, including

[1] Notice of Intent to Issue Funding Opportunity: Carbon Negative Shot Pilots | Department of Energy

[2] The term "competitor" for the purposes of this prize rules document means a CDR credit supplier participating in the CDR Purchase Pilot Prize consistent with the Eligibility and Program Requirements defined in Section 3.2 and 3.3, respectively.

direct air capture (DAC), biomass carbon removal and storage (BiCRS), enhanced carbon mineralization, and other planned or managed carbon removal activities, including natural and artificial. DOE will encourage a wide range of CDR credit suppliers to apply to the initial phase of the program to highlight the best available purchase contract designs and CDR supply offerings, including consistency with the provided definitions of additionality, permanence, delivery terms, and measurement, reporting, and verification (MRV) protocols. In subsequent phases of the program, DOE will codify CDR contracting and delivery rules that ensure CDR is supplied in a consistent and rigorous manner across the areas of interest (AOI), as outlined in Section 3.2 and defined in the Glossary of Terms (Section 1.1). In the final phase, prizes will be paid on delivery of the committed carbon removal.

DOE intends to work closely with private sector partners throughout the CDR Purchase Pilot Prize effort. DOE will encourage industry and civil society to support CDR credit suppliers in their initial applications, to ensure that proposed purchase structures represent the highest quality efforts possible by industry today. DOE will also reward projects in later phases of the prize that marshal the most additional[3] purchase commitments consistent with DOE's potential CDR credit purchase awards. The objective is to incentivize as much additional support for CDR purchasing as possible and scale a diversity of CDR approaches in the coming decades by using government purchasing power to improve the efficiency and effectiveness the CDR credit market, while also enhancing the quality, volume, and transparency of the CDR credit supply. The CDR Purchase Pilot Prize will help to benchmark and standardize the appropriate technical rigor, workforce, community benefits, and contracting terms required for high-quality CDR credit purchasing, and assess the role of the U.S. Federal government alongside and in partnership with the private sector in the CDR credit market.

1.1 Glossary of Terms

Additionality evaluates the degree to which an intervention (e.g., a CDR project) causes a climate benefit above and beyond what would have happened in a no-intervention baseline scenario (e.g., sale of the carbon removal credits). This no-intervention baseline scenario cannot be directly observed (because it did not occur), so it can only be estimated or inferred based on contextual information. A complete assessment of additionality would involve characterization of the degree to which certain financial incentives or payments motivated or facilitated the carbon removal, deviation from local common practices or likely business as usual activities (including implementation barriers associated with an intervention's deployment), and whether the activity would already have occurred as a result of policy or regulation. Additionality can be assessed at the level of individual projects or protocols that define categories of projects. In policy regimes such as cap-and-trade programs, where emissions are permitted in exchange for reduction or storage elsewhere, failures of additionality result in increased emissions.

A buffer pool is a type of insurance mechanism that can be implemented as a safeguard for a CDR project to compensate for any potential CO_2 leakage or reversal, which may happen naturally or in response to planned or accidental external factors.

[3] As described in draft rules for Phases 2 and 3, competitors will be reviewed and scored on their performance in soliciting and securing additional offtake agreements for CDR credit purchase agreements consistent with terms submitted to DOE.

Carbon Dioxide Equivalent (CO_2e) describes the impact of a given greenhouse gas (GHG) (e.g., CO_2, CO, CH_4, N_2O, etc.) by converting its mass to the equivalent mass of CO_2 that would have the same global warming effect. The mass of a GHG is converted to the mass of CO_2e based on the GHG molecule's potential to affect global warming, or its global warming potential (GWP). The GWP takes into account both the radiative forcing effect of the GHG and the gas' lifetime in the atmosphere, and is dependent on the time horizon, which is most commonly 20 years (GWP20) or 100 years (GWP100). These values are different because the GWP is time-integrated and the GWP of CO_2 is always 1, regardless of the time horizon. Details on recommended GWP and CO_2e estimation can be found in Appendix 5: Life Cycle Analysis (LCA) Guidance.

Carbon dioxide removal (CDR) encompasses a wide array of approaches that capture CO_2 that is already in the atmosphere or upper hydrosphere and involves the subsequent secure storage of the captured CO_2 in geological, biobased, and ocean reservoirs, or in the form of long-lived products. CDR is different from point-source carbon capture, which directly captures CO_2 from fossil fuel or industrial facilities before it is released into the atmosphere.

Carbon dioxide removal (CDR) credit is used to represent a net tonne of CO_2e captured from the atmosphere or upper hydrosphere and securely stored as a direct result of a CDR project. Carbon removal credits can be purchased by any individual or entity that is interested in responsibly managing their past and/or future CO_2 emissions. Carbon removal credits are typically registered once a CDR project has been designed and deployed, issued after the CDR project offering has been validated by an independent third party on a cradle-to-grave life cycle basis, and sold at an agreed upon price. To preserve the climate benefits associated with the carbon removal credits, it is imperative that each carbon removal credit is unique (e.g., not listed on multiple registries), certified, and retired[4] shortly after being purchased.

Durability refers to the ability of a CO_2 storage mechanism or reservoir to sustain the isolation of CO_2 from the atmosphere over time without leaking or deteriorating, thus preventing the removed CO_2 from re-entering the atmosphere or ocean. The durability term of a given storage mechanism or reservoir should be defined in years of guaranteed isolation of the CO_2 from the atmosphere or upper hydrosphere as well as the certainty (or uncertainties) of CO_2 storage over time. In contrast to "permanence," which refers to the indefinite isolation of CO_2 from the atmosphere, the durability term is the period within which the CDR supplier (competitor) will assure DOE that the carbon remains stored.

Permanence defines the duration for which CO_2 can be stored in a secure, stable, and safe manner. Storage duration can differ significantly, depending on the type of reservoir (e.g., geological, biobased, ocean, and/or products). For example, storing concentrated CO_2 streams in geologic formations deep underground is considered effectively permanent (i.e., with a residence time on the order of thousands of years), whereas forest carbon stocks can release carbon back into the atmosphere on much shorter timescales in response to external stimuli, such as wildfire or tree harvesting. For the purposes of this

[4] Retirement of a CDR credit signifies that it cannot be resold, thus preventing its use as a financial instrument.

CDR Purchase Pilot rules document, the meaning of "permanent" means secure geologic storage[5] or a method demonstrated and deemed to be equivalent by DOE.

Measurement, Reporting, and Verification (MRV) refers to the degree to which the CO_2 removal can be accurately monitored and validated. More specifically, this involves layered and tailored activities, such as quantifying CO_2 drawdown and storage based on collected measurements, analyzing and/or modeling the effective CDR permanence duration and risk of reversal in response to realistic external stimuli, reliably providing CO_2 measurement data and information in a usable and transparent format to enable ongoing auditing throughout the project lifetime, and obtaining an independent third-party scientific validation of the CO_2 removal methodology and project.

Eligible CDR Pathways Definitions

Direct air capture (DAC) refers to any process or technology that captures CO_2 directly from ambient air using a CO_2 capture medium that is regenerated for re-use. The captured CO_2 is then securely stored geologically or in long-lived products that result in negative emissions, in a process known as DAC with storage.

Enhanced mineralization involves approaches that accelerate the natural reaction of CO_2 from ambient air with alkaline minerals to form stable carbonates, securely storing the CO_2 in a manner intended to be permanent. Sources of alkalinity can be naturally occurring rocks such as basalt or waste material from industrial or mining operations. There are several types of mineralization processes: *in-situ* (e.g., CO_2 reactions in geologic formations underground), *ex-situ* (e.g., extraction, transport, grinding of minerals and subsequent reaction with CO_2 in engineered reactor systems) and surficial (e.g., CO_2 reactions with minerals distributed across land or coastal areas). *Ex-situ* and surficial mineralization processes resulting in net negative emissions will be the focus of this prize, though other CDR methods coupled with *in-situ* mineralization as the storage mechanism would also be in scope.

Biomass carbon removal and storage (BiCRS) involves the use of biomass, either naturally occurring or purpose-grown, to naturally remove CO_2 from the atmosphere or seawater via photosynthesis, in combustion, gasification, or other conversion processes where the resulting CO_2 emissions are captured and stored. BiCRS approaches include bioenergy with carbon capture and storage (BECCS) or the direct conversion of biomass into long-lived, biobased products with market or storage potential (e.g., bioliquids, bio-oils and/or biomass burial). However, to constitute CDR, BiCRS pathways must demonstrate net-negative GHG emissions on a cradle-to-grave life cycle basis, and the removed CO_2 must remain securely stored or locked away in products.

Planned and managed carbon sinks, including natural and artificial mechanism within terrestrial and upper hydrosphere: CDR pathways not defined in the Eligible CDR Pathways definitions above may fall within the scope of "planned or managed carbon sinks," including management

[5] Secure Geologic Storage is defined in *26 C.F.R. § 1.45Q-3, Secure Geological Storage*. Competitors proposing alternative storage mechanisms must provide evidence and demonstrate equivalent permanence of carbon storage.

activities and technological interventions, including within biological or engineered systems in terrestrial or marine environments within the upper hydrosphere. These technologies and management activities are subject to the same requirements outlined within the CDR offering, including the requirement to demonstrate additionality and durable storage consistent with secure geologic storage or equivalent.

2 Background

2.1 Direct Air Capture Prizes Overview

In 2021, President Biden signed the Infrastructure Investment and Jobs Act (Public Law 117-58), also known as the Bipartisan Infrastructure Law (BIL).[6] The BIL authorizes and appropriates a total of up to $115 million for the development and execution of Direct Air Capture (DAC) Prize Competitions, which includes up to $15 million for a Pre-Commercial Prize (BIL Section 41005(a)) and up to $100 million for the Commercial Prize (BIL Section 41005(b)).[7] These prizes will catalyze rapid DAC and CDR technology advancement for carbon management while incorporating environmental justice, community benefits, stakeholder engagement, equity, and workforce development.

The American-Made DAC Pre-Commercial and Commercial Prizes are a suite of prizes that work together to advance DAC and CDR technologies. DOE's Office of Fossil Energy and Carbon Management (FECM) launched the DAC Pre-Commercial Technology Prize and the DAC Pre-Commercial EPIC Prize in March 2023.[8] The Commercial DAC Prize will build on the progress made through the DAC Pre-Commercial Prizes as well as historic and ongoing DOE investments in applied CDR research and development (R&D), including the Regional DAC Hubs Program.[9] Funded by DOE-FECM, the Commercial DAC Prize offers up to $100 million in prizes and support to be split among two competition tracks: the Commercial DAC Pilot Prize and the CDR Purchase Pilot Prize. The CDR Purchase Pilot Prize will provide awards in the form of purchase agreements for CDR credits supplied by a suite of CDR approaches (including, but not limited to DAC technologies) that meet the categories (i.e., technological areas of interest) and criteria outlined in this document. Winners of the CDR Purchase Pilot Prize will receive cash prizes for independently verified CDR credits successfully delivered to DOE. The Commercial DAC Pilot Prize will provide awards over multiple phases to construct first-of-a-kind (FOAK) DAC pilot facilities with the capacity to capture 750 – 3,000 tonnes of CO_2 from the atmosphere per year. Both prize tracks will operate through multiple phases and provide multiple awards for the demonstration and deployment of commercial CDR technologies. Taken collectively, support for small DAC pilots coupled with CDR purchasing contracts is the highest leverage way to catalyze the DAC industry and ensure that it operates as part of a broader

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[6] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021), available at https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

[7] BIL Section 41005 authorizes appropriations to the Secretary of Energy to carry out activities under Section 969D(e)(2)(A) and (B) of the Energy Policy Act of 2005 (42 U.S.C. 16298d(e)(2)(A)–(B)).

[8] Direct Air Capture Pre-Commercial Technology Prize | Department of Energy
Direct Air Capture Pre-Commercial EPIC Prize | Department of Energy

[9] Regional Direct Air Capture Hubs | Department of Energy

commercial carbon removal ecosystem, as directed by Congress, and as voluntary corporate efforts are pioneering today.

The Commercial CDR Pilot Purchase Prize, in alignment with the objectives and requirements of the Commercial DAC Prize (BIL Section 41005(b)), aims to meet Congressional direction in the Joint Explanatory Statement to the Energy and Water Development and Related Agencies Appropriations Act of 2023 to develop a competitive purchasing pilot program for CDR.[10] The CDR Pilot Purchase Prize represents the first time the U.S. Federal Government will purchase high-quality CDR credits from commercial-scale supplier, providing a novel and competitive government demand signal for domestic CDR; a historic milestone in the development of a national and ultimately global CDR market.[11] This prize is expected to demonstrate the level of rigor required to successfully evaluate CDR technologies, and how CDR purchase contracts can accelerate innovation while removing carbon from the air permanently with high confidence.

Together, the Commercial DAC Pilot Prize and the CDR Purchase Pilot Prize will support commercial demonstration and operation of a diverse suite of carbon removal technologies, advance and scale new businesses, and help achieve the Biden Administration's aggressive net-zero emissions target[12] Both prizes will support the domestic creation of good paying jobs across the CDR industry and encourage CDR developers to invest in America's workforce and scale diverse, equitable, inclusive, and accessible businesses.

This Official Rules document contains the rules for Phase 1 of the CDR Purchase Pilot Prize. This document also includes draft rules for Phases 2 and 3 of the CDR Pilot Purchase Prize. The draft rules for Phases 2 and 3 are not binding and are open to public comment. Details on how to submit feedback about the draft rules for Phases 2 and 3 can be found in **Appendix 12**. We encourage feedback from all public, private, and civil sector stakeholders engaged in advancing carbon removal innovation and solution deployment.

Competitors in the CDR Purchase Pilot Prize are commercial technology developers, licensers, and engineering, procurement, and construction firms, non-governmental organizations, higher education institutions, and other eligible entities developing eligible technologies, as defined in Sections 3.2 and 3.5, respectively. Please review Section 3.2 to confirm your team's eligibility for this prize.

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[10] "The Department is directed to establish a competitive purchasing pilot program for the purchase of carbon dioxide removed from the atmosphere or upper hydrosphere, in support of carbon dioxide removal projects authorized in section 969D of the Energy Policy Act of 2005."
H.R. Rep. No. 50-347, Div. D, at 897-898 (2023).

[11] Other federal CDR and DAC funding opportunities and prizes established and administered by DOE have provided financial support for these technologies through cooperative agreement and prizes contingent on performance milestones. The CDR Purchase Pilot Prize is the first effort to provide financial awards in exchange for ownership of CDR credits, as opposed to funding research, development, or demonstration.

[12] FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies | The White House

2.2 CDR Purchase Pilot Prize Background

DOE's FECM is working in collaboration with the National Renewable Energy Laboratory (NREL), which serves as the Prize Administrator, and the National Energy Technology Laboratory (NETL) to issue the CDR Purchase Pilot Prize. Throughout the three phases of the CDR Purchase Pilot Prize, up to $35 million in cash prizes will be distributed to CDR credit suppliers that submit and, if selected as semifinalists and finalists, deliver innovative, technically robust, third-party validated, and commercial-scale CDR credits The CDR Pilot Purchase Prize aims to leverage the technical capacities of DOE and the National Laboratories to establish best practices for CDR purchase program design, CDR project and credit evaluation, and MRV methodology development and implementation.

The CDR Purchase Pilot Prize will support innovative technology developers working to supply and sell carbon removal tons provided by eligible solution categories of carbon removal as defined in the Energy Act of 2020,[13] including: 1) DAC and storage, 2) BiCRS technologies, 3) enhanced geological weathering or enhanced mineralization technologies, and 4) planned and managed carbon sinks, including natural and artificial (e.g., terrestrial and upper hydrosphere). These technologies are defined in Section 3.2. The prize aims to complement the other RD&D efforts at DOE to advance the Carbon Negative Shot target of less than $100 per net tonne of permanent CO_2e removed with the capacity to reach gigatonne scale inclusive of robust carbon accounting and rigorous MRV. Serving as a first-of-a-kind government purchasing initiative for CDR, DOE will work with CDR suppliers (i.e., prize competitors) to develop, implement, and scale projects that supply CDR for both DOE and other governmental and private buyers. Competitors will win increasingly larger prizes as they progress through the three prize phases, from CDR Credit Concept Proposal development (Phase 1) to formal CDR purchase bids (Phase 2) to pilot operation and delivery of third-party verified CDR (Phase 3).

The development of a CDR purchasing market supports the Biden administration's decarbonization goals of a 50%–52% net reduction in GHGs from 2005 level emissions by 2030 and a net-zero GHG emission economy by 2050. Specifically, *The Long-Term Strategy for the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* finds technological CDR options, including DAC with storage, enhanced mineralization, BiCRS, and ocean-based CDR could be deployed in the coming decades to support a net-zero GHG emissions economy by 2050.[14] CDR technologies capture CO_2 directly from the atmosphere and are likely to serve as important approaches to advance the U.S. economy and good paying jobs, in order to achieve net-zero GHG goals. The CDR approaches to be supported under the CDR Purchase Pilot Prize reinforce the broader U.S. government-wide effort to provide a variety of innovative technology solutions to achieve a net-zero GHG economy by 2050 in a cost-effective, reliable, and efficient manner. These activities also maximize the benefits of the clean energy transition as the nation

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[13] *See* Energy Act of 2020, Pub. L. No. 116-68, Div. Z, § 5001 (2020), available at https://www.directives.doe.gov/ipt_members_area/doe-o-436-1-departmental-sustainability-ipt/background-documents/energy-act-of-2020. This provision amended the Energy Policy Act of 2005 to add Section 969D. 42 U.S.C. § 16298d.

