



**U.S. Department of Energy
Office of Clean Energy Demonstrations**

**Bipartisan Infrastructure Law
CARBON CAPTURE DEMONSTRATION PROJECTS PROGRAM**

Funding Opportunity Announcement Number: DE-FOA-0002962

Type: Initial

**Assistance Listing Number: 81.089, Fossil Energy Research and Development
81.255, Clean Energy Demonstrations**

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| Funding Opportunity Announcement Issue Date: | 02/23/2023 |
| Submission Deadline for Letters of Intent: | 03/28/2023 |
| Submission Deadline for Applications: | 05/23/2023 – 5:00 PM ET |
| Expected Date for DOE Selection Notifications: | August 2023 |
| Expected Date for Pre-Selection Interviews: | August 2023 |
| Expected Timeframe for Award Negotiations: | Fall 2023 |

- Applicants must submit a Letter of Intent to be eligible to submit an Application.

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1.0 Funding Opportunity Description

1.1 Background and Context

The Department of Energy's (DOE) [Office of Clean Energy Demonstrations](#) (OCED) is issuing this Funding Opportunity Announcement (FOA), in collaboration with the Office of Fossil Energy and Carbon Management (FECM) and National Energy Technology Laboratory (NETL), for integrated carbon capture and storage (CCS) projects that demonstrate substantial improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture technologies for power, industrial, and other commercial applications. Awards made under this FOA will be funded with funds appropriated by the [Infrastructure Investment and Jobs Act](#), more commonly known as the Bipartisan Infrastructure Law (BIL).

The BIL is a once-in-a-generation investment in infrastructure, designed to modernize and upgrade American infrastructure to enhance United States competitiveness, drive the creation of good-paying jobs with a free and fair choice to join a union, tackle the climate crisis, and ensure stronger access to economic, environmental, and other benefits for [disadvantaged communities](#). The BIL appropriates more than [\\$62 billion to DOE](#) to invest in American manufacturing and workers; expand access to energy efficiency and clean energy; deliver reliable, clean, and affordable power to more Americans; and demonstrate and deploy clean energy technologies.

As part of and in addition to upgrading and modernizing infrastructure, DOE's BIL investments will support efforts to build a clean and [equitable energy economy](#) that achieves a zero-carbon electricity system by 2035, and to put the United States on a path to achieve net-zero emissions economy-wide by no later than 2050 and a fifty percent reduction from 2005 levels in economy-wide net greenhouse gas pollution by 2030 to benefit all Americans.

OCED's mission is to deliver clean energy technology demonstration projects at scale in partnership with the private sector to accelerate deployment, market adoption, and the equitable transition to a decarbonized energy system. OCED was established in December 2021 and was first authorized and funded through the BIL. The founding of OCED builds on DOE's expertise in clean energy research and development and expands DOE's scope to fill a critical gap on the path to net-zero emissions by 2050.

The BIL will invest up to \$2.537 billion to fund domestic CCS demonstration and commercial-scale projects designed to further the development, deployment, and commercialization of technologies to capture and geologically store carbon dioxide (CO₂) emissions securely in the subsurface.

Many proven clean energy technologies poised for significant market share in a global clean energy economy exist today, including carbon capture and storage technologies. DOE seeks to fund projects that demonstrate substantial improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture technologies for power, industrial, and other commercial applications.

1.2 Program Purpose

To reach the President's ambitious domestic climate goal of net-zero emissions economy-wide by 2050, the United States will have to capture, transport, and permanently sequester significant quantities of carbon dioxide. There is growing scientific consensus that, while the first priority for addressing climate change must be to avoid emissions, CCS technologies and permanent sequestration are needed to minimizing the harm due to climate change.

While the technologies needed to decarbonize most of the U.S. economy exist, further innovation will create transformational pathways for meeting these decarbonization goals. Demonstration projects will support this innovation. Supported CCS demonstration projects will benefit entities intending to commercialize and deploy integrated CCS projects. Incentives are already driving CCS investments. Experience gained through successful execution that advance the state of this program can help to accelerate CCS deployment to achieve our climate goals while achieving other societal objectives.

DOE is aware of the concerns from environmental justice and climate organizations about how CCS projects could negatively affect communities, local environmental quality, and the overall climate mitigation effort if not developed with appropriate safeguards in alignment with Federal and state regulations to safeguard the environment, public health, and public safety. DOE has a history of investing in research and development to make carbon management technologies safer, more reliable, and more efficient. With this FOA we continue to support development of carbon management approaches that can enable responsible deployment as we progress towards our climate goals. CO₂ Carbon capture technology has the potential to reduce emissions of other kinds of pollutants in addition to CO₂, protect communities from increases in cumulative pollution, and maintain and create good, high-wage jobs across the country.¹

Therefore, applications to this FOA will include a Community Benefits Plan (CBP) tailored to the scope of this FOA, discussing community and labor engagement; investing in the American workforce; Diversity, Equity, Inclusion and Accessibility (DEIA), and the Justice40 Initiative. These requirements will enable and inform future activities with the intent of developing community-informed carbon capture projects that serve the cost-effective, efficient, equitable, and environmentally responsible at-scale expansion of carbon capture operations that enable industry adoption and create quality jobs.

Successful CBP activities will be central to the implementation of all phases of the Carbon Capture Demonstration Projects Program. For example, DOE will require projects to track and report on outcomes and outputs related to community benefits such as but not limited to changes in non-CO₂ pollution.

¹ <https://www.federalregister.gov/documents/2022/02/16/2022-03205/carbon-capture-utilization-and-sequestration-guidance>

This FOA and any related activities will seek to encourage meaningful engagement and participation of workforce organizations, including labor unions, as well as underserved communities and underrepresented groups, including consultation with Tribal Nations consistent with Executive Orders [13985](#), [14025](#), [14052](#), and [13175](#), as well as the Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships². Consistent with Executive Order [14008](#), this FOA is designed to help meet the goal that 40% of the overall benefits of certain federal investments in clean energy and climate solutions flow to disadvantaged communities, and to drive the creation of good-paying jobs with the free and fair chance for workers to join a union.

The funding for this FOA is authorized under section 41004(b) of the BIL and appropriated by Title III of Division J of the BIL. The programmatic authorizing statutes are:

- DOE Organization Act (Public Law 95-91), 42 U.S.C §§ 7101, et seq., as amended.
- Energy Policy Act of 2005 (Public Law 109-58) § 962(b), 42 U.S.C. § 16292(b), as amended.

Technology Space and Strategic Goals: This FOA seeks applications for transformational domestic, commercial-scale, integrated CCS, demonstration projects designed to further advance the development, deployment, and commercialization of technologies to capture, transport (if required), and store CO₂ emissions from:

- two projects at new or existing coal electric generation facilities
- two projects at new or existing natural gas electric generation facilities, and
- two projects at new or existing industrial facilities not purposed for electric generation.

CCS demonstration projects must be integrated with commercial facility operations and must be conducted in the United States.

Applicants must demonstrate significant improvements in the efficiency, effectiveness, cost, operational and environmental performance of existing carbon capture technologies.

This FOA makes available up to \$1,700,000,000 for approximately 6 projects at up to a 50% federal cost share. Proposed projects must demonstrate as part of the application and during the award at least 90% CO₂ capture efficiency over baseline emissions and a path to achieve even greater CO₂ capture efficiencies for power and industrial operations. Note that if the carbon capture project includes a new, on-site auxiliary system to generate power or steam for its operation, it may need to include CO₂ capture, compression, and storage from the auxiliary system if needed to achieve the minimum unit-wide 90% CO₂ capture inclusive of the power industrial facility all new systems or processes associated with the CCS project.

This FOA focuses on CCS demonstration projects with existing sufficient technical detail to assess the readiness level of the proposed technologies and integrated systems to proceed into at-scale demonstrations and replication leading to commercialization.

² [Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships - The White House](#)

This will align to CCS technologies that have been validated to be at a minimum technology readiness level (TRL) of 7, to ensure that they are fully ready for demonstration. This means that the technologies funded can be readily replicated and deployed into commercial practice. Detailed technical descriptions of the specific Topic Areas (TAs) and associated TRL requirements are provided in the sections that follow. See [Appendix N](#) for a description of CCS Technology Readiness Levels.

Section 41004 of the BIL authorizes funding for both carbon capture large-scale pilot projects and carbon capture demonstration projects. DOE is issuing this carbon capture demonstration projects program FOA (FOA Number: DE-FOA-0002962) and a carbon capture large-scale pilot projects FOA (FOA Number: DE-FOA-0002963), available on [OCED Exchange](#). DOE will not select the same project for both this FOA and the large-scale pilot projects FOA or projects that are interdependent between these two FOAs.

In general, technologies of interest for the carbon capture large-scale pilot projects FOA are less technologically mature (Technology Readiness Levels 5-7) than technologies of interest for the carbon capture demonstration projects FOA (Technology Readiness Levels 7-8). The large-scale pilot projects FOA focuses on technologies that have completed a small-pilot scale prototype at the time of application and will validate scaling factors to enable the large-scale pilot project to proceed to commercial-scale demonstration or commercial-scale application after the large-scale pilot project is complete. The carbon capture demonstration projects FOA focuses on commercial scale, integrated transformational³ demonstration projects designed to further the development, deployment, and commercialization of technologies to capture, transport, and store emissions.

Organizations must decide which of these FOAs to apply to based on the TRL of the proposed project and other application requirements stated in the FOAs.

In September 2022, DOE issued FOA Number: DE-FOA-0002738 titled “BIL: CARBON CAPTURE DEMONSTRATION PROJECTS PROGRAM FRONT-END ENGINEERING DESIGN STUDIES FOR INTEGRATED CARBON CAPTURE, TRANSPORT, AND STORAGE SYSTEMS” to fund Front-End Engineering Design (FEED) studies associated with large CCS demonstration projects. Eligibility or awards made under that FOA do not impact eligibility for this FOA. Applicants need not have applied for or been awarded funding from that FOA to apply for this FOA.

DOE anticipates issuing a third carbon capture FOA in the future for projects that are still performing FEED studies and other early project work and will not be ready to apply to this FOA. Detailed technical descriptions of the specific Topic Areas are provided in the sections that follow.

³ See the definition of transformational technology at 42 U.S.C. § 16292(a)(5).

1.3 Topic Areas

DOE anticipates selecting approximately 6 projects (two each for the Topic Areas discussed below) leading to the completion of facilities employing integrated CCS demonstration systems. Applicants will apply to one of the following Topic Areas (TA) depending on self-classification, based on the primary purpose of the facility, for the proposed CCS demonstration project.

For each Topic Area described below, Applicants must demonstrate significant improvements in the efficiency, effectiveness, cost, operational and environmental performance of existing carbon capture technologies.

1.3.1 Topic Area 1 – CCS Demonstration at a Coal Electric Generation Facility

The objective of each project awarded under **TA-1** is to demonstrate at commercial scale, in a domestic setting, advanced technologies that: (1) capture, transport (if required), and store CO₂ from new or existing, domestic coal electric generation-only or coal combined heat and power (CHP) facility for a minimum of three (3) years with ongoing monitoring and verification; and (2) achieve the minimum *unit-wide* 90% CO₂ capture efficiency (or greater) once stable operations are achieved. An example of a *unit* would be the entire exhaust stream, rather than a slipstream, associated with a single boiler or combustor. Capturing carbon from facility-wide, rather than unit-wide, emissions is permitted but not required.

Technical Requirements

Demonstrations may be conducted at a Coal Electric Generation-Only Facility, or a Coal Combined Heat and Power Facility; both will be referred to hereafter as “Coal electric generation units”. Projects must be designed to process the output from at least an entire unit at the coal-based facility with 90% CO₂ capture efficiency (or greater). Based on these unit-scale findings, Applicants will develop a plan for achieving full facility-wide decarbonization and submit this as a project deliverable.

CCS systems planned to be located at existing coal electric generation facilities that are not currently in commercial operation or with an announced closure date earlier than 15 years from the time of this award will be considered not responsive for the current FOA.

To meet the prior scale development expectations for this Demonstration FOA, proposed projects should have completed:

1. TRL 7 for coal electric generation by completion of an integrated, continuous, pilot-scale test (≥ 10 MWe) using coal exhaust gas at 90% or higher carbon capture efficiency, or
2. TRL 8 for coal electric generation by completion of a 1st of a kind full-scale commercial demonstration. Projects proposing TRL 8 technologies should plan to demonstrate substantial improvement in the efficiency, effectiveness, cost, and environmental performance beyond the first of a kind demonstration.

1.3.2 Topic Area 2 – CCS Demonstration at a Natural Gas Electric Generation Facility

The objective of each project awarded under **TA-2**⁴ is to demonstrate at commercial scale, in a domestic setting, advanced technologies that: (1) capture, transport (if required), and store CO₂ from a new or existing domestic simple cycle or combined cycle natural gas electric generation, natural gas CHP, or natural gas steam methane reformer (SMR) facility producing hydrogen for electricity generation, for a minimum of three (3) years with ongoing monitoring and verification; and (2) achieve the *unit-wide* 90% (or greater) CO₂ capture efficiency once stable operations are achieved.

Technical Requirements

Based on these unit-scale findings, Applicants will develop a plan for achieving full facility-wide decarbonization and submit this as a project deliverable.

The term “natural gas” means any fuel consisting in whole or in part of (i) natural gas; (ii) liquid petroleum gas; (iii) synthetic gas derived from petroleum or natural gas liquids; (iv) any mixture of natural gas and synthetic gas; or (v) biomethane.⁵ Natural gas SMR facilities producing hydrogen for other than electricity generation are non-responsive to this FOA.

To meet the prior scale development expectations for this Demonstration FOA, proposed projects should have completed:

1. TRL 7 for NG electric generation by completion of an integrated, continuous, pilot-scale test with NG exhaust gas (≥ 10 Mwe) at 90% or higher carbon capture efficiency, or
2. TRL 8 for NG electric generation by completion of a 1st of a kind full-scale commercial demonstration. Projects proposing TRL 8 technologies should plan to demonstrate substantial improvement in the efficiency, effectiveness, cost and environmental performance beyond the first of a kind demonstration.

1.3.3. Topic Area 3 – CCS Demonstration at an Industrial Facility Not Purposed for Electric Generation

The objective of each project awarded under **TA-3** is to demonstrate at commercial scale, in a domestic setting, advanced technologies that capture, transport (if required), and store a minimum of 300,000 tonnes CO₂/yr from at least one *process slipstream* at a new or existing domestic industrial facility not purposed for electric generation for a minimum of three years with ongoing monitoring and verification. Note that coal or natural gas must be used to some extent in the process that produces the gas stream targeted for carbon capture. The proposed CCS technology must describe the potential to achieve the *unit-wide* 90% (or greater) CO₂ capture efficiency.

⁴ See the definition of natural gas electric generation facility in 42 U.S.C. § 16292(a)(3).

⁵ 42 U.S.C. § 16292(a)(2).

Based on these unit-scale findings, Applicants will develop a plan for achieving full facility-wide decarbonization and submit this as a project deliverable. The industrial sectors of interest include:

- i. chemical production (e.g., ammonia, petrochemicals) *excluding ethanol and all hydrogen production*,
- ii. mineral production (e.g., cement, lime, and glass),
- iii. pulp and paper production, and
- iv. iron and steel production,
- v. oil refining unit offtake (e.g., catalytic cracker. Note that while steam methane reformers are not permitted alone in any TA, they are permitted in TA 3 if the project also proposes to capture carbon from another gas stream not associated with hydrogen production.)

CCS for natural gas processing is not of interest.

To meet the prior scale development expectations for this Demonstration FOA, proposed projects should have completed:

1. TRL 7 for industrial CO₂ capture by completion of an integrated, continuous, pilot-scale test at 90% or higher carbon capture efficiency using actual exhaust gas from the selected process (preferred) or a reasonably similar alternative gas source (must justify in application), or
2. TRL 8 for industrial CO₂ capture by completion of a 1st of a kind full-scale commercial demonstration. Projects proposing TRL 8 technologies should plan to demonstrate substantial improvement beyond the first of a kind demonstration.

Storage Requirements

For all TAs, captured CO₂ will be stored in a secure, domestic, geologic, subsurface formation that has sufficient capacity to store CO₂ from the proposed integrated CCS demonstration facility. Prior to construction, Applicants must have completed their feasibility and FEED studies, and engineering and design efforts as they relate to any emissions, any equipment, any necessary pipeline connections, and access from the proposed carbon capture facility to storage formation(s). Applicants will need to demonstrate the technical and regulatory readiness to complete all project elements, including any necessary agreements or commitments. Applicants must also provide commitment letters from any partners, subrecipients, or vendors who will be critical to completing the proposed scope.

Go/No-Go Reviews

DOE will use Go/No-Go reviews to manage each project to their specific, negotiated timeline and deliverables by evaluating progress of work toward required deliverables associated with each phase of the project prior to approving work in follow-on budget periods. DOE go/no go reviews will inform decisions to continue to advance or to terminate projects between (or potentially within) each phase of the award.

Additional Guidance for All Applicants

Projects must incorporate and integrate National Environmental Policy Act (NEPA) requirements into their proposed scope, schedule, and budget. Projects proposing work in states with state-level requirements similar to NEPA must specifically incorporate compliance with the state-level regulations into their plans (e.g., a site proposed in California must include compliance with the California Environmental Quality Act [CEQA] as applicable).

Applicants must discuss how they will identify and integrate applicable safety and compliance requirements with all relevant authorities into their proposed project. If at any point in the project, any reportable incidents, violations up to and including stop work orders, or other disciplinary measures are issued by any prevailing authority, this must be reported to DOE. Safety performance will also be reviewed at each Go/No-Go decision point. Multiple or severe violations may lead to project termination.

1.4 Award and Project Management Approach

Awards made under this FOA will utilize a four-phased approach for managing scope, schedule, deliverables, and budget; more information is included in [Appendix K](#). Figure 1 shows an example of the requirements and deliverables for each phase. Activities and deliverables will be further defined during award negotiations and subsequent negotiations between phases. DOE's review and evaluation of deliverables reflecting activities in each phase will inform Go/No-Go decisions that occur between and within phases. Time periods for each phase are nominal and may be significantly accelerated if the applicant has completed all required work scope and documentation.

| Initial Application | Application | Phase 1: Detailed Plan | Phase 2: Site, Permit, Finance | Phase 3: Build & Integrate | Phase 4: Ramp-Up & Operations |
|--|--|--|---|---|---|
| Go/No-Go Decisions | Pre - DOE funding | 5% TPC, Funding, Up to 50% Cost Share, 12-18 Months | 15% TPC, Funding, Up to 50% Cost Share, 2-3 Years | 70% TPC Funding, Up to 50% Cost Share, 3-6 Years | 10% TPC, Funding, Up to 50% Cost Share, 2-4 Years |
| Engineering, Procurement, Construction | <ul style="list-style-type: none"> Separate FEEDs for Capture, Transport, and Storage TRL/MRL/CRL descriptions, Project L1 IPS, Phase 2 L2 IPS Class 4/5 TPC Estimate | <ul style="list-style-type: none"> Integrated FEED for Capture, Transport, and Storage TRL/MRL/CRL Analysis, Uncertainties, Risk Project L2 IPS, Phase 3 L3 IPS Class 3 TPC Estimate | <ul style="list-style-type: none"> Engineering & Design (~90%) TRL/MRL/CRL Updates Project L3 IPS, Phase 3 L4 IPS Class 1 TPC Estimate Standard PM Tool in use | <ul style="list-style-type: none"> Tech Risk updates, tracking Progress Execution Reports Interim Go/No-Go reviews consistent with T/CS | <ul style="list-style-type: none"> Regular operations status reporting Tech Risk Updates, Tracking Final TPC accounting |
| Business Development & Management | <ul style="list-style-type: none"> Business Strategy Team Description Workforce Plan Finance Plan Market potential analysis | <ul style="list-style-type: none"> Project Management Plan (PMP) Risk Management Plan (RMP) Financial Model Updated workforce plans Market & off-take proposals Site Selection | <ul style="list-style-type: none"> Teaming Agreements Site Access Secured Integrated RMP Updated Labor agreements Financing in place Phase 3 T/CS Agreed/Approved | <ul style="list-style-type: none"> Regular progress/status reporting for all agreements Regular financial status reports Other reporting per T/CS Updated RMP covering phases 3 and 4 | <ul style="list-style-type: none"> Financial models updated with off-take and production data Revised growth plans and projections Updated RMP covering ramp and steady state operations |
| Permitting & Safety | <ul style="list-style-type: none"> Safety Plan Permitting Overview Environmental Approval Overview (State & Federal) | <ul style="list-style-type: none"> Site Safety Plans, Technology Safety Plans Physical, Information, Cyber Security Plans Environmental Data Package Initial NEPA Documentation | <ul style="list-style-type: none"> Updated SSP & TSP Final Physical, Information & Cyber security plans Permits for Construction Environmental Authorizations | <ul style="list-style-type: none"> Status reporting on required permits and environmental Safety & security incident reporting & audits Permits for Operations | <ul style="list-style-type: none"> Ongoing permit, safety, and security reporting |
| Community Engagement & Benefits Plan | <ul style="list-style-type: none"> Community Benefits Plan, including: Community & Labor Engagement: Investing in American Workforce; DEIA; Justice40 Initiative | <ul style="list-style-type: none"> Implement Phase 1 scope of CBP Update CBP for Phases 2-4 based on Phase 1 activities | <ul style="list-style-type: none"> Implement Phase 2 scope of CBP Update CBP for Phases 3-4 based on Phase 2 activities | <ul style="list-style-type: none"> Implement Phase 3 scope of CBP Update CBP for Phase 4 based on Phase 3 activities | <ul style="list-style-type: none"> Implement Phase 4 scope of CBP Update CBP based on activities and findings from ramp-up and pilot-scale operations |
| Technical Data & Analysis | <ul style="list-style-type: none"> LCA Analysis TEA Analysis | <ul style="list-style-type: none"> Performance Model Updated LCA Updated TEA | <ul style="list-style-type: none"> Mature LCA, V&V plans Mature TEA w/risk analysis Technical V&V data and plans Project completion testing | <ul style="list-style-type: none"> Periodic TEA and LCA updates V&V data collection & analysis Project completion testing | <ul style="list-style-type: none"> Validated performance model LCA and TEA incorporating operational data Ongoing data collection and dissemination Performance ramp V&V |

Figure 1. Summary of activities and outcomes in each phase of the projects awarded under this FOA.

