



Commercial Direct Air Capture Prize

Carbon Dioxide Removal Purchase Pilot Prize

Modification 4:

Phase 2 and Phase 3 Official Rules

6/11/24

Modification 1 included the following:

- Clarification about the number of images, graphs, and figures allowed in Phase 1 submissions
- Clarification about the life cycle assessment (LCA) and techno-economic analysis (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 included the following:

- Removal of 1,000 tonnes per year delivery requirement
- Clarification of Phase 2 and Phase 3 timelines
- Clarification of Phase 1 TEA requirements
- Implicit carbon dioxide removal (CDR) credit price may be lower than levelized cost per tonne

Modification 4 includes the following:

- Revisions to Sections [1](#) and [2](#)
- Phase 2 Official Rules
- Phase 3 Official Rules
- Updated Appendices [1](#), [5](#), [6](#), and [12](#)

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1 Carbon Dioxide Removal Purchase Pilot Prize Executive Summary

The U.S. Department of Energy's (DOE's) Carbon Dioxide Removal (CDR) Purchase Pilot will provide up to \$35 million in cash prizes to private entities and academic institutions that provide verified carbon dioxide removal credits ("CDR credits") to DOE. Competitors in the CDR Purchase Pilot Prize are commercial technology developers; licensors and engineering, procurement, and construction firms; nongovernmental organizations, higher education institutions, and other eligible entities developing eligible technologies.

This is the Official Rules document for the American-Made CDR Purchase Pilot Prize ("CDR Purchase Pilot" or "Purchase Pilot Prize"). This prize is the first U.S. government initiative to purchase CDR credits directly from domestic technology providers. As acknowledged by global analyses such as the Intergovernmental Panel on Climate Change 1.5 °C Special Report, CDR approaches that remove historic carbon dioxide (CO₂) directly from the atmosphere are a critical aspect of meeting climate goals. This CDR Purchase Pilot Prize initiates a competition that will 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. Goals of the CDR Purchase Pilot Prize also include helping to shape a domestic market for CDR credits and evaluating the potential role of the U.S. government in this market.¹ In August 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 the Bipartisan Infrastructure Law [BIL]).²

1.1 Prize Phases

This Prize will have three phases:

1. **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. A CDR Credit Concept Proposal should summarize a brief (12 pages) concept CDR purchase proposal, consistent with the requirements of [Section 4](#).
2. **Phase 2 (12 months)** – Only winners selected in Phase 1 of the CDR Purchase Pilot Prize ("semifinalists") will be eligible to compete in Phase 2 of the Prize. During Phase 2, semifinalists will work to translate their Phase 1 CDR Credit Concept Proposal into a complete project proposal and a detailed design of a **CDR Credit Purchase Agreement**. Phase 2 competitors will compete for up to ten (10) \$375,000 cash prizes.

¹ A **carbon dioxide removal credit** is used to represent a net tonne of CO₂e captured from the atmosphere or upper hydrosphere and securely stored as a direct result of a CDR project.

² [Notice of Intent to Issue Funding Opportunity: Carbon Negative Shot Pilots | Department of Energy](#)

Phase 2 will have two parts. In Part 1, competitors will draft and submit a binding offer to DOE for the purchase of CDR credits within the Purchase Pilot Prize timeline. Up to ten teams will be selected to participate in Phase 2 Part 2. In Part 2, competitors will enter a CDR Credit Purchase Agreement negotiation period prior to Phase 3 delivery of CDR credits. See [Section 6.7](#) for additional information.

3. **Phase 3 (36 months)** – Only winners of Phase 2 Part 2 (“finalists”) are eligible to compete in Phase 3. During Phase 3, finalists will **deliver the permanent CDR credits committed to DOE** on the scheduled timeline, terms, and conditions established in the revised CDR Credit Purchase Agreement developed and mutually agreed upon during Phase 2 Part 2. In addition to fulfilling their CDR delivery commitment to DOE, Phase 3 competitors will implement community benefits plans (CBPs). Finalists will also demonstrate that their CDR credits have been purchased by external parties under terms and conditions that align with the CDR Credit Purchase Agreement outlined in the Phase 2 submission package.

1.2 Prize Awards

For each phase, cash prizes will be awarded to the winners:

	Number of Winners	Cash Prize Available for Each Winner	Total
Phase 1	Up to 25	\$50,000	\$1,250,000
Phase 2	Up to 10	\$375,000	\$3,750,000
Phase 3	Up to 10	CDR Purchase Agreements: up to \$3,000,000	\$30,000,000

1.3 Prize Timeline

All dates are subject to change at the sole discretion of NREL and DOE.

- **Phase 1 Opens:** 9/29/23
- **Phase 1 Closes:** 12/14/23
- **Phase 1 Winners Announcement:** 5/28/24
- **Phase 2 Part 1 Opens** (subject to change): 6/12/2024
- **Phase 2 Part 1 Closes** (subject to change): 2/10/25
- **Phase 2 Part 1 Winners Announcement** (subject to change): 5/7/25
- **Phase 2 Part 2 Opens** (subject to change): 5/7/25
- **Phase 2 Part 2 Closes** (subject to change): 9/11/25
- **Phase 2 Part 2 Winners Announcement** (subject to change): 12/8/25
- **Phase 3 Opens** (subject to change): 12/8/25
- **Phase 3 Closes** (subject to change): 12/11/28

1.4 Areas of Interest (AOI)

This prize is open to competitors across four CDR technology pathways (“Areas of Interest”):

1. Direct air capture (DAC)
2. Biomass carbon removal and storage (BiCRS)
3. Enhanced carbon mineralization
4. Planned or managed carbon removal activities, including natural and artificial.

Definitions for each AOIs are included in Appendix 1: Glossary of Terms.

DOE encourages a wide range of competitors 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, monitoring, reporting, and verification (MMRV) protocols.³

2 Background

2.1 Direct Air Capture Prizes Overview

In 2021, DOE launched the Carbon Negative Shot as part of its Energy Earthshot initiative. By 2032, the initiative aims to develop and advance pathways and technologies that remove CO₂ from the atmosphere and securely store it at gigaton scales for less than \$100/net metric ton (tonne) of carbon dioxide-equivalent (CO₂e), a cost that includes MMRV and secure storage. The Carbon Negative Shot is the U.S. government's first major effort in CDR and is a DOE-wide call for crosscutting innovation and commercialization of a wide range of CDR pathways. CDR is a CO₂ waste management service, and it will be important to assess and pilot demand-side policy mechanisms such as government purchasing.

Additionally, in 2021, President Biden signed the Infrastructure Investment and Jobs Act (Public Law 117-58), also known as the BIL.⁴ The BIL authorizes and appropriates a total of up to \$115 million for the development and execution of 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)).⁵ 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 development of a CDR purchasing market supports the Biden administration's decarbonization goals of a 50%–52% net reduction in greenhouse gases (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

³ **Measurement, Monitoring, Reporting, and Verification (MMRV)** refers to the degree to which the CO₂ removal can be accurately monitored and validated. More specifically, this involves layered and tailored activities, such as quantifying CO₂ drawdown and storage based on collected measurements of carbon (and other greenhouse gas, as applicable) stocks and flows, analyzing and/or modeling the effective CDR permanence duration and risk of reversal in response to realistic external stimuli, reliably providing CO₂ measurement data and information, including methods for sampling, collection, and harmonization, in a usable and transparent format to enable ongoing auditing throughout the project lifetime, and obtaining an independent third-party scientific validation of the CO₂ removal methodology and project.

⁴ 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>.

⁵ 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)).

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 2050.⁶ CDR technologies capture CO₂ 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 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 2023.⁷ 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, including the Regional DAC Hubs Program.⁸ 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 carbon credit purchase agreements supplied across four AOIs. Winners of the CDR Purchase Pilot Prize will receive cash prizes for independently verified CDR credits successfully delivered to DOE. When it is launched, the Commercial DAC Pilot Prize will provide awards over multiple phases to construct first-of-a-kind DAC pilot facilities with the capacity to capture at least 500 tonnes of CO₂ from the atmosphere per year.

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.⁹ The CDR Pilot Purchase Prize represents the first time the U.S. Federal Government will purchase high-quality CDR credits from commercial-scale domestic suppliers, providing a novel and competitive government demand signal for domestic CDR and a historic milestone in the development of a national CDR market.¹⁰ 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 permanently removing carbon.

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

⁶ [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.

⁷ [Direct Air Capture Pre-Commercial Technology Prize | Department of Energy](#)

[Direct Air Capture Pre-Commercial EPIC Prize | Department of Energy](#)

⁸ [Regional Direct Air Capture Hubs | Department of Energy](#)

⁹ "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).

¹⁰ 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.

Purchase Pilot Prize. Throughout the three phases of the CDR Purchase Pilot Prize, up to \$35 million in cash prizes will be distributed to competitors that 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 MMRV methodology development and implementation.

The prize aims to complement the other research, development, and demonstration efforts at DOE to advance the Carbon Negative Shot target of less than \$100 per net tonne of permanent CO₂e removed with the capacity to reach gigatonne scale inclusive of robust carbon accounting and rigorous MMRV. The AOIs eligible for 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 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. Prize competitors 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 CBP. Competitors selected to compete as semifinalists will develop a complete CBP, which will be reviewed and scored. To receive finalist awards for their proposed purchase agreements, teams will be required to implement the CBP, which includes input and feedback from local communities. Successful competitors will consider and appropriately manage the air, water, and energy; make workforce investments; and deliver other social benefits as part of their projects. Consistent with the Biden-Harris Administration's commitment to Justice40¹¹ through the BIL, successful competitors will develop and implement CBPs that effectively distribute economic, environmental, and other benefits to disadvantaged communities.