[14] The Long-Term Strategy of the United States, Pathways to Net-Zero Greenhouse Gas Emissions by 2050 (whitehouse.gov). Published by the United States Department of State and the United States Executive Office of the President, Washington DC. November 2021.

works to mitigate the climate crisis, create, and maintain good-paying, high-skill jobs, and advance environmental justice.

DOE is aware of and is working to address environmental, climate, and energy justice concerns regarding how CDR projects could impact communities in terms of local environmental quality and economic benefits. To ensure CDR is designed, developed, and commercialized responsibly, this prize competition will include several requirements to maximize success and mitigate risk. CDR credit suppliers applying to compete in the CDR Purchase Pilot Prize will provide a summary of labor, diversity, equity, inclusion, and accessibility (DEIA), and community benefits associated with the CDR credit proposal as well as a commitment and strategy to develop a complete Community Benefits Plan (CBP). Competitors selected to compete as semifinalists will develop a complete CBP which will be reviewed and scored. CDR credit suppliers that receive finalist awards for their proposed purchase contracts will be required to implement the CBP, which includes the input and feedback from local communities. Successful competitors will consider and appropriately manage the air, water, energy, make workforce investments, and deliver other social benefits as part of their projects, Consistent with the Biden-Harris Administration's commitment to Justice40[15] through the BIL, successful competitors will develop and implement CBPs that effectively distribute economic, environmental, and other benefits to disadvantaged communities.

[15] The Justice40 initiative, established by Executive Order (E.O.) 14008 Tackling the Climate Crisis at Home and Abroad, sets a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities. Pursuant to E.O. 14008 and the Office of Management and Budget's Interim Justice40 Implementation Guidance M-21-28 and M-23-09 (https://www.whitehouse.gov/wp-content/uploads/2023/01/M-23-09_Signed_CEQ_CPO.pdf and https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf)), DOE recognizes disadvantaged communities as defined and identified by the White House Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST), located at https://screeningtool.geoplatform.gov/. DOE's Justice40 Implementation Guidance is located at https://www.energy.gov/sites/default/files/2022-07/Final%20DOE%20Justice40%20General%20Guidance%20072522.pdf

3 CDR Purchase Pilot Prize Overview

3.1 CDR Purchase Pilot Prize Format

The CDR Purchase Pilot Prize will progress competitors through three phases. This document provides Official Rules for Phase 1 of the CDR Purchase Pilot Prize, as well as draft rules for Phases 2 and 3 of this prize. The Phase 2 and 3 draft rules are open to public comments; instructions for how to submit your comments are provided in Appendix 12 of this document. Following completion of Phase 1, FECM and NREL may revise the draft prize rules for Phases 2 and 3. As described in detail in subsequent sections, Phase 1 provides an open opportunity for CDR suppliers to submit competitive proposals, in the form of CDR Credit Concept Proposals (12 pages), that outline the primary attributes of their proposed CDR offering. Only winners of Phase 1 (semifinalists) are eligible to compete in Phase 2 and will be scored on a series of criteria outlined in this rules document. Only winners of Phase 2 will be eligible to compete in Phase 3. At the discretion of DOE, all competitors in Phase 2 may be selected to advance to Phase 3. During Phase 2, competitors will be challenged to establish binding implementation criteria for their CDR offering and solicit purchase commitments from other non-governmental buyers. During Phase 3, competitors will deliver third-party verified CDR credits to DOE, consistent with the MRV plan, implementation strategy, CBP, and other purchasing terms and CDR attributes outlined in Phase 1 and codified in Phase 2.

The CDR Purchase Pilot Prize offers up to **$35 million** in prizes to successful competitors:

	Number of Winners	Cash Prize Available for Each Winner	Total
Phase 1	Up to 25 across the 4 Areas of Interest (AOI)	$50,000	$1,250,000
Phase 2	Up to 10 across the 4 Areas of Interest (AOI)	$375,000	$3,750,000
Phase 3	Up to 10 across the 4 Areas of Interest (AOI)	CDR Purchase awards: up to $3,000,000	$30,000,000

3.2 Eligibility

The competition is open to private entities (for-profits and nonprofits) and academic institutions, subject to the following requirements:

- Private entities must be incorporated in and maintain a primary place of business in the United States with majority domestic ownership and control. If an entity seeking to compete does not have majority domestic ownership and control, FECM may consider issuing a waiver of that eligibility requirement where (1) the entity otherwise meets the eligibility requirements; (2) the entity is incorporated in and maintains a primary place of business in the United States; and (3) the entity submits a compelling justification. FECM may require additional information before making a determination on the waiver request. See Appendix 13 for more information on the waiver process;
- Academic institutions must be based in the United States; and
- Non-profit entities must be based in the United States.

Eligible competitors (CDR providers) must offer CDR that is removed and sequestered within the United States, including Tribal Nations, and U.S. Territories, or associated federal or state waters.

A single competitor may only submit one submission per AOI. Competitors submitting proposals to more than one AOI must indicate that multiple submission packages to the CDR Purchase Pilot Prize have been submitted. No competitor may submit more than one submission to a single AOI during any phase of the CDR Purchase Pilot Prize.

Competitors who have previously received DOE financial awards or won DOE prize competitions are eligible to compete in this CDR Purchase Pilot Prize.

Although national laboratories are not eligible to compete, they may support teams in the competition if they are engaging the teams in compliance with lab partnership requirements and any lab capabilities are made available to all competitors.

To be eligible, the team captain will be required to sign the following statement:

> I am providing this submission package as part of my participation in this prize. I understand that the information contained in this submission will be relied on by the federal government to determine whether to issue a prize to the named competitor. I certify under penalty of perjury that the named competitor meets the eligibility requirements for this prize competition and complies with all other rules contained in the Official Rules document. I further represent that the information contained in the submission is true and contains no misrepresentations. I understand false statements or misrepresentations to the federal government may result in civil and/or criminal penalties under 18 U.S.C. § 1001 and § 287, and 31 U.S.C. §§ 3729-3733 and 3801-3812.

Phase 2 Eligibility

- Only semifinalists (winners of the Phase 1) are eligible to compete in Phase 2.

Phase 3 Eligibility

- Only finalists (winners of Phase 2) are eligible to compete in Phase 3.

Ineligible Competitors:

- DOE employees, employees of sponsoring organizations, members of their immediate families (e.g., spouses, children, siblings, or parents), and persons living in the same household as such persons, whether or not related, are not eligible to participate in the prize.
- Individuals who worked at DOE (federal employees or support service contractors) within six months prior to the submission deadline of any contest are not eligible to participate in any prize contests in this program.
- Federal entities and federal employees are not eligible to participate in any portion of the prize.
- Individual DOE national laboratory employees cannot compete in the prize in their official capacity. DOE national laboratory employees may compete on their personal time but may not use any national laboratory resources.

- Entities and individuals publicly banned from doing business with the U.S. government, such as entities and individuals debarred, suspended, or otherwise excluded from or ineligible for participating in federal programs, are not eligible to compete.
- Entities and individuals identified as a restricted party on one or more screening lists of the Departments of Commerce, State, and the Treasury are not eligible to compete. See the Consolidated Screening List.
- Individuals participating in foreign government talent recruitment programs of foreign countries of risk are not eligible to compete.[16] Further, teams that include individuals participating in foreign government talent recruitment programs of foreign countries of risk are not eligible to compete. Participation in a foreign government talent recruitment program could conflict with this objective by resulting in unauthorized transfer of scientific and technical information to foreign government entities.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

3.3 Program Requirements

Eligible competitors will submit reasonably detailed descriptions of the CDR credits being proposed and the associated technology and project(s), which explicitly result in a net-removal of CO_2 from the atmosphere and clearly include the downstream storage or the conversion of the CO_2 within the project boundaries. The storage or conversion process must prevent the re-release of CO_2 into the atmosphere in manner consistent with or equivalent to secure geologic storage[17] (for example, Class VI Underground Injection Control)[18] or a storage mechanism with equivalent permanence. Eligible projects must leverage CDR technologies that can be described by one of the four self-selected competition AOI[19], which are:

- Direct air capture (DAC) storage technologies;
- Biomass with carbon removal and storage (BiCRS) pathways;

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[16] A foreign government talent recruitment program is defined as an effort directly or indirectly organized, managed, or funded by a foreign government to recruit science and technology professionals or students (regardless of citizenship or national origin, and regardless of whether they have a full-time or part-time position). Some foreign-government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government. Many, but not all, programs aim to incentivize the targeted individual to physically relocate to the foreign state for the above purpose. Some programs allow for or encourage continued employment at U.S. research facilities or receipt of federal research funds while concurrently working at and/or receiving compensation from a foreign institution, and some direct participants not to disclose their participation to U.S. entities. Compensation could take many forms, including cash, research funding, complimentary foreign travel, honorific titles, career advancement opportunities, promised future compensation, or other types of remuneration or consideration, including in-kind compensation.

[16] Currently, the list of countries of risk includes Russia, Iran, North Korea, and China.

[17] Secure geologic storage is defined in 26 C.F.R. § 1.45Q-3, Secure Geological Storage. Secure geological storage includes, but is not limited to, storage at deep saline formations, oil and gas reservoirs, and unminable coal seams.

[18] Class VI (Geologic Sequestration) Permit Application and Permitting Tools | US EPA

[19] Definitions of these Areas of Interest can be found in Section 1.1 Glossary Terms under "Eligible CDR Pathways Definitions."

- Enhanced geological weathering or mineralization pathways, including both ex-situ and surficial approaches; and
- Alternative planned or managed carbon sinks, including natural and artificial approaches in terrestrial and upper hydrosphere environments with demonstrable durable storage consistent with secure geologic storage or equivalent.

To the greatest extent possible,[20] DOE will aim to ensure that distribution of semifinalist selections following Phase 1 and finalist selections following Phase 2 will represent a diverse balance across the 4 AOIs defined above.

Overview of competitor CDR submission attributes:

A. **CDR Offering:** Competitors will submit **a CDR Credit Concept Proposal** that describes the proposed technology and the associated project that would provide a specified volume of CDR to DOE, which should include:

   a. **Anticipated CDR credit volume to be delivered** (not less than 3000 net tonnes CO_2e removed (CDR credits) total over the Phase 3 period of 36 months), if selected to compete in Phases 2 and 3, including an estimated delivery schedule within the timeframe of prize phases. There is no minimum annual delivery requirement, but teams must deliver at least 3,000 verified CDR credits by the end of the three-year contract period. The total volume of the CDR offering should not exceed a purchase cost of $3,000,000 and must be delivered within three years of the commencement of Phase 3. The proposed total volume of CDR intended to be delivered during Phase 3 of the prize should be calculated on a net tonne CO_2 removed basis, including a full suite of GHG emissions described in Appendix 5: Life Cycle Analysis (LCA) Guidance.

   b. **An overview of material, energy, labor, and regulatory requirements needed to construct and operate the CDR technology and proposed project(s)**, including potential host site agreements and federal, state, or local permits needed to construct and operate the project(s). To the extent possible, competitors should provide a summary plan with milestones for acquiring these resources over the period of the CDR Purchase Pilot Prize Phases.

   c. **Overall scale and CDR capacity of the project(s)**, and any other delivered or anticipated to be delivered CDR credits associated with the project(s) incorporated in the competitor's submission package, including pre-purchased removals currently under contract in voluntary or compliance carbon markets. Competitors may elect to summarize CDR delivered or committed from other projects unrelated to the submission package offering but should clearly distinguish these removals from the proposed CDR offering.

   d. **Proposed GHG accounting and MRV methodologies or protocols** used to calculate the net removals produced and durably stored by the proposal's CDR project(s) using a cradle-to-grave accounting framework. Competitors should explicitly identify how embodied emissions from project construction and materials are accounted for within the project lifecycle and CDR credit offering, to the greatest extent possible.

[20] The final selection of semifinalists and finalists across AOIs will be determined by the number of sufficiently meritorious applications and a sufficient number of competitors within each AOI.

e. **Complete disclosure of additional financial assistance and incentives** which should account for and include other revenue competitors project(s) may receive in addition to awards provided through the CDR Purchase Pilot Prize, such tax credits or incentives, government grants, other prize awards, philanthropic grants, the sale of any associated co-products, and any other financial or in-kind assistance. The anticipated CDR volume to be delivered to DOE as outlined above in subpoint a. should reflect the total volume of CDR delivered, which would be directly attributed to the prize award.

f. **Summary of the impact of potential CDR Pilot Purchase Prize awards** which should describe how prize awards could enable the construction, commissioning, and operation of new facilities or projects, or would enable the ongoing operation and CDR supply provided from existing facilities or projects.

A. **Independently Verified Removal:** Competitors who successfully advance to Phases 2 and 3 of the CDR Purchase Pilot Prize will be responsible for refining, resubmitting, and obtaining DOE approval of a methodology for independent third-party MRV for the CDR to be supplied in Phase 3. An acceptable MRV methodology should be consistent with the requirements in Appendix 11: Measurement, Reporting, and Verification Plan. Appendix 11 provides criteria for reviewer assessment of independent MRV providers. Phase 1 will provide competitors an opportunity to provide multiple MRV partners to verify the removals associated with Phase 2 submission package deliverables. Following Phase 1 and prior to the commencement of Phase 2, DOE will issue revised draft prize rules to include an approved list of verified MRV service providers, sourced from competitors Phase 1 submission package materials, providing Phase 2 Competitors a list of CDR Purchase Pilot Prize approved independent MRV providers.

B. **Incorporate Societal Considerations and Impacts:** Competitors should propose CDR technologies that consider and advance environmental, public health, and social benefits, and minimize any negative impacts. Phase 1 CDR Credit Concept Proposal should detail the competitors' proposed site and briefly summarize any ongoing or planned engagement with the community, including residents, labor organizations, local governments, and other relevant parties. The Phase 1 **concept CDR purchase proposal** should briefly describe the proposed site and a rationale for selecting the site, including socioeconomic and demographic, environmental and health considerations, and resource considerations. Additionally, competitors should describe plans for incorporating community feedback into the project development plan. Competitors should address environmental, economic, or workforce justice concerns by prioritizing diversity, equity, inclusion, and accessibility within proposed host communities. These requirements are provided in detail in Appendix 10.

1. **Inclusion of a Community Benefits Plan:** Please clearly illustrate how your proposed CDR offering advances diversity, equity, inclusion, and accessibility principles. Indicate who will benefit from your proposed program and how they will benefit. If applicable, include baseline metrics for existing CDR projects operated or under development by the competitor. Competitors should also consider and develop strategies to mitigate or eliminate potential environmental, health, and safety (EH&S) risks or other negative impacts that may result from the proposed CDR credit, including disbenefits to communities. Details regarding Community Benefit plan expectations and scoring are located within Appendix 10: Community Benefit Plan (CBP) Guidance.

2. **Diversity, Equity, Inclusion, and Accessibility (DEIA):** The competitor develops a Community Benefits Plan (CBP) for the proposed CDR project(s) that would provide CDR credits to DOE. Eligible CDR credit proposals submitted by competitors during all phases on the Prize must be located within the United States. The CBP should address environmental benefits and risks, economic development, and labor considerations, community engagement, inclusion, and collaboration, and other social considerations.

3. **Quality Jobs and a Skilled Workforce:** A well-qualified, skilled, and trained workforce is necessary for project success and future commercialization potential. High-quality jobs are critical to attracting and retaining the qualified workforce required. Please describe how the proposed project will secure and engage skilled and trained workers, for example by cooperating with union or other registered apprenticeship programs, entering into project labor agreements that provide assurance of skilled worker availability, or other means. Please also describe the risks and hazards and training standards you will incorporate to ensure worker and public safety.

C. **Additionality:** Competitors must demonstrate that the net removal of CO_2 on a per tonne basis from the proposed CDR project would not have occurred without the financial purchase and direct transfer of the mitigation outcome to the U.S. DOE, consistent with the definition provided in Section 1.1 Glossary Terms: Additionality. This includes demonstrating that:
    i. The activity yielding a net removal of CO_2 was not a requirement or legal mandate of a governmental regulatory requirement;
    ii. The activity was not already sufficiently economically incentivized by other policy and market factors;
    iii. The project or activity is not already common practice among practitioners in a given region, as determined by the DOE; and
    iv. There are meaningful deployment barriers—such as an information deficit (first-of-a-kind) and other resource and constraints or considerations that would prevent the competitors proposed activity from occurring without support from a CDR buyer.

    Generally, the additionality criteria should reflect that the CDR, on an allocated unit (net tonne carbon dioxide) basis, has not already been sold, delivered, or transferred to another entity entitled to the associated claim of a net reduction of emissions from the atmosphere or upper hydrosphere and that it would not have occurred without the purchase provided through Phase 3 of the prize. In addition to the above qualitative considerations, some methods/metrics that may quantitatively demonstrate a CDR project's additionality include: the expected price of the CDR credits, the internal rate of return (IRR) of the project with and without the expected CDR credits and the local/regional CDR technology market penetration.

D. **Secure geologic storage or equivalent:** Competitors must demonstrate both financial and technical means to ensure that the CDR credits provided to and purchased by DOE result in the permanently isolation of CO_2 from the atmosphere, consistent with or equivalent to 26 C.F.R. § 1.45Q-3 Secure Geological Storage, which entails the reliable and sustained separation of CO_2 from the atmosphere. This includes both the means for ongoing MRV and financial and/or substitutional mechanisms to address and rectify scenarios in which stored carbon may be re-released to the atmosphere.
    1. Eligible technologies should demonstrate a proven capacity to permanently isolate carbon from the atmosphere, using secure geologic storage or an equivalent mechanism.