Phase 1 – Detailed Project Planning

Phase 1 activities will focus on completing specific details about the overall project plan and analysis to refine projections submitted as part of the proposal. These activities must provide assurance to DOE that the overall plan is technologically, financially, and legally viable, with buy-in from relevant local and community stakeholders. This could include any plans to develop a skilled labor pool through Workforce and Community Agreements. Teams will integrate FEED studies associated with carbon capture, transport, and storage and complete preliminary engineering, construction, and commercial-scale designs. This will include finalization of a Project Management Plan (PMP), a Risk Management Plan (RMP), an Intellectual Property Management Plan (IPMP), the initial Safety Plan, and an initial financial plan for the entire 4-phase effort, and final site selection (pending NEPA review) for the various technologies to be included in the award.

The integrated FEED study must be complete at the end of Phase 1. Phase 1 should also include a continuation of analysis activities to refine and update Life Cycle Analysis (LCA) and techno-economic analysis (TEA) data provided in the application. Outreach and stakeholder engagement, which should be active prior to the application process, should continue in Phase 1 as the project site(s) are finalized and community economic and development impacts become clearer.

Teams should be fully engaged with the DOE's National Environmental Policy Act (NEPA) team as they develop environmental and regulatory plans to prepare for permitting and approval processes in Phase 2.

Applicants should plan approximately 12 months for Phase 1, depending on the extent of advanced planning and analysis each team has already completed, and how quickly the Recipient can move through the negotiated Go/No-Go requirements to move into Phase 2. DOE anticipates that some teams will have already performed extensive analysis, planning, design, and community engagement as required in Phase 1, and therefore some projects may advance to Phase 2 on a shorter timeline.

Phase 2 – Project Development, Permitting, and Financing

Phase 2 encompasses advanced planning activities and final design completion. Applicants will finalize their project development plans, commercial agreements, financial structure, and complete the necessary permitting and approval activities required to begin construction. By the end of Phase 2, engineering designs must be sufficiently mature to support completion and execution of relevant procurement or construction contracts and overall commencement of major project execution tasks. Long-lead procurement activities may be started in Phase 2 with prior DOE approval. Any agreements or commitments necessary to meet cost share requirements for the remainder of the project, including third-party financing agreements, must be completed. Risk management plans must be revised and updated to reflect progress made and risks mitigated as well as new or emerging risks and corresponding management plans.

By the completion of Phase 2, safety and security plans must be finalized and execution ready. All necessary permits and approvals must be in place to prepare for construction, including completion of required NEPA reviews. Final pre-implementation LCA and TEA activities must be completed to DOE expectations and corresponding verification and validation (V&V) plans (for capture, transport, and storage) must be in place. They will be implemented in Phases 3 and 4. Community and labor engagement must have progressed towards a comprehensive Community Benefits Plan that reflects community input and implementation experience to date and sets the stage for ongoing engagement. Community impact targets must be finalized, and tracking plans must be in place to monitor economic and social impacts of the projects as they progress to implementation.

Evidence of a contingency reserve is required prior to beginning Phase 3 activities. More information on contingency reserve funding can be found in [Section 2.0](#).

Phase 3 – Installation, Integration, and Construction

Phase 3 activities will focus on implementation. DOE expects this phase to be the longest in duration and the most cost intensive. Applicants will employ industry standard project management tools and will be required to provide regular status updates and reports. Plans developed in the preceding phases will be revised and updated as appropriate to reflect actual performance. Previously and newly identified risks will be tracked, actively managed, and regularly reported to DOE. Reporting frequencies and content requirements will be unique to each award and negotiated prior to Phase 3 commencement.

While Applicants will manage implementation, DOE will closely monitor progress and evaluate it against the plans developed through Phase 2. DOE and/or its third-party representatives will visit the site(s) regularly to verify progress and collect data, consistent with the established reporting requirements and substantial involvement.

Phase 3 may look significantly different for each award as there will be varying amounts of construction and retrofitting. Applicants must propose a funding level that is appropriate for the scale of the technologies and infrastructure being installed and constructed, within the limits outlined in [Section 2.0](#).

Phase 3 will conclude with a performance/startup test of the completed carbon capture, transport, and storage system running at full scale operation. This performance test must be completed before the Applicants can proceed to Phase 4.

DOE expects that Phase 3 activities may take approximately 3-6 years, but Applicants may propose shorter or longer lengths if the overall project length is no longer than 12 years.

Phase 4 – Ramp-Up and Sustained Operations

In Phase 4, Applicants will transition to operations. Phase 4 will commence with completion of award-specific criteria which will be negotiated in prior phases. Phase 4 activities will then focus on integrated system performance. By the end of Phase 4, each award will have demonstrated full commercial-scale design operations over an extended period. DOE expects that Phase 4 activities may take approximately 3 years but may extend longer depending on award-specific characteristics.

To meet a key OCED objective that DOE-funded commercial demonstration projects catalyze follow-on private sector investments as well as Justice40 goals, Phase 4 will also include substantial financial, socio-economic, environmental, and operational data collection and reporting to DOE. To the extent practicable while protecting sensitive and proprietary information, DOE will synthesize, anonymize, or otherwise incorporate site and operations data into quantitative and qualitative analyses that can be promulgated to external stakeholders for the purpose of informing future private sector investment decisions.

Applicants must propose a funding level that is appropriate for the scale of the project ramp-up and initial operation using DOE funding within the limits outlined in [Section 2.0](#). Similar to Phase 3, contingency reserve will also be required for Phase 4. Applicants are also encouraged to review the regulations regarding Program Income and be aware of the ways in which Program Income can be treated during the award.

Transitions between Phases

Additional funding for subsequent phases will require successful completion of a Go/No-Go review at the end of each phase. Specific Go/No-Go criteria will be negotiated with each selected project for transitions between each phase. This may include a requirement to submit a standardized set of data to provide quantitative and qualitative insight on metrics spanning the technological, economic, market, workforce, Justice40 goals, and other components of the project's analysis activities.

DOE may also require the negotiation of additional Go/No-Go decision points within phases (i.e., phases may include one or more budget periods with Go/No-Go points at the end of each budget period). Applicants must propose quantitative Go/No-Go criteria for each budget period as part of the Workplan.

If DOE determines that an award is making insufficient progress, additional scrutiny and oversight by DOE or its representatives may be employed, and corrective measures negotiated. Awards may be discontinued at any of the Go/No-Go decision points if the Go/No-Go criteria, project, and/or program requirements are not met. Additional in phases Go/No-Go decisions may be utilized to ensure sufficient project progress.

Specific project structure details for each recipient will be negotiated on a project-by-project basis to produce the best possible balance between project outcomes and DOE risk exposure. Examples of factors that may be considered as part of such negotiations include project and risk management processes, team capabilities, cost share amounts, financial contingencies, and engagement of independent monitors such as an Independent Engineers and/or Community Benefits Plan consultants representing DOE interests.

DOE will require access to project performance and financial data necessary to track progress against a project baseline (or similar). As these projects are new demonstration-scale or commercial deployments, to the greatest extent possible, project progress and information will be shared with interested stakeholders.

Final Outcome

If funded through all four phases, DOE expects that the projects will reach technical and commercial viability under this FOA and will continue to operate beyond the financial assistance project period (well beyond DOE funding). Achieving DOE's broad end goals will necessitate review and evaluation of proposed project characteristics that include cost, schedule, and scope; technology; business; market; financial; management; community support or other factors throughout the project to validate assumptions made for determining commercial viability.

DOE will collect data during the project to ensure that the project can economically continue beyond the project period.

The phased approach is designed to guide projects through the project development process incrementally. Each subsequent phase is structured to ensure that each award meets a standard level of maturity, employs a robust execution approach, and that technical and non-technical project risks are adequately and appropriately managed throughout DOE's award.

As the projects are expected to continue as self-sustaining entities operating fully independent of federal funds, DOE may also request financial sustainability plans or long-term disposition and decommissioning plans as part of future Go/No-Go decision points. This may include proposed sources of funding/revenue and the business model which will support the projects beyond the DOE award. This may also include an estimate of profit and loss demonstrating how the projects will maintain financial self-sufficiency and strategies to grow beyond the initial award or retain sufficient funding for decommissioning and demolition, if appropriate.

2.0 Award Information

| | |
|-------------------------------------|--|
| Anticipated Type of Award: | Cooperative Agreement |
| Application Type(s) Allowed: | New |
| Estimated Number of Awards: | Up to 6 |
| Anticipated Funding Amount: | \$1,700,000,000 |
| Award Budget: | Maximum DOE funding for each award and each Topic Area are listed below. DOE funding will not exceed 50% of the total project cost. |
| Award Project Period: | The maximum project period is 12 years, and the scope of the proposed project would determine the specific project period within the maximum project period. |

DOE may issue awards in one, multiple, or none of the following topic areas:

Table 1. Award Amounts by Topic Area

| TA Number | TA Title | Anticipated Number of Awards | Maximum Award Size for Any One Individual Award (Fed Share*) | Approximate Total Federal Funding Available for All Awards | Anticipated Period of Performance |
|-----------|--|------------------------------|--|--|-----------------------------------|
| TA-1 | CCS Demonstration at a Coal Electric Generation Facility | 0 – 2 | \$350,000,000 | \$700,000,000 | Up to 12 years |
| TA-2 | CCS Demonstration at a Natural Gas Electric Generation Facility | 0 – 2 | \$270,000,000 | \$540,000,000 | Up to 12 years |
| TA-3 | CCS Demonstration at an Industrial Facility Not Purposed for Electric Generation | 0 – 2 | \$230,000,000 | \$460,000,000 | Up to 12 years |
| Total | | Up to 6 | \$850,000,000 | \$1,700,000,000 | |

*The DOE share listed under the anticipated individual award size is the maximum amount of DOE funding that can be proposed for each Topic Area.

Applications that propose a DOE share more than the maximum limits stated above will not be evaluated and will be considered nonresponsive to the FOA.

DOE has substantial involvement in work performed under Cooperative Agreements made as a result of this FOA. DOE is responsible for:

1. Reviewing in a timely manner project work performance and deliverables, and redirecting the work effort as needed to address critical programmatic issues;
2. Conducting program review meetings to ensure adequate progress and that the work accomplishes the program and project activities. At the Go/No-Go decision points, the recipient will provide a continuation application and present the detailed work plan and budget requirements for the following period. In addition to decision point, DOE may conduct unscheduled reviews, if necessary, on a non-interference basis, which may be used by DOE for assessments of whether to have continued performance of the award;
3. Redirecting work or shifting work emphasis, if needed; participating in recipient meetings and conference calls; this includes additional monitoring to permit specified kinds of direction or redirection of the work because of interrelationships with other projects;
4. Serving as scientific/technical liaison between the awardee and other program or industry staff;
5. Oversight of recipient progress to help ensure the project achieves intended results. This may include shifting work emphasis, within the various projects, if necessary to achieve project goals. If work scope changes are required, they will be negotiated between the parties; and
6. Coordinating the conduct of independent reviews of the project if needed.

There are limitations on recipient and DOE responsibilities and authorities in the performance of the project activities. Performance of the project activities must be within the scope of the Statement of Objectives, the terms and conditions of the Cooperative Agreement, and, if applicable, funding and schedule constraints.

The applicant will establish four phases for the proposed project. DOE will only fund up to one phase at a time.

A contingency reserve is required for Phases 3 and 4. The amount of contingency will be determined based on the quantitative risk analysis performed by the recipient. The required contingency may be adjusted based on the level of remaining project risks and other considerations as the project progresses.

Applicants must demonstrate that they can meet unexpected financial needs of the project. The full design package needed to advance to Phase 3 must also include documentation showing that the recipient has access to the required contingency reserve.

Typically, DOE expects contingency funds must be: (a) liquid, (b) immediately available, and (c) unrestricted funds dedicated exclusively to the project for the purpose of mitigating project performance baseline risk. Resources that have other requirements that must be met or subject to other constraints, such as performance guarantees, cannot count towards the contingency requirement.

The contingency reserve is in addition to total project costs and does not count towards the Recipient's minimum 50% cost share requirement. If expended, the contingency will not result in reimbursement by DOE above the total federal share approved in the award. DOE discourages Applicants from reducing scope to comply with the contingency reserve requirement.

DOE may establish more than one budget period for each award (and award phase) and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the completion of each phase, DOE will conduct Go/No-Go reviews of all projects and may provide additional funding only to a subset of Applicants.

This FOA will be carried out in four phases with Go/No-Go decision points between each phase (and possibly within phases). Go/No-Go reviews will be conducted on individual projects as they complete the work in each phase.

Because proposed projects will be at differing maturity states, Phase durations will be negotiated with award Applicants.

Project continuation will be contingent upon several elements, including satisfactory performance and Go/No-Go Decision Point review. At the Go/No-Go Decision Points, DOE's evaluation will include project performance, project schedule adherence, the extent to which milestone objectives are met, compliance with reporting requirements, overall contribution to the program goals and objectives, and other factors as needed.

As a result of this evaluation, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the continued availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

DOE will accept only new applications under this FOA. DOE will not consider applications for renewals of existing DOE-funded awards through this FOA. This announcement and awards made under this announcement will fall under the purview of 2 C.F.R. Part 200 and 2 C.F.R. Part 910.

3.0 Eligibility Information

To be considered for substantive evaluation, an Applicant's submission must meet the criteria set forth below. If the application does not meet these eligibility requirements, it will be considered ineligible and removed from further evaluation.

DOE will not make eligibility determinations for potential Applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the Applicant.

3.1 Eligible Applicants

Domestic Entities

The proposed prime recipient and subrecipient(s) must be domestic entities except as stated below. The following types of domestic entities are eligible to participate either as a prime recipient or subrecipient of this FOA:

1. Industry stakeholders, including any industry stakeholder operating in partnership with the National Laboratories;
2. Institutions of higher education;
3. Multi-institutional collaborations;
4. And other appropriate entities listed below:⁶
 - a. For-profit entities;
 - b. Non-profit entities;
 - c. Tribal Nations
 - d. State and local governmental entities;
 - e. Incorporated Consortia; and
 - f. Unincorporated Consortia

Federal agencies and instrumentalities (other than DOE), DOE/NNSA FFRDC, and Non-DOE/NNSA FFRDC, are eligible to participate only as a subrecipient, and are not eligible to apply as a prime recipient.

For non-DOE/NNSA FFRDCs, the Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under the award.

For DOE/NNSA FFRDCs, the cognizant Grants and Agreements Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The funding for the FFRDC will flow through the prime recipient. The following wording is acceptable for this authorization: Authorization is granted for the Laboratory to participate in the proposed project. The work proposed for the Laboratory is consistent with or complementary to the missions of the Laboratory and will not adversely impact execution of the DOE assigned programs at the Laboratory.

To qualify as a domestic entity, the entity must be organized, chartered, or incorporated (or otherwise formed) under the laws of a particular state or territory of the United States; have majority domestic ownership and control; and have a physical place of business in the United States.

⁶ 42 U.S.C. § 16292(b)(4)(C).

Foreign Entities

In limited circumstances, DOE may approve a waiver to allow a foreign entity to participate as a prime recipient or subrecipient. A foreign entity may submit an Application to this FOA, but the Application must be accompanied by an explicit written waiver request. Likewise, if the Applicant seeks to include a foreign entity as a subrecipient, the applicant must submit a separate explicit written waiver request in the application for each proposed foreign subrecipient.

[Appendix O](#) lists the information that must be included in a foreign entity waiver request. The Applicant does not have the right to appeal DOE's decision concerning a waiver request.

Incorporated Consortia

Domestic incorporated consortia are eligible to participate as a prime recipient or subrecipient. For consortia incorporated (or otherwise formed) under the laws of a state or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated (or otherwise formed) in a foreign country, please refer to the requirements in "Foreign Entities" above. Each consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the DOE Grants and Agreements Officer.

If the consortium includes foreign members, the applicant must submit a separate explicit written waiver request in the application for each foreign member. See [Appendix O](#).

Unincorporated Consortia

Unincorporated Consortia must designate one member of the consortium to serve as the prime recipient/consortium representative. The prime recipient/consortium representative must qualify as a domestic entity. Upon request, unincorporated consortia must provide the DOE Grants and Agreements Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should include the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

If the consortium includes foreign members, the applicant must submit a separate explicit written waiver request in the Application for each foreign member. See [Appendix O](#).

3.2 Cost Sharing

Applicants are bound by the cost share proposed in their applications if selected for award negotiations. The cost share must be at least 50% of the total project costs^{7, 8}. The cost share must come from non-federal sources unless otherwise allowed by law. Cost share may be provided in the form of cash or cash equivalents, or in-kind contributions. Cost share must come from non-federal sources (unless otherwise allowed by law) such as project participants, state or local governments, or third-party financing.

Federal financing, such as DOE Loan Guarantees, cannot be leveraged by applicants to provide the required cost share or otherwise cover the same scope that is proposed in the application. A contingency reserve will also be required for all Phase 3 and 4 activities. More information on contingency reserves can be found in [Section 2.0](#). Neither contingency funds nor any program income should be included as cost share in the Applicant's budget.

DOE understands that projects selected under this FOA may require the use of existing data. For purposes of this FOA, DOE will consider data that is commercially available at an established market price to be an allowable cost under the project (either as DOE share or non-federal cost share) but DOE will not consider in-kind data (e.g., data, owned by an entity, that is not routinely sold commercially but is instead donated to the project and assigned a value) to be an allowable cost under the project, including as Recipient cost share.

Estimation methods used by the Recipient to assign a value to in-kind data cannot be objectively verified by DOE and therefore will not be accepted by DOE as an allowable cost under any project selected from this FOA. Consequently, DOE will not recognize in-kind data costs in any resulting approved DOE budget.

Each project team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual project team members may vary, as long as the cost share requirement for the project as a whole is met.

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the prime recipient, the prime recipient is legally responsible for paying the entire cost share. If the funding agreement is terminated prior to the end of the project period, the prime recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

⁷ Total project costs are the sum of the government share, including FFRDC costs if applicable, and the recipient share of project costs.

⁸ Section 988(c) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16352(c)). See also 2 C.F.R. § 200.306 and 2 C.F.R. § 910.130 for additional cost sharing requirements.

The prime recipient is solely responsible for managing cost share contributions by the project team and enforcing cost share obligation assumed by project team members in subawards or related agreements.

3.3 Applications Specifically Not of Interest and Responsiveness Criteria

The following types of Letters of Intent and Applications will be deemed nonresponsive and will not be reviewed or considered:

- Applications that do not specifically target one of the Topic Areas in [Section 1.3](#).
- Applications that exceed the maximum DOE share as outlined in [Section 2.0](#).
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Applications to advance the maturation of post-combustion and pre-combustion carbon capture technologies, apart from the required design of a CCS demonstration system;
- Applications to advance the maturation of CO₂ compression technologies, apart from the required design of a CCS demonstration system;
- Applications to advance the maturation of CO₂ storage technologies apart from the required design of a CCS demonstration system;
- Applications to advance the maturation of CO₂ conversion technologies;
- Applications that include costs for designing and constructing new electric generation and industrial facilities apart from the required design of a CCS demonstration system;
- Applications to advance the maturation of advanced power cycles (e.g., supercritical CO₂ cycle, and chemical looping configurations) apart from the required design of a CCS demonstration system;
- Applications on technologies to solely increase CO₂ concentration in the exhaust gas (e.g., exhaust gas recirculation (EGR)); Combining EGR with larger carbon capture and sequestration technologies is allowed.
- Applications that include algae-based carbon capture technologies;
- Applications that include materials screening (computational or experimental) of novel sorbents, solvents, membrane or electrochemical materials;
- Applications to advance the maturation of direct air capture;
- Applications that propose a host site that is not located in the United States;
- Applications proposing an existing host site that is not currently in commercial operation or with an announced closure date earlier than 15 years from the date of the award;
- Applications proposing CCS systems located at coal CHP facilities that are not generating electricity to the grid or district energy systems;
- Applications proposing CCS systems located at SMR facilities that: 1) are producing hydrogen from natural gas for other purposes than electricity generation to the grid or 2) are located in a refinery and the Applicant does not also propose to capture CO₂ from a different refinery process that does not produce hydrogen;
- Applications proposing CCS systems located at natural gas CHP facilities that are not generating electricity to the grid or district energy systems;
- In Topic Area 3: Industrial facilities that export the majority of electric power to the grid;

- Applications that propose to capture ethanol or hydrogen as a final product;
- Applications for basic research aimed solely at discovery and/or fundamental knowledge generation;
- Applications for bench- and pilot-scale testing;
- Applications that propose to demonstrate technologies that do not offer significant improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture and sequestration technology;
- Applications that propose to store CO₂ as biomass or its derivatives;
- Applications that include CO₂ pipelines for which the specific route has not been identified;
- Applications that do not use subsurface geologic formations for final storage/disposal
- Applications proposing a reservoir storage site that does not have a competent seal above it;
- Applications that do not have a designated storage/disposal site or have not completed detailed characterization of their storage/disposal site;
- Applications for which the process to acquire pore space rights / mineral rights has not been initiated;
- Applications that are seeking to use funds to characterize their storage site; and
- Applicants that have not completed FEED studies for carbon capture, transport, and storage.

3.4 Limitation on Number of Applications Eligible for Review

An entity may submit multiple Letters of Intent but must select only one to take forward as an Application to this FOA. The Letter of Intent and Application must address only one TA identified in [Section 1.3](#). If an entity submits more than one Application, OCED will request a determination from the applicant's authorizing representative as to which application should be reviewed. Any other submissions received listing the same entity as the applicant will not be eligible for further consideration.

This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential subrecipient or partner) so long as the entity is only listed as the Applicant on one Application submitted under this FOA.