3 Eligibility

Competitors in the CDR Purchase Pilot Prize are commercial technology developers, licensors, and engineering, procurement, and construction firms; non-governmental organizations; higher education institutions; and other eligible entities. DOE encourages a wide range of competitors 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

¹¹ 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>

MMRV protocols. A single competitor may only submit one submission per AOI. Competitors submitting proposals to more than one AOI must indicate that they have submitted multiple submission packages to the CDR Purchase Pilot Prize.

3.1 Eligible Competitors

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.
- Nonprofit entities must be based in the United States.

Eligible competitors (CDR providers) must offer CDR within one of the defined AOIs. Each of the four AOIs is defined in [Appendix 1: Glossary of Terms](#). Carbon dioxide must be removed and sequestered within the United States, including Tribal Nations and U.S. Territories or associated federal or state waters.

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 Phase 1) are eligible to compete in Phase 2 Part 1.
- Only winners of Phase 2 Part 1 are eligible to compete in Phase 2 Part 2.

Phase 3 Eligibility

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

3.2 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.¹² 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.

¹² 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. Currently, the list of countries of risk includes Russia, Iran, North Korea, and China.

4 Program Requirements

All competitors in the CDR Purchase Pilot Prize must address the following Program Requirements:

- A. **Independently Verified Removal:** Competitors who successfully advance to Phases 2 and 3 of the CDR Purchase Pilot Prize will be responsible for submitting, refining, resubmitting, and obtaining DOE approval of an independent third-party MMRV Implementation Partner. The Implementation Partner, and the MMRV methodology utilized by the Implementation Partner should be consistent with the requirements in [Appendix 12: Measurement, Monitoring, Reporting, and Verification Plan](#). [Appendix 12](#) provides criteria for reviewer assessment of independent MMRV providers. Phase 1 will provide competitors an opportunity to propose multiple MMRV Implementation Partners to verify the removals associated with Phase 2 submission package. Following the review of Phase 2 Part 1 submission packages, DOE will issue a list of approved MMRV Implementation Partners by AOI.
- B. **Incorporate Societal Considerations and Impacts:** Competitors must propose CDR technologies that consider and minimize any negative impacts in addition to advancing environmental, public health, and social benefits. Phase 1 CDR Credit Concept Proposals 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 CDR Credit Concept Proposal should briefly describe the rationale for selecting the site, including socioeconomic and demographic, environmental and health, 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 11](#).
 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 environment, health, and safety risks or other negative impacts that may result from the proposed CDR credit, including disbenefits to communities. Details regarding CBP expectations and scoring are located within [Appendix 11: Community Benefits Plan Guidance](#).
 2. **Diversity, Equity, Inclusion, and Accessibility (DEIA):** The competitor develops a CBP for the proposed CDR project(s) that would provide CDR credits to DOE. Eligible CDR credit proposals submitted by competitors during all phases of the Prize must be located within the United States. The CBP should address environmental benefits and risks, economic development, 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, hazards, and training standards you will incorporate to ensure worker and public safety.

- C. **Additionality:** Competitors must demonstrate that the net removal of CO₂ 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 DOE, consistent with the definition provided in [Appendix 1: Glossary of Terms: Additionality](#). This includes demonstrating that:
1. The activity yielding a net removal of CO₂ was not a requirement or legal mandate of a governmental regulatory requirement.
 2. The activity was not already sufficiently economically incentivized by other policy and market factors.
 3. The project or activity is not already common practice among practitioners in a given region, as determined by DOE.
 4. There are meaningful deployment barriers—such as an information deficit (first-of-a-kind) and other resource constraints or considerations that would prevent the competitor’s 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 of 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 permanent isolation of CO₂ 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 CO₂ from the atmosphere. This includes both the means for ongoing MMRV 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 life cycle analysis (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 CO₂. 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 CO₂e captured from the atmosphere and permanently removed).¹³

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.¹⁴
 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 MMRV 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 CO₂ 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.¹⁵
 4. If the proposed storage term exceeds the competitor's monitoring period, the 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 9](#).

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;**

¹³ 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>

¹⁴ **Durability** refers to the ability of a CO₂ storage mechanism or reservoir to sustain the isolation of CO₂ from the atmosphere over time without leaking or deteriorating, thus preventing the removed CO₂ from re-entering the atmosphere or ocean.

¹⁵ 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 CO₂ is determined to be released from 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.

5 Phase 1: Carbon Dioxide Removal Credit Concept Proposal

5.1 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 CO₂e basis consistent with [Appendix 6](#) LCA Guidance. Competitors should demonstrate that they have a commercial technology, implementation strategy, CBP, and MMRV 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.

5.2 Prizes

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

5.3 How To Enter

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

5.4 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 4](#) and addressing the key criteria summarized in [Section 5.5](#) 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 4](#)), including a rigorous and accurate outline of the proposed techno-economic analysis (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, additionality¹⁶ of the proposed CDR to be delivered, and overall quoted cost of CDR on a per net tonne CO₂e removed basis. Competitors may also provide a list of current and

¹⁶ Competitors must demonstrate that the net removal of CO₂ 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 DOE.

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, 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 the credibility and expertise of the proposed independent third-party MMRV 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.

5.5 What To Submit

All documents must be uploaded as PDF files.

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 4	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	<ul style="list-style-type: none">• Cover page (1 page)• A CDR Credit Concept Proposal: 12 pages (excluding cover page), 8.5" by 11" with 1" margins, 12-point font, double-spaced)

Note: Portions of the submission package will be made available to the public. These have been denoted as such, and the U.S Department of Energy does not intend to release the remaining parts of the submission to the public. See [Appendix 2](#) 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 carbon dioxide removal delivery volume and schedule (anticipated total tonnes of CO₂e/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 MMRV 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.

CDR Credit Concept Proposal

Maximum of 12 pages and 3 supporting images or figures in a PDF file

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 MMRV protocol or methods, including prospective independent MMRV partners or verifiers.

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 CO₂e removed basis (CDR credit cost proposed for contracting) and an anticipated delivery schedule.¹⁷
- Provide a time frame (at the decadal granularity) for the permanence or durability of carbon storage for at least 100 years, including an MMRV plan to incorporate long-term storage oversight of stored carbon. The

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

¹⁷ 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.

<p>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.</p> <ul style="list-style-type: none"> • Provide a summary of the additionality of the proposed CDR, including financial, regulatory, and common practice considerations. • Propose an MMRV methodology or development process and identify independent party or parties capable of providing MMRV services (see Appendix 12) • 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 nongovernmental CDR buyers. • Provide an overview of a strategy for CBP development, including but not limited to co-benefits, 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. 	<p>atmosphere for at least 100 years, and, if committing to a long storage term, provides a technical rationale and long-term stewardship plan.</p> <ul style="list-style-type: none"> • 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, and economic impacts. The CBP identifies and mitigates any adverse impacts. • The competitor provides science-based MMRV strategy and identifies one or more independent entities capable of reviewing, overseeing, and implementing the MMRV methodology (Appendix 12). • 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 co-benefits, while identifying and mitigating potential disbenefits.
<p align="center">Section 2: Technology or Project Development <i>Plans for site selection, project development, resource and material procurement, and contingency planning.</i></p>	
<p>Suggested content you provide:</p> <ul style="list-style-type: none"> • 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, 	<p>A single score is provided, taking the following statements into consideration:</p> <ul style="list-style-type: none"> • The Carbon Dioxide Removal Credit Concept Proposal provides a clear description of the carbon dioxide removal technology, process, and the associated project that would be providing carbon dioxide removal in Phase 3 if the competitor is successful. • The competitor provides a clear rationale for their site selection or, if a site has not

<p>publications or demonstrations that have been performed in advance of Phase 1.</p> <ul style="list-style-type: none"> 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. 	<p>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.</p> <ul style="list-style-type: none"> 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.
<p>Section 3: Network, Team, and Resources</p>	
<p>Suggested content you provide:</p> <ul style="list-style-type: none"> 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. 	<p>A single score is provided, taking the following statements into consideration:</p> <ul style="list-style-type: none"> 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.

<p>Reviewer Recommendation</p>	
<ul style="list-style-type: none"> There is no direct corresponding submission requirement for this score. Rather, it is an overall assessment of all materials submitted in HeroX. 	<p>Statement is scored:</p> <ul style="list-style-type: none"> 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 buyers, project financiers or investors, community groups, labor groups, host site landowner(s), independent MMRV 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 2](#).

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. 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.
- To the greatest extent possible,¹⁸ 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.
 - 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 the DOE.

The selection committee will take into account the submission package, reviewers' scores, and program policy factors listed in [Appendix 2](#) 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.

¹⁸ 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.

5.7 Additional Requirements

Please read and comply with the additional requirements in [Appendix 2](#).

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

6 Phase 2: Detailed Design of CDR Credit Purchase Agreement

6.1 Goal

Competitors selected to compete as semifinalists in Phase 2 will build on their CDR Credit Concept Proposal by drafting **a complete summary of proposed terms and conditions for a CDR Credit Purchase Agreement that reflects 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 this section. Additionally, competitors will select an independent MMRV Implementation Partner capable of implementing the MMRV plan outlined by the competitor. Competitors will leverage their CDR credit offerings to solicit purchase commitments from non-DOE entities. Up to ten semifinalists will be selected to compete in Phase 2 Part 2.

In Phase 2 Part 2, winners will negotiate CDR Credit Purchase Agreements with DOE. Competitors that submit meritorious Phase 2 Part 2 submission packages will have the opportunity to compete in Phase 3 and deliver the CDR outlined within the CDR Credit Purchase Agreement and associated documents to DOE for cash prizes.

Winners will be determined through a combination of the online submission package, review of nongovernmental offtake agreements, and CDR Credit Purchase Agreement 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.