It is anticipated that the LCA of the entire project will be used as the basis for evaluating the CO_2e 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 CO_2. To satisfy these requirements, the accompanying LCA should properly account for the temporal aspect of the removal through incorporation of the permanence duration in the functional unit (e.g., net kg CO_2e captured from the atmosphere and permanently removed).[21]

2. Competitors should propose a verifiable storage term (in years, with upper and lower limits identified) for the proposed CDR offering and specify how the storage mechanism is either consistent with a definition of secure geologic storage or provides equivalent storage durability and verifiability.
3. Competitors should propose a storage plan that describes ongoing stewardship, monitoring, and reporting practices that will provide DOE assurance that the carbon remains isolated from the atmosphere for the complete storage term. The proposed MRV plan should provide safeguards and long-term planning to ensure the liability and monitoring of the CDR will guarantee permanent isolation from the atmosphere. In addition to the proposed durability term (or period for which CO_2 is isolated from the atmosphere) competitors must also demonstrate that the project has sufficient financial and contractual safeguards to account for both intended and unintended reversal of carbon storage.[22]
4. If the proposed storage term exceeds the competitors' monitoring period, CDR Credit Concept Proposal, and if applicable, proposed contract terms should explicitly identify the technical and legal justifications for the storage term. This may include references to peer review literature, third-party expert testimonials, and other evidence that would support a sustained long-term stability of the stored carbon beyond the monitoring period.

E. **Scalability**: Competitors should demonstrate a feasible path along with a descriptive timeline to accelerate their proposed CDR technology to the scale of at least one gigatonne per year within the century, with consideration for appropriate planetary boundaries, including land, water, energy, and other technical, social, or political considerations. Competitors should demonstrate that a substantial scale-up of their proposed technology would not pose a risk to domestic or global communities. An appropriate assessment of scale-up risk should account for supply chain factors, storage availability, market demand, energy consumption, ecosystem impacts, land use, legal and regulatory compliance, and/or other material and social resource constraints. Competitors should submit appropriate mitigation strategies for the top three (3) identified risks. This should include completion of a technology maturation plan (TMP) in Phase 3, as described in Appendix 8.

The above criteria are minimum eligibility criteria for competitors for the CDR Purchase Pilot Prize. Selection criteria for subsequent phases and award selection are described in detail in the Prize Rules below. **DOE will not publicly disclose the content of CDR Credit Concept Proposals submitted in Phase 1;**

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[21] For more information regarding the attribution of permanence in a lifecycle assessment, please see FECM's Best Practices for Life Cycle Assessment of Direct Air Capture with Storage (DACS). https://www.energy.gov/fecm/best-practices-life-cycle-assessment-direct-air-capture-storage-dacs

[22] Safeguards may include "buffer pools" designed to overdeliver CDR supply in the case of a partial reversal, financial repayment mechanisms to compensate DOE in the case of a storage reversal, or other insurance or contractual methods to provide recourse if CO_2 is determined to be released form storage.

however, semifinalist awards will be made public, and DOE will issue a public announcement summarizing the technology and location of the proposed CDR project.

3.4 CDR Purchase Pilot Prize Rules

Competitors in the CDR Purchase Pilot Prize will compete in three escalating phases, which are described below.

Phase	Anticipated Time Period	Description	Outcome
1	2 months	CDR Credit Concept Proposal	Selection of 25 semifinalists; awarded at $50,000 per competitor.
2	Up to 16 months	CDR contract and MRV proposal development	Selection of 10 finalists that are eligible to negotiate and agree to contracts to sell CDR to DOE; awarded at $375,000 per team with the eligibility to sign $3 million CDR contracts
3	Up to 36 months	CDR delivery and verification period	10 finalists begin fulfilling CDR contracts with third-party MRV. Prize winner awards will be made on the basis of the fraction of CDR successfully delivered to DOE relative to the total volume committed during Phase 2.

Refer to HeroX for the specific dates for each phase.

Phase 1: (2 months) – Competitors will design a **CDR Credit Concept Proposal** for their CDR project, outlining key contract terms and other key information about their project, which would inform a Phase 2 submission (e.g., detailed CDR offtake contract proposal) for the minimum viable CDR offering. A CDR Credit Concept Proposal should summarize in a brief (12 page) concept CDR purchase proposal, consistent with the requirements of Section 3.2) that will outline the key criteria of the competitor's CDR offering, including:

- **Summary of projects(s) sites**, technology deployed and operated, resource (energy and material) inputs and outputs (wastes and co-products), time to operation, and total estimated net annual removals available to DOE and other potential purchasers. The summary should also specify the volume of CDR credits the competitor would commit to deliver to DOE during Phase 3 for a maximum award of up to $3,000,000, if selected to compete as a finalist.
- **Overview of the credit generating CDR technology costs and associated CDR project's estimated or demonstrated techno-economic assessment (TEA),** including operational and capital costs on a per net tonne CO_2e removed basis. The TEA should note but not include additional policy incentives, grants, or other financial support the project may receive.. Within the Phase 1 CDR Credit Concept Proposal, competitors should submit a preliminary TEA framework outlining inputs

and assumptions to be used for an estimated levelized cost per tonne of CO_2e net removed. The preliminary TEA framework submitted in Phase 1 should outline inputs and boundary conditions for the CDR approach and provide an estimated levelized cost in US dollars per net tonne of CO_2e removed. This should include an overview of material and energy balances for the complete process, anticipated system performance and efficiency considerations, and a comprehensive economic assessment approach for capital, operational, and maintenance expenses. Phase 1 CDR Credit Concept Proposal may estimate revenues from co-products produced if applicable, but these revenues should not be accounted for in the final estimate of the levelized cost per net tonne of CO_2e removed.

- **Description of the estimated and/or measured cradle-to-grave emissions of the proposed technology on a gross and net tonne CO_2e basis**, including non-CO_2 GHG emissions. The screening LCA should clearly delineate the system boundaries of the projects and necessary inputs or coproducts. The final LCA should be provided on the basis of net tonnes removed on a CO_2e basis.
- **Outline of the proposed monitoring or measurement, reporting and verification (MRV) practices**, including third-party verification plans and associated CDR uncertainty estimates. This ***should include a proposed independent MRV implementation partner*** that will validate CDR delivered by the competitor and the protocol or methodology that will be used to calculate the net emissions from the project.
- **Overview of durability term and anticipated permanence** of the CDR project, including demonstration of secure geologic storage or equivalent, quantification of risk of reversal, safeguard mechanism to monitor stored carbon, and a description of the associated durability assurance plans (e.g., buffer pool ratio, third-party insurance, etc.).
- **Project development timeline, financing, and project implementation** demonstrating a defensible pathway to constructing, commissioning, and operating the CDR project providing the net removals offered in the proposal.
- **A brief outline of a pathway to gigaton scale deployment and cost declines**, including consideration of reasonable resources, workforce, and financing barriers. For Phase 1, competitors do not need to complete TMP included in Appendix 8.
- **Overview of the Community Benefits Plan (CBP) approach and development plan**, including plan to develop and implement a complete CBP, engagement activities, and site selection process, including an overview of the proposed site.
- **Disclosure of all signed CDR purchase agreements and/or deliveries** to date sponsored by any non-DOE purchaser, including public and private customers or CDR credit buyers.

Phase 1 winners, selected to compete as semifinalists in Phase 2 will demonstrate alignment with the criteria above and an ability to deliver the proposed CDR within the CDR Purchase Pilot Prize.

Note: Phase 1 provides official prize rules, whereas Phases 2 and 3 provide draft prize rules for stakeholder review and comments. Following a public comment period, FECM and NREL may revise the rules for Phases 2 and 3.

Phase 2 (16 months) – Only winners selected in Phase 1 of the CDR Purchase Pilot Prize will be eligible to compete in Phase 2 of the Prize. During Phase 2, winners of Phase 1 will refine, advance, and structure their CDR offtake agreement plan, to compete toward a finalist award. Winners of Phase 2 will be eligible to compete in Phase 3. During Phase 2, competitors will work to translate their Phase 1 CDR Credit Concept Proposal into a complete CDR purchase offering with complete project proposals. Phase 2 competitors will compete for ten (10) $375,000 cash prizes for the CDR purchase proposals that score highest on the criteria below.

Phase 2 will have two parts. In Part 1 competitors will draft and submit a binding offer to DOE for the purchase of CDR within the Purchase Pilot Prize Timeline. The submission for Phase 2 should not exceed 50 pages and will detail compliance with the full scope of the Program Requirements (Section 3.2) of semifinalists. Part 2 is a contract negotiation period for Phase 3 delivery of CDR credits.

- **Part 1** (6 months)**:**
    - **Detailed design of CDR contract offering,** including a summary of a formal purchase agreement reflecting the terms, conditions and CDR attributes reflected in the Phase 1 submission of a concept CDR purchase proposal. This includes all information and criteria outlined in Section 3.2, as described within the Phase 1 submission package unless otherwise agreed upon by NREL and DOE.
    - **Progress toward CDR Credit Concept Proposal implementation**, including current project status of:
        - CBP feedback, refinement from Phase 1, and progress toward finalization and implementation, including engagement with community residents and local governments, advancement of environmental and public health improvements, workforce agreements or commitments, and other binding commitments for project design, construction, and operation;
        - Advancement and improvement of MRV framework, including selection of an implementation protocol or methodology, an independent and DOE-approved third-party MRV implementation entity, and any improvements or changes from the Phase 1 proposal;
        - Permitting and site agreements for proposed CDR project(s) providing credits, including any Endangered Species Act (ESA) reviews and approvals, EPA National Pollution Discharge Elimination System (NPDES) permits, relevant subsurface injection or EPA Underground Injection Control (UIC) permits needed to construct or operate the competitors' CDR projects, and any other appropriate federal or state permits for operation for the project(s) or participation in this prize including National Environmental Policy Act (NEPA) required reviews and approvals;
        - Revisions of LCA estimation or measurement inputs and modeling parameters, and/or measurement methodology as needed. Similarly, the

impact of any expected cost or LCA changes on the proposed TEA, including changes to the LCA inputs or boundaries; and

- Enhancement in carbon storage durability or permanence oversight and verifying entity review and implementation plan, including timeline, liability, and associated recourse mechanisms.

- **Binding commitments from non-Federal entities to purchase CDR credits** (on a per net tonne CO_2e removed) with terms consistent with the Phase 1 CDR Credit Concept Proposal:

  - Letters of support from private or non-governmental entities willing to enter into offtake agreements with semifinalists;
  - Signed public agreements for future CDR purchases with offtake terms consistent with DOE prize submission agreement;
  - Commitment and ability to deliver scheduled CDR offtake; and
  - Availability of CDR tons in years committed, including staffing, supply chain considerations, available energy, construction and permitting timelines, and storage availability and capacity.

- **Part 2** (up to 10 months):

  - **Contract negotiations**—during the last 10 months of Phase 2, some, or all, of the Phase 2 winners will negotiate their CDR delivery contracts directly with DOE. These contracts will include a delivery schedule for CDR credits and commitment to a specific MVR provider and verification methodology. More information will be provided in the Official Rules document for Phase 2.

Winners will be determined through a combination of the online submission package, review of nongovernmental offtake agreements, and CDR delivery contract negotiations. The competitors who show the greatest potential to deliver the most CDR to DOE ***and*** to outside stakeholders will move on to the next phase. Winners of Phase 2 will be considered finalists and will receive a cash prize. See the draft Phase 2 Rules for more information.

Phase 3 (36 months) – Only winners of Phase 2 are eligible to compete in Phase 3. Phase 2 will have up to ten (10) winners, all of which will be eligible to compete in Phase 3. During Phase 3, competitors will compete independently within their designated AOI to deliver the permanent CDR committed to DOE on the scheduled timeline and criteria established within the contract developed and mutually agreed upon during Phase 2. Competitors will have 36 months to deliver and verify the complete volume of CDR committed within the contract delivered to DOE following Phase 2, for a maximum award of $3,000,000 per competitor. In addition to fulfilling their CDR deliver commitment to DOE, Phase 3 competitors will demonstrate that their CDR offering has been purchased by external parties under terms that align with the criteria outlined in the Phase 1 submission package and Phase 2 CDR. During Phase 3:

- Competitors will demonstrate delivery of independently verified CDR credits to DOE consistent with an independently verified MRV protocol, using an approved MRV service provider (designated following Phase 2).

- Winners will be determined through a combination of the online submission packages demonstrating successful and independently verified delivery of CDR, CBP implementation, and market development and customer discovery. Winners will receive a cash prize.

3.5 Anticipated Timeline

These rules are applicable to the CDR Pilot Purchase Prize. Please visit HeroX to view the key dates.

Phase	Anticipated Time Period	Anticipated Submission Package Review Period
1	2 months	3 months
2	Up to 16 months	3 months
3	Up to 36 months	Competitors will propose a delivery schedule during Phase 2, with at minimum annual progress reviews over the 36-month Phase 3 period

4 Phase 1: CDR Credit Concept Proposal

4.1 Goal

Competitors design a concept CDR Credit Concept Proposal for a specific CDR technology and associated project(s) located within the United States, that would effectively provide permanent net removal on a CO_2e basis consistent with Appendix 5 LCA Guidance. Competitors should demonstrate that they have a commercial technology, implementation strategy, CBP, and an MRV plan sufficient to provide independent validation of techno-economics and delivery of the proposed CDR credit volume purchased, including oversight and monitoring of carbon storage.

4.2 Prizes

Up to 25 teams will be awarded $50,000 each.

4.3 How To Enter

Complete a submission package online on or before the contest closing date.

4.4 Phase 1

Phase 1 includes three primary steps:

1. **Preparation, Activation, and Submission** –Competitors should prepare a CDR Credit Concept Proposal that does not exceed 12 pages, meeting all the Program Requirements (defined in Section 3.3) and addressing the key criteria summarized in Section 3.4 for Phase 1.

2. **Assessment** – The Prize Administrator screens submissions for eligibility and completion and assigns expert reviewers to independently score the content of each submission. The prize judge will review the relevant submission information and determine the winners. The judging criteria assess the following competitor activities:

    - **Project Capabilities** – Demonstrate alignment with the program requirements (Section 3.2), including a rigorous and accurate outline of the proposed TEA and LCA, storage mechanism including the long-term liability and stewardship plan for sequestered carbon, appropriateness and completeness of a proposed CBP development strategy, additionality of the proposed CDR to be delivered, and overall quoted cost of CDR on a per net tonne CO_2e removed basis. Competitors may also provide a list of current and past voluntary CDR credits sales if offtake agreements or commitments have been made public.

    - **Program Development** – Provide an overview of progress toward implementing and operating the CDR technology or pathway outlined in the CDR Credit Concept Proposal, including permitting progress, past CDR delivered to voluntary or compliance buyers, and previous project trials or demonstrations that support the LCA, technoeconomic assessment (TEA), and storage durability or permanence of the CDR project proposed.

    - **Network, Team, and Resources** – Summarize the core capacity of the team developing the CDR project as well as credibility and expertise of the proposed independent third-party MRV implementation group.

3. **Announcement** – After the semifinalists are publicly announced, the Prize Administrator notifies them and requests the necessary information to distribute cash prizes. After winning Phase 1, semifinalists will implement their plan, make progress on their plan, and compete in Phase 2.

4.5 What To Submit

All documents must be uploaded as a PDF.

Reviewers and the prize judge will evaluate competitors' submissions by agreeing or disagreeing with a set of assigned statements on a scale. These statement sections, which are the criteria, are weighted as follows:

CDR Credit Concept Proposal Section	Weight
Project Overview and a CDR Credit Concept Proposal: Includes all key program requirements in Section 3.3	70%
Technology and/or Project Development	20%
Network, Team, and Resources	10%

A complete submission package for Phase 1 should include the following items:

Item	Content
Submission Package	• Cover page (1 page) • A CDR Credit Concept Proposal: 12 pages (excluding cover page), 8.5" by 11" with 1" margins, 12-pt font, double-spaced)

Note: Portions of the submission package will be made available to the public. These have been denoted as such, and DOE does not intend to release the remaining parts of the submission to the public. See Appendix 1 for additional details.

Cover Page (1 page) – List basic information about your submission. Will be made public.

- Company, organization, or institution name
- Brief summary of proposed technology and CDR delivery volume and schedule (anticipated total tCO_2e/yr)
- Key project members (names, roles, contacts, and links to their LinkedIn profiles)
- AOI for which the CDR Credit Concept Proposal intends to compete and a brief rationale for the selection
- Your city, state, and nine-digit zip code
- Relevant partners and proposed independent MRV implementation partner

Each of the following three sections should be addressed in the core narrative deliverable. The content bullets are only suggestions to guide your responses. The individual answers to the questions do not have a word limit; however, **the aggregate response to these three sections must not exceed 12 pages at 12-point font size double-spaced**, not including captions, figures/graphs, or references. A word count must be included at the end of your submission. You may also include **up to three labeled supporting images, figures, or graphs**. The reviewers will score the questions based on the content you have provided.