4.0 Application and Submission Information

4.1 Application Package

All submissions must conform to the form and content requirements described below, including maximum page lengths.

- Each must be submitted in Adobe PDF format unless stated otherwise;
- Each must be written in English;
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Calibri typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;
- A **control number** will be issued when an Applicant begins the OCED eXCHANGE application process. The control number must be included with all application documents. Specifically, the control number must be prominently displayed on the upper right corner of the header of every page and included in the file name (i.e., *Control Number_Applicant Name_Application*);
- Page numbers must be included in the footer of every page; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If Applicants exceed the maximum page lengths indicated below, DOE will review only the authorized number of pages and disregard any additional pages.

Note: The maximum file size that can be uploaded to the OCED eXCHANGE website is 50MB. Files in excess of 50MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 50MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:

ProposalContent_Part_1
ProposalContent_Part_2

DOE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 50MB.

4.2 Application Submission

There are several one-time actions before submitting an application in response to this FOA, and it is vital that Applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an Applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

4.2.1 OCED eXCHANGE

To apply to this FOA, Applicants must register with and submit application materials through OCED's online application portal, OCED eXCHANGE, at <https://oced-exchange.energy.gov>. See detailed instructions at [Financial Opportunities: Manuals \(energy.gov\)](#). OCED eXCHANGE is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. If an Applicant experiences technical difficulties with a submission, the Applicant should contact the OCED eXCHANGE helpdesk for assistance (OCED-exchangeSupport@hq.doe.gov).

4.2.2. Unique Entity Identifier (UEI) and System for Award Management

Each Applicant (unless the Applicant is excepted from those requirements under 2 C.F.R. § 25.110) is required to: (1) Be registered in the SAM at <https://www.sam.gov> before submitting its application; (2) provide a valid UEI number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active federal award or an application or plan under consideration by a federal awarding agency. DOE may not make a federal award to an Applicant until the Applicant has complied with all applicable UEI and SAM requirements and, if an Applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, the DOE will determine that the Applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another Applicant. Designating an Electronic Business Point of Contact and obtaining a special password called a Marketing Partner ID Number are important steps in SAM registration.

NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process. Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process, they should utilize the HELP feature on SAM.gov. Additional entity validation resources can be found here: [GSAFSD Tier 0 Knowledge Base - Validating your Entity](#).

4.2.3. FedConnect

Register in FedConnect at <https://www.fedconnect.net>. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

4.2.4. Grants.gov

Register in Grants.gov (<http://www.grants.gov>) to receive automatic updates when Modifications to this FOA are posted. However, please note that Letters of Intent, Concept Papers, and Applications will not be accepted through Grants.gov. As applicable, modifications to this FOA will be posted on the OCED eXCHANGE website and the Grants.gov system. However, you will only receive an email when a modification is posted if you register for email notifications for this FOA in Grants.gov. OCED recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

4.2.5. Electronic Authorization of Applications and Award Documents

Submission of an application and supplemental information under this FOA through electronic systems used by the DOE, including OCED eXCHANGE and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

4.3. *Application Forms*

The application forms and instructions are available on OCED Exchange. To access these materials, go to <https://oced-exchange.energy.gov/> and select the appropriate FOA number.

4.4. *Submission Dates and Times*

All required submissions must be submitted in OCED eXCHANGE no later than 5 p.m. ET on the dates provided on the cover page of this FOA.

4.5. *Requirement for Full and Complete Disclosure*

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

4.6. Proposal Content

This application process includes multiples phases: Letter of Intent and Application.

4.6.1. Letter of Intent

Applicants must submit a Letter of Intent by the specified due date and time to be eligible to submit an Application. Letters of Intent will be used by OCED to plan for the merit review process. The letters should not contain any proprietary or sensitive business information. The letters will not be used for down-selection purposes, and do not commit an Applicant to submit an application.

Applicants are not bound to the statements made in the Letter of Intent; it is reasonable for project partners, locations, or other factors to change during the application development process. DOE will not provide feedback on the Letters of Intent. OCED will not review or consider nonresponsive Letters of Intent (Section 3.3).

Each Applicant must provide all the following information as part of the Letter of Intent:

- Lead organization (Applicant);
- Project title;
- Major project subcontractors;
- Major project vendors;
- Key individuals;
- Zip Code(s) to be impacted by the project;
- Topic Area of Interest;
- Expected duration of each phase of the project; and
- Abstract – The abstract provided should be not more than 200 words in length and should provide a truncated explanation of the proposed project.

4.6.2. Application

All Application documents must be marked with the control number issued to the Applicant. Each Application must be limited to a single proposal. Applications must conform to the content and form requirements listed below and must not exceed the stated page limits. Applicants must provide sufficient citations and references to justify the claims and approaches made to DOE. However, DOE and reviewers are under no obligation to review cited sources.

4.6.2.1. *Application for Federal Assistance (SF-424)*

| | |
|------------------------|--|
| (PDF, 3 pages maximum) | File Naming Convention: ControlNumber_LeadOrganization_App424 |
|------------------------|--|

The Standard Form ([SF-424](#)) represents the government-wide standard form for grant application packages, and requires basic information about the Applicant (name, address, telephone number, type of Applicant, etc.), including a list of sources of proposed funding and a description of the proposed project. Complete all required fields in accordance with the instructions on the form.

In Field 21 of the SF-424, the authorized representative must certify and agree with the Certification and Assurances found at [Certifications and Assurances for Use with SF-424 | Department of Energy](#)

Note: The dates and dollar amounts on the SF-424 are for the complete project.

4.6.2.2. *Technical Volume*

An application must include a Technical Volume, which includes the following components that are further detailed below: a) Cover Page; b) Project Overview; c) Technical Description, Innovation, and Impact, d) Technical Approach and Project Management Plan, e) Technical Qualifications and Resources. The Technical Volume may not be more than 55 pages, including the table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the components listed above. The Applicant should consider the weighting of each of the technical review criterion ([Section 5.2.2](#)) when preparing the Technical Volume.

| a) Cover Page | |
|------------------------|--|
| (PDF, 2 pages maximum) | File Naming Convention: ControlNumber_LeadOrganization_Cover_Page |

The cover page must include the project title, the specific FOA Topic Area being addressed , both the technical and business points of contact, names of all team member organizations, senior/key personnel, and their organizations (including collaborating organizations), the project location(s) by the city, state, and zip code + 4 and State for each location where project work will be performed by the prime recipient or subrecipient(s), and any statements regarding confidentiality as described in section 8.1. For each proposed prime recipient and subrecipient(s) that meets the criteria for domestic entity as stated in section 3.1, the applicant must state and certify that entity's domestic entity status. For each proposed prime recipient and subrecipient(s) that does not meet the criteria for domestic entity stated in section 3.1, the applicant must state the entity's status as a foreign entity and submit a foreign entity waiver request as specified in [Appendix O](#).

| b) Project Overview (Approximately 15% of the Technical Volume) | |
|---|--|
| (PDF, 8 page maximum) | File Naming Convention: ControlNumber_LeadOrganization_Project_Overview |

The Project Overview should contain, at a minimum, the following information:

- **Background:** The Applicant should discuss the background of their organization, including the history, successes, and current development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Application. Applicants should also explain why they are championing the proposed project and the driving force behind their commitment to its successful completion.
- **Project Goal:** The Applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal, including the ways in which the proposed project will lead to industry adoption. It should also include the ways in which the proposed project location and related infrastructure, skilled workforce, community benefits, etc. will contribute to the success of the overall project.
- **Carbon Capture Host Site, Transportation, and Storage Site Description and Integration.** Applicants are required to describe the new or existing proposed host site, transport method, and storage site facilities, including, but not limited to, process diagrams, emissions profiles, P&IDs, geologic characterizations, and availability and quality of land, water, steam and/or waste heat (as applicable). A corresponding narrative is required to provide application reviewers a clear understanding of the proposed capture and sequestration process and project from technical, cost effectiveness, and integrated systems perspectives. At a minimum, the description shall include the following:
 - *Anticipated feed conditions* (e.g., pressure, temperature, flow rate, gas composition, and contaminant levels),
 - *Electrical, water and waste management.* Applicants should describe how electricity consumption, heat, water, and waste will be managed in the proposed CCS demonstration project and tied into the existing host facility.
 - *Contaminants Controls.* Applicants should describe how contaminants in the gas stream targeted for carbon capture (e.g., NO_x, SO_x, PM_s) and chemical contaminants associated with the carbon capture technology (e.g., amines, nitrosamines) will be managed and their potential effects on the carbon capture system, host site, and/or environment.
 - *Long term impacts of solvent, sorbents, membranes, etc.* Applicants should describe the plans for recharging/regenerating the solvent, sorbent beds, membranes, etc. to maintain adherence to 90% carbon capture target as well as long term impacts on the process equipment, infrastructure, and the environment.
 - *CO₂ product disposition.* Applicants must demonstrate that the proposed CO₂ capture technology will produce a CO₂ stream of required temperature and quality suitable for cost-effective compression and transport/disposition of the stream, without adversely affecting existing operations, compressors, pipelines, or geologic-storage formations.
 - *Description of the CO₂ capture equipment design concept* (e.g., membrane module architecture, absorber/desorber design, etc.).

- *Description of the economic and performance testing plan.* Applicants must identify the key cost and performance metrics that must be validated to successfully demonstrate the CCS technology and reduce uncertainties and risks to facilitate private-sector investments in follow-on deployments. Applicants must describe the activities to be performed and data to be collected to validate the cost and performance of the integrated CCS demonstration system.
- Description of how the capture system will be integrated with the host plant (including any gas preconditioning steps and any integration challenges), and how the integration will differ (or not) from the relevant referenced pilot demonstrations
- **DOE Impact:** The Applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
- Identify any potential long-term constraints the project will have on the impacted communities' access to natural resources (e.g., water) and tribal cultural resources. If applicable, describe a long-term cleanup strategy that ensures communities and neighborhoods remain healthy and safe and not burdened with cleanup costs and waste.
- The Applicant should outline a climate resilience strategy that accounts for climate impacts and extreme weather patterns such as high winds (tornadoes and hurricanes), heat and freezing temperatures, drought, wildfire, and floods.

| c) Technical Description, Innovation, and Impact (Approximately 35% of the Technical Volume) | |
|--|--|
| (PDF, 20 page maximum) | File Naming Convention: ControlNumber_LeadOrganization_Technical_Description |

The Technical Description should contain, at a minimum, the following information:

- **Relevance and Outcomes.** The Applicant should provide a detailed description of the proposed demonstration project, including the objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA including meeting DOE project performance objectives. The Applicant should clearly specify the expected outcomes of the project.
- **Readiness.** The Applicant should provide a discussion of the proposed CCS demonstration project from technical, environmental, cost effectiveness, and integrated systems perspectives. This will include evaluation of supplied mass and energy balances, estimates of heating and cooling duties and electric power requirements covering the carbon capture system and balance-of-plant, cost of capture, and levelized cost of electricity (if applicable), as well as the adequacy and completeness of information provided in the State Point Data Table (see [Appendix F](#)) and Block Flow Diagram and Supplemental Data ([Appendix L](#)).

The Applicant should provide justification that the proposed CCS technology has attained the required TRL and is capable of meeting specific TA performance targets to support readiness for the proposed CCS demonstration. Scientific, engineering, and technical information and performance data obtained from prior tests of the proposed technology should be provided to support evidence of the readiness of the proposed technology for demonstration at the scale proposed. The Applicant is asked to provide copies of the table in [Appendix P](#) for all prior demonstrations (pilot and industrial) as well as the proposed project in this application. Note that failure to provide at least two tables (one for the current demonstration, and one for the most relevant pilot demonstration) will be considered noncompliant.

- **Feasibility.** The Applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. This section should also address the project's access to necessary infrastructure (e.g., transportation, water, electricity transmission) including any use of existing infrastructure, as well as to a skilled workforce.
- **CO₂ Capture Host Site Selection.** Applicants are required to identify the location for conducting the integrated CCS demonstration project. Applicants must discuss the adequacy of the proposed CO₂ capture host site for the CCS demonstration project. Applicants must also discuss the fit of the site from a community benefits standpoint (including social characterization of nearby communities, community support for the project, and workforce availability), with reference to the CBP as appropriate. Applicants must provide plans for execution of the host site agreement, including key criteria and any conditions. The specific facility must be located **exclusively in the United States**.
- **CO₂ Storage Site Selection.** Applicants are required to provide supporting information showing that the UIC Class VI injection well permits and all relevant permits to construct the proposed storage facility have been granted or that the applications to obtain such permits have been submitted to EPA, the corresponding state agency(s), or any other applicable regulatory entities. If the permits are not granted at the time of the application, the Applicants should discuss the timing when the permits are expected to be granted and any potential obstacles to obtaining those permits. Permits must be granted before construction/drilling begins (Phase 3). The specific facility must be located **exclusively in the United States**.
- **Summary of the CO₂ Capture FEED.** Applicants are required to submit summary results of a FEED study for the proposed CO₂ capture technology integrated with the proposed host site and designed for a minimum CO₂ capture efficiency of 90%. Format and content guidance are in [Appendix C](#). Please include a summary of the Techno-Economic Analysis with the FEED Summary. Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution.
- **CO₂ Pipeline FEED Study.** Applicants are required to submit summary results of a FEED study for the proposed CO₂ pipeline and associated infrastructure required to connect the selected CO₂ capture host and storage sites. Please include a summary of the Techno-Economic Analysis with the FEED Summary.

Format and content guidance are in [Appendix D](#). Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution.

- **CO₂ Storage FEED Study.** Applicants are required to submit summary results of a FEED study for the proposed CO₂ storage site. Included with this summary should be a detailed characterization of the storage site, current mineral rights (or a summary of ongoing discussions), and geologic and reservoir modeling studies to justify CO₂ injectivity and long-term storage plans. Please include a summary of the Techno-Economic Analysis with the FEED Summary. Format and content guidance are in [Appendix E](#). Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution.
- **Carbon Capture Technology Description.** The Applicants are required to describe the advanced carbon capture technology, including but not limited to, the following:
 - Preliminary process flow diagrams;
 - Mass and energy balances;
 - Steam and power requirements;
 - As applicable, a discussion of the absorption/desorption chemistry and operating cycle for solvent and sorbent systems; and
 - As applicable, a description of relevant membrane chemistry, including transport mechanism.
- **Innovation and Impacts:** The Applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed CCS technology, how the proposed technology would demonstrate significant improvements in the efficiency, effectiveness, cost, and environmental performance of CCS systems for power, industrial, or other commercial applications over current and emerging technologies, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful.

| d) Technical Approach and Project Management (Approximately 20% of the Technical Volume) | |
|--|--|
| (PDF, 10 page maximum) | File Naming Convention: ControlNumber_LeadOrganization_Technical_Approach |

The Technical Approach should include a summary of the Project Objectives, Technical Scope, and Work Breakdown Structure (WBS), Milestones, Go/No-Go decision points, and Project Schedule. A Project Management Plan is separately requested. The Technical Approach should contain, at a minimum, the following information:

- **Project Objectives:** The Applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes.
- **Technical Scope Summary:** The Applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete decision points (see below for more information on Go/No-Go decision points).

The Applicant should describe the specific expected end result of each performance period, including milestones detailed in the Community Benefits Plan.

- **Work Breakdown Structure (WBS) and Task Description Summary:** The WBS/Workplan should describe the work to be accomplished and how the Applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period, task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as “we will then complete a proprietary process” is unacceptable).

It is the Applicant’s responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the PMP. The PMP will contain a more detailed description of the WBS and tasks.

- **Milestone Summary:** The Applicant should provide a summary of appropriate milestones throughout the project to track overall project progress. The Applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the milestones listed in the PMP.
- **Go/No-Go Decision Points:** Provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. At a minimum, each project must have at least one project-wide Go/No-Go decision point at the end of each Phase of the project. Interim Go/No-Go decision points may also be used. The Applicant should also provide the specific technical and Community Benefits criteria to be used to evaluate the project at the Go/No-Go decision point. The summary provided should be consistent with the description in the PMP.
- **End of Project Goal:** The Applicant should provide a summary of the end of project goal(s). The summary provided should be consistent across all documents in application.
- **Requirements for Infrastructure Projects:** Within the first 2 pages of the Workplan, include a description of how the project complies with Buy America (see [Section 4.8.3.](#)) and Davis-Bacon Requirements (see [Section 4.8.4.](#)) as applicable.
- **Project Management:** The Applicant should provide a summary of the team’s proposed management strategy, including the following:
 - The overall approach to and organization for managing the work;
 - The roles of each project team member;
 - Any critical handoffs/interdependencies among project team members;
 - The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices;
 - The approach to project risk management, including a plan for securing a qualified workforce and mitigating risks to project performance including but not limited to community or labor disputes;
 - A description of how project changes will be handled;

- If applicable, the approach to Quality Assurance/Control; and
- How communications will be maintained among project team members.

The summary provided within the Technical Volume should be consistent with the PMP (see [Appendix K](#)). The PMP will contain more detailed information.

- **Market Transformation Plan:** The Applicant should describe how the project will advance market transformation, including the following:
 - Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan.
 - Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, and product distribution.

| e) Technical Qualifications and Resources (Approximately 30% of the Technical Volume) | |
|---|---|
| (PDF, 15 page maximum) | File Naming Convention: ControlNumber_LeadOrganization_Technical_Qualifications |

The Technical Qualifications and Resources should contain, at a minimum, the following information:

- Describe the project team’s unique qualifications and expertise, including those of key subrecipients. The project team should include the following members or skill sets, at a minimum: CO₂ capture technology developer or licensor, CO₂ pipeline operator (if applicable), CO₂ capture storage site owner or operator, EPC company(s), financial partner(s), NEPA compliance consultant, LCA consultant, and CBP consultant.
- Describe the project team’s existing equipment and facilities, or equipment or facilities already in place on the proposed project site, that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project.
- This section should also include relevant, previous work efforts (of similar size, scope, and complexity), demonstrated innovations, and how these enable the Applicant to achieve the project objectives.
- Describe a brief summary of the relevant experiences of key personnel leading and supporting the project
- Describe the time commitment of the key team members to support the project.
- Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable.

- Describe the skills, certifications, or other credentials of the construction and ongoing operations workforce.
- For multi-organizational projects, describe succinctly:
 - The roles and the work to be performed by each organization;
 - How the various efforts will be integrated and managed;
 - Process for making project management decisions;
 - Intellectual Property issues; and
 - Communication plans.

4.6.2.3. **Community Benefits Plan: Job Quality and Equity**

| | |
|-------------------------|---|
| (PDF, 25 pages maximum) | File Naming Convention: ControlNumber_LeadOrganization_Comm_Benefits |
|-------------------------|---|

Deployment of new technology will likely be more successful if equity and justice, community and labor engagement, and quality jobs are integrated into technology development from the beginning. For example, failing to meaningfully engage with community stakeholders, Tribes, and labor unions has been a contributing factor to delays or cancellations of energy and carbon management projects in the past. Related to CCS specifically, DOE has received many questions and concerns related to potential benefits or negative impacts such as changes to air pollution, water pollution, energy prices, and jobs, among other topics. With thorough assessment of potential technology impacts and meaningful engagement, impacted groups can be project partners whose questions and concerns can improve overall project outcomes as well as pathways for future deployment. This is clear from feedback obtained from DOE stakeholders, requests for information, published research, and information obtained from DOE project work.

Therefore, applications must include a Community Benefits Plan (CBP) that describes how the proposed project would: (1) support meaningful community and labor engagement; (2) invest in America's workforce; (3) advance diversity, equity, inclusion, and accessibility; and (4) contribute to the President's goal that 40% of overall benefits of certain federal investments flow to disadvantaged communities (the Justice40 Initiative). CBP activities should also be incorporated into the project schedule, workplan, budget, and other key documents.

The sections below outline the requirements for each goal. Requirements are intentionally flexible to generate the best approaches from project teams that are responsive to communities, workers, and impacted groups. If there is content overlap between a specific CBP section and other parts of the CBP or the overall application, Applicants should point reviewers to more comprehensive efforts addressed elsewhere in the application. In cases where information is incomplete, Applicants should clearly explain the reason for missing information and provide plans to address those gaps during the project.

For this FOA, the CBP sections must specifically address localized impacts related to changes in air pollution (including criteria air pollutants and other hazardous pollutants such as NO_x, SO_x, and PM, as well as potential pollution from solvents, sorbents, or other materials used in the CCS

technology), water use, water pollution, impacts to consumer energy prices, safety related to CO₂ transport via pipeline, and job retention or creation.

Within the CBP, the Applicant is encouraged to provide specific detail on how to ensure accountability and the delivery of measurable community and jobs benefits, ideally through the use of negotiated agreements between the Applicant and the community, and/or the Applicant and labor unions referred to collectively here as “Workforce and Community Agreements.”⁹ Such agreements facilitate community and labor input and social buy-in, identify how concerns will be mitigated, and specify the distribution of community and economic benefits, including job quality, access to jobs and business opportunities for local residents, and mitigate community harms, thus reducing or eliminating these types of risks.

Plans should be specific, actionable, and measurable: the idea is to move beyond vision or assessment to concrete goals, outcomes, and implementation plans. Each CBP section should therefore propose specific milestones and metrics to measure progress. Applicants are encouraged to use SMART (Specific, Measurable, Achievable, Relevant and Timely) milestones whenever possible. Major milestones and work descriptions relevant to the plan should be included within the project schedule, workplan, budget, and other key documents. Each section should also include information about the resources intended to implement the specified activities.

The Community Benefits Plan should provide the most details regarding actions the Applicant would take during Phase 1 but should also describe in a higher-level summary what goals, deliverables, outcomes, and implementation strategies the Applicant would pursue in Phases 2 – 4. If DOE selects a project, DOE will provide feedback to award Applicants and require that they update their Community Benefits Plan during award negotiations.

Public transparency around community benefit activities can support project success and buy-in, and DOE will work to develop publicly available summaries of CBPs with project performers after awards are made as appropriate. Applicants may share details of their CBP with stakeholders and other parties at their own discretion.