6.2 Prizes

Up to 10 teams will be awarded \$375,000 each at the end of Phase 2 Part 1.

6.3 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.

6.4 Phase 2 Process

Phase 2 consists of two parts. Part 1 will last 8 months. At the end of that 8-month period, competitors will submit a detailed design of their CDR Credit Purchase Agreement, a detailed progress report on CDR Credit Concept Proposal implementation, and details about their nongovernmental offtake agreements. DOE will evaluate these submission packages and select up to 10 competitors to advance to Phase 2 Part 2.

Part 2 will last up to 4 months. During this period, competitors will select their MMRV Implementation Partner and complete negotiation of their CDR Credit Purchase Agreement with DOE. Up to 10 competitors from Phase 2 Part 2 will advance to Phase 3.

6.5 Phase 2 Part 1 Submission Package

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

- Cover Page: will be made public (2 pages)

- Submission Package (50 pages)
- Buyers Letters of Reference

6.5.1 COVER PAGE CONTENT (WILL BE MADE PUBLIC): OPTIONAL TEMPLATE PROVIDED

- Company, organization, or institution name
- Brief summary of proposed technology and CDR delivery volume and schedule (anticipated total tCO₂e/yr)
- Key project members (names, roles, emails, and links to their LinkedIn profiles, including the MMRV Implementation Partner)
- Competitor's city, state, and nine-digit zip code
- Proposed MMRV Implementation Partner

6.5.2 SUBMISSION PACKAGE CONTENT

Complete 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** inclusive of any used for the detailed TEA and LCA summaries. Please note that the proposed MMRV methodology or protocol will not contribute to the submission package page limit. The reviewers will score the submission based on the criteria within [Section 6.6](#) and the content you have provided.

Section 1—Detailed Design of CDR Credit Purchase Agreement

- A list of rigorous and market-worthy contract provisions outlining the volume (which shall not be less than 3,000 tonnes total) of CDR to be supplied to DOE in Phase 3 (in CO₂e net removed terms). Provisions shall include price per net tonne and delivery schedule (net tonnes per calendar year), including considerations for under-delivery, and termination consideration if the competitor fails to deliver. If the proposed delivery schedule is different from the Phase 1 delivery schedule, competitor must provide a detailed rationale for this change.
- A CDR Credit Purchase Agreement 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 financial, regulatory, and common practice additionality, and verifiability of storage permanence in the form of secure geologic storage or equivalent. The CDR Credit Purchase Agreement should explicitly state that successful delivery will be contingent upon validation and verification by the proposed MMRV 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.

- Documentation of a proposed independent third party MMRV Implementation Partner and the specific MMRV methodology that the Implementation Partner will use to measure, report, and verify the CDR credits supplied to DOE.
- The CDR Credit Purchase Agreement should explicitly state that successful delivery will be contingent upon validation and verification by the proposed MMRV 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.
- Complete documentation of the MMRV methodology that will be used by the MMRV implementation partner. Competitors may provide a link to this documentation in their submission package or submit it separately to dacprizes@nrel.gov with the email subject line: "Team Name: Phase 2 MMRV Methodology Documentation." This documentation does not count toward the Phase Part 1 page limit.
- The CDR Credit Purchase Agreement shall include provisions guaranteeing a commitment to permanently isolate the removed CO₂ 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 11](#), including a summary of a contractual commitment to implement the 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](#).

Section 2—CDR Concept Proposal Implementation Update

- A summary of the CDR project(s) that will provide verified credits for the CDR Purchase Pilot Prize. The summary should include a description of the technology and storage mechanism, the project location(s), approximate total annual capacity, and timeline for construction and operation, including anticipated permitting timelines
- A detailed summary of project development activities performed since the end of Phase 1 (December 14, 2023), including the status of and progress made towards developing the appropriate equipment procurement, host site agreement, and physical infrastructure required to deliver the CDR credits proposed within the Phase 1 CDR Credit Concept Proposal and Phase 2 Detailed Design of CDR Credit Purchase Agreement.
- An update on any key project development milestones described in Phase 1, including the go-live dates for any demo, pilot, or commercial-scale facilities.
- If any of the key project development milestones described in Phase 1 were not met, or experienced significant delays, provide a detailed explanation for change and a new project development timeline for the activities.
- Describe any ongoing project development risks germane to the delivery of your Phase 3 CDR credits to DOE, including your mitigation plans.
- CBP 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.
- Permitting and site agreements for proposed CDR project(s) providing credits, including any Endangered Species Act reviews and approvals, U.S. Environmental Protection Agency (EPA)

National Pollution Discharge Elimination System permits, relevant subsurface injection or EPA Underground Injection Control 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 required reviews and approvals.

- A complete TEA summary as described in [Appendix 5](#).
- A complete LCA summary as described in [Appendix 6](#).
- Enhancement in carbon storage durability or permanence oversight and verifying entity review and implementation.

Section 3—Customer Discovery and Market Development

- Provide a complete list of CDR purchase commitments, deliveries, advanced market commitments, or similar agreements that the competitor has secured since the end of Phase 1 (December 14, 2023). The CDR purchase review should include a complete list of committed buyers, links to public announcements (if available), purchase volumes and delivery schedules, and sale prices (unless explicitly prohibited by sales agreement).
- Overview of contracting provisions, including justification for consistency with program requirements for CDR Credit Purchase Agreement dictated in [Section 6.6](#).
- Summarize anticipated future CDR credit sale strategy including planned pricing, scale-up, and marketing strategy. Competitors may use the TMP template provided in [Appendix 8](#) or an alternative addendum, if applicable.

6.5.3 BUYERS REFERENCE FORM

Competitors should identify up to two entities that purchased, or committed to purchase, CDR credits from your organization and ask them to fill out the Buyers Reference Form. **It is your responsibility to ensure the buyers complete the reference form prior to the submission deadline.** As part of your submission package, you may provide a list of the entities and points of contact you requested to fill out the reference form.

6.6 Phase 2 Part 1 Scoring

The scoring of submissions will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each submission package. Apart from the MMRV methodology, which may be linked to 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.

- 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 2](#) 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.
- Up to 10 competitors from Phase 2 Part 1 will be selected to advance to Phase 2 Part 2.
- Reviewers will assess submissions against the following criteria:

Narrative Section	Description	Weight
Detailed Design of CDR Credit Purchase Agreement	<ul style="list-style-type: none"> • The competitor provides a rigorous and market-worthy CDR Credit Purchase Agreement detailing the delivery schedule and timeline of CDR supply (on a CO₂e net removed basis). • The CDR Credit Purchase Agreement includes an explicit price per net tonne and meets the minimum delivery volume and provisions that effectively address under-delivery and failure to deliver. • The CDR Credit Purchase Agreement offers CDR credits at a competitive price and volume, relative to similar CDR projects or technologies within an AOI. • Any differences between the proposed CDR Credit Purchase Agreement and the Phase 1 CDR Credit Concept Proposal are identified and an explanation for how the alterations improve the likelihood of success is provided. • The CDR Credit Purchase Agreement describes 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 CDR Credit Purchase Agreement includes provisions addressing failure to deliver the proposed volume within a given year of Phase 3, including any provisions facilitating flexible delivery in the case of unforeseen challenges. The provisions proposed by the competitor are realistic and market-worthy and provide reasonable assurance of delivery for not less than 3,000 CDR credits over the period of Phase 3. • The CDR Credit Purchase Agreement explicitly identifies an independent third party MMRV Implementation Partner for the project and includes reference to a specific protocol or methodology the MMRV Implementation Partner will use. The CDR Credit Purchase Agreement appropriately qualifies that a 	40%

	<p>CDR credit delivery will only be considered complete following verification from the identified MMRV entity. If the committed durability term in the CDR Credit Purchase Agreement exceeds the monitoring term, the competitor's CDR Credit Purchase Agreement reflects scientific consensus or legal mechanisms that are consistent with secure geologic storage or equivalent.</p> <ul style="list-style-type: none"> • The CDR Credit Purchase Agreement 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 11. The CDR Credit Purchase Agreement 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. 	
CDR Project Implementation Update	<ul style="list-style-type: none"> • 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 detailed summary of project development activities performed since the end of Phase 1, including progress made in procurement of necessary equipment; relevant local, state, and federal permits; resources (feedstocks, water, electricity, etc.); and infrastructure, host site agreements, permits, project financing and any other indication of readiness to deliver CDR credits within the proposed performance schedule. • The detailed summary provides substantial progress toward operationalizing a CDR project. The progress described by the competitor indicates strong likelihood of success in Phase 2 Part 2 and Phase 3. The CDR project has met or exceeded all relevant project development milestones outlined in Phase 1 Concept Proposal. • The competitor successfully demonstrates its ability to deliver no less than 3,000 tonnes of CDR credits within the timeframe of Phase 3. • The competitor articulates ongoing project development risks and describes mitigation plans. • The competitor's detailed TEA summary allows for a robust evaluation of process-specific CDR costs and complies with the requirements listed in Appendix 5. • The competitor's detailed LCA summary allows for a robust evaluation of process-specific environmental impacts and complies with the requirements listed in Appendix 6. • The competitor's net CDR cost after accounting for life cycle emissions is reasonable and competitive with comparable CDR activities at similar developmental stages. 	35%