<table>
<tr><th colspan="2">CDR Credit Concept Proposal
Maximum of 12 pages and 3 supporting images or figures (PDF)</th></tr>
<tr><td colspan="2">Section 1: Project Overview
Detailed description of the proposed CDR technology, including LCA, TEA, additionality, carbon storage mechanism, anticipated volume of CDR to be delivered, and MRV protocol or methods, including prospective independent MRV partners or verifiers.</td></tr>
<tr><td>Suggested content you provide:
Provide a detailed LCA and TEA framework for the proposed CDR technology, and to the extent possible, the specific project that would produce CDR credits for DOE. Clearly define the boundaries of the LCA and TEA framework, including inputs and outputs associated with these estimates and any supporting trial data.
Provide a quote price for the proposed CDR on a per net tonne CO_2e removed basis (CDR credit cost proposed for contracting) and an anticipated delivery schedule.[23]
Provide a timeframe (at the decadal granularity) for the permanence or durability of carbon storage for at least 100 years, including an MRV plan to incorporate long-term storage oversight of stored carbon. The storage description must include a technical summary of approaches to ensure the carbon remains isolated and may include financial (insurance, buffer pools, claw-back) mechanisms to redress storage reversals.
Provide a summary of the additionality of the proposed CDR, including financial, regulatory, and common practice considerations.</td><td>A single score is provided, taking the following statements into consideration:
The competitor proposes a rigorous and comprehensive LCA and TEA framework that uses appropriate EPA or peer-reviewed emissions factors to provide a defensible LCA and TEA for the proposed technology at the project level.
The quoted price and delivery schedule are reasonable (in the context of the TEA) and the proposed CDR solution is cost-effective relative to other proposed solutions submitted within the same AOI.
The durability or carbon storage term is well defended, and the competitor proposes appropriate technical and financial methods to ensure that the carbon remains isolated from the atmosphere for at least 100 years, and if committing to a long storage term, provides a technical rationale and long-term stewardship plan.
The proposed CDR is clearly additional meaning that it would not be a common practice or required by law or policy and was financially directly attributable to DOE’s purchase (if selected to compete in Phase 3).
The CBP is robust and adequately considers the benefits the project would provide, including environmental, social,</td></tr>
</table>

[23] In advance of Phases 2 and 3, competitors should provide an estimated delivery schedule (on a quarterly or annual basis) that will initiate CDR delivery one year from the beginning of Phase 3 and conclude full delivery of committed CDR within 3 years of delivery commencement.

• Propose an MRV methodology or development process and identify independent party or parties capable of providing MRV services (see Appendix 11) • Define a clear pathway to scalability (to gigatonne scale if possible) and potential cost reductions. • Summarize any current or future public CDR offtake agreements with non-governmental CDR buyers. • Overview of a strategy for CBP development, including but not limited to cobenefits as well as disbenefit mitigation strategies associated with the CDR credits proposed through the prize, such as environmental, public health, labor and workforce development, and economic benefits. • Describe the CBP development strategy and implementation approach and its suitability for the region and community wherein the crediting project(s) would be sited.	and economic impacts. The CBP identifies and mitigates any adverse impacts. • The competitor provides science-based MRV strategy and identifies one or more independent entities capable of reviewing, overseeing, and implementing the MRV methodology (Appendix 11). • The competitor provides a clear strategy for scaling the proposed CDR technology and outlines how the technology could provide gigatonne scale removals within the century. • The competitor adequately summarizes current and past sale of CDR to non-governmental buyers, or appropriately explains why the technology has not engaged in CDR credit sales to date. • The competitor provides a credible and actionable strategy to develop and implement a robust CBP within the prize timeline, delivering meaningful and substantial engagement and cobenefits, while identifying and mitigating potential disbenefits.
Section 2: *Technology or Project Development, including plans for site selection, project development, resource and material procurement, and contingency planning.*	
Suggested content you provide: • Provide a clear overview of the CDR technology, process, and project that would provide CDR supply for Phase 3. • Describe the proposed site location(s) for the removal and storage of carbon, including feedstocks such as energy or material inputs as appropriate. • Describe the technology readiness level of the CDR technology and its alignment with the proposed AOI. Describe any testing, publications or demonstrations that have been performed in advance of Phase 1. • Outline any potential financing, construction, permitting, or investment challenges for developing the proposed CDR project, including but not limited to energy, access to storage resources, labor needs, permitting hurdles, and siting considerations.	**A single score is provided, taking the following statements into consideration:** • The CDR Credit Concept Proposal provides a clear description of the CDR technology, process, and the associated project that would be providing CDR in Phase 3 if the competitor is successful. • The competitor provides a clear rationale for their site selection or if a site has not been selected, they have provided a detailed outline of the regions they are considering and a rationale for how these sites meet the needs of the CDR technology. • The CDR Credit Concept Proposal provides a thorough background on the process of the CDR technology, including support for its commercial readiness and cites any relevant testing, demonstration, or deployment activities. • The competitor proactively identifies potential financial, regulatory or resource bottlenecks that could delay delivery of CDR and proposes appropriate contingencies and safeguards to address these issues.

Section 3: *Network, Team, and Resources*	
Suggested content you provide: • Offer a brief summary of the CDR company, including other related and ongoing projects, research and development efforts, and brief biographies of key team members and their qualifications relevant to the CDR offering. • Provide a brief summary of the competitor, and as appropriate partners' capabilities and resources, including technical, financial, and labor capacities that will enable timely delivery of CDR as described in the CDR Credit Concept Proposal	**A single score is provided, taking the following statements into consideration:** • The competitor offers a brief but sufficient summary of the team's key members, their capabilities and qualifications, and assets relevant to delivering on the proposed CDR offering as outlined in the CDR Credit Concept Proposal. • The competitor provides a succinct outline of the financial, material, energy, and labor resources available to successfully implement the project and appropriately identifies any resource deficits, including plans to resolve these insufficiencies over the course of the prize.

Reviewer Recommendation	
• There is no direct corresponding submission requirement for this score. Rather, it is an overall assessment of all materials submitted in HeroX.	**Statement is scored:** • This competitor should be strongly considered for a Phase 1 prize. (yes/no)

Letters of Commitment or Support (Optional)
Combine and upload as a single file one-page letters from relevant entities (e.g., partners, potential or past customers) to provide context and show the viability of the CDR Credit Concept Proposal. This could include letters from partners or others you believe are critical to the success of your proposal, including CDR buyer, project financiers or investors, community groups, labor groups, or host site landowner(s), independent MRV service provider, or project development partners. Any letters of commitment or support must be on letterhead, uploaded as a single file, and readable by Microsoft Word or Adobe PDF.

Please read and comply with the additional requirements about your submission in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

4.6 How We Score

The scoring of submissions will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each submission. Each section of the narrative questions receives a weighted score, based on the bulleted list of statements. The bullets guide the single overall score for each section. The final score from an individual reviewer for a submission package equals the weighted sum of the scores for all the sections. All

reviewers' scores will then be averaged for a final reviewer score for the submission package. The final prize judge considers reviewer scores when deciding the winners of the prize.

- Reviewers may not have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in this contest or have a familial or financial relationship with an individual who is a registered competitor.

Note: Expert reviewers also provide comments on the submissions they review. The Prize Administrator intends to provide comments to competitors after the winners are announced. These comments are intended to help competitors continue to improve and iterate on their submissions. The comments are the opinions of the expert reviewers and do not represent the opinions of DOE.

The selection committee will take into account the submission package, reviewers scores, and program policy factors listed in Appendix 1 when determining winners. DOE is the judge and final decision maker and may elect to award all, none, or some of the submissions accepted at each submission deadline.

4.7 Additional Requirements

Please read and comply with the additional requirements in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

STOP: Only Phase 1 rules are official prize rules. The following prize rules for Phases 2 and 3 are draft prize rules for public comment and may be altered following the completion of Phase 1. DOE encourages feedback from stakeholders across the CDR industry and civil society.

5 Phase 2: Detailed Design of CDR Contract Offering

5.1 Goal

Competitors selected to compete as semifinalists in Phase 2 will build on the competitor's CDR Credit Concept Proposal by drafting **a complete summary of proposed terms and conditions for a CDR offtake contract that reflect the attributes described in the Phase 1 CDR Credit Concept Proposal submission**. During Phase 2, competitors will solidify the proposed terms and logistics of their CDR offering as described in the draft rules outlined in this section. Additionally, competitors will identify and select an independent party capable of implementing the MRV plan as outlined by the competitor. During Phase 2, competitors will leverage the CDR credit offering developed in their Phase 1 CDR Credit Concept Proposal to solicit purchase commitments from non-DOE entities. During the second part of Phase 2, competitors will negotiate delivery contracts with DOE. Competitors that submit meritorious Phase 2 Submission Packages (CDR offtake contracts, MRV methodology and implementation partner documentation, and customer discovery and market development strategy), as described in Section 5.4, will have the opportunity to compete in Phase 3 and deliver the CDR outlined within the contract and associated documents to DOE for cash prizes.

5.2 Prizes

Up to 10 teams will be awarded $375,000 each.

5.3 How To Enter

Only winners of Phase 1 will be eligible to compete in Phase 2. To compete in Phase 2, competitors will complete a submission package online at HeroX before the contest closing date.

5.4 Phase 2 Process

Phase 2 consists of four components:

1. **Detailed design of CDR contract offering** – Competitors will advance the CDR Credit Concept Proposal outlined in Phase 1 by drafting a summary of a complete offtake contract with terms and conditions consistent with the prize rules requirements in Section 3.2. The overview of contract provisions, terms, and conditions should include all criteria and requirements evaluated in the CDR Credit Concept Proposal and provide information and content require for the development of a legal document by DOE, under which DOE could provide the competitor with cash prizes for the successful and verified CDR credit delivery.

2. **MRV Implementation Partner** – As described in the following sections, CDR purchase contracts should identify and commit to a transparent and scientifically robust MRV methodology. To mitigate conflicts of interest, enhance transparency, and bolster the MRV field, competitors must identify and select an MRV partner capable of overseeing, implementing, and ultimately verifying the CDR delivered under the purchase contract during Phase 3. As outlined in the scoring criteria below, a separate MRV methodology document and MRV partner description will also be submitted for review and scoring at the end of Phase 2. Semifinalist competitors' selection of an independent MRV provider should fall within the designated list of approved MRV providers within the revised official prize rules issued following Phase 1.

3. **Customer discovery and market development** – To advance the demand for high-quality CDR, Phase 2 competitors will leverage the CDR Credit Concept Proposal submitted during Phase 1 to solicit purchase commitments from other buyers. The terms and conditions of these offtake agreements should be consistent with those of the contract the competitor will submit to DOE in Phase 2 of the CDR Purchase Pilot Prize, including the price of the CDR credit offering. Successful competitors will effectively solicit offtake agreements or formal purchase commitments from multiple entities to scale their technology, establish ongoing revenue, and develop a durable business model.

4. **Contract negotiations**—negotiations of a CDR credit delivery contract with DOE. Competitors will refine and negotiate a final contract document based on the detailed design of the CDR credit offering provided during part 1 of Phase 2.

5.5 What To Submit

All documents must be uploaded as a PDF.

Reviewers and the prize judge will evaluate competitors' submissions by agreeing or disagreeing with a set of assigned statements on a scale. These statement sections, which are the criteria, are weighted as follows:

Narrative Section	Weight
Detailed Design of CDR Offtake Contract	50%
MRV Implementation Partner and Methodology	25%
Customer Discovery and Market Development	25%

A complete submission package for the Phase 2 should include the following items:

Item	Content
Submission Package	• Complete CDR purchase contract summary • Complete and public MRV methodology[24] • MRV implementation partner and brief testimonial of willingness to verify the competitor's CDR delivery • Summary of offtake commitments or agreements solicited during Phase 2

Cover Page(s) List basic information about your submission Maximum of 2 pages
• Company, organization, or institution name • Brief summary of proposed technology and CDR delivery volume and schedule (anticipated total tCO_2e/ yr) • Key project members (names, roles, contacts, and links to their LinkedIn profiles, including the MRV implementation partner) • AOI for which the CDR Credit Concept Proposal will compete in and a brief rationale for the selection. • Competitor's city, state, and nine-digit zip code • MRV implementation partner, including a brief summary of qualifications, MRV methodology citation (if public), and letter of support.

Answer each of the following three sections. The content bullets are suggestions to guide your responses. You decide where to focus your answers. Individual answers to the three sections do not have a word limit; however, **the aggregate response to these three sections must not exceed 50 pages at 12-point font size double-spaced**, not including captions, figures/graphs, or references. You may include **up to five supporting images, figures, or graphs**. The reviewers will score the questions based on the content you have provided.

[24] In the instance, a public or published methodology is unavailable or insufficient for the needs of the competitor, Phase 2 competitors may submit a self-developed or independently-developed MRV methodology document. This document may be submitted in HeroX and must be mutually reviewed and agreed upon by the MRV implementation partner.

Submission Package Maximum of 50 pages[25], not including 5 supporting images or figures (PDF)	
Section 1: Complete CDR Purchase Contract Summary*	
Suggested content you provide: • Briefly summarize the CDR project(s) which will provide verified credits for the CDR Purchase Pilot Prize. An overview should provide a summary of the technology and storage mechanism, the project location(s), approximate annual capacity, timeline for construction and operation. • A summary of rigorous and market-worthy contract provisions outlining the volume, not less than 3,000 tonnes total, of CDR to be supplied to DOE in Phase 3 (in CO_2e net removed terms), including price per net tonne, timeframe and deadlines for delivery (e.g., net tonnes per calendar year) including considerations for under-delivery, and termination consideration if the competitor fails to deliver. • Submission of a complete summary of a purchase contract that adequately reflects the criteria submitted in the Phase 1 CDR Purchase concept Proposal, including the CDR credit offering (anticipated volume, resource requirements and contingencies, proposed GHG accounting protocol or methodology, disclosure of any additional financial assistance or incentives), terms and specifications for independent verification, incorporation of a CBP, terms of assurance of assurance of financial, regulatory, and common practice additionality, and verifiability of storage permanence in the form of secure geologic storage or equivalent. • Documentation of an independent third party MRV implementation partner and commitment to a specific MRV methodology which the implementation	**A single score is provided, taking the following statements into consideration:** • The competitor provides an appropriate summary of the technology and project(s), including an overview of annual removal capacity, storage mechanism, and timeline for construction and operation. • The competitor provides a contract summary that adequately provides provisions detailing the delivery schedule and timeline of CDR supply (on a CO_2e net removed basis). The contract includes an explicit price per net tonne and meets the minimum delivery volume. The contract includes provisions that effectively address under-delivery and failure to deliver. • The submitted CDR purchase contract summary, with limited to no modification, adequately reflects the criteria submitted in the competitors Phase 1 CDR Purchase concept proposal, including the CDR credit offering (anticipated volume, resource requirements and contingencies, proposed GHG accounting protocol or methodology, disclosure of any additional financial assistance or incentives), terms and specifications for independent verification, incorporation of a thorough and actionable CBP, terms of assurance for financial, regulatory, and common practice additionality, and verifiability of storage permanence in the form of secure geologic storage or an equivalent mechanism. • The contract summary explicitly identifies an independent third party that will conduct MRV for the project and includes reference to a specific protocol or methodology the MRV implementation partner will use. The contract

[25] Total page count for the submission package does not include MRV protocol documents or methodologies, which can be cited or linked to within the proposed offtake contract. MRV documents that are not listed on public registries or published in the public domain should be uploaded with the submission package but will not be counted toward the maximum page limit. Total page count for the submission package also does not include the CBP, but the CDR purchase contract summary within the submission package should detail contractual requirements for compliance with the CBP documents and summarize how assessment of the CBP implementation will be incorporated within the terms of the CDR credit contract.

partner will utilize to measure, report, and verify the CDR credits supplied to DOE. Summary contract provisions should explicitly state that successful delivery will be contingent upon validation and verification by the contracted MRV implementation entity. If the proposed contractual durability term exceeds the proposed monitoring period, please provide technical or legal justification for assurance the CDR will remain stored for the full term with little uncertainty. • Summary of contract provisions guaranteeing a commitment to permanently isolate the removed CO_2 from the atmosphere for a minimum of 100 years, and financial or legal recourse mechanisms to assess and address any reversals. • A complete CBP and implementation plan, inclusive of the guidance provided within Appendix 10, including a summary of a contractual commitment implement to CBP within the period of the prize. • As appropriate and necessary, an Environmental Health & Safety (EH&S) Assessment consistent with the guidance in Appendix 6.	appropriately qualifies that a CDR credit delivery will only be considered complete following verification from the identified MRV entity. If the committed durability term in the contract exceeds the monitoring term, the competitor's contract reflects scientific consensus or legal mechanisms that are consistent with secure geologic storage or equivalent. • The contract summary provides an explicit timeframe for carbon storage durability and stipulates legal and/or financial recourse mechanisms that would redress or repay DOE for any reversal of carbon storage during the committed storage term. • The CBP is consistent with the requirements and guidance of Appendix 10. The summary contract appropriately requires that delivery of CDR credits must be consistent with an established CBP approved by DOE. • If included, the project provides a rigorous and comprehensive EH&S Risk Assessment in accordance with the guidance provided in Appendix 6.
*DOE Interview on purchase contract terms (if appropriate and selected) If selected for an interview, the competitor will schedule and participate in an interview process with DOE federal merit reviewers to answer questions and discuss CDR contract provisions and other Submission Package materials.	Competitor has provided satisfactory and sufficient responses to DOE questions during the interview process. Competitor has appropriately addressed and amended contract terms to reflect mutually agreed upon negotiation terms to provide an appropriate contract for CDR offtake.
Section 2: MRV Methodology and Implementation Partner	
Suggested content you provide: • Provide a summary of the selected MRV implementation entity, including the entity's qualifications, experience, and expertise, including alignment with DOE criteria (see Appendix 11). • Provide a complete MRV methodology, covering the complete scope of CDR credit development, including baseline justification and measurement, GHG estimation and quantification, project oversight, and carbon storage validation. Competitors should justify the	**A single score is provided, taking the following statements into consideration:** • The competitor has provided a sufficient and comprehensive summary of the selected MRV implementation entity, including a summary of relevant expertise, experience and capacity (as outlined in Appendix 11). • The competitor has submitted a rigorous MRV guidance document in the form of a methodology or protocol that would enable a third-party to successfully measure, report, and verify CDR delivered to DOE. The MRV guidance is technically sufficient and is

appropriateness of the MRV methodology for the competitor's technology and project. • Submit a written testimonial from the MRV implementation partner committing to provide MRV services under the provided methodology and within the contracted timeframe. As appropriate, the testimonial should address and summarize the entity's competencies and experience performing MRV work for similar or comparable projects.	appropriate for the project being developed by the competitor. • The competitor submits a written testimonial from the selected MRV implementation entity committing to participation in the project, including use of the proposed MRV methodology. The testimonial effectively justifies the entity's qualification and capacity to oversee MRV for the competitor's project(s) and associated removals.
Section 3: Customer Discovery and Market Development	
Suggested content you provide: • Provide a complete list of CDR purchase commitments, deliveries, advanced market commitments, or similar agreements that the competitor has secured since the beginning of Phase 1. The CDR purchase review should include a complete list of committed buyers, links to public announcements (if available), purchase volumes and timeframes, and sale prices (where possible). • Overview of contracting provisions, including justification for consistency with program requirements for CDR purchase contract dictated in Section 3.3. • Summarize future CDR credit sale strategy including planned pricing, scale up, and marketing strategy. Competitors may use the TMP template provided in Appendix 8 or alternative addendum, if applicable.	**A single score is provided, taking the following statements into consideration:** • The competitor provides a list of offtake commitments (or similar market commitments) accrued since the beginning of Phase 1 from buyers with purchasing terms that indicate alignment with CDR delivery requirements outlined in Section 3.3, to the degree possible. • The competitor demonstrates a capacity to solicit commercial interest and successfully enter into purchase agreements with CDR buyers. • The competitor successfully articulates a commercialization strategy that appropriately describes a sales plan that would enable rapid scale-up and sustained revenue beyond the CDR Purchase Pilot Prize.