Awardees must implement their CBP as part of carrying out the project; the CBP is expected to deepen and evolve during each phase for awarded projects. During the life of the award DOE or its representative(s) will independently evaluate the recipient’s implementation status and effectiveness, including as part of the Go/No-Go review process. Adequate progress made in implementing the community benefits plan will be required for projects to advance through phases.

⁹ Workforce and Community Agreements include good neighbor agreements, community benefits agreements, community workforce agreements, project labor agreements, and other collective bargaining agreements.

Applicants are also encouraged to provide Community and Labor Partnership Documentation from representative organizations reflecting substantive engagement and feedback on Applicant's approach to community benefits. These letters of support should be submitted under the Community Partnership Documentation (see [Section 4.6.3.4](#)) and do not count toward the Community Benefits Plan page limit.

Detailed guidance and examples on creating each section of the CBP will be provided under the application documents section on the OCED Exchange website at <https://oced-exchange.energy.gov>. Applicants are encouraged to read these resources prior to writing their Community Benefits Plan. Applicants are also encouraged to leverage information generated in other portions of this FOA to support Community Benefits Plan development, including the Environmental Considerations Summary and LCA.

Community and Labor Engagement

The Community and Labor Engagement section should describe the Applicant's plans and actions to engage with Tribal governments and local stakeholders such as community-based organizations representing local residents and businesses, labor unions and other worker organizations, workforce development organizations, local government, emergency responders, communities with environmental justice concerns, disadvantaged communities, and community-based organizations that support or work with disadvantaged communities. By facilitating labor and community input, social buy-in, and accountability, such engagement can substantially reduce or eliminate stalls or slowdowns, litigation, and other risks associated with project implementation.

Community and labor engagement should be responsive to the priorities of impacted groups, ensure community and labor input can impact project decisions, and support transparency and accountability. Ideally, engagement can lay groundwork for 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.

If awarded and in conjunction with DOE, recipients will also identify to DOE any federally recognized Indian Tribes, which include Alaska native village or regional or village corporations (who are not project partners) for whom the proposed project may have implications. The recipient will provide information to support DOE's development of a Tribal engagement plan that acknowledges each Tribe's consultation policies, traditions, and expectations, and adheres to DOE Order 144.1 on Tribal consultation. Appropriate mitigation will be identified through government-to-government consultation to offset any such potentially adverse implications. DOE is and remains responsible for government-to-government consultation with any federally recognized Indian Tribes, which include Alaska native village or regional or village corporations about the proposed project.

The Community and Labor Engagement section should include the following elements:

- **Background and Experience.** A description of prior and ongoing efforts by the project team to engage community stakeholders, Tribes, and workforce organizations including labor unions.

- **Community History and Dynamics.** A description of the current and historical social, cultural, economic, labor, and environmental landscape, decision-making structures, and other relevant information about the project's affected areas and groups.
This is a first step of "getting to know the area" that should be completed before conducting a more structured stakeholder analysis and can identify sources of influence and conflicts to establish a foundation for proactive engagement around major projects.
- **Stakeholder Analysis.** A description of key stakeholder groups (sectors, labor unions, communities, organizations, etc.); how they were identified; and anticipated level of engagement (e.g., advisory committee, working group member, active public participant).
- **Statement on existing community and labor support.** A statement discussing the extent to which the surrounding community or communities, Tribes, and labor unions have indicated support for or concerns with the ongoing operations of the host site(s) and/or the proposed project.
- **Engagement Implementation Strategies, Methods, and Timeline.** An engagement plan which includes objectives for the engagement and when and how project teams will engage stakeholders, workforce organizations including labor unions, and communities. This should include a description of specific engagement methods (e.g., listening sessions, town halls, open houses, mediated discussions) matched to project phases and goals. Applicants should describe how they will extend these methods to include traditionally excluded stakeholders. If awarded, Applicants will work in conjunction with the Department of Energy to develop a Tribal engagement plan as appropriate. This section should demonstrate how engagement will explicitly address topics related to changes in Non-CO₂ air pollution, emissions, or discharges, including criteria air pollutants and materials used in the capture unit such as solvents; Waste streams including wastewater, spent solvent, or solvent degradation products; water use; impacts to consumer energy prices; safety related to CO₂ transport via pipeline; job retention or creation; and any other process or construction inputs or outputs that could cause positive or negative environmental, health, economic, or other impacts.
- **Two-way Engagement Statement.** A statement discussing how the project will incorporate community input. The statement should describe elements of the project where engagement can impact project decisions or characteristics—and specifically identify whether project site(s) could be changed based on social considerations and what opportunities exist for community participation in and access to project data.
- **Workforce and Community Agreements Statement.** A description of any plans to negotiate a Community Benefits Agreement, Good Neighbor Agreement, Project Labor Agreement, Community Workforce Agreement, and/or other collective bargaining agreements. Given project complexity and sensitivities, Applicants should consider pursuing multiple agreements.
- **Engagement Evaluation Strategy.** A description how stakeholder engagement success will be evaluated, including by evaluating stakeholder perceptions of the progress.
- **Resource Summary.** A summary of the resources dedicated to implementing the plan including staff with relevant expertise and budget.

Investing in the American Workforce

A well-qualified, skilled, and trained workforce is necessary to ensure project stability, continuity, and success, and to meet program goals. High-quality jobs are critical to attracting and retaining the qualified workforce required. Applicants should describe their approach to ensuring jobs are of sufficient quality during construction and operation to attract and retain the skilled workforce needed for project success, mitigate health and safety issues, and invest in workforce development.

The Investing in the American Workforce section should include the following elements:

- **Background and Experience.** A summary of the project team’s previous or ongoing efforts to provide above average pay and benefits to properly classified employees in both the construction and ongoing operations; support the rights of workers to a free and fair chance to join a union; attend to workplace health and safety in partnership with workers, and invest in workforce development.
- **Quality Jobs.** A description of plans to attract, train, and retain a skilled, qualified, local, and diverse workforce for construction, ongoing operations/production/maintenance, and scale-up activities, including the anticipated quality of jobs the project will create (i.e., wages—beyond compliance with Davis-Bacon prevailing wages and benefits, opportunities for wage progression, classification as employees, jobs for in-state workers, etc.). Describe how these jobs will be sufficiently attractive to skilled and trained workers under competitive labor market conditions.
- **Workforce Development.** A description of plans for workforce development, including:
 - Investing in workforce education and training (e.g., labor-management training programs, registered apprenticeships, partnerships with community colleges, sector-based approaches to workforce development);
 - Supporting workers’ skill acquisition and opportunities for advancement; and
 - Utilizing an appropriately credentialed workforce (e.g., requirements for appropriate and relevant professional and safety training, certification, and licensure, including where appropriate utilization of graduates from registered apprenticeship programs).
- **Worker Rights.** Employees’ ability to organize, bargain collectively, and participate, through labor organizations of their choosing, in decisions that affect them contributes to the effective conduct of business and facilitates amicable settlements of any potential disputes between employees and employers, providing assurances of project efficiency, continuity, and multiple public benefits. Provide information including:
 - How the applicant will ensure workers can form and join unions of their choosing, and how they will have the opportunity to organize within the workplace during construction and ongoing operations. An affirmative commitment could be an intention or willingness to permit union recognition through card check (as opposed to requiring union elections); intention or willingness to enter into binding arbitration to bargain first contracts with the union; a pledge to allow union organizers access to appropriate onsite non-workplaces (e.g., lunchrooms), and/or other supportive commitments or pledges.
 - Plans to ensure project success and continuity by mitigating labor disputes or strikes (e.g., neutrality with respect to union organizing and good faith negotiations);

- Activities and policies to ensure worker engagement in the design and execution of workplace safety and health plans;
- Plans to ensure workplace health and safety and worksites are free from harassment and discrimination;
- Descriptions of how Project Labor Agreements or Community Workforce Agreements will be utilized in construction activity (e.g., collective bargaining agreements between unions and contractors that govern terms and conditions of employment for all workers on a construction project);
- Plans to track retention rates and address areas of worker or workplace concern.
- **Milestones and Timelines.** A list of milestones and timelines for the proposed activities.
- **Resource Summary.** A description of project resources dedicated to implementing activities including staff with relevant expertise and budget.

Diversity, Equity, Inclusion, and Accessibility

The Community Benefits Plan must include a section describing how Diversity, Equity, Inclusion, and Accessibility (DEIA) objectives will be incorporated into the project. The section should detail how the Applicant 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.

Historically Black Colleges and Universities, other 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 that meet the eligibility requirements are encouraged to participate on the application team. The Selection Official may consider the inclusion of these types of entities as part of the selection decision.

DEIA plans should describe steps taken to ensure an inclusive workplace environment committed to equal opportunity and free of harassment. This should include compliance with civil rights obligations and nondiscrimination laws, including Title VI of the Civil Rights Act of 1964 and implementing regulations, the Americans with Disabilities Act of 1990 (ADA), and Section 504 of the Rehabilitation Act, all other civil rights requirements, and accompanying regulations.

The DEIA section should include the following elements:

- **Background and Experience.** A description of prior and ongoing efforts by the project team relevant to DEIA.
- **Strategies, Milestones, and Timelines.** A description of targeted DEIA outcomes and implementation strategies, including milestones and timelines. For example, Applicants can discuss any commitments to partner with Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, and Veteran Owned Businesses for contractor support needs; plans to partner with workforce training organizations serving under-represented communities and those facing systemic barriers to quality employment such as those with disabilities, returning citizens, opportunity youth, women, and veterans; and/or plans to provide comprehensive supportive services (such as childcare and transportation assistance) to increase representation and access in project's construction and operations jobs.
- **Resource Summary.** A description of project resources dedicated to implementing DEIA activities including staff with relevant expertise and budget.

Justice40 Initiative

Applicants should submit a Justice40 Initiative section that describes plans to advance energy and environmental justice (EEJ) through their project. The Justice40 Initiative section should include an assessment of project impacts and where they flow, and an implementation strategy that explains what actions the Applicants will take to maximize benefits and minimize negative impacts and measure, track, and report project impacts. Meaningful engagement with impacted communities is a key component of EEJ and is covered in detail as part of the Community and Labor Engagement section. Applicants should address how their plans will be transparent and accountable to impacted disadvantaged communities.

Project impacts and community assessments should be quantifiable, measurable, and trackable to the greatest extent possible. If no project sites or related activities are located within or near a disadvantaged community, Applicants should provide a detailed explanation to support this conclusion.

The Justice40 Initiative section should include the following elements:

- **Background and Experience.** A description of any prior or ongoing efforts by the project team relevant to energy and environmental justice and local community impacts of CCS.
- **Assessment of impacted communities and groups.** A description of all applicable communities or groups which could experience impacts from the proposed project at both early and late phases. Applicants should identify which of these are considered disadvantaged communities.¹⁰

¹⁰ Pursuant to E.O. 14008 and the Office of Management and Budget's Interim Justice40 Implementation Guidance M-21-28, DOE has developed a definition and tools to locate and identify disadvantaged communities. These resources can be located at <https://energyjustice.egs.anl.gov/>. Pursuant to Office of Management and Budget's Memorandum M-23-09, DOE recognizes disadvantaged communities as defined and identified by the White House Council of Environmental Quality's

For each disadvantaged community, Applicants should characterize the existing burdens they are facing using EJSCREEN, disadvantaged community definition tools, or other analytic tools. Applicants should include which tool was used in their analysis. Impacts to communities and Tribes/ANCs should be considered for all inputs and outputs along all four phases of the project, in addition to impacts at the project site(s) or work location(s).

- **Assessment of project benefits and where they flow.** Applicants should describe in detail all anticipated project benefits. This description should clearly enumerate:
 - a) specific project benefits and metrics that will be used to track each benefit;
 - b) where/to whom project benefits are expected to flow and the extent to which these benefits flow to disadvantaged communities; and
 - c) how well the anticipated benefits align with community priorities ascertained through community engagement.

Benefits could include measurable direct or indirect investments or positive project outcomes that contribute to the eight DOE Justice40 policy priorities 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 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.

If this project could result in reductions in air or water pollution, or reduction in water use, Applicants should describe clearly the expected magnitude of those benefits and under what conditions they could occur.

- **An assessment of project negative impacts and where they flow.** Applicants should describe all anticipated project negative impacts. This description should clearly enumerate:
 - a) specific project negative impacts and metrics that will be used to track each impact;
 - b) where/to whom impacts are expected to flow and the extent to which these benefits flow to disadvantaged communities;
 - c) how additional project negative impacts will interact with existing cumulative burdens.

Climate and Economic Justice Screening Tool (CEJST) Version 1.0, which can be 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>.

Negative impacts could include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health impacts. Consider direct impacts, indirect impacts, and cumulative impacts. This section may refer to the impacts identified in the NEPA Environmental Considerations Summary.

In this section, Applicants must specifically discuss any anticipated increases in: Non-CO₂ air pollution, emissions, or discharges, including criteria air pollutants and materials used in the capture unit such as solvents; waste streams, including wastewater, spent solvent, or solvent degradation products; water use; and consumer energy prices. Applicants must also specifically address safety risks from CO₂ transport and storage.

- **Assessment of information gaps.** Describe where additional work is needed to fully assess or measure potential project impacts or impacted communities. Applicants should outline research, engagement and analytical goals to clarify the unknowns as part of their implementation plan.
- **Implementation Plan, Milestones and Timelines.** An Implementation plan which includes strategies, methods, and milestones to maximize benefits, minimize negative impacts and measure, track, and report impacts. This should specifically discuss minimizing and mitigating any increases in air pollution, water pollution and use, and how Applicants will mitigate safety risks from CO₂ transport and storage. Applicants should clearly describe how the plan includes accountability, feedback, and transparency mechanisms with impacted groups and disadvantaged communities, such as community agreements and access to/participation in collecting project data.
- **Addressing barriers to realizing benefits and minimizing negative impacts.** A discussion of potential barriers to realizing benefits and minimizing negative impacts, and plans for mitigating those barriers.
- **Resource Summary.** Describe resources dedicated to implementing the plan including staff with relevant expertise and budget.

4.6.2.4. *Community Partnership Documentation*

| | |
|---|--|
| (PDF, each letter may not exceed 3 pages) | File Naming Convention: ControlNumber_LeadOrganization_PartnerDoc |
|---|--|

In support of the Community Benefits Plan, Applicants may submit documentation to demonstrate existing or planned partnerships with potentially affected Tribes, labor unions, and community entities, such as, organizations that represent and serve disadvantaged or overburdened communities or workers and/or local businesses. The Partnership Documentation could be in the form of a letter on the partner's letterhead outlining the planned partnership signed by an officer of the entity, a Memorandum of Understanding, or other similar agreement. Such letters must state the specific nature of the partnership and must not be general letters of support. If the Applicant intends to enter into a Workforce and Community Agreement as part of the Community Benefits Plan, please include letters from proposed partners as appropriate.

4.6.2.5. *Resumes*

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|---------------------|---|
| (PDF, 2 pages each) | File Naming Convention: ControlNumber_LeadOrganization_Resumes |
|---------------------|---|

Applicants are required to submit two-page resumes for senior and key senior personnel that demonstrate their experience and ability to lead the proposed project.

4.6.2.6. *Letters of Commitment*

| | |
|--------------------|--|
| (PDF, 1 page each) | File Naming Convention: ControlNumber_LeadOrganization_LOCs |
|--------------------|--|

Submit letters of commitment from 1) all subrecipients and 2) all third-party cost share providers. If applicable, the letter must state that the third party is committed to providing a specific minimum dollar amount or value of in-kind contributions allocated to cost sharing.

The following information for each third party contributing to cost sharing should be identified: (1) the name of the organization; (2) the proposed dollar amount to be provided; and (3) the proposed cost sharing type – (cash-or in-kind contributions). Letters of support or endorsement for the project from entities that do not have a substantive role in the project are not accepted.

4.6.2.7. *Project Management Plan*

| | |
|-----------------|---|
| (PDF, 50 pages) | File Naming Convention: ControlNumber_LeadOrganization_PMP |
|-----------------|---|

Applicants are required to submit a Project Management Plan (PMP). A PMP template is available as [Appendix K](#).

4.6.2.8. *Initial Environmental, Health, & Safety Assessment*

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|----------------------|--|
| (PDF, 10 pages each) | File Naming Convention: ControlNumber_LeadOrganization_EHSA |
|----------------------|--|

Applicants are required to submit an initial summary of the plan to perform EH&S assessment of the proposed project in accordance with the format provided in [Appendix G](#).

4.6.2.9. *Life Cycle Analysis*

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|-----------------------|---|
| (PDF, N/A pages each) | File Naming Convention: ControlNumber_LeadOrganization_LCA |
|-----------------------|---|

Applicants are required to submit an initial Life Cycle Analysis (LCA) of the proposed CCS demonstration project in accordance with the guidance provided in [Appendix J](#). The LCA will be updated as a Phase 2 deliverable.

4.6.2.10. Business Case Analysis

| | |
|----------------------|---|
| (PDF, 30 pages each) | File Naming Convention: ControlNumber_LeadOrganization_BCA |
|----------------------|---|

Applicants are required to submit a Business Case Analysis in the format provided in [Appendix H](#). If the plan includes the utilization of 45Q (or other federal or state) tax credits, the Business Case Analysis shall include, at a minimum, details on the anticipated revenue and duration of the credits. The plan must also include a preliminary discussion of plans to deploy the technology beyond the proposed project.

4.6.2.11. Project Financing Plan

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|---|---|
| (PDF, 20 pages each, plus excel spreadsheets) | File Naming Convention: ControlNumber_LeadOrganization_PFP |
|---|---|

Applicants are required to submit a Project Financing Plan in the format provided in [Appendix I](#). The Applicant shall provide sufficient evidence to demonstrate the Applicant's financial capability to fund, or obtain funding, for the non-DOE share of the proposed project costs, including contingency. The Project Financing Plan must be based on the economic and business assumptions developed in the application and should demonstrate that the project has adequate funding, including contingency, to complete the proposed scope of work. The Project Financing Plan should address all financing aspects of the project.

4.6.2.12. Budget Justification Workbook

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|------------|--|
| (MS Excel) | File Naming Convention: ControlNumber_LeadOrganization_Budget_Justification File Naming Convention: ControlNumber_LeadOrganization_Subrecipient_Budget_Justification |
|------------|--|

The Budget Justification must include the Budget Justification Workbook, Subrecipient budget justification (if applicable), Contract budget justification (if applicable), and Budget for DOE/NNSA FFRDC (if applicable) as necessary elements.

Budget Justification Workbook

Applicants must complete the Budget Justification Workbook which is available on OCED eXCHANGE at <https://oced-Exchange.energy.gov/>. Applicants must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants must include costs associated with implementing the various requirements (e.g., Buy America requirements for infrastructure projects, Davis-Bacon Act, Community Benefits Plan, reporting, oversight) and with required annual audits and incurred cost proposals in their proposed budget documents. Such costs may be reimbursed as a direct or indirect cost.

The “Instructions and Summary” included with the Budget Justification Workbook will auto-populate as the Applicant enters information into the Workbook. Applicants must carefully read the “Instructions and Summary” tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the above file naming convention for the title.

Subrecipient Budget Justification

Applicants must provide a separate budget justification for each subrecipient that is expected to perform work. The budget justification must include the same justification information described in the “Budget Justification Workbook” section above. Save each subrecipient budget justification in a Microsoft Excel file using the above File Naming Convention for the title.

Funding, Cost Share and Subaward with FFRDC

DOE will NOT fund DOE/NNSA FFRDCs participating as a subrecipient through the DOE field work authorization process. DOE will NOT fund non-DOE/NNSA FFRDCs through an interagency agreement with the sponsoring agency. Therefore, the prime recipient and FFRDC are responsible for entering into an appropriate subagreement that will govern, among other things, the funding of the FFRDC portion of the work from the prime recipient under its DOE award. Such an agreement must be entered into before any project work begins.

The Applicant must prepare the budgets utilizing rates appropriate for funding the FFRDCs through subawards. The Applicant’s cost share requirement will be based on the total cost of the project, including the Applicant’s, the subrecipient’s, and the FFRDC’s portions of the project. Note that the FFRDC effort, in aggregate, may not exceed 5% of the total estimated cost of the project, including the Applicant’s and the FFRDC’s portions of the effort.

4.6.2.13. Summary for Public Release

| | |
|---------------|--|
| (PDF, 1 page) | File Naming Convention: ControlNumber_LeadOrganization_PublicRelease |
|---------------|--|

Applicants must submit a one-page summary of their project that is suitable for dissemination to the public. It should be a self-contained document that identifies the name of the Applicant, the lead project manager, the project title, the objectives of the project, a description of the project (including the proposed capture technology, the proposed CO₂ capture rate (tonnes per year), the carbon capture host site and the location of the carbon storage site), the potential impact of the project (e.g., benefits, outcomes), and major participants, and the project’s commitments and goals described in the Community Benefits Plan. This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made.

4.6.2.14. Summary Slides

| | |
|---------------------------|--|
| (MS PowerPoint, 5 slides) | File Naming Convention: ControlNumber_LeadOrganization_Slide |
|---------------------------|--|

Applicants must provide a up to a 5-slide deck summarizing the proposed project.

The Summary Slide deck must include the following information:

- The project title;
- The proposed project cost and schedule
- The location of the major project work sites
- A description of the project
- The proposed carbon capture technology
- The proposed storage site(s)
- The proposed capture rate (tonnes per year)
- The impact of the project on industry;
- Any key graphics (illustrations, charts and/or tables);
- The project's key idea/takeaway;
- Topline community benefits;
- Requested DOE funds and proposed Applicant cost share.

4.6.2.15. Environmental Considerations Summary

| | |
|-------|---|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_Environmental_Considerations |
|-------|---|

DOE's decision whether and how to distribute federal funds under this FOA is subject to the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321, et seq.). Your responses will assist DOE in determining the appropriate level of NEPA review (if your proposal is selected) and in preparing an environmental assessment (EA) or environmental impact statement (EIS), if necessary. While not all information may be available at the proposal stage, please provide as much detail and information as is currently available. Consultation with experts or advisors in your organization to assist with your responses is highly recommended.