Customer Discovery and Market Development	<ul style="list-style-type: none"> The competitor provides a list of offtake commitments (or similar market commitments) accrued since the end of Phase 1 from buyers with purchasing terms that indicate alignment with CDR delivery requirements outlined in Section 4, to the degree possible. The competitor demonstrates a capacity to deliver CDR, relative to their total delivery capacity, by successfully entering into purchase agreements with CDR buyers that will result in delivery of CDR within the timeline of the prize. The competitor successfully articulates a commercialization strategy that would enable rapid scale-up and sustained revenue beyond the CDR Purchase Pilot Prize. The competitor demonstrates a capacity to solicit commercial interest in scaled-up CDR deployments, beyond the CDR Purchase Pilot Prize, by entering into future purchase agreements. 	25%
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Additional Deliverables	Description	Scoring
Buyer's Reference Form(s)	<ul style="list-style-type: none"> The competitor has provided Buyer's Reference Forms for one or two entities that purchased, or committed to purchase, CDR credits from its organization. The competitor has provided a list of the entities and points of contact that filled out the reference form. 	Pass or Fail

6.7 Phase 2 Part 2 Submission Package

Up to 10 competitors from Phase 2 Part 1 will be selected to compete in Phase 2 Part 2. A complete submission package for the Phase 2 should include the following items:

- Cover Page: will be made public (2 pages)
- Submission Package (20 pages)
- Revised CDR Purchase Agreement

6.7.1 COVER PAGE CONTENT

- Company, organization, or institution name
- Brief summary of proposed technology and CDR delivery volume and schedule (anticipated total tCO₂e/yr)
- Key project members (names, roles, contacts, and links to their LinkedIn profiles, including the MMRV Implementation Partner)
- Competitor's city, state, and nine-digit zip code
- MMRV Implementation Partner, including a brief summary of qualifications, MMRV methodology citation (if public), letter of support, and contractual relationship

6.7.2 SUBMISSION PACKAGE CONTENT

Complete each of the following 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 20 pages at 12-point font size double-spaced**, not including captions, figures/graphs, or references. You may include **up to two**

supporting images, figures, or graphs. The reviewers will score the questions based on the content you have provided.

Section 1—MMRV Methodology and Implementation Partner¹⁹

- Select an MMRV Implementation Partner ([Appendix 12](#)). To mitigate conflicts of interest, enhance transparency, and bolster the MMRV field, competitors must select an MMRV partner capable of overseeing, implementing, and ultimately verifying the CDR credits delivered under the CDR Credit Purchase Agreement during Phase 3.
- Provide a complete MMRV methodology, covering the complete scope of CDR credit development, including baseline justification and measurement, GHG estimation and quantification, project oversight, and carbon storage validation. The proposed MMRV methodology or protocol text document will **not** contribute to the total page length limit for the Phase 2 Part 2 Submission Package and should be submitted as a separate attachment in [HeroX](#). Competitors should justify the appropriateness, suitability, and rigor of the MMRV methodology for the competitor's technology and project.
- Submit a written testimonial from the MMRV Implementation Partner committing to provide MMRV services under the provided methodology and within the Phase 3 timeframe. The testimonial should include a description of the financial arrangement between the competitor and the Implementation Partner, including a price per tonne for the verification services.

Section 2—CDR Project Implementation Update

- Describe CBP refinement from Phase 2 Part 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.
- Include permitting and site agreements for proposed CDR project(s), providing credits, 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 of the project(s) or participation in this prize including National Environmental Policy Act (NEPA) required reviews and approvals.
- Include revisions of TEA and LCA results from Phase 2 Part 1 with justifications.
- Describe enhancement in carbon storage durability or permanence oversight and verify entity review and implementation.

Section 3—Customer Discovery and Market Development

- 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 2 Part 2. The CDR purchase review should include a complete list of committed buyers, links to public announcements (if available), purchase volumes and time frames, and sale prices (where possible).
- Overview of contracting provisions, including justification for consistency with program requirements for CDR Credit Purchase Agreement dictated in [Section 4](#).
- 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.

¹⁹ DOE reserves the right to amend the list of approved MMRV partners, including adding or removing approved entities, at any time and at its sole discretion.

6.7.3 CDR CREDIT PURCHASE AGREEMENT

Concurrent with preparation of Phase 2 Part 2 Submission Package, competitors will negotiate a revised CDR Credit Purchase Agreement directly with DOE and NREL. Failure to agree on terms during this negotiation period may result in non-selection as a Phase 2 winner of the CDR Purchase Pilot Prize.

- CDR Credit Purchase Agreement negotiations will occur during up to two (2) scheduled one (1) hour long meetings with DOE and NREL staff. DOE and NREL staff will outline and identify terms and provisions within the sample CDR Credit Purchase Agreement submitted in Phase 2 Part 1. The competitor will have an opportunity to propose alternative terms for consideration. DOE and NREL will provide written documentation of any requested revisions to the CDR Credit Purchase Agreement following scheduled negotiation meetings with competitors.
- Upon completion of Phase 2 Part 2, the competitor will resubmit a revised CDR Credit Purchase Agreement that reflects the mutually agreed revisions. The revised CDR Credit Purchase Agreement should be submitted within the Phase 2 Part 2 submission package, but will **not** be included within the total page count limit. It should be submitted as a separate document in [HeroX](#) with revisions shown, in addition to a clean version of the document.

6.8 Phase 2 Part 2 Scoring

The scoring of submissions will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each submission package. Apart from the MMRV methodology, which may be linked to 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.
- During the evaluation period for Phase 2 Part 2, each team will participate in a virtual interview session with the prize administration team to provide additional details about their Phase 2 Part 2 progress. Participation is mandatory. Additional information will be provided to Phase 2 Part 2 competitors prior to the interview day.
- The selection committee will take the submission package, reviewers scores, interview findings, and program policy factors listed in [Appendix 2](#) 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.
- Up to 10 competitors from Phase 2 Part 2 will be selected to advance to Phase 3.
- Reviewers will assess submissions against the criteria in the following table:

Narrative Section	Description	Weight
MMRV Methodology and Implementation Partner	<ul style="list-style-type: none"> • The competitor has selected an approved MMRV Implementation Partner. • The competitor has submitted a rigorous MMRV 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 MMRV guidance is technically sufficient and is appropriate for the project being developed by the competitor. • The competitor submits a written testimonial from the selected MMRV implementation entity committing to participation in the project, including use of the proposed MMRV methodology. The testimonial effectively describes the financial arrangement between the competitor and Implementation Partner. 	60%
CDR Project Implementation Update	<ul style="list-style-type: none"> • The competitor provides a detailed summary of project development activities performed since the end of Phase 2 Part 2. • The competitor successfully demonstrates its ability to deliver no less than 3,000 tonnes of CDR credits within the time frame of Phase 3. • The competitor articulates ongoing project development risks and describes mitigation plans. • The competitor confirms that any revisions to the TEA or LCA since the end of Phase 2 Part 1 are reasonable and do not substantially affect the economic or environmental viability of the process. • The competitor has submitted a revised CDR Credit Purchase Agreement that successfully incorporates the requested revisions from DOE and the National Renewable Energy Laboratory (NREL). 	25%
Customer Discovery and Market Development	<ul style="list-style-type: none"> • The competitor provides a list of offtake commitments (or similar market commitments) accrued since the end of Phase 2 Part 1 from buyers with purchasing terms that indicate alignment with CDR delivery requirements outlined in Section 4, 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 would enable rapid scale-up and sustained revenue beyond the CDR Purchase Pilot Prize. 	15%

Additional Deliverables	Description	Scoring
CDR Credit Purchase Agreement	<ul style="list-style-type: none"> • The competitor has successfully negotiated a revised CDR Credit Purchase Agreement directly with DOE and NREL. • The competitors continues to demonstrate their ability to deliver no less than 3,000 tonnes of CDR credits within the timeframe of Phase 3. 	Pass or Fail

7 Phase 3: CDR Credit Delivery

7.1 Goal

Up to 10 teams will compete in Phase 3. Phase 3 will last a maximum of 36 months. During Phase 3, competitors will implement and execute the CDR Credit Purchase Agreements agreed upon with DOE following Phase 2 Part 2. During Phase 3, competitors will also implement the CBP developed and submitted to DOE during Phase 2. Up to 10 teams will compete in Phase 3.

To complete Phase 3 and win the CDR Purchase Pilot Prize, teams must successfully deliver a minimum of 3,000 CDR credits to DOE, with accompanying documentation from MMRV providers, and successfully implement a CBP.

7.2 Prizes

Teams that compete in Phase 3 will win up to \$3,000,000 per team. The final prize amounts per team will be determined based on the volume of independently verified CDR credits delivered to DOE by the end of Phase 3. Teams will only be paid upon successful delivery of verified credits to DOE. Prize awards will be made on an annual basis during Phase 3, following satisfactory delivery of Phase 3 Submission Packages, including MMRV implementation documentation. Cash prizes will be awarded on the basis of successful CDR credits delivered each year of Phase 3; however, only competitors that successfully deliver the full volume of CDR credits specified within their Phase 2 Part 2 CDR Credit Purchase Agreement will be designated as CDR Purchase Pilot Prize Winners.

7.3 Phase 3: CDR Credit Delivery

During Phase 3, competitors will follow the CDR credit delivery plan agreed upon with DOE as part of the CDR Credit Purchase Agreements. A minimum of 3,000 tonnes must be delivered to DOE within the 36-month Phase 3 timeline. DOE will only accept delivery of CDR credits on an annual basis and no credits will be accepted after the 36-month period has ended.

7.4 Phase 3 Submission Package

Teams are required to submit a Phase 3 submission package annually, even if they are not delivering CDR Credits to DOE in that period. Each submission package will include:

- Cover page
- CDR delivery documentation
- MMRV implementation verification documentation
- CBP documentation and implementation report
- Documentation of delivery to non-DOE customers.

7.4.1 COVER PAGE (PUBLIC)

- Company, organization, or institution name
- Key project members (names, roles, contacts, and links to their LinkedIn profiles, including the DOE-approved MMRV Implementation Partner)
- Competitor's city, state, and nine-digit zip code

- MMRV Implementation Partner, including brief summary of qualifications, and MMRV methodology citation (if public).