Reviewer Recommendation	
• There is no direct corresponding submission requirement for this score. Rather, it is an overall assessment of all materials submitted in HeroX.	**Statement is scored:** • This competitor should be strongly considered for a Phase 2 prize. (yes/no)

Buyer Letters of Reference (PDF listing buyers who have committed to purchasing CDR from the competitor's project)
Competitors should include up to two references from buyers who have purchased or committed to purchase CDR from the project(s) included within the contract submitted within the Phase 2 Submission Package. Competitors should provide a description of the entities' purchases or commitments and contact information through the Resources tab on HeroX. It is the responsibility of the competitor to ensure that provided buyer references complete the reference form on time. As part of the Phase 2 Submission Package, DOE will review references and testimonials from other CDR buyers who have purchased CDR from or committed to purchase CDR from the competitor. Submissions from buyer references will be private and will not be shared with the competitor.

Please read and comply with the additional requirements about your submission in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

5.6 How We Score

The scoring of submissions will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each Submission Package, including the summary CDR credit purchase contract, the MRV implementation methodology and partnership documents, and the customer discovery and market development documents. Apart from the MRV methodology, which may be linked to, cited, or submitted independently, all deliverables should be submitted within one complete PDF file. Each section of the narrative deliverables receives a weighted score, based on the bulleted list of statements. The bullets guide the single overall score for each section. The final score from an individual reviewer for a submission package equals the weighted sum of the scores for all the sections. All reviewers' scores will then be averaged for a final reviewer score for the submission package. The final prize judge considers reviewer scores when deciding the winners of the prize.
    - Reviewers may not have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in this contest or have a familial or financial relationship with an individual who is a registered competitor.

Note: Expert reviewers also provide comments on the submissions they review. The Prize Administrator intends to provide comments to competitors after the winners are announced. These comments are intended to help competitors continue to improve and iterate on their submissions. The comments are the opinions of the expert reviewers and do not represent the opinions of DOE.

- Interviews: The Prize Administrator, at its sole discretion, may decide to hold short interviews with a subset of the competitors. Interviews would be held prior to the announcement of winners and would serve to help clarify questions the judge may have. Attending interviews is required, and interviews are not an indication of winning.

The selection committee will take the submission package, reviewers scores, interview findings, and program policy factors listed in Appendix 1 into account when determining winners. DOE is the judge and final decision-maker and may elect to award all, none, or some of the submissions accepted at each submission deadline.

5.7 Additional Requirements

Please read and comply with the additional requirements in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

6 Phase 3: CDR Credit Delivery

6.1 Goal

During Phase 3, competitors will implement and execute on the CDR credit supply contracts developed by DOE following Phase 2. During Phase 3, competitors will also implement the CBP developed and submitted to DOE during Phase 2.

6.2 Prizes

Teams that successfully participate in Phase 3 will compete for maximum awards of $3,000,000 per team, which will be determined based on the final volume of the independently verified CDR delivered by the end of Phase 3. Teams eligible to compete in Phase 3 will have successfully received finalist awards following Phase 2. Final Phase 3 awards will be determined by the volume of CDR delivered over the full period of Phase 3 and will be individually determined by the competitor's commitment to DOE within the CDR credit purchase contract summary submitted to DOE and refined and agreed upon by both parties following Phase 2.

6.3 How to Enter

Complete a submission package online at HeroX before the contest closing date.

6.4 Phase 3: CDR Credit Delivery

During Phase 3, competitors will enter into self-prescribed timelines within their selected AOI in order to fulfill delivery and verification of the complete CDR credit volume contracted following Phase 2.

6.5 What to Submit

All documents must be uploaded as a PDF.

Reviewers and the prize judge will evaluate your submission by agreeing or disagreeing with a set of assigned statements on a scale. These statement sections, which are the criteria, are weighted as follows:

Submission Package	Weight
Delivery of CDR	50%*
Fulfillment of independent MRV implementation	20%
Implementation of CBP	20%
Progress toward fulfillment of private or compliance CDR delivery	10%
*Reviewer recommendation	Reviewer recommendation will reflect a composite score of the 3 above criteria, however, timely fulfillment of

	the CDR credit delivery, consistent with the terms of the contract provided by and agreed upon with DOE will be a necessary but insufficient criterion for finalist awards. Adequate implementation and fulfillment of the CBP and independent MRV will also be evaluated in selection of prize winners.

A complete submission package for the Phase 3 should include the following items:

Item	Content
Submission Package	• Cover page content • CDR delivery documentation (submitted annually upon verification) • MRV implementation verification documentation • CBP documentation and implementation report • Verification of CDR delivery to voluntary and compliance buyers (Letters of Support)
Site Inspection and Evaluation	• On a case-by-case basis, DOE employees and/or program administrators may perform site visits during Phase 3

Note: Portions of the submission package will be made available to the public. These have been denoted as such, and DOE does not intend to release the remaining parts of the submission to the public. See Appendix 1 for additional details.

Cover Page – *Submitted with Each Phase 3 Delivery Update*
• Company, organization, or institution name • Key project members (names, roles, contacts, and links to their LinkedIn profiles, including the DOE-approved MRV implementation partner) • AOI for which delivery will compete in and a brief rational for the selection. • Competitor's city, state, and nine-digit zip code • MRV implementation partner, including brief summary of qualifications, MRV methodology citation (if public), and letter of support.

Deliverables provided in Phase 3 should demonstrate successful fulfillment and verification of the CDR volume anticipated in Phase 2. Competitors that successfully complete Phase 2 and engage in a CDR purchase contract with DOE will provide documentation and independent MRV reporting to provide

assurance that the contracted volume of CDR committed is successfully stored and permanently isolated from the atmosphere. Ultimately, cash prizes will be made on the basis of tonnes of CDR delivered and independently verified relative to the quantity contractually obligated during Phase 2.[26]

Awards will be made on the basis of tonnes of CDR successfully delivered and verified by the completion of Phase 3, DOE will only consider a tonne of CDR successfully delivered if the accompanying CBP and MRV plan and documentation have been fulfilled.

<table>
<tr><th colspan="2">Section 1: CDR Delivery Documentation
Provide technical and legal documentation demonstrating successful and durable delivery of CDR</th></tr>
<tr><td>Suggested content you provide:
Documentation and carbon accounting information supporting delivery of CDR at the specified volume and timeframe. Documentation should reflect the contracted and specified granularity mutually agreed upon in Phase 2.
Complete State-Point Data Table (Appendix 3) and Life Cycle Analysis (Appendix 5) aligned with prize rule guidance.</td><td>A single score is provided, taking the following statements into consideration:
Competitor has delivered satisfactory and defensible documentation of CDR delivery consistent with the contract and MRV plan provided to DOE during Phase 2.
Documentation includes the appropriate State-Point Data Table (Appendix 3) and Lifecycle Analysis (Appendix 5) parameters outlined in the prize rules.</td></tr>
<tr><th colspan="2">Section 2: Fulfillment of Independent MRV Implementation
Describe the progress toward implementing the MRV agreed upon following Phase 2</th></tr>
<tr><td>Suggested content you provide:
The independent MRV implementation partner will, at a minimum, submit an annual report providing independent technical measurement and validation of CDR supplied to DOE during Phase 3 of the prize. Documents will summarize technical information collected during the term, including any analysis done, to demonstrate the success or failure to meet the terms of the CDR purchase contract. To the extent possible, documentation should support third-party validation and direct measurement of the project supplying CDR and outline future implementation plans to assure secure storage.</td><td>A single score is provided, taking the following statements into consideration:
The competitor provides a complete overview of progress and key milestones demonstrating the implementation of the CBP provided in Phase 2, including any documentation of environmental, labor, public health, workforce development or other benefits (e.g., financial, social, or other) associated with the projects and CDR supplied to DOE. The documentation demonstrates that the project meets or exceeds the benefits outlined in the Phase 2 deliverables, while minimizing any environmental, public health, or economic harms, anticipated or unintended.</td></tr>
</table>

[26] For example, a competitor that had committed to supply DOE with 5,000 tonnes of CDR and successfully delivered the first tonne (CDR credit) within a year of the commencement of Phase 3, but only successfully delivered 4,000 tonnes by the end of Phase 3 would receive 80% of the maximum finalist award ($3,000,000) for a total cash prize of $2,400,000.

Section 3: Fulfillment of CBP *Describe the progress toward implementing the CBP agreed upon following Phase 2*	
Suggested content you provide: • An overview of the competitor's progress and key milestones with respect to implementation of the CBP provided in Phase 2, including any documentation of environmental, labor, public health, workforce development or other benefits or impacts (e.g., financial, social, or other) associated with the projects supplying CDR credits to DOE. • An outline of any ongoing or future activities that will advance CBP implementation beyond the scope and timeline of Phase 3 of the CDR Purchase Pilot Prize.	**A single score is provided, taking the following statements into consideration:** • The competitor provides a complete overview of progress and key milestones demonstrating the implementation of the CBP provided in Phase 2, including any documentation of environmental, labor, public health, workforce development or other benefits (e.g., financial, social, or other) associated with the projects and CDR supplied to DOE. The documentation demonstrates that the project meets or exceeds the benefits outlined in the Phase 2 deliverables, while minimizing any environmental, public health, or economic harms, anticipated or unintended.
Section 4: Delivery to Non-DOE CDR Customers *Provide letters of support from or documentation of delivery to customers buying CDR from the same or similar projects as DOE. If projects delivering CDR are distinct, provide a rationale for equivalence or comparability.*	
Suggested content you provide: • Provide a summary of progress toward delivering CDR to voluntary or compliance buyers purchasing CDR from the competitor, supplied through the same of similar projects. • Submit letters of support or documentation of CDR delivery validated and signed by other non-DOE entities that have purchased CDR from projects supported through the CDR Purchase Pilot prize.	**A single score is provided, taking the following statements into consideration:** • The competitor provides a complete summary of progress towards (tonnes delivered to DOE) and other buyers. The competitor has made substantial progress in either delivering or preparing to deliver committed CDR to purchasers. • Letters of support or documentation of delivery to non-DOE CDR purchasers confirm the competitor is effectively making progress in fulfilling order and developing a reliable business model.

Reviewer Recommendation	
• There is no direct corresponding submission requirement for this score. Rather, it is an overall assessment of all materials submitted in HeroX.	**Statement is scored:** • This competitor has successfully and verifiably completed delivery of the committed volume of CDR, including successful implementation of the CBP and submission of independent MRV documentation (yes/no)

MRV Verification Documentation (a PDF providing legal documentation and independent validation of the CDR delivered to DOE, and other buyers if applicable)
As a part of your submission package, the independent, DOE-approved MRV partner will independently submit documentation of successful CDR delivery to DOE, including an MRV summary demonstrating fulfillment of CDR supplied, independent measurements and data collected from the project, and analysis of storage durability, including monitoring and stewardship protocols, if appropriate.

Please read and comply with the additional requirements about your submission in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

6.6 How We Score

The scoring of submissions will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each submission. Each section of the narrative questions receives a weighted score, based on the bulleted list of statements. The bullets guide the single overall score for each section. The final score from an individual reviewer for a submission package equals the weighted sum of the scores for all the sections. All reviewers' scores will then be averaged for a final reviewer score for the submission package. The final prize judge considers reviewer scores when deciding the winners of the prize.
    - Reviewers may not have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in this contest, or have a familial or financial relationship with an individual who is a registered competitor.

Note: Expert reviewers also provide comments on the submissions they review. The Prize Administrator intends to provide comments to competitors after the winners are announced. These comments are intended to help competitors continue to improve and iterate on their submissions. The comments are the opinions of the expert reviewers and do not represent the opinions of DOE.

- Interviews: The Prize Administrator, at its sole discretion, may decide to hold short interviews with a subset of the contest competitors. Interviews would be held prior to the announcement of winners and would serve to help clarify questions the judge may have. Attending interviews is required, and interviews are not an indication of winning.

When making the final determination of winners, the judge will take into account the submission package, reviewer scores, interview or site visit findings, and program policy factors listed in Appendix 1. DOE is the judge and final decision-maker and may elect to award all, none, or some of the submissions accepted at each submission deadline.

6.7 Additional Requirements

Please read and comply with the additional requirements in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

Appendix 1: Additional Terms and Conditions

A.1 Universal Contest Requirements

Your submission for the CDR Purchase Pilot Prize is subject to the following terms and conditions:

- You must post the final content of your submission or upload the submission form online at HeroX before the prize closes. FECM will not accept late submissions or any other form of submission.
- You must mark all submissions that you wish to protect from public disclosure according to the instructions later in this section. Unmarked or improperly marked submissions will be deemed to have been provided with unlimited rights and may be used in any manner and for any purpose whatsoever.
- You must include all the required submission elements. The Prize Administrator may disqualify your submission after an initial screening if you fail to provide all required submission elements. Competitors may be given an opportunity to rectify nonsubstantive submission errors due to technical challenges with the submission platform, including late submissions due to a system glitch.
- Your submission must be in English and in a format readable by Microsoft Word or Adobe PDF. Scanned handwritten submissions will be disqualified.
- DOE or NREL will disqualify submissions if they contain any matter that, in their sole discretion, is indecent, obscene, defamatory, libelous, lacking in professionalism, or demonstrates a lack of respect for people or life on this planet.
- Your clicking "Accept" on the HeroX platform and proceeding to register for the contest described in this document forms a valid and binding agreement between you and the U.S. Department of Energy, and is in addition to the existing HeroX Terms of Use for all purposes relating to its contests. You should print and keep a copy of these rules, which apply only to the contest described here and to no other contest on the HeroX platform or anywhere else.
- You will be required to sign the following statement as part of your submission to this prize program:

  I am providing this submission package as part of my participation in this prize. I understand that the information contained in this submission will be relied on by the federal government to determine whether to issue a prize to the named competitor. I certify under penalty of perjury that the named competitor meets the eligibility requirements for this prize competition and complies with all other rules contained in the Official Rules document. I further represent that the information contained in the submission is true and contains no misrepresentations. I understand false statements or misrepresentations to the federal government may result in civil and/or criminal penalties under 18 U.S.C. § 1001 and § 287, and 31 U.S.C. §§ 3729-3733 and 3801-3812.

A.2 Verification for Payments

The Prize Administrator will verify the identity and the role of a participant potentially qualified to receive the prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrator will notify winning competitors using provided email contact information after the date that results are announced. Each competitor (or parent/guardian if under 18 years of age) will be required to sign and return to the Prize Administrator, within 15 days of the date the notice is sent, a completed NREL Request for ACH Banking Information form and a completed W-9 form (https://www.irs.gov/pub/irs-pdf/fw9.pdf). At the sole discretion of the Prize Administrator, a winning competitor will be disqualified from the competition and receive no prize funds if: (i) the person/entity cannot be contacted; (ii) the person/entity fails to sign and return the required documentation within the required time period; (iii) the notification is returned as undeliverable; or (iv) the submission or person/entity is disqualified for any other reason.