1. **Please provide a brief summary of the proposed project.** Describe proposed activities (not goals and objectives) and specify if this project is part of a larger project or connected to another project.
2. **Is there ongoing or anticipated federal government involvement in any aspect of this project (e.g., funding, permitting, technical assistance, project located on federally administered land)?** *If "yes," please list the agency and describe the nature of the involvement.*
3. **Is the project fully defined (i.e., all sites and activities are known)?** *If "no", please describe the sites and/or activities/tasks that are yet to be defined.*

4. **Add a table as seen below for each location where proposed project activities would take place:**

| Proposed location (physical address or coordinates) | Setting of the proposed location (e.g., urban, industrial, suburban, agricultural, university campus, manufacturing facility, etc.) and the current condition or use of the site | General description of the proposed activities | Land administration (e.g., federal [specify BLM, USFS, etc.], Tribal, state, local, private) |
|---|--|---|--|
|---|--|---|--|

5. **Attach a map showing the location(s) of the proposed project, and a site layout map showing the proposed facilities and associated infrastructure.** *(A GIS shapefile is preferable, if available.)* The map showing the location(s) of the proposed project and site layout map requested with the Environmental Considerations Summary may be submitted as separate files and may be in larger engineering formats. While the maps may be created as a GIS shapefile or other engineering formats, the maps must be saved and submitted as a PDF file.
6. **Describe new facilities to be constructed, any modifications of existing facilities, and any new infrastructure or facilities necessary for the construction or operation of the proposed project.** *(e.g., access roads, laydown areas, off-site parking areas, railroad links, docks, water outfalls and intakes, pipelines, electrical transmission, waste treatment facilities, etc.)*
7. **Identify and describe any existing, modifications to, or new permits, licenses, or authorizations that would be required to perform project activities.** *(e.g., environmental permits, operating permits, or drilling permits)*
8. **Provide a brief description of the existing environmental burdens at the proposed project location(s) and surrounding areas, including those contributed to or exacerbated by existing facilities the project will leverage or modify.** *Existing environmental burdens can be identified using available tools, such as DOE's Energy Justice Dashboard (beta) (<https://www.energy.gov/diversity/energy-justicedashboard-beta>) or the U.S. Environmental Protection Agency's EJSCREEN (<https://www.epa.gov/ejscreen>).*
9. **Would any of the following have the potential to be impacted (directly or indirectly) by the proposed project? If "yes", provide a detailed description of: (1) the resources that could be affected, and (2) how project activities may affect those resources (including potential direct and indirect [visual, noise, etc.] impacts).**
- Tribal lands or resources of Tribal interest and/or sensitivity
 - Environmental Justice (EJ) Populations (EJ populations include minority, low income, and Tribal populations)
 - Historic, archeological, or cultural resources (includes listed and eligible resources over 50 years old or of cultural significance)

- d. Areas having a special designation (e.g., federal and state designated wilderness areas, national parks, national natural landmarks, wild and scenic rivers, state and federal wildlife refuges, and marine sanctuaries)
- e. Threatened or endangered species (whether proposed or listed by state or Federal governments), including their habitat
- f. Land resources (e.g., prime farmland, unique farmland, or other farmland of statewide or local importance, tundra, rainforests)
- g. Floodplains
- h. Wetlands
- i. Air quality (indoor and/or outdoor)
- j. Greenhouse gas emissions
- k. Water quality (surface and/or ground water and/or special sources of water including sole source aquifers)
- l. Ocean resources (e.g., coral reefs) Coastal zones
- m. Marine mammals or essential fish habitat Land use
- n. Socioeconomic conditions
- o. Sensitive receptors (e.g., hospitals, schools, daycare facilities, elderly housing)
- p. Navigable Airspace
- q. Transportation infrastructure

10. Please describe:

- a. any coordination or discussions that have been initiated or the plan to coordinate with state and/or federal agencies (e.g., State Historic Preservation Office, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Nuclear Regulatory Commission, etc.)
- b. any coordination or discussions that have been initiated with any Tribal governments
- c. any issues that would generate public controversy regarding proposed project
- d. any studies, reviews, and/or plans that have been completed for the proposed project (e.g., environmental site assessments, waste management plans, health and safety plans, cultural resource surveys, identification of prime or unique farmland, wildlife surveys, etc.)
- e. any environmental considerations and/or mitigation strategies that have been incorporated into the proposed project (e.g., measures to reduce and/or avoid greenhouse gas emissions, and/or impacts to cultural resources, historic properties, state or federally protected species, wetlands, floodplains, traffic, ambient noise, etc.)
- f. any discussions with affected communities

4.6.2.16. Current and Pending Support Disclosures

| | |
|-------|---|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_Current_Support |
|-------|---|

Current and pending support is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support.

As part of the application, the lead project manager and all senior/key personnel at the applicant and subrecipient level must provide a list of all sponsored activities, awards, and appointments, whether paid or unpaid; provided as a gift with terms or conditions or provided as a gift without terms or conditions; full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or in-kind; foreign or domestic; governmental or private-sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. All connections with foreign government-sponsored talent recruitment programs must be identified in current and pending support.

For every activity, list the following items:

- The sponsor of the activity or the source of funding;
- The award or other identifying number;
- The title of the award or activity. If the title of the award or activity is not descriptive, add a brief description of the research being performed that would identify any overlaps or synergies with the proposed research;
- The total cost or value of the award or activity, including direct and indirect costs and cost share. For pending proposals, provide the total amount of requested funding;
- The award period (start date – end date); and
- The person-months of effort per year being dedicated to the award or activity.

To identify overlap, duplication of effort, or synergistic efforts with the project proposed under the application, append a description of the other award or activity to the current and pending support.

Details of any obligations, contractual or otherwise, to any program, entity, or organization sponsored by a foreign government must be provided on request to either the applicant institution or DOE. Supporting documents of any identified source of support must be provided to DOE on request, including certified translations of any document.

Principal Investigators and senior/key personnel must provide a separate disclosure statement listing the required information above regarding current and pending support. Each individual must sign and date their respective disclosure statement and include the following certification statement:

I, [Full Name and Title], certify to the best of my knowledge and belief that the information contained in this Current and Pending Support Disclosure Statement is true, complete, and accurate. I understand that any false, fictitious, or fraudulent information, misrepresentations, half-truths, or omissions of any material fact, may subject me to criminal, civil or administrative penalties for fraud, false statements, false claims or otherwise. (18 U.S.C. §§ 1001 and 287, and 31 U.S.C. §§ 3729-3733 and 3801-3812). I further understand and agree that (1) the statements and representations made herein are material to DOE's funding decision, and (2) I have a responsibility to update the disclosures during the period of performance of the award should circumstances change which impact the responses provided above.

The information may be provided in the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vita (SciENCv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf>. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats. If the NSF format is used, the individual must still include a signature, date, and a certification statement using the language included in the paragraph above.

Definitions:

Current and pending support

(a) All resources made available, or expected to be made available, to an individual in support of the individual's RD&D efforts, regardless of

- (i) whether the source is foreign or domestic;
- (ii) whether the resource is made available through the entity applying for an award or directly to the individual; or
- (iii) whether the resource has monetary value; and

(b) includes in-kind contributions requiring a commitment of time and directly supporting the individual's RD&D efforts, such as the provision of office or laboratory space, equipment, supplies, employees, or students. This term has the same meaning as the term Other Support as applied to researchers in NSPM-33:

For researchers, Other Support includes all resources made available to a researcher in support of and/or related to all of their professional RD&D efforts, including resources provided directly to the individual or through the organization, and regardless of whether or not they have monetary value (e.g., even if the support received is only in-kind, such as office/laboratory space, equipment, supplies, or employees).

This includes resource and/or financial support from all foreign and domestic entities, including but not limited to, gifts provided with terms or conditions, financial support for laboratory personnel, and participation of student and visiting researchers supported by other sources of funding.

Senior/key personnel – an individual who contributes in a substantive, meaningful way to the scientific development or execution of a research, development and demonstration (RD&D) project proposed to be carried out with DOE award.¹¹

¹¹ Typically, these individuals have doctoral or other professional degrees, although individuals at the masters or baccalaureate level may be considered senior/key personnel if their involvement meets this definition. Consultants, graduate students, and those with a postdoctoral role also may be considered senior/key personnel if they meet this definition.

4.6.2.17. Potentially Duplicate Funding Notice

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| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_DuplicateFunding |
|-------|--|

If the applicant or project team member has other active awards of federal funds, the applicant must determine whether the activities of those awards potentially overlap with the activities set forth in its application to this FOA. If there is a potential overlap, the applicant must notify DOE in writing of the potential overlap and state how it will ensure any project funds (i.e., recipient cost share and federal funds) will not be used for identical cost items under multiple awards.

Likewise, for projects that receive funding under this FOA, if a recipient or project team member receives any other award of federal funds for activities that potentially overlap with the activities funded under the DOE award, the recipient must promptly notify DOE in writing of the potential overlap and state whether project funds from any of those other federal awards have been, are being, or are to be used (in whole or in part) for one or more of the identical cost items under the DOE award.

If there are identical cost items, the recipient must promptly notify the DOE Grants and Agreements Officer in writing of the potential duplication and eliminate any inappropriate duplication of funding.

4.6.2.18. Transparency of Foreign Connections

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| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_ForeignConnections |
|-------|--|

Applicants must identify the following as they relate to the proposed recipient and subrecipients:

1. the identity of all owners and covered individuals who are a party to any Foreign Government-Sponsored Talent Recruitment Program of a foreign country of risk (i.e., China, Iran, North Korea, and Russia);
2. The existence of any joint venture or subsidiary that is based in, funded by, or has a foreign affiliation with any foreign country of risk;
3. Any current or pending contractual or financial obligation or other agreement specific to a business arrangement, or joint venture-like arrangement with an enterprise owned by a foreign state or any foreign entity;
4. Percentage, if any, that the proposed recipient or subrecipient is wholly or partially owned by an entity in a foreign country of risk;
5. The percentage, if any, of venture capital or institutional investment by an entity that has a general partner or individual holding a leadership role in such entity who has a foreign affiliation with any foreign country of risk;

6. any technology licensing or intellectual property sales to a foreign country of risk, during the 5-year period preceding submission of the proposal; and

7. Any foreign business entity, offshore entity, or entity outside the United States related to the proposed recipient or subrecipient.

4.6.2.19. *CO₂ Capture FEED Study*

| | |
|-------|---|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_CC_FEED |
|-------|---|

See [Appendix C](#). Please include Techno-Economic Analysis within the FEED. Note that the complete FEED study is initially an optional input, although DOE may request it with the application.

4.6.2.20. *CO₂ Pipeline FEED Study*

| | |
|-------|---|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_PIPE_FEED |
|-------|---|

See [Appendix D](#). Please include Techno-Economic Analysis within the FEED. Note that the complete FEED study is initially an optional input, although DOE may request it with the application.

4.6.2.21. *Sequestration FEED Study*

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|-------|--|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_STORAGE_FEED |
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See [Appendix E](#). Please include Techno-Economic Analysis within the FEED. Note that the complete FEED study is initially an optional input, although DOE may request it with the application.

4.6.2.22. *Storage Permits*

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| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_PERMITS |
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Include PDF copies of the Class VI AND Storage Site permits. If you do not have either permit, then submit a copy of the application(s) and a description of where you are in the process of obtaining the permits.

4.6.2.23. *Key Performance Parameter Tables*

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| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_KPP_Tables |
|-------|--|

A table of parameters necessary to compare current Capture demonstrations with previous demonstrations. See [Appendix P](#) for more info.

4.6.2.24. *Disclosure of Lobbying Activities*

| | |
|-------|---|
| (PDF) | File Naming Convention: ControlNumber_LeadOrganization_LLL |
|-------|---|

Prime recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters. Recipients and subrecipients are required to complete and submit SF-LLL, “Disclosure of Lobbying Activities” (<https://www.grants.gov/web/grants/forms/sf-424-individual-family.html>) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

4.7. *Intergovernmental Review*

This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

4.8. *Funding Restrictions*

4.8.1. *Allowable Costs*

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable federal cost principles. Pursuant to 2 C.F.R. § 910.352, the cost principles in the Federal Acquisition Regulations (48 C.F.R. Part 31 Subpart 31.2) apply to for-profit entities. The cost principles contained in 2 C.F.R. Part 200 Subpart E apply to all entities other than for-profits.

4.8.2. *Pre-Award Costs*

Applicants selected for award negotiations must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the federal award directly pursuant to the negotiation and in anticipation of the federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the federal award and **only** with the written approval of the federal awarding agency, through the DOE Grants and Agreements Officer. Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis. Pre-award expenditures are made at the Applicant’s risk. OCED is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the Applicant anticipated. This includes any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to DOE completing the NEPA review process.

4.8.3. Buy America Requirements for Infrastructure Projects

Pursuant to the Build America, Buy America Act (referred to here as “Buy America”) in Title IX of Division G of the BIL, federally assisted projects that involve infrastructure work, undertaken by applicable recipient types, require that:

- All iron, steel, and manufactured products used in the infrastructure work are produced in the United States; and
- All construction materials used in the infrastructure work are manufactured in the United States.

Whether a given project must apply this requirement is project-specific and dependent on several factors, such as the recipient’s entity type, whether the work involves “infrastructure” as that term is defined in Section 70912 of the BIL, and whether the infrastructure in question is publicly owned or serves a public function.

Applicants are strongly encouraged to assess whether their project may have to apply this requirement, both to make an early determination as to the need of a waiver, as well as to determine what impact, if any, this requirement may have on the proposed project’s budget.

For additional information on Buy America requirements, visit DOE's [Build America, Buy America](#) webpage.

4.8.4. Davis-Bacon Act Requirements

Projects awarded under this FOA will be funded under Division D of the BIL. Accordingly, per Section 41101 of the BIL, all laborers and mechanics employed by the recipient, subrecipients, contractors or subcontractors in the performance of construction, alteration, or repair work funded in whole or in part under this FOA shall be paid wages at rates not less than those prevailing on similar projects in the locality, as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code commonly referred to as the “Davis-Bacon Act” (DBA). There are also weekly reporting requirements.

Recipients of funding under this FOA will also be required to undergo DBA compliance training and to maintain competency in DBA compliance. The Grants and Agreements Officer will notify the recipient of any DOE sponsored DBA compliance trainings. The Department of Labor offers free Prevailing Wage Seminars several times a year that meet this requirement, at <https://www.dol.gov/agencies/whd/government-contracts/construction/seminars/events>.

For additional guidance on how to comply with the DBA provisions and clauses, see <https://www.dol.gov/agencies/whd/government-contracts/construction> and <https://www.dol.gov/agencies/whd/government-contracts/protections-for-workers-in-construction>.

4.8.5. Risk Assessment

Pursuant to 2 C.F.R. § 200.206, DOE will conduct an additional review of the risk posed by applications submitted under this FOA.

Such risk assessment will consider:

1. Financial stability;
2. Quality of management systems and ability to meet the management standards prescribed in 2 C.F.R. Part 200 as amended and adopted by 2 C.F.R. Part 910;
3. History of performance;
4. Audit reports and findings; and
5. The applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-federal entities.

In addition, the risk assessment should include assessment of community opposition, potential labor disputes, availability of a skilled workforce, and public and worker health and safety considerations.

DOE may make use of other publicly available information. DOE may also make use of the history of an applicant's performance under DOE or other federal agency awards. DOE reserves the right to ask for information pertaining to prior practices or violations at facilities included in the proposal. Depending on the severity of the findings and whether the findings were resolved, DOE may elect not to fund the applicant.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 C.F.R. Part 180 and must require non-federal entities to comply with these provisions. These provisions restrict federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in federal programs or activities.

The applicant should consider that for large construction projects, DOE may require a Project Labor Agreement (PLA), an agreement between a private entity (or entities) and a labor organization (or organizations) representing individuals who will be working on a construction project. Assessment of applicability will be conducted on a case-by-case basis.

Further, as DOE invests in critical infrastructure and funds critical and emerging technology areas, DOE also considers possible vectors of undue foreign influence in evaluating risk. If high risks are identified and cannot be sufficiently mitigated, DOE may elect to not fund the award.

4.8.6. Human Subjects Research

No funding will be provided under this FOA for any activities involving human subjects.

4.8.7. Performance of Work in the United States (Foreign Work Waiver)

a. Requirement

All work performed under awards issued under this FOA must be performed in the United States. The recipient must flow down this requirement to its subrecipients.

b. Failure to Comply

If the recipient fails to comply with the Performance of Work in the United States requirement, DOE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share.

The recipient is responsible should any work be performed outside the United States, absent a waiver, regardless of whether the work is performed by the recipient, subrecipients, contractors or other project partners.

c. Waiver

To seek a foreign work waiver, the applicant must submit a written waiver request to DOE.

[Appendix O](#) lists the information that must be included in a request for a foreign work waiver.

4.8.8. Prohibition related to Foreign Government-Sponsored Talent Recruitment Programs

a. Prohibition

Persons participating in a Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk are prohibited from participating in projects selected for federal funding under this FOA. Should an award result from this FOA, the recipient must exercise ongoing due diligence to reasonably ensure that no individuals participating on the DOE-funded project are participating in a Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk. Consequences for violations of this prohibition will be determined according to applicable law, regulations, and policy.

Further, the recipient must notify DOE within five (5) business days upon learning that an individual on the project team is or is believed to be participating in a foreign government talent recruitment program of a foreign country of risk. DOE may modify and add requirements related to this prohibition to the extent required by law.

b. Definitions

1. **Foreign Government-Sponsored Talent Recruitment Program.** An effort directly or indirectly organized, managed, or funded by a foreign government, or a foreign government instrumentality or entity, to recruit science and technology professionals or students (regardless of citizenship or national origin, or whether having 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 relocate physically 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.

2. Foreign Country of Risk. DOE has designated the following countries as foreign countries of risk: Iran, North Korea, Russia, and China. This list is subject to change.

4.8.9. Affirmative Action and Pay Transparency Requirements

All federally assisted construction contracts exceeding \$10,000 annually will be subject to the requirements of [Executive Order 11246](#), as amended, Equal Employment Opportunity.

1. Recipients, subrecipients, contractors and subcontractors are prohibited from discriminating in employment decisions on the basis of race, color, religion, sex, sexual orientation, gender identity or national origin.
2. Recipients and Contractors are required to take affirmative action to ensure that equal opportunity is provided in all aspects of their employment. This includes flowing down the appropriate language to all subrecipients, contractors and subcontractors.
3. Recipients, subrecipients, contractors and subcontractors are prohibited from taking adverse employment actions against applicants and employees for asking about, discussing, or sharing information about their pay or, under certain circumstances, the pay of their co-workers.

The Department of Labor's ("DOL") Office of Federal Contractor Compliance Programs ("OFCCP") uses a neutral process to schedule contractors for compliance evaluations. OFCCP's Technical Assistance Guide should be consulted to gain an understanding of the requirements and possible actions the recipients, subrecipients, contractors and subcontractors must take <https://www.dol.gov/sites/dolgov/files/ofccp/Construction/files/ConstructionTAG.pdf?msclkid=9e397d68c4b111ec9d8e6fecb6c710ec>. Additional guidance may also be found in the National Policy Assurances, produced by DOE.

Additionally, for construction projects valued at \$35 million or more and lasting more than one year, the recipients, subrecipients, contractors and subcontractors may be selected by OFCCP to participate in the *Mega Construction Project Program*.

DOE, under relevant legal authorities including Sections 205 and 303(a) of Executive Order (EO) 11246, will require participation as a condition of the award. This program offers extensive compliance assistance with EO 11246. For more information regarding this program, see <https://www.dol.gov/agencies/ofccp/construction/mega-program>.

4.9. Other Submission Requirements

4.9.1. Post Submission Materials and Just-In-Time Documents

Some materials will be required as post submission materials that are due after the merit review is complete. The applicant will be notified on what documents and materials to submit, the format required, and where and when to submit the materials.

4.10. Administrative and National Policy Requirements

To receive a Federal award under this FOA, all applicants must follow applicable cross-cutting administrative and national policy requirements. The policies are requirements based on social, economic, or other objectives or considerations that may be attached to the expenditure of federal funds by award recipients, consortium participants, and contractors, in general, or may relate to the expenditure of federal funds for other specified activities.

These administrative and national policy requirements include, but are not limited, to the following:

- Clean Air Act (42 U.S.C. § 7401 *et seq.*)
- Clean Water Act (33 U.S.C. § 1251 *et seq.*)
- National Flood Insurance Act of 1968 and Flood Disaster Prevention Act of 1973 (42 U.S.C. § 4001 *et seq.*), DOE regulations at 10 C.F.R. Part 1022, and Executive Order 13690 – establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input
- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*) and DOE regulations at 10 C.F.R. Part 1040 Subpart B
- Section 504 of the Rehabilitation Act of 1973 as amended (29 U.S.C. § 794) and DOE regulations at 10 C.F.R. Part 1040 Subpart D
- Age Discrimination Act of 1975 as amended (42 U.S.C. § 6101 *et seq.*) and DOE regulations at 10 C.F.R. Part 1040 Subpart E
- Title IX of the Education Amendments of 1972 (20 U.S.C. § 1681 *et seq.*) and DOE regulations at 10 C.F.R. Part 1042
- Federal Funding and Transparency Act of 2006; 2 C.F.R. Part 170

5. Application Review Information

5.1. Compliance Criteria

Letters of Intent

Letters of Intent are deemed compliant if:

- The Applicant entered all required information and clicked the “Submit” button in OCED eXCHANGE by the deadline stated in the FOA.

Applications

To be determined compliant, all Applicant submissions must:

- comply with the applicable content and form requirements listed in [Section 4.0](#);
- include all required documents;
- be successfully uploaded in OCED eXCHANGE <https://OCED-exchange.energy.gov>, including clicking the “Submit” button; and
- be submitted by the deadline stated in the FOA.

DOE will not review or consider submissions submitted through means other than OCED eXCHANGE, submissions submitted after the applicable deadline, or incomplete submissions.