7.4.2 CDR DELIVERY DOCUMENTATION

- Documentation supporting delivery of CDR at the specified volume and time frame
Documentation should reflect the contracted and specified granularity mutually agreed upon in Phase 2
- Complete State-Point Data Table ([Appendix 4](#)) aligned with prize rule guidance
- Any revisions to or expansions of the detailed LCA summary.

7.4.3 MMRV IMPLEMENTATION DOCUMENTATION

- As a part of your submission package, the independent, DOE-approved MMRV partner will independently submit an annual report providing independent technical measurement and validation of the CDR supplied to DOE during Phase 3 of the prize. Documents will summarize technical information collected during the term, including independent measurements and data collected from the project as well as analysis of storage durability, including monitoring and stewardship protocols, if appropriate.
- 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.
- The DOE-approved MMRV partner should email the MMRV implementation documentation directly to dacprizes@nrel.gov no later than the annual submission deadline. It is the competitor's responsibility to ensure that this documentation is submitted before the deadline.

7.4.4 CBP DOCUMENTATION AND IMPLEMENTATION REPORT

- 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.

7.4.5 DELIVERY TO NON-DOE CUSTOMERS

- Provide a summary of progress toward delivering CDR credits to voluntary or compliance buyers purchasing CDR credits from the competitor, supplied through the same or 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.

7.5 Phase 3 Scoring

The scoring of each annual submission package will proceed as follows:

- A panel of expert reviewers reads, scores, and comments on each submission. 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.
- 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 reviewers may have. Attending interviews is required, and interviews are not an indication of winning.
- DOE and Program Administrators reserve the right to perform site visits on relevant competitor projects during Phase 3, if those visits will aid in the effective evaluation of the competitors Phase 3 submission package. DOE will work in good faith with the competitors to arrange these visits.
- 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 decisionmaker and may elect to award all, none, or some of the submissions accepted at each submission deadline.
- Reviewers will assess submissions against the following criteria:

Submission Package	Description	Scoring
CDR Delivery Documentation	<ul style="list-style-type: none">• Competitor has delivered satisfactory and defensible documentation of CDR delivery consistent with the CDR Credit Purchase Agreement and MMRV plan provided to DOE during Phase 2.• Documentation includes the appropriate State-Point Data Table (Appendix 4) parameters outlined in the prize rules and any revisions to the detailed LCA summary.	Pass or Fail
MMRV Implementation Documentation	<ul style="list-style-type: none">• The MMRV implementation documentation was submitted to DOE by the approved MMRV Implementation Partner no later than the annual submission deadline.• The documentation provided by the DOE-approved MMRV Implementation Partner sufficiently supports the delivery of CDR credits under the approved MMRV methodology or protocol. Documentation provided by the independent MMRV Implementation Partner provides attestation that the competitor has delivered CDR credits to DOE within the appropriate timeframe of Phase 3, using the mutually agreed upon MMRV methodology or protocol specified within the revised CDR Credit Purchase Agreement submitted in Phase 2 Part 2. The MMRV Implementation	Pass or Fail

	<p>Documentation provides clear and transparent disclosure of direct measurements, estimated emissions factors, modeling tools, inputs, and assumptions as well as any other supporting information regarding ongoing monitoring.</p> <ul style="list-style-type: none"> • If a competitor or MMRV Implementation Partner intends to post a public MMRV report for credits issued to DOE, the competitor is responsible for notifying DOE two weeks in advance of any public disclosure. 	
CBP Documentation and Implementation Report	<ul style="list-style-type: none"> • 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. 	Pass or Fail
Delivery to non-DOE Buyers	<ul style="list-style-type: none"> • The competitor provides a complete summary of progress towards tonnes delivered to DOE and other buyers. 	Pass or Fail

Competitors must score “Pass” in every category to complete Phase 3 and win the CDR Purchase Pilot Prize.

7.6 Additional Requirements

Please read and comply with the additional requirements in [Appendix 2](#).

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

Appendix 1: Glossary of Terms

Additionality evaluates the degree to which an intervention (e.g., a carbon dioxide removal [CDR] project) causes a climate benefit above and beyond what would have happened in a no-intervention baseline scenario. 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.

Biomass carbon removal and storage (BiCRS) involves the use of biomass, either naturally occurring or purpose-grown, to naturally remove (CO₂) from the atmosphere or seawater via photosynthesis, in combustion, gasification, or other conversion processes where the resulting CO₂ 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 greenhouse gas (GHG) emissions on a cradle-to-grave life cycle basis, and the removed CO₂ must remain securely stored or locked away in products. BiCRS is a technology pathway (Area of Interest [AOI]) that is eligible for the CDR Purchase Pilot Prize.

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 CO₂ leakage or reversal, which may happen naturally or in response to planned or accidental external factors.

Carbon dioxide equivalent (CO₂e) describes the impact of a given greenhouse gas (GHG) (e.g., CO₂, CO, CH₄, N₂O, etc.) by converting its mass to the equivalent mass of CO₂ that would have the same global warming effect. The mass of a GHG is converted to the mass of CO₂e 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 (GWP-20) or 100 years (GWP-100). These values are different because the GWP is time-integrated and the GWP of CO₂ is always 1, regardless of the time horizon. Details on recommended GWP and CO₂e estimation can be found in [Appendix 6: Life Cycle Analysis \(LCA\) Guidance](#).

Carbon dioxide removal (CDR) encompasses a wide array of approaches that capture CO₂ that is already in the atmosphere or upper hydrosphere and involves the subsequent secure storage of the captured CO₂ 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 CO₂ 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 CO₂e 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 CO₂ 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 retired²⁰ shortly after being purchased.

Carbon dioxide removal (CDR) Credit Purchase Agreement is a key deliverable of the Phase 2 Part 1 submission package. The CDR Credit Purchase Agreement is a proposal document developed by the competitor for the delivery of CDR credits to the U.S. Department of Energy (DOE). The CDR Credit Purchase Agreement should provide the complete list of terms and conditions for qualified delivery of CDR credits during Phase 3 of the CDR Purchase Pilot Prize, including, but not limited to, a delivery schedule including volume and verification deadlines; any relevant project milestone developments; commitment to crediting and verification under a specified measurement, monitoring, reporting, and verification (MMRV) methodology by an eligible MMRV Implementation Partner, terms and conditions for termination of the agreement; and any other provisions relevant to the verification, transfer, delivery, and retirement of CDR credits provided to DOE in Phase 3 of the prize. The CDR Credit Purchase Agreement is not a procurement document, nor is it a legally binding contract. It is a summary of the market-worthy terms under which competitors will deliver their tonnes.

Direct air capture (DAC) refers to any process or technology that captures CO₂ directly from ambient air using a CO₂ capture medium that is regenerated for reuse. The captured CO₂ is then securely stored geologically or in long-lived products that result in negative emissions, in a process known as DAC with storage. DAC is a technology pathway (“Area of Interest”) that is eligible for the CDR Purchase Pilot Prize.

Durability refers to the ability of a CO₂ storage mechanism or reservoir to sustain the isolation of CO₂ from the atmosphere over time without leaking or deteriorating, thus preventing the removed CO₂ 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 CO₂ from the atmosphere or upper hydrosphere as well as the certainty (or uncertainties) of CO₂ storage over time. In contrast to “permanence,” which refers to the indefinite isolation of CO₂ from the atmosphere, the durability term is the period within which the CDR supplier (competitor) will assure DOE that the carbon remains stored.

Enhanced mineralization involves approaches that accelerate the natural reaction of CO₂ from ambient air with alkaline minerals to form stable carbonates, securely storing the CO₂ 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., CO₂ reactions in geologic formations underground), *ex-situ* (e.g., extraction, transport, grinding of minerals and subsequent reaction with CO₂ in engineered reactor systems) and surficial (e.g., CO₂ 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*

²⁰ Retirement of a CDR credit signifies that it cannot be resold, thus preventing its use as a financial instrument.

mineralization as the storage mechanism would also be in scope. Enhanced mineralization is a technology pathway (“Area of Interest”) that is eligible for the CDR Purchase Pilot Prize.

Measurement, monitoring, reporting, and verification (MMRV) refers to the degree to which the CO₂ removal can be accurately monitored and validated. More specifically, this involves layered and tailored activities, such as quantifying CO₂ 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 CO₂ 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 CO₂ removal methodology and project.

Measurement, Monitoring, Reporting, and Verification (MMRV) Implementation Partners are independent and unbiased entities, deemed by DOE to have the appropriate and necessary qualification, equipment, and expertise to implement an MMRV methodology or protocol. The MMRV Implementation Partner is accountable for providing or supervising and auditing the measurement, modeling, and monitoring procedures used to calculate, report, and verify CDR credits generated by a competitor’s CDR project. The MMRV Implementation Partner is a distinct entity from the competitor and is accountable for providing DOE and the National Renewable Energy Laboratory (NREL) attestation and MMRV documentation of CDR credits delivered by a competitor during Phase 3 of the Prize. Following Phase 2 Part 1, DOE will issue a list of approved MMRV Implementation Partners for each AOI, based on Phase 2 Part 1 Submission Packages.

Measurement, Monitoring, Reporting, and Verification (MMRV) protocols or methodologies are documents that provide a detailed list of procedures and requirements for specifying the equipment and methods used to collect measurements, interpret data, and quantify CDR credits generated by an eligible CDR project operated by the competitor. An MMRV protocol or methodology should be identified and submitted within the Phase 2 Part 1 submission package. The MMRV Implementation Partner will use the designated and approved MMRV methodology or protocol to quantify and verify the CDR credits generated by a competitor during Phase 3 of the prize.