A.3 Teams and Single-Entity Awards

The Prize Administrator will award a single dollar amount to the designated primary Competitor. In this case, the Competitor shall be a private entity (for-profit or nonprofit) or and academic institution. The primary Competitor is solely responsible for allocating any prize funds among its team members and/or allocating the funds for operational use. The primary Competitor entity is also responsible for all associated taxes.

A.4 Submission Rights

The public videos in this contest must be submitted and released to the public under a Creative Commons Attribution 4.0 International License (see http://creativecommons.org/licenses/by/4.0/).

By making a submission and consenting to the rules of the contest, a competitor is granting to DOE, the Prize Administrator, and any other third parties supporting DOE in the contest a license to display publicly and use the parts of the submission that are designated as “public” for government purpose. This license includes posting or linking to the public portions of the submission on the Prize Administrator’s or HeroX’s website, on the contest website, DOE websites, and partner websites, and the inclusion of the submission in any other media, worldwide. The submission may be viewed by DOE, the Prize Administrator, and judges for purposes of the contests, including but not limited to screening and evaluation purposes. The Prize Administrator and any third parties acting on their behalf will also have the right to publicize the competitors’ names and, as applicable, the names of competitors’ team members and organizations that participated in the submission, on the contest website indefinitely.

By entering, the Competitor represents and warrants that:

> The competitor is the sole, original author and copyright owner of the submission or that the competitor has acquired sufficient rights to use and to authorize others, including DOE, to use the submission as specified throughout the rules; that the submission does not infringe upon any copyright, trade secret, trademark, nondisclosure agreement, patent, or any other third-party rights; and that the submission is free of malware.

A.5 Copyright

Each competitor represents and warrants that the competitor is the sole author and copyright owner of the submission; that the submission is an original work of the competitor, or that the competitor has acquired sufficient rights to use and to authorize others, including DOE, to use the submission, as specified throughout the rules; that the submission does not infringe upon any copyright or upon any other third-party rights of which the competitor is aware; and that the submission is free of malware.

A.6 Contest Subject to Applicable Law

All contests are subject to all applicable federal laws and regulations. Participation constitutes each participant's full and unconditional agreement to these Official Contest Rules and administrative decisions, which are final and binding in all matters related to the contest. This notice is not an obligation of funds; the final awards are contingent upon the availability of appropriations.

A.7 Resolution of Disputes

DOE is solely responsible for administrative decisions, which are final and binding in all matters related to the contest.

In the event of a dispute, the authorized account holder of the email address used to register will be deemed to be the competitor. The "authorized account holder" is the natural person or legal entity assigned an email address by an internet access provider, online service provider, or other organization responsible for assigning email addresses for the domain associated with the submitted address. Competitors and potential winners may be required to show proof of being the authorized account holder.

The Prize Administrator will not arbitrate, intervene, advise on, or resolve any matters between team members or any disputes between teams.

A.8 Publicity

The winners of these prizes (collectively, "Winners") will be featured on DOE and NREL websites.

Except where prohibited, participation in the contest constitutes each winner's consent to DOE's and its agents' use of each winner's name, likeness, photograph, voice, opinions, and/or hometown and state information for promotional purposes through any form of media, worldwide, without further permission, payment, or consideration.

A.9 Liability

Upon registration, all participants agree to assume and, thereby, have assumed any and all risks of injury or loss in connection with or in any way arising from participation in this contest or development of any submission. Upon registration, except in the case of willful misconduct, all participants agree to and, thereby, do waive and release any and all claims or causes of action against the federal government and its officers, employees, and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential; and whether foreseeable or not), arising from their participation in the contest, whether the claim or cause of action arises under contract or tort.

In accordance with the delegation of authority to run this contest delegated to the Assistant Secretary of FECM, the Assistant Secretary has determined that no liability insurance will be required of competitors to compete in this competition, per 15 USC 3719(i)(2).

A.10 Records Retention and Freedom of Information Act (FOIA)

All materials submitted to DOE as part of a submission become DOE records. Any confidential commercial information contained in a submission should be designated at the time of submission.

Competitors are encouraged to employ protective markings in the following manner:

- The cover sheet of the submission must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

  > Notice of Restriction on Disclosure and Use of Data:
  >
  > Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]

- The header and footer of every page that contains trade secrets or privileged commercial or financial information must be marked as follows: “May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure.”

- In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

Competitors will be notified of any FOIA requests for their submissions in accordance with 29 C.F.R. § 70.26. Competitors may then have the opportunity to review materials and work with a FOIA representative prior to the release of materials.

A.11 Privacy

If you choose to provide HeroX with personal information by registering or completing the submission package through the contest website, you understand that such information will be transmitted to DOE and may be kept in a system of records. Such information will be used only to respond to you in matters regarding your submission and/or the contest unless you choose to receive updates or notifications about other contests or programs from DOE on an opt-in basis. DOE and NREL are not collecting any information for commercial marketing.

A.12 General Conditions

DOE reserves the right to cancel, suspend, and/or modify the contest, or any part of it, at any time. If any fraud, technical failures, or any other factor beyond DOE’s reasonable control impairs the integrity or proper functioning of the contests, as determined by DOE in its sole discretion, DOE may cancel the contest.

Although DOE indicates in the Phase 1, Phase 2, and Phase 3 contests that it will select up to several winners for each contest, DOE reserves the right to only select competitors who are likely to achieve the goals of the program. If, in DOE's determination, no competitors are likely to achieve the goals of the program, DOE will select no competitors to be winners and will award no prize money.

ALL DECISIONS BY DOE ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CONTEST.

A.13 Program Policy Factors

While the scores of the expert reviewers will be carefully considered, it is the role of the Prize Administrator to maximize the impact of contest funds. Some factors outside the control of competitors and beyond the independent expert reviewer scope of review may need to be considered to accomplish this goal. The following is a list of such factors. In addition to the reviewers' scores, the below program policy factors may be considered in determining winners:

- Geographic diversity and potential economic impact of projects.
- It may be desirable to select a project, or group of projects, if such a selection presents lesser schedule risk, lesser budget risk, lesser technical risk, lesser societal considerations and impacts risk, and/or lesser environmental risks. Environmental risk includes, but is not limited to, an adverse impact to air, soil, water, or an increase in overall cradle-to-grave greenhouse gas footprint (carbon dioxide equivalent, CO_2e).
- The technological and competitor membership diversity within Areas of Interest (AOI).
- The quality, quantity, or reliability of CDR transactions or offtake agreements additional to the tonnes committed through the CDR Purchase Pilot Prize which the competitor has secured during the prize period.
- The demonstrated resource capacity, technical expertise, or unbiased nature of the identified or proposed independent MRV partner.
- Whether the use of additional DOE funds and provided resources are nonduplicative and compatible with the stated goals of this program and DOE's mission generally.
- The degree to which the submission exhibits technological or programmatic diversity when compared to the existing DOE project portfolio and other competitors.
- Whether the submission is likely to lead to increased employment, workforce development, and manufacturing in the United States, including in low- to moderate-income communities.
- The degree to which the submission exhibits team member diversity and the inclusion of underrepresented groups, with participants including but not limited to graduates and students of Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), and other minority-serving institutions (MSIs) or members operating within Qualified Opportunity Zones or other underserved communities.

- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers.

- The degree to which the submission will accelerate transformational technological, financial, or workforce advances in areas that industry by itself is not likely to undertake because of technical or financial uncertainty.

- The degree to which the submission supports complementary DOE-funded efforts or projects, which, when taken together, will best achieve the goals and objectives of DOE.

- The degree to which the submission expands DOE's funding to new competitors and recipients who have not been supported by DOE in the past.

- The degree to which the submission enables new and expanding market segments.

- Whether the project promotes increased coordination with nongovernmental entities for the demonstration of technologies and research submissions to facilitate technology transfer.

- Whether the submission content sufficiently supports the competitor's intent to produce high-quality CDR with geologic or equivalent storage and establish a viable U.S.-based business in the near future.

Appendix 2: Impact Tracking Metrics

Beginning of performance period (baseline) and on an annual basis:

1. Number of tonnes removed
    - Gross
    - Net (inclusive of any CO_2 that has "leaked")
2. Net CDR cost with breakdown clearly illustrated
3. Process energy requirements
    - Thermal
    - Electrical
4. Process emissions
5. Overall process uncertainty in metric tons delivered
6. Permanence claim
7. Risk of reversal quantification
8. Land area requirements
9. Number of jobs created
    - Number of full time/salaried
    - Number of part time/hourly
    - Percentage of employees hired from specific project region
10. Employee turnover rate compared to industry baselines.
11. Number of new national lab partnerships (e.g., Cooperative Research and Development Agreements, license agreements)
12. Dollars raised by company as investment/follow-on funding
13. Total revenue
    - Amount from sale of co-products
    - Amount from tax credits
    - Amount from pre-purchase and/or offtake agreements
14. Number of prototypes launched
15. Number of demonstration projects launched
16. Number of patents filed/issued
17. Number of peer-reviewed publications
18. Number of public presentations

19. Number of CDR contracts (e.g., pre-purchase, off-takes) signed with corresponding tonnes (CDR credits) clearly labeled
20. Number of CDR contracts (e.g., pre-purchase, off-takes) delivered with corresponding tonnes clearly labeled
21. Website development and traffic
22. Number and identity of project partners including materials suppliers, financers, insurance, energy suppliers, CO_2 offtakers (e.g., conversion, transport and/or storage operators), project developers, engineering, procurement and construction (EPC) firms, independent third-party verifiers, marketplaces, carbon registries etc.
23. Identification and quantification of potential non-GHG emissions, co-benefits, and/or negative environmental impacts which include, but are not limited to: biodiversity, habitat creation or preservation, disease vectors, wildfire risk mitigation, drought resilience, erosion and/or flood control, soil quality, co-products, community education, job creation, poverty alleviation, waste reduction, reduced noise pollution, sustainable recreation and tourism opportunities, and urban beautification.

Appendix 3: State-Point Data Tables

Instructions for Completing Data Tables

The tables that follow in this attachment shall be populated with data developed by the prize competitor. Competitors shall complete the appropriate combinations of Table 1 (required for all prize competitors) and Tables 2–7 that relate to their proposed process concept. *Merit scoring will correspond to the completeness of the data table and supporting information.*

Competitors are required to provide the demonstrated performance data for their proposed CDR process.

Key data or estimates provided in the table(s) shall be supported with short narratives in bullet form within the narrative. These bullets shall describe the sources for the individual data provided. This may be measurements made directly by the competitor and shall identify the apparatus and methodology used in the measurement(s). Due to page limitations, citations may be utilized to describe the sources for the individual data provided by the competitor or others, or by example calculations for noncritical data. Other acceptable sources of data are open literature (with a citation and description) or estimated or extrapolated data (with a description of the method/model used for the estimate, or the procedure used for extrapolation). Arguments supported by theory/mechanisms shall be provided for projected performance for novel processes and technologies.

Table 1. Data Table for Individual CDR Technologies

	Units	Current Performance	Phase 1:	Phase 3:
CDR Technology				
CDR Technology and Technology Readiness Level (TRL)				
Scale (net CO_2 captured from the atmosphere)	Net tonnes CO_2/yr.			
Scale (gross CO_2 captured from the atmosphere)	Gross metric tons CO_2/yr.			
Total Energy Requirements[1]	GJ/tonne CO_2 removed from atmosphere			
Total Thermal Energy Requirements	GJ/tonne CO_2 removed from atmosphere			
Required Temperature of Thermal Energy	°C			

Total Electricity Energy Requirements	GJ/tonne CO_2 removed from atmosphere			
Volumetric Productivity	gmol CO_2/m^3 capture media/ time; $kgCO_2$/ha/yr; other as appropriate			
CO_2 Capture Percentage From air *(for applicable pathways)*	%			
Energy or Feedstock Source(s)	Material and volume, carbon content, and energy content on a CO_2e tonne removed basis			
Emissions Related to Energy Source	CO_2e tonne/yr.			

[1] Total thermal and electricity requirements encompass the entire process, including pretreatment, process operation, compression, transport, storage and long-term monitoring etc.

Other parameters and units that may be helpful:

- CO_2 Concentration in the Feed Stream (e.g., flue gas, process stream), mol%
- Carbon Capture Efficiency, %
- Co-product generation specs. (rate, purity)
- CO_2 Product Purity, % (if applicable)
- CO_2 Product Oxygen Concentration, mol% (if applicable)
- Relevant Environmental Conditions (temperature, humidity, elevation/partial pressure, air flow rates)
- Storage/utilization mechanism and permanence estimate, yrs
- Uncertainty in net tonnes removed, %
- Land area requirements, km^2
- Details on co-benefits
- Cycle time (if applicable)

Appendix 4: Techno-Economic Analysis (TEA) Guidance

The TEA shall follow the analysis procedures documented in NETL's "Quality Guidelines for Energy System Studies: Performing a Techno-Economic Analysis for Power Generation Plants"[2] to the greatest extent possible. TEA requirements for each phase are shown in the table below:

Phase 1 Submission	Phase 2 Submission
Preliminary TEA	TEA

Adjustments to the guidelines can be made due to the nature of the carbon dioxide removal (CDR) technology being modeled. CDR technologies that include power and heat production integrated with the CDR system should include it in their TEA according to the guidelines. It is highly recommended that the TEA present both the gross CO_2 removed from flue gas for the system configuration presented (relevant to equipment sizing), as well as the net CO_2 removed when accounting for other on-site emission point sources within the total plant boundary (informative for system efficiency relating to CO_2 captured).

As outlined in the document, the required elements of a complete TEA include:

- General block flow diagram identifying all major process equipment for the carbon dioxide removal technology and accompanying stream tables
- Materials and energy balances of the complete process, including electric power requirements, heating and/or cooling requirements, etc.
- System performance summary
- Complete stream tables showing operating pressures, temperatures, compositions, and enthalpies for all streams entering or leaving major process equipment
- Economic analysis, including capital cost estimation and operation and maintenance costs
    - Include a list of equipment used to develop the capital cost estimate, including
        - Key parameters and their value for equipment costing (i.e., height, diameter, heat duty, delta temperature, power, etc.)
        - Individual component cost (i.e., absorber, regenerator, air contactor, etc.)
- Final summary report.

For your reference, the NETL Quality Guidelines document includes additional pertinent information, including, but not limited to:

- Description of common missteps and omissions
- Guidance on system boundaries
- Example performance summary and cost tables.

Sensitivity analysis identifying critical CDR technology and operating parameters and their impact on overall plant performance and economics should be performed. This analysis shall include the sensitivity of cost of electricity and the cost of CDR to the capital cost of the capture, compression, transport and storage/utilization system, as well as the CDR cost as a function of the CDR efficiency and other process parameters of interest.

Involvement of a variety of stakeholders is seen as an important facet to developing an effective carbon capture technology. It is considered critical that a qualified organization with professional experience in performing this type of work conduct the TEA. *This activity shall not be viewed as a training exercise for inexperienced personnel.*

Appendix 5: Life Cycle Analysis (LCA) Guidance

Life cycle analysis (LCA) is an existing framework that is well-suited to evaluate carbon dioxide removal (CDR) systems. By design, LCA provides a holistic perspective of the potential environmental impacts of a product or process throughout its entire lifetime. This includes the extraction of raw materials through end of life. Emissions to the environment (air, water, and land) are translated to a variety of potential impacts ranging from climate change to human health. Two International Organization for Standardization (ISO) standards provide the principles and framework (14040) and requirements and guidelines (14044) for conducting LCA. LCA requirements for each phase are shown in the table below:

Phase 1 Submission	Phase 2 Submission
Preliminary LCA	LCA

Preliminary LCA (Pre-LCA) Discussion:

The pre-LCA is intended to provide a high-level description of life cycle considerations for the CDR technology. If quantitative data are not available, the competitor should provide a qualitative discussion and highlight any major uncertainties and missing information.

LCA:

This effort should result in an LCA that is in conformance with the ISO 14040/14044 standards for the CDR technology. Given the stage of the project, it is expected that there will be significant uncertainty in some portions of the LCA. These should be addressed through evaluation of multiple scenarios and sensitivity analyses, as provided in the technology-specific guidance below.

Refined LCA:

The refined LCA is intended to be a revision of the LCA that reflects any changes as the project design progresses toward completion. At this stage, the competitor should be prepared to assess specific regionalized inputs and scale-up considerations.

Life Cycle Analysis Requirements for CDR Technologies

Pre-LCA

The following information should be provided or discussed qualitatively for the pre-LCA:

- Process
  - High-level carbon balance of the proposed approach
  - Disposition of the captured CO_2–will it be stored underground or utilized in a long-lasting product?
  - Define any co-products that might be produced as part of the CDR operation.
- Energy and Material Inputs
  - Planned sources of energy (electricity and heat)
  - Ranges of energy and material requirements per kg CO_2 captured.
- Impacts
  - Discuss potential co-benefits, including the reduction in criteria air pollutants (CAPs), and harms

LCA

The approach and boundaries for the LCA depend on the ultimate fate of the captured CO_2 based on one of the two following options:

Option 1: In this option, the captured CO_2 from the CDR pilot is sent to saline storage for permanent geologic storage. The majority of the necessary inputs for the LCA should be leveraged from the techno-economic analysis (TEA) (e.g., materials and energy balances, block flow diagrams). The LCA shall be conducted in accordance with the "FECM Best Practices for LCA of Direct Air Capture With Storage (DACS)." Table 5 of the Best Practices document summarizes the requirements.