5.2. Technical Review Criteria

5.2.1. Letters of Intent

Feedback will not be provided on Letters of Intent; they will only be used for DOE planning purposes.

5.2.2. Applications

Applications will be evaluated against the technical review criteria shown below. All sub-criteria are of equal weight.

Criterion 1: Technology Merit and Site Suitability (25%)

This criterion involves consideration of the following factors:

- a) Adequacy of the Applicant’s description of the proposed CCS demonstration project from the technical, environmental, cost effectiveness, and integrated systems perspectives and degree to which the proposed project meets the stated objectives and success metrics of the FOA.

- b) Degree to which the proposed carbon capture technology is ready for demonstration on the proposed commercial process and at the scale proposed. Degree to which the Applicant provides data from prior testing on an integrated, continuous, pilot-scale or demonstration-scale system using actual exhaust gas from the same type of commercial process as that proposed (preferred) or from a reasonably similar alternative and supporting analysis that the proposed carbon capture technology has attained a TRL of 7 and can achieve at least 90% carbon capture efficiency to support readiness for the proposed CCS demonstration. (Footnotes and the bibliography are only to be utilized to validate the information requested in the narrative.)
- c) Thoroughness of the description of the proposed domestic carbon capture host site, and how the carbon capture technology will be integrated within the host site, including, but not limited to: process diagrams; emissions profiles; availability and quality of steam and/or waste heat (as applicable); anticipated feed conditions for the stream targeted for capture; electrical, water and waste management; contaminants controls; and NEPA and permitting activities conducted to date. Adequacy of plans for execution of the host site agreement, including key criteria and any conditions. Adequacy of the proposed domestic carbon capture host site to meet FOA objectives and adequacy and completeness of information provided to justify the selection for the specific carbon capture host site.
- d) Thoroughness of the description of the CO₂ pipeline, including the transportation route, specifications, requirements, challenges, maps, rights-of-way, and current status of permitting activities. Adequacy of the CO₂ pipeline to meet FOA objectives and the extent to which the Applicant submitted evidence that provides confidence that the Applicant will be able to secure access to the proposed CO₂ transportation route for the proposed project as well any rights of way or permits necessary for the pipeline infrastructure.
- e) Thoroughness of the description of the proposed carbon storage site, including level of commitment, characterization, and NEPA and permitting activities conducted to date. Adequacy of the proposed carbon storage site to meet FOA objectives and adequacy and completeness of information provided to characterize the pore space and injectivity behavior of the specific carbon storage site. Quality of supporting information showing that the UIC Class VI injection well permits and any required permit(s) to prepare for the proposed storage site for injection and storage have been granted or the applications to obtain such permits have been submitted
- f) Thoroughness of the description of the proposed carbon capture technology, including but not limited to the following: equipment design concept, preliminary process flow diagrams, mass and energy balances, steam and power requirements, management and impact of emissions originating in the carbon capture system (e.g., amines, nitrosamines), a discussion of the absorption/desorption chemistry and operating cycle for solvent and sorbent systems including recharging/regenerating (as applicable); and a description of relevant membrane chemistry for membrane systems, including transport mechanism (as applicable). Thoroughness of the description of remaining technical challenges for the proposed carbon capture technology. Adequacy of the proposed carbon capture system to meet FOA objectives.

- g) Degree to which the proposed project would demonstrate significant improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture technologies for power, industrial, or other commercial applications when compared to the technology in existence on December 27th 2020. Degree to which the projected performance of the proposed carbon capture technology was substantiated by experimental evidence from prior testing on exhaust gas from the same type of commercial process as that proposed (preferred) or from a reasonably similar alternative.
- h) Evidence that the project is proposed at an appropriate scale and that the proposed demonstration will facilitate subsequent deployments of the carbon capture technology at similar scales. Note that a reasonable scale-up is roughly 10x.
- i) Thoroughness of the description of the testing plan and its adequacy to validate key cost and performance metrics and reduce uncertainties and risks to facilitate private-sector investments in follow-on deployments.
- j) Adequacy and completeness of information provided in the State Point Data Table, Block Flow Diagram and Supplemental Data, and key performance parameter table.
- k) Adequacy of the Initial Environmental, Health & Safety Risk Assessment, including identification of risks and evaluation of increases or decreases of criteria pollutants and noise impacts.
- l) Adequacy of the preliminary LCA to meet FOA objectives and degree to which a complete description of the preliminary LCA was provided.
- m) Thoroughness of the summary of the CO₂ capture FEED study and the extent to which the information provides evidence that the FOA objectives are likely to be achieved.
- n) Thoroughness of the summary of the CO₂ pipeline FEED study and the extent to which the information provides evidence that the FOA objectives are likely to be achieved.
- o) Thoroughness of the summary of the CO₂ storage FEED study or and the extent to which the information provides evidence that the FOA objectives are likely to be achieved.

Criterion 2: Technical Approach and Project Management Plan (15%)

This criterion involves consideration of the following factors:

- a) Adequacy and feasibility of the Applicant's approach to achieving the objectives of the FOA and the overarching goal of readiness for Phases 3–4 by the end of Phase 2.
- b) Thoroughness of the project description and plans necessary for the design, installation/modification, permitting, and operation of equipment for required scale of design.
- c) The adequacy and completeness of the Data Management Plan (DMP) in conveying a clear explanation of data collection methodologies, file types, data analytics considerations, machine learning applications (if applicable), and data storage. Thoroughness and significance of the details concerning how project data will be shared with DOE and the public.

- d) The following aspects of the PMP shall be evaluated:
- i. Adequacy and completeness of the PMP in: establishing integrated baselines (technical scope, budget, schedule) and performance metrics that will be assessed during the proposed CCS demonstration project and in managing project performance relative to those baselines; defining the actions that will be taken when these baselines must be revised; and identifying project risks and strategies for mitigation.
 - ii. Soundness and completeness of the project schedule; including all tasks necessary for successful completion of the project; incorporating and showing relationships among all technical, business, financial, NEPA, permitting and other appropriate factors; including important milestones and decision points; and allocating sufficient and appropriate time to complete the project deliverables and success criteria.
 - iii. Adequacy of the Baseline Cost Plan for establishing the baseline cost (including supporting documentation for the cost estimate) for the project and incorporating costs for all tasks necessary for performing the proposed project.
 - iv. Adequacy of the project management system to monitor and control project scope, cost, and schedule.
 - v. Adequacy of the Project Communication Protocol for ensuring effective communication between the Recipient and DOE.
 - vi. Adequacy of the Risk Management Plan for assessing, identifying, tracking, and managing project risk; completeness of the identification of potential risk elements, quality and adequacy of the approach to assessing and managing risk, conformance of risk management approach with industry standards, and adequacy of the approaches to risk mitigation.
 - vii. Adequacy of the Environmental Management Plan for assessing, monitoring, and reporting the potential environmental impacts to air, land and water resources, and potential impacts of waste production.

Criterion 3: Applicant/Team Capabilities and Commitments (20%)

This criterion involves consideration of the following factors:

- a) Demonstrated experience of the Applicant and partnering organizations in the technology areas addressed in the application and in managing projects of similar size, scope, and complexity.
- b) Adequacy of the credentials, capabilities, and experience of senior and key personnel and partnering organizations.
- c) Clarity and likely effectiveness of the project organization, including sub-recipients or partners, to successfully complete the project.
- d) Adequacy and availability of proposed personnel, facilities, and equipment to perform project tasks.

- e) Completeness of proposed team structure that includes these team members or skill sets, if applicable: CO₂ capture technology developer or licensor, CO₂ capture host site owner(s) or operator(s), CO₂ pipeline operator, CO₂ storage site owner, EPC(s), financial partner(s), NEPA compliance consultant, LCA consultant, CBP consultant, or others as appropriate. Adequacy of the letters of commitment from proposed team members.
- f) Strength of the commitment(s) for use and availability of the proposed carbon capture host site to support the proposed project, including strength of the evidence showing the Applicant's right to capture CO₂ at the proposed carbon capture host site.
- g) Strength of the commitment(s) for use and availability of the proposed CO₂ pipeline to support the proposed project, including strength of the evidence showing the Applicant's right of way (ROW) to transport CO₂ from the host site to the storage site.
- h) Strength of the commitment(s) for use and availability of the proposed carbon storage site (if different than the carbon capture host site) to support the proposed project, including strength of the evidence showing the Applicant's right to store CO₂ at the proposed carbon storage site.

Criterion 4: Financial and Market Viability (20%):

This criterion involves consideration of the following factors:

- a) Degree to which future similar projects would be financially viable independent of DOE cost share.
- b) The adequacy and justification of the proposed project budget and spend plan covering both DOE funding and non-federal cost share. This includes the Applicant's ability to provide contingency to meet unknown project cost overruns often seen with large demonstration projects.
- c) Adequacy, completeness, and viability of the proposed Project Financing Plan.
- d) Reasonableness and completeness of the plan, including a financing schedule, demonstrating the potential for the Applicant to successfully implement the project.
- e) Completeness of financial information and consistency with the funding and financial business plans and with other application materials.
- f) Viability of financial projections in the financial model to attract investors and lenders.
- g) Degree of financial commitment to the project evidenced by the Applicant and other project parties.
- h) The availability, credibility, and risk/terms of non-federal cost share sources and funds necessary to meet ongoing cost share needs. This includes the ability to leverage DOE financial assistance funding from this FOA including state and local incentives and private financing.
- i) The adequacy of the business plan for developing key project agreements such as financing, acquisition strategies, power purchase agreements, feedstock supply, offtake (sales) agreements, transport and storage services, and other relevant project documents.

- j) The adequacy and clarity of the financial risk management discussion and a demonstrated understanding of financial and market risks involved in the proposed work, as well as the quality of the mitigation strategies to address them.
- k) The potential of this project to have a catalytic impact on further deployment of CCS for similar applications.

Criterion 5: Community Benefits Plan (20%)

Overall Approach

- a) The extent to which the plan specifically and convincingly demonstrates how the proposed project will provide societal benefits and mitigate/minimize negative impacts to workers and communities—including impacts related to air pollution, water use, water pollution, consumer energy prices, safety related to CO₂ transport via pipeline, and job retention or creation.
- b) The extent to which the actions outlined in the Community Benefits Plan (CBP) are supported by enforceable, negotiated Workforce and Community Agreements (e.g., good neighbor agreements, workforce agreements, project labor agreements, collective bargaining agreements, and similar agreements).
- c) The extent to which the team and resources—including staff, facilities, capabilities, and budget—are capable of implementing plans outlined in the CBP.
- d) Extent to which the Community Benefits Plan is integrated into the project management schedule and other key documents and provides mechanisms, supported by measurable actions, to impact project direction in a timely manner.

Community and Labor Engagement

- e) The extent to which the project demonstrates a clear and appropriately robust plan to meaningfully engage affected local stakeholders including community-based organizations that support or work with disadvantaged communities; labor unions; and/or Tribes, in a manner that can impact project decisions.
- f) The extent to which impacted communities and labor unions⁷ are appropriately included as core partners in the project and/or affirm support.

Investing in the American Workforce

- g) The extent to which the CBP demonstrates that the jobs supported by the proposed project will be quality jobs and provides robust and credible plan to attract, train, and retain skilled workers (e.g., through a workforce and community agreement and commitment to workers' free and fair choice to join a union or labor organization of their choosing; and/or commitments to wages above prevailing wage requirements, benefits, or other worker support).
- h) The extent to which the Community Benefits Plan demonstrates plans to invest in workers by supporting workers' skill acquisition and opportunities for advancement, including through registered apprenticeship; utilizing an appropriately credentialed workforce; and commitments to wages above prevailing wage requirements benefits.

Diversity, Equity, Inclusion, and Accessibility

- i) The extent to which the CBP includes specific and high-quality actions to meet DEIA goals, which may include DEIA recruitment procedures; partnerships with workforce training or support organizations serving workers facing systematic barriers to employment; the provision of supportive services to help train, place, and retain individuals from underrepresented communities in good-paying jobs, registered apprenticeships, or other career-track training opportunities.
- j) The extent to which the proposed project partners or contracts with Minority-Serving Institutions (MSIs), Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, and/or Tribal Nations.

Justice40 Initiative

- k) The extent to which the CBP identifies specific and measurable benefits, how the benefits will flow, and how negative impacts would be mitigated—and specifically describes these impacts on disadvantaged communities.
- l) The extent to which the project illustrates the ability to support the overall goal of the Justice40 Initiative that 40% of the overall benefits of certain federal investments flow to disadvantaged communities.

5.3. *Standards for Application Evaluation*

Applications that are determined to be eligible will be evaluated in accordance with this FOA and the guidance provided in the “DOE Merit Review Guide for Financial Assistance and Unsolicited Proposals” available at <https://www.energy.gov/management/articles/merit-review-guide-financial-assistance-and-unsolicited-proposals-current>

5.4. *Evaluation and Administration by Non-Federal Personnel*

In conducting the merit review evaluation, the Go/No-Go Reviews and Peer Reviews, the government may seek the advice of qualified non-federal personnel as reviewers. The government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities, including DOE contractors.

The Applicant, by submitting its application, consents to the use of non-federal reviewers/administrators. Non-federal reviewers must sign conflict of interest and non-disclosure acknowledgements (NDA) prior to reviewing an application. Non-federal personnel conducting administrative activities must sign an NDA.

5.5. Other Selection Factors

5.5.1. Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Applications to select for award negotiations:

- It may be desirable to select for award a project, or group of projects, that represent a diversity of technologies under this FOA;
- It may be desirable to select for award a project, or group of projects, with a broad or specific geographic distribution under this FOA;
- It may be desirable to select for award a project, or group of projects, that leverage existing public-private partnerships and/or Federal resources;
- It may be desirable to select for award a project, or group of projects, that can demonstrate greater than the minimum required CO₂ capture efficiency;
- It may be desirable to select a project, or group of projects, if such a selection will optimize use of available funds; and
- It may be desirable to select a project, or group of projects, if such a selection will have an outsized catalytic impact on overall CCS deployment; and
- 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 community negative impact risk, and/or lesser environmental risks. Environmental risk includes, but is not limited to, an adverse impact to air (including non-CO₂ gasses such as SO_x and NO_x), soil, water, or increase in overall cradle-to-grave greenhouse gas footprint (carbon dioxide equivalent, CO₂e).
- It may be desirable to select a project or group of projects based on the degree to which the proposed project will employ procurement of U.S. iron, steel, manufactured products, and construction materials.
- It may be desirable to select a project, or group of projects which incorporate Applicant or team members from Minority Serving Institutions (e.g., Historically Black Colleges and Universities (HBCUs)/Other Minority Serving Institutions); and partnerships with Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or Tribal Nations.
- It may be desirable to select a project or group of projects, when compared to the existing DOE project portfolio and other projects to be selected from the subject FOA, contributes to the total portfolio meeting Justice40 goals.

5.6. Evaluation and Selection Process

5.6.1. Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

5.6.2. Recipient Integrity and Performance Matters

DOE, prior to making a federal award with a total amount of federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently the [Federal Awardee Performance and Integrity Information System \(FAPIS\)](#)) (see 41 U.S.C. § 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.206.

5.6.3. Pre-Selection Interviews and Site Visits

As part of the evaluation and selection process, DOE may invite one or more Applicants to participate in pre-selection interviews. The invited Applicant(s) will meet with DOE representatives to provide clarification on the contents of the Full Applications and to provide DOE an opportunity to ask questions regarding the proposed project. The information provided by Applicants to DOE through pre-selection interviews contributes to DOE's selection decisions.

DOE will arrange to meet with the invited Applicants in person at DOE's offices or a mutually agreed upon location. DOE may also arrange site visits at certain Applicants' facilities and at its discretion, may meet with community stakeholders concerning the project. In the alternative, DOE may invite certain Applicants to participate in a one-on-one conference with DOE via webinar, videoconference, or conference call.

The pre-selection interviews and site visits may also include discussions with affected stakeholders or communities potentially impacted to understand their concerns/risks. In the alternative, DOE may invite certain applicants to participate a one-on-one meeting with DOE virtually.

DOE will not reimburse Applicants for travel and other expenses relating to the pre-selection interviews or site visits, nor will these costs be eligible for reimbursement as pre-award costs.

Participation in pre-selection interviews or site visits with DOE does not signify that Applicants have been selected for award negotiations.

5.6.4. Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

5.7. Anticipated Notice of Selection and Award Negotiation Dates

OCED anticipates notifying Applicants selected for negotiation of award and negotiating awards by the dates provided on the cover page of this FOA.

6. Award Administration Information

6.1. Award Notices

6.1.1. Ineligible Submissions

Ineligible Applications will not be further reviewed or considered for award. The Grants and Agreements Officer will send a notification letter by email to the technical and administrative points of contact designated by the Applicant in OCED eXCHANGE. The notification letter will state the basis upon which the Application is ineligible and not considered for further review.

6.1.2. Application Notifications

DOE will notify Applicants of its determination by email to the technical and administrative points of contact designated by the Applicant in OCED eXCHANGE. The notification letter will inform the Applicant whether or not its Application was selected for award negotiations. Alternatively, DOE may notify one or more Applicants that a final selection determination will be made at a later date, subject to the availability of funds or other factors.

6.1.3. Successful Applicants

Receipt of a notification letter selecting an Application for award negotiations does not authorize the Applicant to commence the project. If an application is selected for award negotiations, it is not a commitment by DOE to issue an award. Applicants do not receive an award until award negotiations are complete and the Grants and Agreements Officer executes the funding agreement, accessible by the prime recipient in FedConnect.

Applicants must designate a primary and a backup point-of-contact in OCED eXCHANGE with whom DOE will communicate to conduct award negotiations. The Applicant must be responsive during award negotiations by providing requested documentation, including just-in-time documentation and meet the negotiation deadlines.

If the Applicant fails to do so or if award negotiations are otherwise unsuccessful, DOE will cancel the award negotiations and rescind the Selection. DOE reserves the right to terminate award negotiations at any time for any reason.

6.1.4. Alternate Selection Determinations

In some instances, an Applicant may receive a notification that its application was not selected for award and DOE designated the application to be an alternate. As an alternate, DOE may consider the Application for federal funding in the future. A notification letter stating the Application is designated as an alternate does not authorize the Applicant to commence the project. DOE may ultimately determine to select or not select the Application for award negotiations.

6.1.5. Unsuccessful Applicants

DOE shall promptly notify in writing each Applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

6.2. *Award Conditions and Reporting*

Applicants of an award made under this FOA must comply with requirements of all applicable federal, state, and local laws, regulations, DOE policy and guidance, instructions in this FOA, and the award terms and conditions. Applicants must require subrecipients' compliance with all applicable requirements. Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement.

7. Questions/Agency Contacts

Upon the issuance of a FOA, DOE personnel are prohibited from communicating (in writing or otherwise) with Applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding this FOA must be submitted to: CCdemoprojectsprogram@hq.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on OCED eXCHANGE at: <https://OCED-exchange.energy.gov>. **You must first select this specific FOA Number to view the questions and answers specific to this FOA.** OCED will attempt to respond to a question within 3 business days unless a similar question and answer has already been posted on the website. Questions related to the registration process and use of the OCED eXCHANGE website should be submitted to: OCED-ExchangeSupport@hq.doe.gov. Include FOA name and number in subject line.

8. Other Information

8.1. *Treatment of Application Information*

DOE takes very seriously the confidentiality of all applicants and will treat information submitted in applications, as well as the identity of applicants, as confidential to the fullest extent permissible under Federal law. In order for DOE to protect confidential information, the applicant must also treat the information as confidential and properly mark it as described below. DOE will not be able to protect information that the applicant has released publicly or is in the public domain. For additional information on DOE's Freedom of Information Act (FOIA) regulations, see 10 C.F.R. Part 1004.

Applicants should not include business sensitive (e.g., commercial or financial information that is privileged or confidential), trade secrets, proprietary, or otherwise confidential information in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOIA. Applicants are advised to not include any critically sensitive proprietary detail.

If an application includes business sensitive, trade secrets, proprietary, or otherwise confidential information, it is furnished to the federal government (government) in confidence with the understanding that the information shall be used or disclosed only for evaluation of the application. Such information will be withheld from public disclosure to the extent permitted by law, including FOIA. Without assuming any liability for inadvertent disclosure, DOE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for merit review of the application or as otherwise authorized by law. This restriction does not limit the government's right to use the information if it is obtained from another source.

Applications and other submissions containing confidential, proprietary, or privileged information must be marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under FOIA or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

The cover sheet of the Application and other submissions must be marked as follows and identify the specific pages containing trade secrets, confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain trade secrets, confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. 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 confidential, proprietary, or privileged information must be marked as follows: "Contains Trade Secrets, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure." In addition, each line or paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

8.2. *Retention of Submissions*

DOE expects to retain copies of all Applications and other submissions. No submissions will be returned. By applying to DOE for funding, Applicants consent to DOE's retention of their submissions.

8.3. Personally Identifiable Information

All information provided by the Applicant must to the greatest extent possible exclude Personally Identifiable Information (PII), which is information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name. (See OMB Memorandum M-07-16 dated May 22, 2007, found at:

<https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf>

By way of example, Applicants must screen resumes to ensure that they do not contain PII such as personal addresses, personal landline/cell phone numbers, and personal emails. **Under no circumstances should Social Security Numbers (SSNs) be included in the application.** Federal agencies are prohibited from collecting, using, and displaying unnecessary SSNs. (See, the Federal Information Security Modernization Act of 2014 (Pub. L. No. 113-283, Dec 18, 2014; 44 U.S.C. § 3551).

8.4. Uniform Commercial Code Financing Statements

Per 2 C.F.R. § 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with federal funds, and when the federal share of the financial assistance agreement is more than \$1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of \$5,000 purchased with project funds. These financing statement(s) must be approved in writing by the Grants and Agreements Officer prior to the recording, and they shall provide notice that the recipient's title to all equipment (not real property) purchased with federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the government retains an undivided reversionary interest in the equipment.

The UCC financing statement(s) must be filed before the Grants and Agreements Officer may reimburse the recipient for the federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the Grants and Agreements Officer may direct.