Permanence defines the duration for which CO₂ 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 CO₂ 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 CDR Purchase Pilot rules document, the meaning of “permanent” means secure geologic storage²¹ or a method demonstrated and deemed to be equivalent by DOE.

Planned and managed carbon sinks, including natural and artificial mechanisms within terrestrial and upper hydrosphere are CDR pathways not defined in the eligible CDR pathways definitions above that may fall within the scope of “planned or managed carbon sinks.” These could be management activities

²¹ 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.

and technological interventions, including those 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. Planned and managed carbon sinks is a technology pathway (“Area of Interest”) that is eligible for the CDR Purchase Pilot Prize.

Appendix 2: Additional Terms and Conditions

A2.1 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. The U.S. Department of Energy's (DOE's) Office of Fossil Energy and Carbon Management 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 DOE, 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.

A2.2 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.

A2.3 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 an 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.

A2.4 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.

A2.5 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.

A2.6 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.

A2.7 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.

A2.8 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.

A2.9 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 DOE's Office of Fossil Energy and Carbon Management, 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).

A2.10 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 [Freedom of Information Act] 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.

A2.11 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.

A2.12 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 select only 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.

A2.13 Program Policy Factors

Although 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 [CO₂e]).
- The technological and competitor membership diversity within AOIs.
- The quality, quantity, or reliability of CDR transactions or offtake agreements additional to the tonnes committed through the CDR Purchase Pilot Prize that the competitor has secured during the prize period.
- The demonstrated resource capacity, technical expertise, or unbiased nature of the identified or proposed independent MMRV 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 DOE goals and objectives.
- 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 3: Impact Tracking Metrics

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

1. Number of tonnes removed
 - Gross
 - Net (inclusive of any CO₂ that has "leaked")
2. Net CDR cost with breakdown clearly illustrated
3. Process energy requirements
 - Thermal
 - Electrical
4. GHG emissions
5. Overall process uncertainty in metric tonnes 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 coproducts
 - Amount from tax credits
 - Amount from prepurchase 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., prepurchase, offtakes) signed with corresponding tonnes (CDR credits) clearly labeled
 20. Number of CDR contracts (e.g., prepurchase, offtakes) delivered with corresponding tonnes clearly labeled
 21. Website development and traffic
 22. Number and identity of project partners including materials suppliers; financiers; insurers; energy suppliers; CO₂ 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, coproducts, community education, job creation, poverty alleviation, waste reduction, reduced noise pollution, sustainable recreation and tourism opportunities, and urban beautification.

Appendix 4: State-Point Data Tables

Instructions for Completing Data Tables

The tables in this attachment shall be populated with data developed by the prize competitor. Competitors should complete the appropriate rows of Table 1 (required for all prize competitors) that relate to their proposed process concept. Competitors may develop and complete their own state-point data tables as needed to address the unique inputs and metrics of their proposed technology. *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 tonnes 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 (<i>for applicable pathways</i>)	%			
Energy or Feedstock Source(s)	Material and volume, carbon content, and energy content on a CO ₂ e tonne removed basis			
Emissions Related to Energy Source	CO ₂ e 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:

- CO₂ Concentration in the Feed Stream (e.g., flue gas, process stream), mol%
- Carbon Capture Efficiency, %
- Co-product generation specs. (rate, purity)
- CO₂ Product Purity, % (if applicable)
- CO₂ Product Oxygen Concentration, mol% (if applicable)
- Relevant Environmental Conditions (temperature, humidity, elevation/partial pressure, air flow rates, etc.)
- Storage/utilization mechanism and permanence estimate, year
- Uncertainty in net tonnes removed, %
- Land area requirements, km²
- Details on co-benefits
- Cycle time (if applicable).

Appendix 5: Techno-Economic Analysis (TEA) Guidance

Competitors are required to submit a TEA framework in Phase 1 and a detailed TEA summary in Phase 2. These materials should be submitted in written form with corresponding figures as part of the required

PDFs but may be based on external modeling performed in a spreadsheet software, process simulator, or comparable tool.

TEA results should reflect the costs of the proposed CDR project to the extent possible. Submitted analysis will be used by DOE to assess the general economic viability of the proposed technology and broad correspondence with the implicit CDR credit price based on the proposed credit delivery volume.

Competitors are encouraged to review the TEA reference materials listed at the end of this appendix for further guidance on conducting high-quality TEAs. It is critical that qualified personnel with professional experience in performing this type of work conduct the TEAs. This activity shall not be viewed as a training exercise.

Phase 1 TEA Framework

In Phase 1, competitor must provide as part of the CDR Credit Concept Proposal a TEA framework for the proposed CDR technology that is, to the extent possible, focused on the specific project that would produce CDR credits for DOE. The framework must clearly define the boundaries of the assessment including inputs, outputs, and any supporting experimental or trial data.

Phase 2 Detailed TEA Summary

In Phase 2, competitors must provide as part of the Part 1 submission package a detailed TEA summary. The summary should be consistent with the LCA, the MRV plan, and all other aspects of the competitor's submission.

The required elements of the detailed TEA summary include a:

- Block flow diagram identifying all major process steps, inputs, and outputs
- Thorough description of all process steps
- List of specific feedstock/material requirements, wastes, and energy requirements per gross tonne of CO₂ removed
- List of specific capital equipment with technical parameters and sizing (e.g., capacity, diameter, etc.) for each piece of equipment
- Discussion of selected interest rate and equipment lifetime(s)
- Discussion of cost contributions from the inputs listed below
- Calculation and disclosure of gross and net CDR costs as detailed below with a visualized breakdown by input
- Discussion of uncertainty and key model sensitivities
- Plan for cost reduction over time and at larger scales.

Competitors should discuss as much relevant technical detail as possible about the proposed technology to enable verification of technical feasibility and associated cost estimates. This discussion can include experimental or pilot results, underlying process chemistry or Earth system modeling, feedstock characteristics, stream tables, site characteristics, effects of dynamic ambient conditions, specific equipment design considerations, safety and redundancy measures, design margins, and MMRV requirements.

The following inputs should receive specific coverage in the TEA as applicable:

- Materials/feedstocks (including sorbent/solvent replenishment)
- Transportation of materials/feedstocks
- CO₂ purification, transportation, and storage
- Energy
- Non-energy utility needs, including water, nitrogen, compressed air, etc.
- Labor including benefits
- Waste management

- Capital equipment including equipment replacement over project lifetime
- Other capital costs including equipment installation; piping; instrumentation; electrical systems; civil engineering; design and engineering; engineering, procurement, and construction; contingencies; and any other ancillary equipment required for facility start-up and operation
- Up-front cost or rent for land and buildings
- Interest on capital costs using reasonable and expected rates
- Equipment and facility maintenance
- MMRV equipment and activities
- Any other major cost drivers unique to the competitor's circumstances.

All sources and estimation assumptions for cost data should be disclosed to a reasonable extent.

Intended use of tax credits or other policy supports, such as 45Q, and revenues from coproducts/by-products must be described but not included in the final TEA results. Coproduct/by-product revenues that exceed CDR costs may violate the additionality requirement of the prize.

Non-recurring engineering costs, corporate overhead, and profit margins should not be included in the TEA. Inputs that contribute negligible costs may be excluded with justification.

The primary result reported in the detailed TEA summary should be the total CDR cost per tonne calculated on both a gross and a net basis. All relevant and customary project costs, as detailed in this appendix, should be calculated on an annual basis before being divided by the expected annual tonnes of gross or net CDR.

Up-front capital costs and recurring equipment replacement costs must be annualized to allow for this calculation. Competitors should use the following formula for a capital recovery factor (CRF) to annualize capital costs (*CapEx*) using a reasonable interest rate (*i*), which should be in the range of 10% to 25% per year or higher to reflect the current risk profile of CDR projects, and a reasonable facility operating lifetime (*n*).

$$\text{Annual CapEx} = \text{CapEx} \cdot \text{CRF} = \text{CapEx} \cdot \frac{i \cdot (1 + i)^n}{(1 + i)^n - 1}$$

If certain pieces of equipment are expected to be replaced before the end of the facility's operating lifetime, then a separate CRF using that equipment's particular lifetime must be used to annualize the corresponding expense. The interest rate used, facility lifetime, and any separate equipment lifetimes must be transparently disclosed in the detailed TEA summary. The prize administrator and reviewers reserve the right to apply alternative CRF assumptions during the review period.

The gross CDR cost should be calculated by dividing total annual costs by the gross number of tonnes removed from the atmosphere or upper hydrosphere and stored annually before accounting for emissions as calculated in the corresponding LCA.

The net CDR cost represents the CDR cost after offsetting the project's life cycle emissions using a fraction of the gross amount of CDR, which is required to isolate the amount of net CO₂ removal from the atmosphere or upper hydrosphere. To calculate the net CDR cost, total annual costs should be divided by the net annual removal amount after accounting for emissions as calculated in the corresponding LCA.

For example, consider a project with:

- Total annual gross removal of 3,000 tonnes of CO₂
- Total annual emissions (including annualized up-front emissions) of 1,000 tonnes of CO₂-equivalent

- Total operating costs of \$400,000 per year
- Total capital costs of \$4,000,000
- An expected facility lifetime of 10 years
- An interest rate of 15%.

Such a project would have a CRF of 20%, annualized capital costs of $\$4,000,000 \times 20\% = \$800,000$, and total annual costs of $\$800,000 + \$400,000 = \$1,200,000$. It would have a gross CDR cost of $\$1,200,000 / 3,000 \text{ tonne (t)} = \$400/\text{t}$, and a net CDR cost of $\$1,200,000 / (3,000 \text{ t} - 1,000 \text{ t}) = \$600/\text{t}$.