The following provides additional clarity and specificity for some items in the Best Practices:

- Required data:
    i. Separately report and account for any captured fossil CO_2 (e.g., from on-site fossil fuel combustion) from the captured atmospheric CO_2 for consistency with the functional unit.
    ii. Include technical/physical flow amounts (e.g., kWh of electricity, MJ of heat) as key outputs in addition to the LCA impacts.
    iii. Energy inputs to the facility, including fuels and electricity.
        1. For electricity inputs, a minimum of six scenarios should be modeled corresponding to different grid mix carbon intensities, available in the NETL CO2U OpenLCA LCI Database and the NETL CO2U LCA Documentation Spreadsheet as:
            a. Regional grid consumption mix (modeled as the balancing authority) based on proposed location of hub
            b. Current U.S. grid mix
            c. 100% renewables
            d. 100% grid average coal
            e. 100% natural gas combined cycle (NGCC) with carbon capture
            f. 2050 U.S. grid mix.
        2. For heat inputs, the following scenarios shall be assessed using the data provided by NETL:
            a. Regional source of natural gas
            b. National average natural gas
            c. If external low-grade/waste heat is utilized for the DAC process, describe the source and availability.
    iv. CO_2 transport and saline aquifer storage life cycle inventory values (gate-to-grave emissions data to be used for all projects using saline storage) are available in the NETL CO2U OpenLCA LCI Database and the NETL CO2U LCA Documentation Spreadsheet as "Saline aquifer transport and storage."

- LCA results:
    i. Shall be normalized to 1 kg of CO_2 removed from the atmosphere and permanently stored.
    ii. A contribution analysis shall be provided so that impacts can be differentiated by major operation/input.

- Emissions scope:
    i. The scope of environmental impacts shall include all the impact categories listed in Section 4 of the Best Practices for LCA of DAC. To accomplish this, the environmental inventory will need to include data beyond GHG emissions. Some examples of emissions to include are NO_X and SO_2 emissions to air for acidification and particulate matter of 2.5 microns or less to air for human health particulate, and heavy metals emissions to water for ecotoxicity, A complete list can be found by referring to the US EPA website for TRACI 2.1 (https://www.epa.gov/sites/default/files/2015-12/traci_2_1_2014_dec_10_0.xlsx).
    ii. For GHG emissions, the global warming potential shall be reported using the 100-year global warming potential (GWP) characterization factors as the default values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) and

Sixth Assessment Report (AR6), sensitivity cases using the 20-year GWP values are required:

GHG	AR5 (IPCC 2013)[3]		AR6 (IPCC 2021)[4]	
	100-Year (Default)	20-Year	100-Year (Default)	20-Year
CO_2	1	1	1	1
CH_4	36	85	29.8	82.5
N_2O	298	264	273	273
SF_6	23,500	17,500	25,200	18,300

Note: These GWP characterization factors may be updated by NETL to reflect the latest science.

- Additional Resources – NETL has tools that may be helpful in completing the LCA requirement. These tools are not exhaustive but can be used to provide some life cycle inventory data for some energy and material inputs. The version of tools used for the life cycle analysis should be clearly specified in the report. The following resources are recommended:
    i. FECM Best Practices – Best Practices for LCA of DAC With Storage
    ii. Additional General LCA guidance – CO2U LCA Guidance Document
    iii. NETL Life Cycle Inventory Data – NETL CO2U OpenLCA LCI Database
    iv. Electricity Consumption LCI Data – NETL Grid Mix Explorer.

- LCA submission requirements for phase deliverables:
    i. LCA Report – See CO2U LCA Guidance Document, Chapter 6: "Completing the NETL CO2U LCA Report Template."
    ii. LCA Model with Life Cycle Inventory Data – See the CO2U LCA Guidance Document for modeling guidance (no specific LCA software type is required).
    iii. List of all licensed LCA data used within the model (DOE will confirm or obtain license to access licensed data within the LCA model).

Option 2: If the CO_2 captured from the modeled CDR technology will be utilized to make a product, the LCA shall follow the guidelines set forth in the NETL report "Carbon Dioxide Utilization Life Cycle Analysis Guidance for the U.S. DOE Office of Fossil Energy," known as the CO2U LCA Guidance Document, or simply the guidance document. The guidance document is part of the NETL LCA CO2U Guidance Toolkit, which provides additional support for the creation of the required LCA. The guidance document outlines the analysis requirements and how to use the supporting data and tools. As outlined in the guidance document, the LCA must compare a proposed product system—the supply chain of the proposed CO_2 utilization project—to an appropriate comparison product system using a multiproduct functional unit and system expansion. All materials in the toolkit, including the guidance document, can be accessed at www.netl.doe.gov/LCA/CO2U. In addition to the LCA requirements outlined for Option 1, the following shall also be accounted for:

- Development of a Comparison Product System LCA – The GHG benefits of capture and utilization technologies require a comparison to the current commercial process for developing the same product or service as derived from the carbon utilization product proposed in the project. Guidance on how to develop the comparison product system is contained within the CO2U LCA Guidance Document.

Refined LCA

The refined LCA is intended to reflect any changes in design since the original LCA. All of the steps for modeling and reporting should be consistent with the LCA description above. A qualitative discussion should also be provided to describe a summary of the changes from the LCA. The refined LCA should include:

- Scale-up considerations—economies of scale impacts
- Representation of regionalized sources of energy inputs, including contractual procurements for dedicated sources (e.g., power purchase agreement [PPA])
- Representation of regionalized storage or utilization site.

Appendix 6: Basis for Technology EH&S Risk Assessment

Phase 2 summary CDR credit contract submissions may include a complete environmental, health and safety (EH&S) risk assessment.

The purpose of the EH&S activity is to assess the environmental friendliness and safety of any future process based on the materials and process being proposed under the subject DOE prize. This is a major concern for many CDR technologies being developed today. Exposure to nanoparticles is also coming under increasing scrutiny by the U.S. Environmental Protection Agency (EPA), National Institute for Occupational Safety and Health (NIOSH) and others. The EH&S risk assessments should be conducted by qualified and experienced organizations and professionals (e.g., environmental scientists, industrial hygienists, safety engineers). *Unanticipated or uncontrolled EH&S risks will impede commercialization of CO_2 capture and/or CDR technologies, and the EH&S assessment is a critical element of the development project.*

Required elements for the EH&S Assessment are:

1. All potential ancillary or incidental air and water emissions and solid wastes produced from the proposed technology shall be identified and their magnitude estimated. In addition to materials used, researchers shall consider possible byproducts of side reactions that might also occur in the system, accumulated waste products, and the fate of contaminants from the feed gas stream. Environmental degradation products shall be addressed. Bioaccumulation, soil mobility, and degradability shall be considered. Conditions at the point of discharge shall be examined.
2. If possible, a concise but complete and comprehensible description of the various toxicological effects of the substances identified in (1) above shall be provided. A thorough literature search shall be conducted to examine potential human health effects and ecotoxicity. Where information is lacking for a particular material, it shall be compared to similar substances or classes of substances.
3. Properties related to volatility, flammability, explosivity, other chemical reactivity, and corrosivity shall also be collected from existing databases or if necessary, through direct measurement in cases where the substance is not in common use.
4. The compliance and regulatory implications of the proposed technology shall be addressed with reference to applicable U.S. EH&S laws and associated standards, including the Comprehensive Environmental Response and Liability Act of 1980 (CERCLA), Toxic Substances Control Act (TSCA), Clean Water Act (CWA), Clean Air Act (CAA), Superfund Amendments and Reauthorization Act (SARA) Title III, and the Occupational Safety and Health Act (OSHA).
5. An engineering analysis shall be conducted for any potentially hazardous materials identified to look for ways their use can be eliminated or minimized. Less-hazardous materials should be substituted where possible. For any new materials being proposed, synthetic options shall be examined that may lead to similar, less-hazardous compounds with the required functionality. Possible engineering controls and other mitigation strategies shall be described as appropriate.
6. Precautions for safe handling and conditions for safe storage shall be identified, including any incompatibilities with other materials that may be used in the process. Waste treatment and off-site disposal options shall be examined. Accidental release measures shall also be discussed.

Appendix 7: Energy Data eXchange (EDX) Requirements

DOE is required to improve access to federally funded research results, proper archiving of digital data, and expanded discovery and reuse of research datasets per DOE and executive orders. The Energy Data eXchange (EDX) is a data laboratory developed and maintained by NETL to find, connect, curate, use, and reuse data to advance fossil energy and environmental research and development (R&D).

Data products generated under the resulting award will be required to be submitted in the EDX at https://edx.netl.doe.gov/. Data products include but are not limited to software code, tools, applications, webpages, portfolios, images, videos, and datasets.

EDX uses federation and web services to elevate visibility for publicly approved assets in the system, including connections with DOE's Office of Scientific and Technical Information (OSTI) systems, Data.gov, and Re3Data. This ensures compliance with federal requirements, while raising visibility for researcher's published data products to promote discoverability and reuse.

EDX supports a wide variety of file types and formats including: (1) data, (2) metadata, (3) software/tools, and (4) articles (provided that there is an accompanying Government use license). A partial list of file formats accepted by EDX is provided below, however, EDX is designed for flexibility and accepts all types of file formats.

- Common data product submission formats: ASC, AmiraMesh, AVI, CAD, CSV, DAT, DBF, DOC, DSV, DWG, GIF, HDF, HTML, JPEG2000, JPG, MOV, MPEG4, MSH/CAS/DAT, NetCDF, PDF, PNG, PostScript, PPT, RTF, Surface, TAB, TIFF, TIFF Stacks, TXT, XLS, XML, Xradio, ZIP, and others.
- Geographic formats: APR, DBF, DEM, DLG, DRG, DXF, E00, ECW, GDB, GeoPDF, GeoTIFF, GML, GPX, GRID, IMG, KML, KMZ, MDB, MrSID, SHP, and others.

Information provided to EDX will be made publicly available, unless authorized under the resulting award. Additional information on EDX is available at https://edx.netl.doe.gov/about.

When data products are submitted to EDX, the data product will need to be registered with a digital object identifier (DOI) through OSTI to ensure more visibility in other search repositories (i.e., osti.gov, data.gov, Google Scholar, etc.). The OSTI DOI can be established through an application programming interface (API) by completing just a few additional fields.

The recipient or subrecipient should coordinate with the project manager on an annual basis to assess if there is data that should be submitted to EDX and identify the proper file formats prior to submission. All final data products shall be submitted to EDX by the recipient prior to the completion of the project.

Appendix 8: Technology Maturation Plan (TMP) Template

TECHNOLOGY MATURATION PLAN

for *{insert project title}*

{Date Prepared}

SUBMITTED BY

{Organization Name}

{Organization Address}

{City, State, Zip Code}

TEAM CAPTAIN

{Name}

{Phone Number}

{E-mail}

SUBMITTED TO

U.S. Department of Energy

This plan should be formatted to include the following sections, with each section to include the information described below:

A. TECHNOLOGY READINESS LEVEL

- Using the technology readiness levels (TRLs) in Appendix 9, specify the current TRL of the proposed technology. Note that to be at a certain TRL, all of the descriptions must be met. The application must provide a clear technical write-up describing the state of the proposed technology and use TRL description-based activities to justify the TRL score assigned.
- Provide a one-paragraph description of the target commercial application(s).

B. PROPOSED WORK

- Relate the proposed project work to the maturation of the proposed technology.
- List known performance attributes and their performance requirements to the extent possible. Explain how the performance requirements were determined (i.e., from FOAs; program plans; technology road maps; need to surpass the current state of the art). Be as specific as practical on any supporting technical/economic assessments.

- Define the TRL that is anticipated at the end of the project and describe how the project objectives will meet the TRL description if the project is successful.

C. POST-PROJECT PLANS

- Describe known post-project work needed to attain the next TRL. Explain why that work is not part of the proposed project, and why the project end point sets the best foundation practical for the next phase of work. To the extent practical, include market assessments and deployment strategies.

Appendix 9: Definition of Technology Readiness Levels (TRLs)

The following is a description of the DOE technology readiness levels.

Relative Level of Technology Development	TRL	TRL Definition	Description
System Operations	9	Actual system operated over the full range of expected mission conditions.	The technology is in its final form and operated under the full range of operating mission conditions. Examples include using the actual system with the full range of wastes in hot operations.
System Commissioning	8	Actual system completed and qualified through testing and demonstration.	The technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental testing and evaluation of the system with actual waste in hot commissioning. Supporting information includes operational procedures that are virtually complete. An Operational Readiness Review (ORR) has been successfully completed prior to the start of hot testing.
	7	Full-scale, similar (prototypical) system demonstrated in relevant environment.	This represents a major step up from TRL 6, requiring demonstration of an actual system prototype in a relevant environment. Examples include testing full-scale prototype in the field with a range of simulants in cold commissioning (1). Supporting information includes results from the full-scale testing and analysis of the differences between the test environment, and analysis of what the experimental results mean for the eventual operating system/environment. Final design is virtually complete.
Technology Demonstration	6	Engineering/ pilot-scale, similar (prototypical) system validation in relevant environment.	Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. Examples include testing an engineering scale prototypical system with a range of simulants. Supporting information includes results from the engineering-scale testing and analysis of the differences between the engineering scale, prototypical system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. TRL 6 begins true engineering development of the technology as an operational system. The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the operating system. The prototype should be capable of performing all the functions that will be required of the operational system. The operating environment for the testing should closely represent the actual operating environment.

Technology Development	5	Laboratory scale, similar system validation in relevant environment.	The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. Examples include testing a high-fidelity, laboratory-scale system in a simulated environment with a range of simulants (1) and actual waste (2). Supporting information includes results from the laboratory scale testing, analysis of the differences between the laboratory and eventual operating system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. The major difference between TRL 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical.
Technology Development	4	Component and/or system validation in laboratory environment.	The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of ad hoc hardware in a laboratory and testing with a range of simulants and small-scale tests on actual waste. Supporting information includes the results of the integrated experiments and estimates of how the experimental components and experimental test results differ from the expected system performance goals. TRL 4–6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system. The laboratory system will probably be a mix of on-hand equipment and a few special purpose components that may require special handling, calibration, or alignment to get them to function.
Research to Prove Feasibility	3	Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development (R&D) is initiated. This includes analytical studies and laboratory-scale studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative tested with simulants. Supporting information includes results of laboratory tests performed to measure parameters of interest and comparison to analytical predictions for critical subsystems. At TRL 3, the work has moved beyond the paper phase to experimental work that verifies that the concept works as expected on simulants. Components of the technology are validated, but there is no attempt to integrate the components into a complete system. Modeling and simulation may be used to complement physical experiments.
Basic Technology Research	2	Technology concept and/or application formulated.	Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are still limited to analytic studies. Supporting information includes publications or other references that outline the application being considered and that provide analysis to support the concept. The step up from TRL 1 to TRL 2 moves the ideas from pure to applied research. Most of the work is analytical or paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.

	1	Basic principles observed and reported.	This is the lowest level of technology readiness. Scientific research begins to be translated into applied R&D. Examples might include paper studies of a technology's basic properties or experimental work that consists mainly of observations of the physical world. Supporting information includes published research or other references that identify the principles that underlie the technology.

1 Simulants should match relevant chemical and physical properties.

2 Testing with as wide a range of actual waste as practicable and consistent with waste availability, safety, ALARA, cost, and project risk is highly desirable.

Source: U.S. Department of Energy. 2011. "Technology Readiness Assessment Guide." Office of Management.

Appendix 10: Community Benefits Plan (CBP) Guidance

Prize competitors will be required to develop a CBP to ensure that federal investments advance the following four goals: (1) investing in the American workforce, (2) advancing diversity, equity, inclusion, and accessibility (DEIA), (3) Justice40 Initiative, and (4) community and labor engagement. The below sections set forth the CBP requirements for each of these goals.

Investing in the American Workforce (IAW)

Quality jobs are the key to attracting and retaining the appropriately skilled, trained, or credentialed workforce required to meet the CDR Purchase Pilot Prize objectives. New jobs should be supported by workforce development activities to build a stable skilled and trained workforce that will meet project labor needs at all stages of maturation.

The purpose of this section is to lay the groundwork for developing a robust IAW section as part of a CBP. This section includes a preliminary IAW assessment, which outlines workforce needs and relevant labor unions, job creation, and any negative workforce impacts of the project. This section also includes descriptions of research, partners, timeline, personnel, and resources required to develop the IAW section of a full CBP.

Elements of the IAW section include:

1. A **preliminary IAW assessment** that includes:
    a. An assessment of **workforce needs and labor unions** representing workers or trades that will be needed for technology development, prototyping, testing, business development, and commercialization.
    b. An assessment of the **jobs that will be created**, the occupational distribution, and skills or knowledge gaps that will need to be filled, and, if applicable, the training programs with whom the competitor could work to fill those gaps. Project teams should outline recruitment strategies and projected hires by occupation and assess job growth and workforce development opportunities associated with the proposal. A collective bargaining agreement, labor-management partnership, or other similar agreement would provide evidence of such a plan. Alternatively, competitors may describe:
        i. wages, benefits, and other worker supports to be provided benchmarking against prevailing wages for construction and local median wages for other occupations;
        ii. commitments to invest in workforce education and training, including measures to reduce attrition, increase productivity from a committed and engaged workforce, and support the development of a resilient, skilled, and stable workforce for the project; and
        iii. efforts to engage employees in the design and execution of workplace safety and health plans.
    c. A description of employees' ability to organize, bargain collectively, and participate, through labor organizations of their choosing, in decisions that affect them contributes to the effective conduct of business and facilitates amicable settlements of any potential disputes between employees and employers, providing assurances of project efficiency, continuity, and multiple public benefits. In the description, explain whether workers can form and join unions of their choosing, and how they will have the opportunity to organize with the purposes of exercising collective voice in the workplace.
    d. If applicable, an assessment of **any anticipated negative impacts on the workforce**, such as worker displacement resulting from this project, disruption to existing collective bargaining agreements, reduction in wages and benefits, etc.