8.5. *Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment*

As set forth in 2 C.F.R. § 200.216, Applicants and subrecipients are prohibited from obligating or expending project funds (federal funds and recipient cost share) to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Section 889 of Public Law 115-232, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

See Public Law 115-232, Section 889, 2 C.F.R. § 200.216, and 2 C.F.R. § 200.471 for additional information.

8.6. *Title to Subject Inventions*

Ownership of subject inventions is governed pursuant to the authorities listed below:

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;
- All other parties: The Federal Non-Nuclear Energy Act of 1974, 42 U.S.C. § 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below);
- Class Patent Waiver;

DOE may issue a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States.

Advance and Identified Waivers: For an applicant not covered by a Class Patent Waiver or the Bayh-Dole Act, the applicant may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to DOE within the timeframes set forth in the award's intellectual property data terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 C.F.R. Part 784.

DEC: On June 07, 2021, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES (DEC) UNDER THE BAYH-DOLE ACT TO FURTHER PROMOTE DOMESTIC MANUFACTURE OF DOE SCIENCE AND ENERGY TECHNOLOGIES. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with the U.S. Manufacturing Commitments section further below.

A copy of the DEC can be found at <https://www.energy.gov/gc/determination-exceptional-circumstances-decs>. Pursuant to 37 C.F.R. § 401.4, any nonprofit organization or small business firm as defined by 35 U.S.C. § 201 affected by any DEC has the right to appeal it by providing written notice to DOE within 30 working days from the time it receives a copy of the determination.

DOE may issue and publish on the website above further DEC's prior to the issuance of awards under this FOA. DOE may require additional submissions or requirements as authorized by any applicable DEC.

8.7. Government Rights in Subject Inventions

Where Applicants retain title to subject inventions, the United States government retains certain rights.

Government Use License

The United States government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the government.

March-In Rights

The United States government retains march-in rights with respect to all subject inventions. Through "march-in rights," the government may require a prime recipient or subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the government may grant licenses for use of the subject invention when a prime recipient, subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by federal statutes in a reasonably satisfied manner; or
- The United States manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

8.8. *Rights in Technical Data*

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

“Limited Rights Data”: The United States government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government Rights in Technical Data Produced Under Awards: The United States government normally retains unlimited rights in technical data produced under government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under DOE awards may be protected from public disclosure for up to five years after the data is generated (“Protected Data”).

For awards permitting Protected Data, the protected data must be marked as set forth in the award’s intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

8.9 *Copyright*

The prime recipient and subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without DOE approval. When copyright is asserted, the government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the government.

8.10 Fraud, Waste, and Abuse

The mission of the DOE Office of Inspector General (OIG) is to strengthen the integrity, economy and efficiency of the Department's programs and operations including deterring and detecting fraud, waste, abuse and mismanagement.

The OIG accomplishes this mission primarily through investigations, audits, and inspections of DOE activities to include grants, cooperative agreements, loans, and contracts. The OIG maintains a Hotline for reporting allegations of fraud, waste, abuse, or mismanagement. To report such allegations, please visit <https://www.energy.gov/ig/ig-hotline>.

Additionally, recipients of DOE awards must be cognizant of the requirements of [2 C.F.R. § 200.113](#). Applicants and subrecipients (if applicable) are encouraged to allocate sufficient costs in the project budget to cover the costs associated for personnel and data infrastructure needs to support performance management and program evaluation needs including but not limited to independent program and project audits to mitigate risks for fraud, waste, and abuse.

8.11 U.S. Manufacturing Commitments

A primary objective of DOE's multi-billion-dollar research, development, and demonstration investments is to cultivate new research and development ecosystems, manufacturing capabilities, and supply chains for and by United States industry and labor. Therefore, in exchange for receiving taxpayer dollars to support an applicant's project, the applicant must agree to a U.S. Competitiveness provision requiring that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States unless the Recipient can show to the satisfaction of DOE that it is not commercially feasible.

Award terms, including the specific U.S. Competitiveness Provision applicable to the various types of recipients and projects, are available [here](#).

Please note that a subject invention is any invention conceived or first actually reduced to practice in performance of work under an award. An invention is any invention or discovery which is or may be patentable. The recipient includes any awardee, recipient, sub-awardee, or sub-recipient.

As noted in the U.S. Competitiveness Provision, if an entity cannot meet the requirements of the U.S. Competitiveness Provision, the entity may request a modification or waiver of the U.S. Competitiveness Provision. For example, the entity may propose modifying the language of the U.S. Competitiveness Provision in order to change the scope of the requirements or to provide more specifics on the application of the requirements for a particular technology.

As another example, the entity may request that the U.S. Competitiveness Provision be waived in lieu of a net benefits statement or United States manufacturing plan.

The statement or plan would contain specific and enforceable commitments that would be beneficial to the United States economy and competitiveness.

Examples of such commitments could include manufacturing specific products in the United States, making a specific investment in a new or existing United States manufacturing facility, keeping certain activities based in the United States or supporting a certain number of jobs in the United States related to the technology. DOE may, in its sole discretion, determine that the proposed modification or waiver promotes commercialization and provides substantial United States economic benefits, and grant the request. If granted, DOE will modify the award terms and conditions for the requesting entity accordingly.

More information and guidance on the waiver and modification request process can be found in the [DOE Financial Assistance Letter](#) on this topic. Additional information on DOE's Commitment to Domestic Manufacturing for DOE-funded R&D is available [here](#).

The U.S. Competitiveness Provision is implemented by DOE pursuant to a Determination of Exceptional Circumstances (DEC) under the Bayh-Dole Act and DOE Patent Waivers. See Section 8.8 Title to Subject Inventions for more information on the DEC and DOE Patent Waivers.

8.12 Government Right to Reject or Negotiate

DOE reserves the right, without qualification, to reject any or all applications in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

8.13 Export Control

The United States government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the United States to protect national security, foreign policy, and economic interests without imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as "Export Controls".

All recipients and subrecipients are responsible for ensuring compliance with all applicable United States Export Control laws and regulations relating to any work performed under a resulting award.

The recipient must immediately report to DOE any export control violations related to the project funded under the DOE award, at the recipient or subrecipient level, and provide the corrective action(s) to prevent future violations.

8.14 Interim Conflict of Interest Requirements for Financial Assistance

The DOE Interim Conflict of Interest Policy for Financial Assistance (COI Policy) can be found [here](#). The interim COI policy is applicable to all non-Federal entities that receive DOE funding by means of a financial assistance award (e.g., a grant, cooperative agreement, or technology investment agreement) and, through the implementation of the interim COI policy by the entity, to each investigator who is planning to participate in, or is participating in, the project funded wholly or in part under the DOE financial assistance award. The interim COI policy establishes standards that provide a reasonable expectation that the design, conduct, and reporting of projects funded wholly or in part under DOE financial assistance awards will be free from bias resulting from financial conflicts of interest or organizational conflicts of interest. The Recipient is subject to the requirements of the interim COI policy, and the recipient must certify that it is compliant with all the requirements in the interim COI policy. The Recipient must flow down the requirements of the interim COI policy to any subrecipient non-Federal entities.

APPENDIX A: APPLICATION REQUIREMENTS CHECKLIST

| Component | File Format | Page Limit | File Name |
|--|-------------|--------------------|---|
| SF-424 Application for Federal Assistance | PDF | N/A | ControlNumber_LeadOrganization_App424 |
| Cover Page | PDF | 2 pages | ControlNumber_LeadOrganization_Cover_Page |
| Project Overview | PDF | 8 | ControlNumber_LeadOrganization_Project_Overview |
| Technical Description, Innovation, and Impact | PDF | 20 | ControlNumber_LeadOrganization_Technical_Description |
| Technical Approach and Project Management Plan | PDF | 10 | ControlNumber_LeadOrganization_Technical_Approach |
| Technical Qualifications and Resources | PDF | 15 | ControlNumber_LeadOrganization_Technical_Qualifications |
| Community Benefits Plan: Job Quality and Equity | PDF | 25 | ControlNumber_LeadOrganization_Comm_Benefits |
| Community Partnership Documentation | PDF | 3 pages per letter | ControlNumber_LeadOrganization_PartnerDoc |
| Resumes | PDF | 2 pages each | ControlNumber_LeadOrganization_Resumes |
| Letters of Commitment | PDF | 1 page each | ControlNumber_LeadOrganization_LOCs |
| Project Management Plan | PDF | 50 | ControlNumber_LeadOrganization_PMP |
| Initial Environmental, Health, & Safety Assessment | PDF | 10 | ControlNumber_LeadOrganization_EHSA |
| Life Cycle Analysis | PDF | N/A | ControlNumber_LeadOrganization_LCA |

| | | | |
|--|---------------|-----|--|
| Business Case Analysis | PDF | 30 | ControlNumber_LeadOrganization_BCA |
| Project Financing Plan | PDF | 20 | ControlNumber_LeadOrganization_PFP |
| Budget Justification Workbook | MS Excel | N/A | ControlNumber_LeadOrganization_Budget_Justification |
| Subrecipient Budget Justification | MS Excel | N/A | ControlNumber_LeadOrganization_Subrecipient_Budget_Justification |
| Summary of Public Releasee | PDF | 1 | ControlNumber_LeadOrganization_Public_Release |
| Summary Slides | MS PowerPoint | 5 | ControlNumber_LeadOrganization_Slide |
| Environmental Considerations Summary | PDF | N/A | ControlNumber_LeadOrganization_Environmental_Considerations |
| Current and Pending Support Disclosures | PDF | N/A | ControlNumber_LeadOrganization_Current_Support |
| Potentially Duplicate Funding Notice | PDF | N/A | ControlNumber_LeadOrganization_DuplicateFunding |
| Transparency of Foreign Connections | PDF | N/A | ControlNumber_LeadOrganization_ForeignConnections |
| CO ₂ Capture FEED Study (optional) | PDF | N/A | ControlNumber_LeadOrganization_CC_FEED |
| CO ₂ Pipeline FEED Study (optional) | PDF | N/A | ControlNumber_LeadOrganization_PIPE_FEED |
| CO ₂ Storage FEED Study (optional) | PDF | N/A | ControlNumber_LeadOrganization_STORAGE_FEED |
| Storage Permits | PDF | N/A | ControlNumber_LeadOrganization_PERMITS |
| Key Performance Parameters Tables | PDF | N/A | ControlNumber_LeadOrganization_KPP_TABLES |
| Disclosure of Lobbying Activities | PDF | N/A | ControlNumber_LeadOrganization_LLL |

APPENDIX B: LIST OF ACRONYMS

| | |
|-------|--|
| DEIA | Diversity, Equity, Inclusion, and Accessibility |
| DMP | Data Management Plan |
| DOE | Department of Energy |
| OCED | Office of Clean Energy Demonstrations |
| FFATA | Federal Funding and Transparency Act of 2006 |
| FOA | Funding Opportunity Announcement |
| FOIA | Freedom of Information Act |
| FFRDC | Federally Funded Research and Development Center |
| GAAP | Generally Accepted Accounting Principles |
| G/AO | Grants and Agreements Officer |
| IPMP | Intellectual Property Management Plan |
| M&O | Management and Operating |
| MPIN | Marketing Partner ID Number |
| MSI | Minority-Serving institution |
| MYPP | Multi-Year Program Plan |
| NDA | Non-Disclosure Acknowledgement |
| NEPA | National Environmental Policy Act |
| NNSA | National Nuclear Security Administration |
| OMB | Office of Management and Budget |
| OSTI | Office of Scientific and Technical Information |
| PII | Personal Identifiable Information |
| RFI | Request for Information |
| RFP | Request for Proposal |
| SAM | System for Award Management |
| SOPO | Statement of Project Objectives |
| SPOC | Single Point of Contact |
| TA | Topic Area |
| TIA | Technology Investment Agreement |
| TRL | Technology Readiness Level |
| UCC | Uniform Commercial Code |
| UEI | Unique Entity Identifier |
| WBS | Work Breakdown Structure |
| WP | Work Proposal |

APPENDIX C: CO₂ CAPTURE FEED STUDY GUIDANCE

CO₂ Applicants are required to submit summary results of a FEED study for the proposed CO₂ capture technology integrated with the proposed host site. Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution. Activities include, but are not limited to, those listed below:

1. **Project Scope and Design** that includes research / business objectives and the summary of the proposed project.
2. **Project Design Basis** including, but not limited to site characteristics and ambient conditions, fuel feedstock and exhaust gas characteristics, and host site environmental requirements. The design basis shall clearly identify all permits and environmental reviews necessary to initiate construction. All internal or corporate approvals required by the host site to initiate construction shall be identified.
3. **Engineering Design Package.** Design of the carbon capture system shall result in equipment sizing fully substantiated with kinetic, heat and mass transfer data, as well as justification for choice of materials of construction. The cost estimate shall include preparation of a capital cost estimate, including the cost of capture in \$/tonne CO₂ captured, levelized cost of electricity (LCOE) for **TA-1 and TA-2** and levelized cost of product for **TA-3**.

The FEED shall include, at a minimum: process flow diagrams; carbon capture process model scaled-up for the proposed industrial facility; utility flow diagrams; piping and instrumentation diagrams; heat and material balances; ; final layout drawings; complete engineered process and utility equipment lists; single line diagrams for electrical; electrical equipment and motor schedules; vendor quotations; detailed project execution plans; resourcing and work force plans; a hazard and operability study (HAZOP) review; and a constructability review. The FEED shall incorporate all engineering disciplines necessary to perform the final design and construction, which include, but are not limited: to process, civil, architectural, structural, mechanical, piping, electrical, and control systems engineering.

Engineering design shall cover both the carbon capture system and balance-of-plant. Balance-of-plant includes, but is not limited to, utilities such as compression, cooling water, water treatment, waste treatment, and the sources of energy, electricity, and/or steam, necessary to power the carbon capture system.

The latter may include integration of an external energy source (e.g., natural gas-fueled, solar, wind, geothermal) or integration of the carbon capture system into the existing plant. If the carbon capture system is designed to purchase renewable electricity or to generate it on site, then the plant must include a method of energy storage or back-up power generation to supply electricity when renewable electricity is not available.

If the carbon capture system requires co-generation of power or steam for its operation, it must include CO₂ capture, compression, and storage from both the base facility and co-generation plant.

The engineering design package should also cover the integration of the carbon capture process within the industrial facility, including but not limited to the following: novel approaches to recover waste heat from the facility and integrate it with the carbon capture system; and design of pollution control systems upstream of the carbon capture system. If multiple major emission sources exist at the facility, the Applicant should describe whether aggregation of the sources into one stream, upstream of the carbon capture facility, is proposed.

FEED Study – Requirements

It is understood that the content to be included in a Front-End Engineering and Design (FEED) study package is tailored by the type of project and the needs of the owner. Often Engineering and Construction (E&C) firms practicing in a given industry (e.g., power generation or industrial sectors) will have an in-house standard in the absence or lack of owner definition. The goal of any FEED study is for the owner and E&C firm to collaboratively define as much of the project’s scope as possible to reduce risk and uncertainty prior to executing the project. Often, Items 1 – 3 of the lists below are provided by the owner to the E&C firm.

The following is a list of content to be included in the FEED study package. Applicants are encouraged to include additional materials outside this list that resulted from the uniqueness of their respective project or the needs of the owner. Applicants are also encouraged to integrate FEED study activities with CBP requirements and activities as appropriate for the project.

- 1.) Project Background
 - a. Discusses Project need or Research/Business Objective
- 2.) Project Scope
 - a. Provides a summary of the proposed project and how it will meet the objective
 - b. Provides the system boundaries of the proposed project
- 3.) Project Design Basis
 - a. Site Characteristics
 - i. Location, topography, available land, transportation access, available utilities, ...
 - ii. Community Benefits, including regional analysis of communities and disadvantaged communities, and whether those communities rely on limited resources (e.g., water) that could be impacted by the project. This information should be consistent with the Engagement Plan, EEJ Assessment, and J40 plan.
 - b. Site Ambient Conditions
 - i. Elevation, atmospheric pressure, temperature averages/extremes, prevailing wind, seismic data, air composition,
 - c. Fuel Feedstock and Exhaust Gas Characteristics
 - i. Design compositional analyses of the fuel (coal, natural gas, etc.)
 - ii. Design compositional analyses of the exhaust gas (flow rate, composition, etc.)

- d. Environmental and Permit Requirements - as dictated by the authority(s) having jurisdiction (e.g., State DEP, EPA, etc.)
 - i. Air emission permitting limitations and required control technologies
 - ii. Water discharge permitting limitations and required control technologies
 - iii. Waste disposal (e.g., coal ash, spent absorbents, etc.) permitting limitations and required control technologies
- e. Site Specific Design Considerations
 - i. Flood plain, soil conditions, rainfall/snowfall criteria, building/enclosure permitting, noise regulations, local community requirements (plumes visibility)
- f. Modularization Design Requirements
- 4.) Basic contracting and purchasing strategy
- 5.) Engineering Design Packages
 - a. Process Engineering
 - i. Process area descriptions
 - ii. Block Flow Diagram (BFD), Process Flow Diagram (PFD), and Process & Instrumentation Diagram (P&ID)
 - iii. Process simulation output and heat and material balances (H&MB)
 - iv. HAZOP/PHA documentation
 - v. Major Process Equipment specifications/data sheets
 - vi. Equipment and instrumentation lists
 - 1. Key parameters and their value for equipment costing (i.e., height, diameter, heat duty, delta Temperature, power, materials of construction, etc.)
 - vii. Cause and Effect diagrams
 - viii. Overpressure Relief/Flare Study
 - b. Civil Engineering
 - i. Soil Load Analysis
 - ii. Storm water runoff plan
 - iii. Geologic assessment
 - iv. Spill containment assessment
 - c. Structural Engineering
 - i. Foundation design drawings (e.g., concrete sonotubes & slabs, helical pillars)
 - ii. Structural and Architectural drawings (e.g., process equipment/piping structural supports, access gangways/ladders, building enclosures, etc.)
 - iii. Material take-offs
 - d. Mechanical Engineering
 - i. General site plan view(s)
 - ii. 3-D model and/or equipment elevation sections & plan drawings
 - iii. Piping/tracing/insulation line list and material specification
 - iv. Piping isometrics

- v. Piping layout/routing drawings
- e. Electrical Engineering
 - i. Electrical load lists
 - ii. One-line diagram(s)
 - iii. Electrical equipment (e.g., substation, motor control centers, switchgear) specifications
 - iv. Cable/cable tray routing drawings
 - v. Lighting drawings
- f. Instrumentation & Controls Engineering (System Integration)
 - i. Control system architecture specification
 - ii. Instrument/equipment lists and specifications
 - iii. Loop drawings
 - iv. Communications infrastructure (e.g., remote SCADA ability, telephone, internet) specifications
- g. Fire Protection Engineering
 - i. Fire protection system (e.g., sprinkler, foam, water cannons, etc.) design specifications and drawings
- h. Facilities Engineering
 - i. Building/Security Infrastructure Plans
 - 1. Front Office/Administration
 - 2. Control Room(s)
 - 3. Maintenance/Shop Area
 - ii. HVAC
- i. Site Security
- j. Logistics
- k. Constructability
 - i. Construction access
 - ii. Lay-down areas
 - iii. Sequencing of construction work
- l. Project Cost Estimate (~ +/- 15%, AACE Class 3 or similar)
 - i. Individual component capital cost (i.e., absorber, regenerator, etc.)
 - ii. Breakdown of operating costs
 - iii. Overall cost of capture (\$/tonne of CO₂ product)
- m. Estimated Project Schedule

APPENDIX D: CO₂ PIPELINE FEED STUDIES

CO₂CO₂ Applicants are required to submit summary results of a FEED study for the proposed CO₂ Pipeline connecting the CO₂ capture and storage site(s). Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution.

1. Project Parameters including, but not limited to:

- a. Site characteristics and ambient conditions,
- b. Product gas compositions,
- c. Permit list, review agencies, and environmental requirements,
- d. Land use, right-of-way, property boundaries, and title research,
- e. Roads, railroads, utility corridors research,
- f. Project environment, safety and health (ES&H) criteria including pipeline construction and operational impacts to communities and the environment, potential impacts to disadvantaged communities, as well as pipeline failure risk analysis and risk acceptance criteria for pipeline operations.
- g. Unsteady state / downtime / flow assurance / maintenance
- h. Project management plan and an updated risk register.
- i. Overall project schedule in Gantt chart.

2. Engineering Design Package including, but not limited to:

- a. A Route Report and Maps, complete with:
 - i. A GIS database to house all route and survey information,
 - ii. Pipeline route map incorporating aerial photography, property boundaries, right-of-way and workspace, environmental features, elevation profile, hydrological data, pipeline materials, foreign crossings, and others,
 - iii. Topographic and crossing investigation/survey including elevation, environmental or population impact, crossing methods, constructability issues, and proposed mitigation and other relevant information at key locations,
 - iv. Right-of-way, workspace, land, and access investigation/survey including property ownership, land use types, damage assessment, utility corridors, access points, workspace configurations, and other relevant information at key locations,
 - v. Geotechnical and hydrotechnical investigations (desktop or field),
 - vi. Wetland and environmental survey/investigation information,
 - vii. Cultural and archeological survey/investigation information,
 - viii. Population density study and preliminary High Consequence Area (HCA) determination,
 - ix. Disadvantaged community designations,
 - x. Site selection for aboveground facilities including booster stations, meter stations, launchers and receivers, and mainline block valves,
 - xi. Routing critical path.