Due to factors excluded from the TEA such as profit margin, corporate overhead, non-recurring engineering, inflation, subsidies, coproduct/by-product revenues, potential use of concessional finance, and other miscellaneous costs, the implicit CDR credit price based on the award and proposed delivery volume may be different than the net CDR cost calculated by the competitor.

Reference TEA Materials

Competitors may refer to the following resources for guidance on conducting TEAs:

- [National Energy Technology Laboratory \(NETL\) Quality Guidelines for Energy System Studies: Cost Estimation Methodology for NETL Assessments of Power Plant Performance](#)
- [NETL Quality Guidelines for Energy System Studies: Performing a Techno-Economic Analysis for Carbon Conversion Technologies](#)
- [NETL Direct Air Capture Case Studies: Solvent System](#)
- [NETL Direct Air Capture Case Studies: Sorbent System](#)
- [Sandia National Laboratories Techno-Economic Analysis: Best Practices and Assessment Tools](#)
- [Global CO₂ Initiative Techno-Economic Assessment & Life Cycle Assessment Guidelines for CO₂ Utilization](#)
- [Assess Carbon Capture, Utilization, and Storage Techno-Economic Assessment Resources.](#)

Appendix 6: Life Cycle Analysis (LCA) Guidance

Competitors are required to submit a preliminary LCA in Phase 1 and a detailed LCA summary in Phase 2. These materials should be submitted in written form with corresponding figures as part of the required PDFs but may be based on external modeling performed in a spreadsheet software, LCA software, or comparable tool.

Operating assumptions used in the LCA should reflect the proposed CDR project to the extent possible. Submitted analysis will be used by DOE to assess the potential for the proposed project to achieve negative emissions and limit non- GHG environmental impacts.

Competitors are encouraged to review the LCA reference materials listed at the end of this appendix for further guidance on conducting high-quality LCAs. It is critical that qualified personnel with professional experience in performing this type of work conduct the LCAs. This activity shall not be viewed as a training exercise.

Phase 1 Preliminary LCA

The preliminary 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.

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

- Process
 - High-level carbon balance of the proposed approach
 - Disposition of the captured CO₂: will it be stored underground or used in a long-lasting product?
 - Definition of any coproducts 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 CO₂ captured.
- Impacts
 - Discuss potential co-benefits, including the reduction in criteria air pollutants and potential harms.

Phase 2 Detailed LCA Summary

In Phase 2, competitors must provide a detailed LCA summary as part of the Part 1 submission package. The summary should be consistent with the TEA, the MMRV plan, and all other aspects of the competitor's submission.

The required elements of the detailed LCA summary include the following (Some information important for the LCA, such as a description of the process steps and a list of feedstock requirements, should be provided by the competitor in the detailed TEA summary described in [Appendix 5](#)):

1. High-level visual representation of the system boundary used for the LCA
2. Discussion of GHG emissions contributions from all inputs listed below with particular emphasis on the energy procurement strategy
3. Calculation and disclosure of GHG emissions per gross tonne of CO₂ removed using IPCC AR6 global warming potentials across requested GWP and electricity scenarios with a visualized breakdown by input
4. Discussion of CO₂ utilization or storage approach and allocation of post-decommissioning GHG emissions if applicable
5. Calculation and disclosure of non-GHG environmental impacts per gross tonne of CO₂ removed using [EPA's TRACI](#) impact assessment method across requested electricity scenarios
6. Discussion of uncertainty and key model sensitivities
7. Plan for GHG emissions and environmental impact reduction over time and at larger scales.

The following inputs should receive specific coverage in the LCA as applicable using the most up-to-date and geographically representative LCA data possible:

- Materials/feedstocks (including sorbent/solvent replenishment)
- Transportation of materials/feedstocks
- CO₂ purification, transportation, and storage
- Energy
- Non-energy utility needs including water, nitrogen, compressed air, etc.
- Waste management
- Capital equipment including equipment replacement over project lifetime
- Direct and indirect land-use change
- Any other major impact drivers unique to the competitor's circumstances.

All sources (e.g., ecoinvent, U.S. Life Cycle Inventory) and estimation assumptions for emissions and other impact factors should be disclosed to a reasonable extent.

Environmental impacts from one-time and up-front inputs, such as capital equipment and facility construction, may be distributed across the expected lifetime of the project for the purposes of this exercise. Inputs that contribute negligible impacts may be excluded with justification.

The functional unit of the LCA must be the mass of CO₂ captured from the atmosphere or upper hydrosphere and stored with a reference flow of one gross tonne of CO₂ captured from the atmosphere or upper hydrosphere and stored. Competitors must calculate and disclose the following midpoint indicators with the specified units using this functional unit and reference flow. Final indicators should model impacts using a cradle-to-grave system boundary to the extent possible, which includes raw material sourcing, project operation, end-of-life decommissioning, and subsequent storage monitoring.

- Climate change: kg CO₂e/[kg CO₂e]/gross t CO₂ captured and stored
- Acidification potential: kg [SO₂-eq]/gross t CO₂ captured and stored
- Ecotoxicity (freshwater):[CTUe]/gross t CO₂ captured and stored
- Eutrophication potential: [kg N-eq]/gross t CO₂ captured and stored
- Human toxicity, carcinogenic: [CTUh]/gross t CO₂ captured and stored
- Human toxicity, non-carcinogenic: [CTUh]/gross t CO₂ captured and stored
- Ozone depletion: kg -11-eq [kg CFC-11-eq]/gross t CO₂ captured and stored
- Particulate matter formation: kg [kg PM_{2.5}-eq]/gross t CO₂ captured and stored
- Photochemical oxidant formation: [kg O₃-eq]/gross t CO₂ captured and stored

For the climate change indicator, competitors should use average global warming potential (GWP) values from the [Sixth Assessment Report \(AR6\)](#) published by the Intergovernmental Panel on Climate Change (IPCC). Results using GWP-100 factors must be reported by default, and results using GWP-20 factors must also be provided as a scenario. See the table below for common GWP factors to use and refer to [EPA's IPCC GWP tracker on Data.gov](#) for a full list. The prize administrator and reviewers reserve the right to apply alternative and updated GWP values during the review period.

GHG	AR6 GWP-100 (Default)	AR6 GWP-20 (Scenario)
CO ₂	1.0	1.0
Fossil CH ₄	29.8	82.5
Non-fossil CH ₄	27.0	79.7
N ₂ O	273.0	273.0
SF ₆	25,200	18,300
CFC-11	6,226.0	8,321.0

To calculate the eight non-climate change indicators, the most recent version of [EPA's TRACI](#) impact assessment method must be applied. Direct releases to the environment from the CDR project represent elementary flows to the environment and should be measured or predicted to calculate impacts using the corresponding flow in TRACI. Otherwise, TRACI should be applied in the conventional manner to all relevant inputs and outputs across the cradle-to-grave system boundary for the modeled CDR system.

Processes intending to use any amount of grid-based electricity must model results using at least the following scenarios:

- Regional grid mix in project location using [EPA eGRID](#) territory and emissions data
- Current average U.S. grid mix as specified in [EPA eGRID](#)
- 100% renewables mix (using current impact factors for renewable sources)
- 100% unabated coal.

For processes using thermal energy from natural gas, biomass-powered heat, waste heat, or some other heat source, competitors must describe the source, availability, and corresponding process; sustainability; and scalability implications. Transportation energy sources (e.g., diesel) can be modeled with other energy sources or separately as transportation-specific contributors, and competitors are free to model and provide the impacts of different transportation energy scenarios (e.g., electrified trucking) as long as a baseline assumption of representative conditions is provided.

To assist reviewers with determining the robustness of CDR claims, competitors must fully describe their energy procurement strategy in addition to the intended use of any attributes, certificates, or similar instruments, including renewable energy certificates (RECs), power purchase agreements (PPAs), and renewable natural gas (RNG) certificates. Any use of behind-the-meter (BTM) power, book-and-claim systems, and 24/7 carbon-free energy (CFE) through temporal and geographic matching must be clearly disclosed.

Some CDR processes produce valuable coproducts/by-products. Conventional LCA impact allocation rules may be used to allocate overall process impacts between generated CDR and coproducts/by-products. In some cases, coproducts/by-products may have lower emissions than their conventional counterparts after allocation. Corresponding emissions reductions, if present, may be quantified and reported as part of the LCA but must be separated from the impact quantification for generated CDR. The prize administrator and reviewers reserve the right to apply alternative impact allocation methods during the review period, and competitors are encouraged to apply such procedures conservatively.

Storage of removed CO₂ in long-lived products as a means of CDR is permitted as long as it is consistent with the additionality and MMRV requirements of the prize. In cases where a long-lived product is manufactured with removed CO₂, the LCA must include any process steps required to utilize the removed CO₂ that would not have occurred otherwise as well as any induced or marginal environmental impacts. Any emissions reduction benefits created by the system relative to a comparison system must be reported separately and not combined with generated CDR.

Reference Materials

Competitors may refer to the following resources for general guidance on conducting LCAs:

- National Energy Technology Laboratory ([NETL Carbon Dioxide Utilization Life Cycle Analysis Guidance](#))
- [NETL CO₂U LCA Guidance Toolkit](#)
- [FECM Best Practices for Life Cycle Assessment \(LCA\) of Direct Air Capture with Storage \[DACS\]](#)
- [ISO 14040](#) and [ISO 14044](#)
- [ILCD Handbook General Guide for Life Cycle Assessment](#)
- [Global CO₂ Initiative Techno-Economic Assessment & Life Cycle Assessment Guidelines for CO₂ Utilization](#)
- [Assess Carbon Capture, Utilization, and Storage Life Cycle Analysis Resources](#)

Appendix 7: Basis for Technology EH&S Risk Assessment

Phase 2 summary CDR Credit Purchase Agreement submissions may include a complete environment, 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 EPA, National Institute for Occupational Safety and Health, 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 carbon dioxide 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:

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 by-products 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, Toxic Substances Control Act, Clean Water Act, Clean Air Act, Superfund Amendments and Reauthorization Act Title III, and the Occupational Safety and Health Act.
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 8: 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 data sets per DOE and executive orders. The Energy Data eXchange (EDX) is a data laboratory developed and maintained by National Energy Technology Laboratory (NETL) to find, connect, curate, use, and reuse data to advance fossil energy and environmental research and development.