2. A **description of research** that will need to be done to develop a detailed plan, including resources and data sets needed to successfully recruit and retain skilled labor within the project team.
3. A **description of any labor partners** who may be interested in collaborating on or learning about the plan.
4. A **timeline** for developing the plan, including appropriate milestones.
5. A **description of personnel** who will work on the plan, including trainings or qualifications that may need to be acquired.
6. An **estimate of financial resources** required for developing the plan.

Diversity, Equity, Inclusion, and Accessibility (DEIA)

Competitors should submit a DEIA section within the CBP that describes the actions the competitor will take, if selected for the award, to foster a welcoming and inclusive environment, support people from groups underrepresented in science, technology, engineering, and mathematics (STEM) and/or applicable workforces, advance equity, and encourage the inclusion of individuals from these groups in all phases of the project. The section should detail how the competitor will partner with underrepresented businesses, educational institutions, and training organizations that serve workers who face barriers to accessing quality jobs, and/or other project partners to help address DEIA.

Minority-serving institutions, minority business enterprises, minority-owned businesses, woman-owned businesses, veteran-owned businesses, Tribal Colleges and Universities, community-based groups, faith-based organizations, or entities located in an underserved community are encouraged to participate on the application team.

Elements of the DEIA plan should include the following:

1. **Background**. Describe prior and ongoing efforts by the project team relevant to DEIA, based on findings from an initial assessment that examines the context of DEIA in organizations related to the project team.
2. **Strategies, Milestones, and Timelines**. Describe targeted DEIA outcomes and implementation strategies, including milestones; include a DEIA schedule for execution; and address accountability measures. Milestones and work descriptions should be included within the schedule and workplan. Competitors are encouraged to use SMART (specific, measurable, achievable, relevant, and timely) milestones whenever possible.
3. **Resource Summary**. Describe project resources dedicated to implementing DEIA activities, including staff, facilities, capabilities, and budget. To fill open positions for the DOE-funded project, partner with workforce training organizations serving under-represented communities and those facing systemic barriers to quality employment such as those with disabilities, returning citizens, opportunity youth, and veterans; In addition, competitor should consider providing comprehensive support services to increase representation and access in project's construction and operations jobs.

For the Phase 2 submission, teams will be required to demonstrate their technology and consider deployment locations. Hence, teams should include contributions to the Justice40 Initiative and are encouraged to consider community and labor engagement as well.

Justice40 Initiative

Executive Order 14008 created the Justice40 Initiative[27], which sets a goal that 40% of the overall benefits of certain federal climate, clean energy, and other investments flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution. Recipients of DOE funds should ensure that performance of project tasks within disadvantaged communities meaningfully benefits disadvantaged communities and does not result in increased burden to the disadvantaged community.

The purpose of this section is to lay the groundwork for developing a robust Justice40 section as part of a CBP. This section includes a preliminary Energy and Environmental Justice Assessment, which outlines groups and communities affected by the project and project impacts (benefits and negative impacts). This section also includes descriptions of research, partners, timeline, personnel, and resources required to develop the Justice40 Section of a full CBP.

Elements of the Justice40 Initiative section include:

1. A **preliminary Energy and Environmental Justice Assessment** that includes:
    - An analysis of **communities, including disadvantaged communities**, that will be affected by the project. Applicants should use the Climate and Economic Justice Screening Tool (CEJST), a geospatial mapping tool by the White House Council on Environmental Quality, as the primary tool to identify disadvantaged communities. In addition, disadvantaged communities include all Federally Recognized Tribes, whether or not they have land. See https://www.whitehouse.gov/wp-content/uploads/2023/01/M-23-09_Signed_CEQ_CPO.pdf. Applicants are encouraged to use the information available through tools such as the Environmental Protection Agency's EJSCREEN to assist in assessing how the benefits of a project will reverse or mitigate the burdens of disadvantaged communities. Specify what tools were used.
    - An overview of analyses needed to assess the likely **benefits and negative impacts** that can be anticipated based on project design, prior experience, or readily available data. Specify what methodology/data sources were used.
        - Benefits include (but are not limited to) measurable direct or indirect investments or positive project outcomes that achieve or contribute to the following in disadvantaged communities: (1) a decrease in energy burden; (2) a decrease in environmental exposure and burdens; (3) an increase in access to low-cost capital; (4) an increase in high-quality job creation, the clean energy job pipeline, and job training for individuals; (5) increases in clean energy enterprise creation and contracting (e.g., minority-owned or disadvantaged business enterprises); (6) increases in energy democracy, including community ownership; (7) increased parity in clean energy technology access and adoption; and (8) an increase in energy resilience.
    - A discussion of anticipated negative and cumulative environmental impacts on disadvantaged communities. Are there anticipated negative or positive environmental

[27] The Justice40 initiative, established by Executive Order (E.O.) 14008 Tackling the Climate Crisis at Home and Abroad, sets a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities. Pursuant to E.O. 14008 and the Office of Management and Budget's Interim Justice40 Implementation Guidance M-21-28 and M-23-09 (https://www.whitehouse.gov/wp-content/uploads/2023/01/M-23-09_Signed_CEQ_CPO.pdf and https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf)), DOE recognizes disadvantaged communities as defined and identified by the White House Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST), located at https://screeningtool.geoplatform.gov/. DOE's Justice40 Implementation Guidance is located at https://www.energy.gov/sites/default/files/2022-07/Final%20DOE%20Justice40%20General%20Guidance%20072522.pdf

impacts associated with the project, and how will the competitor mitigate any negative impacts? Within the context of cumulative impacts created by the project, competitors should use Environmental Protection Agency EJSCREEN tool to quantitatively discuss existing environmental impacts in the project area. See EJScreen: Environmental Justice Screening and Mapping Tool | US EPA.

2. A **description of research** that will need to be done to develop a detailed plan, including scoping data sources for incorporation into the plan (existing data sources as well as data sets that need to be developed).
3. A **description of any partners serving disadvantaged communities** who may be interested in collaborating on or learning about the plan.
4. A **timeline** for developing the plan, including appropriate milestones. A description of how and when anticipated benefits are expected to flow to disadvantaged communities. For example, will the benefits be provided directly within the disadvantaged community(ies) identified in the Justice40 Initiative section, or are the benefits expected to flow in another way? Further, will the benefits flow during project development or after project completion, and how will competitor track benefits delivered?
5. A **description of personnel** who will work on the plan, including trainings or qualifications that may need to be acquired.
6. An **estimate of financial resources** required for developing the plan.

Community and Labor Engagement

Community and labor engagement relates to the competitor's plans and actions to engage with community stakeholders, including community-based organizations representing residents and businesses, labor unions and worker organizations, local government, emergency responders, communities with environmental justice concerns, and relevant Tribes/Alaska Native Corporations (ANCs). Communities involve both local communities—towns, cities, or counties in geographic proximity to a project and Tribes/ANCs in close proximity to a project—and potentially broader groups that experience common conditions, which will need to be identified and scoped as part of the engagement plan. Successful competitors will demonstrate the ability to develop a plan that would meet the intent of meaningful community and labor engagement.

Community and labor engagement should ideally lay the groundwork for the eventual negotiation of Workforce and Community Agreements, which could take the form of one or more kinds of negotiated agreements with communities, labor unions, or, ideally, both. Registered apprenticeship programs, labor-management training partnerships, quality pre-apprenticeship programs, card check neutrality, and local and targeted hiring goals are all examples of provisions that Workforce and Community Agreements could cover that would increase the success of a DOE-funded project.

Competitors should also provide Community and Labor Partnership Documentation from representative organizations reflecting substantive engagement and feedback on competitor's approach to community benefits including job quality and workforce continuity; diversity, equity, inclusion, and accessibility; and the Justice40 Initiative detailed below.

Elements of the Community and Labor Engagement Section include:

1. A preliminary Engagement Assessment that includes:
    a. A description of prior engagement efforts by the project team to engage communities, Tribes, and labor stakeholders. If applicable, provide an assessment of and evidence of (e.g., letters of support, memorandums of understanding (MOUs), etc.) existing labor and

community support for and/or concerns with the project, including a description of steps taken to gather this information.

   b. A description of what project or technical aspects of the proposed project could be modified based on future engagement, including a discussion of whether there is a pathway for the project to consider changing target site(s) based on social considerations.
   c. A description of plans for any novel governance or financing structures, oversight mechanisms, or other mechanisms to maximize localized benefits.

2. A description of research that will need to be done to develop a detailed plan, including scoping data sources for incorporation into the plan (existing data sources, as well as data sets that need to be developed).
3. A description of resources, references, or community partners that will be useful in developing the plan.
4. A timeline for developing the plan, including appropriate milestones.
5. A description of personnel who will work on the plan, including training or qualifications that may need to be acquired.
6. An estimate of financial resources required for developing the plan.

Appendix 11: Measurement, Reporting and Verification (MRV) Plan

Prize competitors will be required to develop a robust MRV plan that adheres to and adapts to the best available scientific principles for their proposed CDR technology approach. The MRV plan should describe the activities that will be performed to directly monitor the carbon removal during the entirety of project operation as well as the securely stored carbon after the project operations have been concluded, for at least 50 years. Proposals that contain the most comprehensive MRV plans will be prioritized to reflect the robust monitoring requirements for high quality carbon removals outlined in DOE's Carbon Negative Shot. The below sections set forth the core components that must be addressed in the submission's MRV plan.

Monitoring and Measurement Requirements

The baseline scenario that the CDR project will be evaluated against should be clearly defined and justified. Competitors should describe the project and/or region-specific measurement tools, sensors and/or models that will be employed to quantify (1) dynamic baseline CO_2 fluxes, (2) emissions from the mitigation activity, (3) CO_2 drawdown, (4) CO_2 stored in a qualified reservoir and (5) potential physical leakage from the reservoir. It is expected that any calibration procedures associated with these measurements will be discussed in the MRV plan. Whenever possible, multiple quantification tools and sensors should be employed to monitor relevant CO_2 fluxes (e.g., gaseous, aqueous and/or solid), with confirmations provided through the incorporation of relevant models. In the event that acquiring measurement data is not physically possible for a CDR project, competitors must provide a compelling justification and describe the effect on the associated uncertainty with the CDR delivery to the DOE. Citations to peer-reviewed scientific literature and/or methodologies should be provided to reflect the credibility of the key assumptions and measurement principles employed in the MRV plan.

Though not the explicit focus of the MRV plan, competitors should identify at least 3 potential environmental harms along with reasonable and quantifiable hazard identification criteria (e.g., heavy metal concentration, particulate matter exposure, volatile organic compound levels etc.). Additionally, competitors must describe mitigation mechanisms that will be enacted in the event that the hazard identification thresholds are exceeded as a result of the CDR project activities.

Reporting Requirements

Competitors should explicitly mention the duration of removal operations and storage periods (i.e., permanence). From the results of the cradle-to-grave lifecycle analysis, competitors should clearly delineate the boundaries and net-negativity of the CDR project using a simplified block flow diagram which identifies on-site emissions, gross removals and the emissions associated with any upstream (e.g., materials and/or energy sourcing) and/or downstream processes (e.g., CO_2 purification, compression, transport, utilization and/or storage). The block flow diagram should include the uncertainty associated with any reported CO_2 flux estimates.

Competitors should develop and outline a plan for transparently reporting, on a recurring basis, the uncertainty associated with CO_2 drawdown and subsequent storage permanence, based on conservative calculations. Additionally, competitors should outline how this uncertainty will affect the net tonnes delivered and/or cost of the CDR offered to the DOE, as well as potential process uncertainties which can be directly reduced through completion of the proposed project.

Verification Requirements

It is imperative that competitors describe their plans for obtaining at least 2 independent reviews of their CDR project by third-party validation and verification bodies. Verification should ensure that storage of CO_2 is compliant with Underground Injection Control (UIC) Class VI permitting requirements, or regulatory requirements for an equivalent storage mechanism.[28] Additionally, the MRV plan must discuss the transfer of responsibility of the stored CO_2 after successful project completion and the use of any relevant insurance mechanisms.

Criteria for MRV Provider Approval

During Phase 1, it is expected that all CDR Purchase Concept Proposals will provide at least one independent MRV service provider. These service providers may include non-profits, government agencies, national laboratories, institutions of higher-education, private companies, or other entities capable of evaluating and verifying the CDR supplied by the project in a rigorous and unbiased manner. The MRV provider must be an entity separate from the competitor. Along with the Phase 1 submission package, reviewers will evaluate the merits, credibility, and eligibility of proposed independent MRV providers as well as the proposed MRV methodology. Following Phase 1 and prior to the commencement of Phase 2, DOE will issue official prize rules for Phases 2 and 3, including a list of approved MRV providers. Metrics reviewers and DOE will leverage to evaluate the eligibility and credibility of independent MRV providers include, but are not limited to:

- Proven technical and financial resources sufficient to fulfill the measurement and verification requirements of the proposed protocols;
- Breadth and depth of technical expertise including experience providing MRV services for other non-DOE purchasers;
- Independence from the competitor and legal protection for perverse incentives;
- Experience and demonstrated success in providing verification for regulatory or compliance markets for CDR or comparable emissions accounting benefits; and
- Adequate equipment, facilities, and operational capacity to meet the demands of the proposed MRV methodology.

[28] For more information about the UIC Class VI permitting requirements, refer to https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-carbon-dioxide

Appendix 12: Public Comment on Draft Prize Rules Guidance

All comments on the prize rules for Phases 2 and 3 of the CDR Purchase Pilot Prize are due by 10/31/23 and must follow these guidelines:

- Comments must be submitted as a document readable by Microsoft Word
- Comments may not exceed 2 pages, single spaced, in 12-point font
- Comments must reference specific sections, subsections, and headers within the CDR Purchase Pilot Prize rules document
- Comments may only pertain to Phases 2 and 3 of the CDR Purchase Pilot Prize. Comments discussing Phase 1 will not be considered.
- Comments must be sent to dacprizes@nrel.gov on or before 10/31/23

FECM and NREL will consider the comments submitted and may revise the rules for Phases 2 and 3 of this Prize. DOE will issue Official Prize Rules for Phases 2 and 3 following the completion of Phase 1.

Appendix 13: Waiver for Foreign Entity Participation

Waiver for Foreign Entity Participation

Many of the technology areas DOE funds fall in the category of critical and emerging technologies (CETs). CETs are a subset of advanced technologies that are potentially significant to U.S. national and economy security.[29] For projects selected under this prize, all recipients and subrecipients must be organized, chartered or incorporated (or otherwise formed) under the laws of a state or territory of the United States; have majority domestic ownership and control; and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Waiver Criteria

Foreign entities seeking to participate in a project funded under this FOA must demonstrate to the satisfaction of DOE that:

a) Its participation is in the best interest of the U.S. industry and U.S. economic development;
b) The project team has appropriate measures in place to control sensitive information and protect against unauthorized transfer of scientific and technical information;
c) Adequate protocols exist between the U.S. subsidiary and its foreign parent organization to comply with export control laws and any obligations to protect proprietary information from the foreign parent organization;

[29] See Critical and Emerging Technologies List Update (whitehouse.gov)

d) The work is conducted within the U.S. and the entity acknowledges and demonstrates that it has the intent and ability to comply with the U.S. Manufacturing Plan; and
e) The foreign entity will satisfy other conditions that may be deemed necessary by DOE to protect U.S. government interests.

Content for Waiver Request

A Foreign Entity waiver request must include the following:

a) Information about the entity: name, point of contact, and proposed type of involvement with the Institute;
b) Country of incorporation, the extent of the ownership/level control by foreign entities, whether the entity is state owned or controlled, a summary of the ownership breakdown of the foreign entity and the percentage of ownership/control by foreign entities, foreign shareholders, foreign state or foreign individuals;
c) The rationale for proposing a foreign entity participate (must address criteria above);
d) A description of the project's anticipated contributions to the U.S. economy;
   - How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
   - How the project will promote domestic American manufacturing of products and/or services;
e) A description of how the foreign entity's participation is essential to the project;
f) A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
g) Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request foreign work waiver).

DOE may also require:

- A risk assessment with respect to IP and data protection protocols that includes the export control risk based on the data protection protocols, the technology being developed and the foreign entity and country. These submissions could be prepared by the project lead, but the prime recipient must make a representation to DOE as to whether it believes the data protection protocols are adequate and make a representation of the risk assessment – high, medium or low risk of data leakage to a foreign entity.
- Additional language be added to any agreement or subagreement to protect IP, mitigate risk or other related purposes.

DOE may require additional information before considering the waiver request.

The applicant does not have the right to appeal DOE's decision concerning a waiver request.

Waiver for Performance of Work in the United States (Foreign Work Waiver)

As set forth in Section 3.2., **at least 100%** of the work under these funding agreements must be performed in the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of DOE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. ("foreign work");
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
- The associated benefits to be realized and the contribution to the project from the foreign work;
- How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

DOE may require additional information before considering the waiver request.

The applicant does not have the right to appeal DOE's decision concerning a waiver request.