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 data sets.

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 researchers' 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 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 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 9 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 10: 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 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 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 research and development. 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.
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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 11: Community Benefits Plan 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 following 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
 - 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. This 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 a 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 they may need.
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 DOE-funded project, partner with workforce training organizations serving underrepresented 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 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,²² 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, 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 EPA'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

²² 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 EPA's 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 they may need.
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 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, etc.) existing labor and community support for and/or concerns about 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 they may need.
- 6. An estimate of financial resources required for developing the plan.

Appendix 12: Measurement, Reporting and Verification (MMRV) Plan

Prize competitors will be required to develop and submit a robust MMRV plan that adheres to and adapts to the best available scientific principles for their proposed CDR technology approach. The MMRV plan should describe the activities that will be performed to directly measure, model, and monitor the carbon removal during the entirety of project operation as well as ensure the secure storage after the CDR credit delivery and project operations have been concluded, for at least 50 years. Beyond the crediting period, competitors should provide an approach to ensure that removed CO₂ remains isolated from the atmosphere for the complete durability term. This may include a long-term monitoring plan as well as financial or legal instruments to ensure that premature storage reversals are detected, measured, and accounted for and appropriately reconciled through repayment, delivery of comparable CDR credits, or other proposed mechanisms. Phase 2 submissions will be scored on the comprehensiveness and rigor of proposed MMRV plans to support the robust monitoring requirements for high quality carbon removals outlined in DOE's Carbon Negative Shot. As indicated in the rule for Phase 2 Part 1, the competitor is responsible for designating an independent third party MMRV provider ("MMRV implementation partner") as well as a specific methodology or protocol the MMRV partner will implement to verify CDR credits produced by the competitor's CDR project. The sections below set forth the core components that must be addressed in the submission's MMRV plan.

Monitoring and Measurement Requirements

The baseline or counterfactual scenario that the CDR project will be evaluated against should be clearly defined and justified based on present economic incentives and common practices. Competitors should provide evidence supporting a presumed common practice or "business as usual" outcome, had the CDR project not occurred, to both demonstrate the additionality of the CDR credits generated from the project and to establish an emissions baseline. Competitors should describe the project and/or region-specific measurement tools, sensors and/or models that will be employed to quantify (1) dynamic baseline CO₂ fluxes; (2) emissions from any associated mitigation activity; (3) CO₂ drawdown from the carbon removal project; (4) CO₂ stored in a qualified reservoir; (5) emissions that result from the CDR project through site preparation, construction, and operation (which should also receive coverage in the LCA); and (6) potential physical leakage from the reservoir. It is expected that any calibration procedures associated with these measurements will be discussed in the MMRV plan. Whenever possible, multiple physical quantification tools and sensors should be employed to monitor relevant CO₂ 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 DOE, as well as a proposed modeling strategy to estimate GHG fluxes with the greatest certainty possible. 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 MMRV plan. DOE will evaluate the rigor and accuracy of the MMRV methodology or protocol submitted by the competitor, including the appropriateness of the methodology or protocol for the credited CDR project, as well as the qualifications of the MMRV Implementation Partner.

Reporting Requirements

Competitors should explicitly mention the duration of carbon dioxide removal operations and storage periods (i.e., durability term). DOE recognizes that carbon storage may continue for periods well beyond the committed storage term. In these instances, competitors should establish and submit a contractual durability term during which 1) carbon storage can be monitored, and 2) a storage reversal would require financial recourse or substitution of alternative credits. Alternatively, if the committed carbon storage term for a competitor's CDR credits exceeds the monitoring term, the crediting methodology and credit offtake agreement should provide details regarding liability and oversight beyond the monitoring period. From the results of the cradle-to-grave life cycle analysis, competitors should clearly delineate the boundaries and net-negativity of the CDR project using a simplified block flow diagram that 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., CO₂ purification, compression, transport, use, and/or storage). The block flow diagram should include the uncertainty associated with any reported CO₂ flux estimates.

Competitors should develop and outline a plan for transparently reporting, on a recurring basis, the uncertainty associated with CO₂ 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 DOE, as well as potential process uncertainties that can be directly reduced through completion of the proposed project.

Verification Requirements

During Phase 2 Part 1, competitors should identify a specific MMRV methodology or protocol, under which the competitors CDR credits will be quantified and verified, as well as CDR credit verifier, that will oversee implementation of the MMRV methodology and testify to the accuracy of credits generated. If applicable, verification should ensure that geologic storage of CO₂ is compliant with Underground Injection Control (UIC) Class VI permitting requirements or regulatory requirements for an equivalent storage mechanism.²³ Additionally, the MMRV plan must discuss the transfer of responsibility or management of the stored CO₂ or alternative storage reservoir after successful project completion and the use of any relevant insurance mechanisms. The verification of CDR credits delivered should also include the review and validation of the long-term carbon storage monitoring plan and financial or legal mechanisms for resolving premature reversal of storage.

Criteria for MMRV Provider Approval

During Phase 1, it is expected that all CDR Purchase Concept Proposals will provide at least one independent MMRV service provider. These service providers may include nonprofits, 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 MMRV provider must be an entity separate from and without financial or other interest in the competitor. Along with the Phase 1 submission package, reviewers will evaluate the merits, credibility,

²³ 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>

and eligibility of proposed independent MMRV providers as well as the proposed MMRV methodology. Following Phase 2 Part 1 and prior to the commencement of Phase 2 Part 2, DOE will issue a list of approved MMRV providers. CDR suppliers who are competing in Phase 2 Part 2 must work with a DOE-approved MMRV provider to verify their tonnes. Following Phase 2 Part 1, DOE will review competitors' submission packages, including the CDR Project Implementation update, which should provide designation of an MMRV Implementation Partner and the CDR crediting methodology that will be used to quantify and verify delivered CDR credits.

DOE will then assess the MMRV methodology or protocol and the MMRV Implementation Partner, as well as the qualifications and capabilities of the MMRV partner to perform the measurement, quantification, and verification responsibilities mandated under a given methodology or protocol. Moreover, DOE reserves the right to perform oversight and review of MMRV practices and procedures performed by the competitor and the MMRV Implementation Partner during Phase 3, including, but not limited to site visits, collection of independent site measurements, and independent assessment of key quantification uncertainties. Any information collected will remain private to the competitor and will only be evaluated internally by DOE for CDR credit validation purposes.

Metrics independent reviewers and DOE will leverage to evaluate the eligibility and credibility of independent MMRV providers include, but are not limited to:

- Proven technical and financial resources sufficient to fulfill the measurement, monitoring, and verification requirements of the proposed protocol or methodology, under the specified AOI;
- Breadth and depth of technical expertise, including experience providing MMRV services for other non-DOE purchasers on similar or related CDR projects
- Demonstrated independence from the competitor including disclosure of any conflicts of interest with respect to the success of the competitor in the CDR Purchase Pilot Prize
- Demonstrated ability and willingness to serve the competitor over the complete credit delivery and monitoring periods
- Experience and demonstrated success in providing verification for regulatory or compliance markets for CDR or comparable emissions accounting benefits
- Experience and demonstrated ability to perform the MMRV duties and responsibilities identified within the competitor's selected MMRV methodology or protocol
- Scientific modeling expertise required for carbon flux modeling where appropriate
- Ability to conduct site visits or other means of physical sampling or observation as requested by DOE
- Adequate equipment, facilities, and operational capacity to meet the demands of the proposed MMRV methodology.

Following the review of Phase 2 Part 1 submission packages, DOE will issue a list of approved MMRV Implementation Partners by AOI. Proposed MMRV Implementation Partners may be deemed qualified to provide MMRV services under multiple AOIs. DOE reserves the right to amend the list of approved MMRV Implementation Partners, including adding or removing approved entities, at any time and at its sole discretion.

Metrics independent reviewers and DOE will leverage to evaluate the eligibility and credibility of CDR crediting methodologies or protocols may include:

- Rigor and scientific support of technical assumptions related to carbon removal effectiveness, baseline carbon fluxes, additionality, emissions accounting, emissions displacement/leakage, and storage duration
- Applicability to the proposed CDR process under consideration
- Consistency with the best available science regarding appropriate measurement, modeling, quantification, verification, and monitoring techniques
- Appropriateness and rigor of the long-term monitoring approach, including reliance on modeling and physical sampling requirements
- Reliance on physical measurements, leveraging best available sample collection methods, error mitigation practices, and equipment, where economically and technically feasible
- Consideration of broader environmental and social impacts and legal, regulatory, or permitting requirements
- Qualifications and reputation of methodology or protocol authors
- Robust approach to uncertainty estimation and reporting.

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.²⁴ 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 Funding Opportunity Announcement (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
- d) The work is conducted within the United States and the entity acknowledges and demonstrates that it has the intent and ability to comply with the U.S. Manufacturing Plan
- 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

²⁴ See [Critical and Emerging Technologies List Update \(whitehouse.gov\)](#)

- 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 intellectual property 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 should be added to any agreement or subagreement to protect intellectual property, 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 U.S. 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.