- b. A Design Basis document that covers:
 - i. Operating philosophy,
 - ii. Codes, standards, specifications, and procedures,
 - iii. Design criteria including metallurgical requirements to address ductile fracture propagation,
 - iv. Route selection process,
 - v. Hydraulic analysis,
 - vi. Material selection and pressure design,
 - vii. Crossing design,
 - viii. Corrosion control,
 - ix. Integrity management.
 - c. Key Design Calculations and Drawings that cover:
 - i. Pressure design,
 - ii. Maximum Operating Pressure (MOP) determination,
 - iii. Hydraulic analysis,
 - iv. Pipeline and equipment sizing,
 - v. Material take-off,
 - vi. Process flow diagram (PFD),
 - vii. Preliminary piping and instrumentation diagram (P&ID),
 - viii. Power requirements, sources, costs, and timing.
 - d. Technical Specifications for major materials and activities, including but not limited to pipe, valves, launcher/receiver, facility piping, rotating equipment, static equipment, construction, survey, welding, and others.
 - e. Preliminary Hazard and Operability Analysis (HAZOP).
 - f. If converting a pipeline to CO₂ service, a conversion-to-service plan for PHMSA regulatory compliance that includes an integrity assessment plan to demonstrate fitness for service.
 - g. Additional safety risk assessment
 - i. Air dispersion and atmospheric modeling study
 - ii. Emergency Response Plan (ERP)
 - iii. Use of crack arrestors
 - iv. Current state-of-the-art of odorant additives for CO₂
3. **Project cost estimate.** Design of the pipeline system shall support an itemized capital cost estimate consistent with AACE (Association of the Advancement of Cost Engineering) Class 3, or similar, with an expected accuracy range of -10% to -20% on the low side and +10% to +30% on the high side. The cost estimate should include a basis of estimate for each item. Provide a benchmark study for the overall cost estimate if available. Each Recipient is required to submit a pipeline buildout plan with a P-10, P-50 and P-90 project cost analysis based on the acquisition and installation of carbon transport pipeline networks that fulfill the Build America, Buy America Act provisions in the BIL.

APPENDIX E: CO₂ STORAGE FEED AND STORAGE FIELD DEVELOPMENT PLAN

Applicants are required to submit summary results of a FEED study for the proposed CO₂ storage site. Although the full FEED study is not required to be submitted, DOE may request submittal of the full FEED study and underlying documentation at any point during application review or project execution.

The storage complex should have appropriate subsurface characteristics to meet objective, such as large volumes of accessible pore space in laterally extensive storage reservoirs overlain by regionally extensive seals to protect against adverse environmental impacts.

The Storage Field Development Plan should: (1) explain the strategy for developing the storage field to maximize its potential utility; (2) describe all elements of the proposed storage field facilities and establish a logical order and timing for the development of all anticipated facilities, accounting for changing needs for monitoring and use of pore space and changing CO₂ delivery rates over time; and (3) present a cost plan over the proposed life of the project. It is expected that the facilities description within the Storage Field Development Plan would be based on information associated with the relevant permits (e.g., UIC or OCS permit application and associated permit terms and conditions, NPDES permit, monitoring well permits, site access road permit), along with regulatory rules and guidance. The Plan should include, if relevant, the assessment and repurposing or plugging of legacy wells and other existing infrastructure. It is understood that this Plan will be only a draft or preliminary until after relevant permits are received, financing is arranged, and other considerations are settled.

There are several major cost categories related to the development of a CO₂ storage site, including wells, infrastructure, compression, and monitoring deployment. Each of these will bring their own cost uncertainty due to outside influences such as oilfield contractor demand, steel price, supply chain disruptions, and inflation. To set the correct expectations, each Plan is required to include a project cost breakdown with a P-10, P-50 and P-90 project cost analysis. Project risks and their effect on cost should be clearly explained. In addition, each proposed well should have a full Authorization for Expenditures (AFE) with cost uncertainty ranges defined for each line item.

The Storage Field Development Plan should additionally report the progression of the storage resource status through Prospective, Contingent, and Capacity based on the SRMS guidelines described at [SPE CO₂ Storage Resource Management System \(SRMS\)](#). Projects should follow the SRMS process to classify the status of the storage resource(s). The estimated classification of the resource(s) and capacity(ies) will be used by DOE to demonstrate how IJJA-funded projects are increasing storage capabilities in the U.S.

Suggested contents of the Storage Field Development Plan are described below. Please note however that DOE will accept the Plan in whatever format is company standard for the Applicant/Recipient, assuming that the Plan has all needed information to understand the build-out, operations and costs for the planned storage of CO₂.

Suggested contents of the Field Development Plan:

1. Executive Summary

2. Legal Considerations and Rights

- Pore/Surface Rights
- Rights of Way and Easement
- Liability Relief
- Procurement Plan (as needed)

3. Storage Development Description and Rationale for Development Plan

- Field Characterization Results
- Seismic Interpretation and Structural Configuration
- Geological Interpretation and Reservoir Description, including:
 - Stratigraphy
 - Structure and Dip
 - Porosity
 - Permeability
 - Minerology
 - Saturations
 - In-Situ Stress State
 - Geochemistry
 - Fault Zone Presence and Characteristics
 - Cap Rock Characteristics
- Petrophysics
- Well logs
- Coring and Core analysis plans
- Special Core Analysis (SCAL)
- Volumetrics by segment
- Aquifer strength
- Reservoir Pressure, Temperature, and Reservoir Fluids
- Reservoir Units and Modelling Approach
- Injection Rate and Mass Over Time
- Area of Review Calculation
- Legacy Well Evaluation
- Well test (DST) plans / Injectivity testing
- Reservoir fluid characterization plans
- Geomechanics testing

4. Development and Management Plan

- Development Plan / Well layout
- Well Construction and Legacy Well Mitigation Plans
- Completion design
- Rig scheduling / drill well timing
- Injection Facilities
- Monitoring Plan (Seismic, Pressure, Temperature, etc.)
- Injection Operations

- Flow Assurance Operations
- Decommissioning & PISC Plan
- Costs (AACE Class 3 or other as appropriate)
 - Pre-Project Costs (Seismic, Exploration Drilling, Appraisal Drilling, Studies)
 - Drilling and completion of wells (including future recompletes)
 - Assessment and repurposing or plugging of legacy wells, pipelines and other existing infrastructure
 - Facilities
 - Flow Assurance
 - Field OpEx, excluding tariffs
 - Decommissioning & PISC costs
- Project Risks & Mitigations (e.g., faults and potential for induced seismicity or leakage as well as the natural seismicity)
- Storage Management Plan

APPENDIX F: STATE-POINT DATA TABLES

Instructions for completing data tables: The tables that follow in this attachment shall be populated with data provided by the Applicant. Applicants proposing projects shall complete the appropriate combinations of Tables 1, 2 and 3 that relate to their proposed process concept. *Merit scoring of application will correspond to the completeness of the data table and supporting information.* Key data or estimates provided in the table(s) shall be supported with short narratives in bullet form within the Scientific and Technical Merit section. These bullets shall describe the sources for the individual data provided. This may be measurements made directly by the Applicant 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 Applicant or others, or by example calculations for noncritical data. Other acceptable sources of data are the open literature (with citation and description), or estimated or extrapolated data (with description of method/model used for the estimate, or the procedure used for extrapolation). Arguments supported by theory/mechanisms shall be provided for projected performance for new, advanced solvent, sorbent, or membrane materials.

For **TA-1**, Applicants are required to provide the demonstrated performance data for their solvent, sorbent, or membrane technology. Applicants shall prepare the State Point Data Table for coal-based relevant exhaust gas conditions. Applicants should substantiate performance of the proposed technology by providing pilot-scale validation (i.e., total system) with coal relevant exhaust gas conditions.

For **TA-2**, Applicants are required to provide the demonstrated performance data for their solvent, sorbent, or membrane technology. Applicants shall prepare the State Point Data Table for natural gas relevant exhaust gas conditions CO_2 . Applicants should substantiate performance of the proposed technology by providing pilot-scale validation (i.e., total system) with NG relevant exhaust gas conditions.

For **TA-3**, Applicants are required to provide the demonstrated performance data for their solvent, sorbent, or membrane technology. Applicants shall prepare the State Point Data Table for exhaust gas conditions similar to the ones in the selected industrial application. Applicants should substantiate performance of the proposed capture technology by providing pilot-scale validation (i.e., total system) with actual exhaust gas having a similar CO_2 concentration as to the one in the selected industrial application.

Table F1. State-Point Data for Solvent Based Systems

| | Units | Measured/ Estimated Performance | Projected Performance |
|--|-----------------------------|---------------------------------------|--------------------------|
| Pure Solvent | | | |
| Molecular Weight | mol ⁻¹ | | |
| Standard Boiling Point | °C | | |
| Standard Freezing Point | °C | | |
| Vapor Pressure @ 15°C | bar | | |
| Working Solution | | | |
| Concentration | kg/kg | | |
| Specific Gravity (15 °C/15 °C) | - | | |
| Specific Heat Capacity @ STP | kJ/kg·K | | |
| Viscosity @ STP | cP | | |
| Surface Tension @ STP | dyn/cm | | |
| CO ₂ Mass Transfer Rate [K _L] | m/s | | |
| CO ₂ Reaction Rate | - | | |
| Thermal Conductivity | W/(m·K) | | |
| Absorption | | | |
| Pressure | bar | | |
| Temperature | °C | | |
| Equilibrium CO ₂ Loading | gmol CO ₂ /kg | | |
| Heat of Absorption | kJ/kg CO ₂ | | |
| Solution Viscosity | cP | | |
| Desorption | | | |
| Pressure | bar | | |
| Temperature | °C | | |
| Equilibrium CO ₂ Loading | gmol CO ₂ /kg | | |
| Heat of Desorption | kJ/kg CO ₂ | | |
| Pilot Scale Data | | | |
| Location | | | |
| The following information should be provided for the longest steady-state duration test performed at pilot scale | | | |
| Scale | tCO ₂ /year | | |
| Duration of Long-Term Test (consecutive hours) | hr | | |

| | | | |
|---|-----------------------|--|--|
| CO ₂ concentration in the feed stream (e.g., flue gas, process stream) | Mol % | | |
| Carbon Capture Efficiency | % | | |
| Solvent Make-up rate | %/yr | | |
| Reboiler Duty | KJ/Kg CO ₂ | | |
| Details on solvent reclamation or refreshing | | | |
| CO ₂ Product Purity | Mol % dry | | |
| CO ₂ Product Oxygen Concentration | Mol% (or ppm) | | |

Definitions for Table 1:

- *STP* – Standard Temperature and Pressure (15 °C, 1 atm)
- *Pure Solvent* – Agent(s), working alone or as a component of a working solution, responsible for enhanced CO₂ absorption. For example: the amine monoethanolamine (MEA) in an aqueous solution.
- *Working Solution* – The solute-free (*i.e.*, CO₂-free) liquid solution used as the working solvent in the absorption/desorption process. For example: the liquid mixture of MEA and water.
- *Absorption* – The conditions of interest for absorption are those that prevail at maximum solvent loading, which typically occurs at the bottom of the absorption column. Measured data are preferable to estimated data.
- *Desorption* – The conditions of interest for desorption are those that prevail at minimum solvent loading, which typically occurs at the top of the desorption column. Operating pressure and temperature for the desorber/stripper are process dependent. Measured data are preferable to estimated data.
- *Pressure* – The pressure of CO₂ in equilibrium with the solution. If the vapor phase is pure CO₂, this is the total pressure, and if it is a mixture of gases, this is the partial pressure of CO₂.
- *Concentration* – Mass fraction of pure solvent in working solution.
- *Loading* – The basis for CO₂ loading is moles of pure solvent.
- *Mass Transfer Rate* – Overall liquid phase mass transfer coefficient.
- *CO₂ Reaction Rate* – A characterization of the CO₂ absorption trend with respect to time, as complete in the range of time as possible.
- *Details on solvent reclamation or refreshing* – Include information about reclamation rates or solvent replacement/refreshing during the long-term test.
- *CO₂ Product Purity* – Average purity of the CO₂ product from the capture system during the long-term testing.
- *CO₂ Product Oxygen Concentration* – Oxygen content of the CO₂ produced during the long-term testing.

Table F2. State-Point Data for Sorbent Based Systems

| | Units | Measured Performance (Powder form) | Projected or Measured Performance (structured material system) |
|--|--------------------------------|---------------------------------------|---|
| Sorbent | | | |
| True Density @ STP | kg/m ³ | | |
| Bulk Density | kg/m ³ | | |
| Average Particle Diameter | mm | | |
| Particle Void Fraction | m ³ /m ³ | | |
| Packing Density | m ² /m ³ | | |
| Solid Heat Capacity @ STP | kJ/kg·K | | |
| Crush Strength | kgf | | |
| Attrition Index | - | | |
| Thermal Conductivity | W/(m·K) | | |
| Adsorption | | | |
| Pressure | bar | | |
| Temperature | °C | | |
| Equilibrium Loading | gmol CO ₂ /kg | | |
| Heat of Adsorption | kJ/gmol CO ₂ | | |
| CO ₂ Adsorption Kinetics | gmol/time | | |
| Desorption | | | |
| Pressure | bar | | |
| Temperature | °C | | |
| Equilibrium Loading | gmol CO ₂ /kg | | |
| Heat of Desorption | kJ/gmol CO ₂ | | |
| CO ₂ Desorption Kinetics | gmol/time | | |
| Pilot Scale Information | | | |
| Location | | | |
| The following information should be provided for the longest steady-state duration test performed at pilot scale | | | |
| Scale | tCO ₂ /year | | |
| Duration of Long-Term Test (consecutive hours) | hrs | | |
| CO ₂ concentration in feed stream (e.g., flue gas, process stream) | % | | |
| Carbon Capture Efficiency | % | | |

| | | | |
|---|-----------------------|--|--|
| Cycle Time | Hr | | |
| Sorbent Make-up rate | %/yr | | |
| Details on sorbent reactivation or refreshing | | | |
| Heat Duty | KJ/Kg CO ₂ | | |
| CO ₂ Product Purity | Mol % dry | | |
| CO ₂ Product Oxygen Concentration | Mol% (or ppm) | | |

Definitions for Table 2:

- *STP* – Standard Temperature and Pressure (15 °C, 1 atm)
- *Sorbent* – Adsorbate-free (*i.e.*, CO₂-free) and dry material as used in adsorption/desorption cycle.
- *Adsorption* – The conditions of interest for adsorption are those that prevail at maximum sorbent loading. Measured data are preferable to estimated data.
- *Desorption* – The conditions of interest for desorption are those that prevail at minimum sorbent loading. Operating pressure and temperature for the desorber/stripper are process dependent. Measured data are preferable to estimated data.
- *Pressure* – The pressure of CO₂ in equilibrium with the sorbent. If the vapor phase is pure CO₂, this is the total pressure, and if it is a mixture of gases, this is the partial pressure of CO₂.
- *Packing Density* – Ratio of the active sorbent area to the bulk sorbent volume.
- *Loading* – The basis for CO₂ loading is mass of dry sorbent.
- *Kinetics* – A characterization of the CO₂ adsorption/desorption trend with respect to time, as complete in the range of time as possible.
- *Cycle Time* – time for entire absorption and regeneration cycle utilized during long term testing
- *Details on sorbent reactivation or refreshing* – Include information about reactivation process and rates or sorbent replacement during the long-term test
- *CO₂ Product Purity* – Average purity of the CO₂ product from the capture system during the long-term testing
- *CO₂ Product Oxygen Concentration* – Oxygen content of the CO₂ produced during the long-term testing

Table F3. State-Point Data for Membrane Based Systems

| | Units | Measured/ Estimated Performance | Projected Performance |
|--|---------------------------|---------------------------------------|--------------------------|
| Materials Properties | | | |
| Materials of Fabrication for Selective Layer | | | |
| Materials of Fabrication for Support Layer (if applicable) | | | |
| Nominal Thickness of Selective Layer (μm) | | | |
| Membrane Geometry | | | |
| Max Trans-Membrane Pressure | bar | | |
| Hours tested without significant degradation | | | |
| Membrane Performance | | | |
| Temperature | $^{\circ}\text{C}$ | | |
| Pressure Standardized Flux for Permeate (CO_2) | GPU or equivalent | | |
| $\text{CO}_2/\text{H}_2\text{O}$ Selectivity | - | | |
| CO_2/N_2 Selectivity | - | | |
| Type of Measurement (Ideal or mixed gas) | - | | |
| Proposed Module Design | | | |
| Flow Arrangement | - | | |
| Packing Density | m^2/m^3 | | |
| Shell-Side Fluid | - | | |
| | | | |
| Pilot Scale Information | | | |
| Location | | | |
| The following information should be provided for the longest steady-state duration test performed at pilot scale | | | |
| Scale | $\text{tCO}_2/\text{yr.}$ | | |
| CO_2 concentration in feed stream (e.g., flue gas, process stream) | % | | |
| Duration of Long-Term Test (consecutive hours) | hrs | | |
| Average CO_2 capture Efficiency | % | | |
| Starting CO_2 Capture Efficiency | % | | |

Definitions for Table 3:

- *Membrane Geometry* – Flat discs or sheets, hollow fibers, tubes, etc.
- *Pressure Standardized Flux* – For materials that display a linear dependence of flux on partial pressure differential, this is equivalent to the membrane's permeance.
- *GPU* – Gas Permeation Unit, which is equivalent to $10^{-6} \text{ cm}^3/(\text{cm}^2\cdot\text{s}\cdot\text{cmHg})$ at 1 atm and 0 °C. For non-linear materials, the dimensional units reported shall be based on flux measured in $\text{cm}^3/(\text{cm}^2\cdot\text{s})$ (at 1 atm and 0 °C) with pressures measured in cm Hg. Note: $1 \text{ GPU} = 3.3464 \times 10^{-6} \text{ kgmol}/(\text{m}^2\cdot\text{s}\cdot\text{kPa})$ [SI units]
- *Type of Measurement* – Either mixed or pure gas measurements; projected permeance and selectivities shall be for mixture of gases found in de-sulfurized exhaust gas.
- *Flow Arrangement* – Typical gas-separation module designs include spiral-wound sheets, hollow-fiber bundles, shell-and-tube, and plate-and-frame, which result in either co-current, counter-current, crossflow arrangements, or some complex combination of these.
- *Packing Density* – Ratio of the active surface area of the membrane to the volume of the module.
- *Shell-Side Fluid* – Either the permeate or retentate stream.
- Details on membrane reactivation or replacement – Include information about reactivation process and rates or membrane replacement during the long-term test
- Starting CO₂ Capture Efficiency – Capture efficiency achieved in the first hour of long-term testing
- Ending CO₂ Capture Efficiency – Capture efficiency achieved in the last hour of long-term testing
- CO₂ Product Purity – Average purity of the CO₂ product from the capture system during the long-term testing
- CO₂ Product Oxygen Concentration – Oxygen content of the CO₂ produced during the long-term testing
- Membrane Feed Pressure – Pressure of gas fed to the membrane for separation during the long-term test. *Repeat this parameter for each stage of membrane used during the long-term test
- Permeate Pressure – Pressure of the corresponding permeate of the membrane that accounts for the trans membrane pressure drop and any vacuum used. * Repeat this parameter for each stage of membrane used during the long-term test

APPENDIX G: BASIS FOR CCS TECHNOLOGY EH&S ASSESSMENT

An assessment of EH&S risks is required with the application and as part of the deliverables for each Go/No-Go review. Unanticipated or uncontrolled EH&S risks will impede commercialization of CCS technologies, and the EH&S assessment is a critical element of the demonstration project. An updated EH&S assessment at the end of Phase 1, shall be coordinated with the FEEDs for capture, pipeline, storage system. Final EH&S assessment at the end of Phase 4 needs to be updated with data collected during the operation phase of the project. The EH&S risk assessment shall be conducted by qualified and experienced organizations and professionals (*e.g.*, environmental scientists, industrial hygienists, safety engineers).

Required elements for the EH&S Assessment are:

- 1) All potential ancillary or incidental air and water emissions, and solid wastes produced from the proposed technology shall be identified and their magnitude estimated. In addition to solvents or sorbents 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. Accumulation, 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 CCS 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 offsite disposal options shall be examined. Accidental release measures shall also be discussed.

APPENDIX H: BUSINESS CASE ANALYSIS

The business case analysis demonstrates an understanding of the current and projected landscapes of this CCS demonstration project, any future deployment projects, and the potential utilization of tax credits including their projected revenue and duration.

The first section of the business case analysis should identify the potential market size of a technology option proposed by the Applicant. The analysis will contain a business case analysis, technical overview; market analysis; future deployment projection; and quantification of potential benefits of the technology.

An outline of each of the five major pieces of the analysis are as follows:

Business Case Analysis

- a. A *pro forma* which quantifies the projected financial parameters such as operating costs, operating revenues, financing cash flows, EBITDA, tax credits/liabilities, ROI, and IRR over the project lifespan. The Business Case Analysis should also include a list of key economic/financial assumptions.

Technical Overview

- a. Description of the technology and potential applicability across the coal, natural gas, and industrial point source sector area.

Market Analysis

- a. Survey of relevant carbon emission point sources
- b. Applicability of technology to these sources
- c. Financial analysis of application of the technology to these sources
- d. Discussion of potential financing structures and partnerships for deployment of the technology
- e. Discussion of the potential utilization of tax credits and other incentives, including projected revenue and duration

Future Deployment Projection

- a. Provide the potential deployment scale of the technology across the current and future coal, natural gas, and industrial point source sector
- b. Identify and compare competing technology options
- c. Discussion of potential barriers to large scale deployment
- d. Discuss steps that will be taken during the proposed project to enable future deployment of the technology.

Quantify Potential Benefits of the technology

- a. Provide estimates of the potential benefits of large-scale deployment in terms of metrics such as manufacturing jobs, revenue, emissions reductions, etc.

APPENDIX I: PROJECT FINANCING PLAN

Applicants must present a viable plan to obtain funding for the entire non-DOE share of the total project cost in the form of a **Project Financing Plan** that identifies all sources of project funds.

For non-federal cost share commitments that are in the form of cash, each provider must present audited financial statements for the prior year and all unaudited interim financial statements for the current year. If audited financial statements are not available, the financial statements presented must be certified by the Chief Financial Officer of the organization that the statements were prepared on the basis of U.S. Generally Accepted Accounting Principles (US GAAP). Each provider must describe how the financial statements evidence the capacity of the provider to supply their committed cost share.

For non-federal cost share commitments that are not in cash, provide a full description of the commitment and justification for the qualification of such commitment as non-federal cost share. Provide supporting evidence regarding the value of the non-cash commitment.

Applicant must certify in writing that all non-federal cost share will come from qualified sources.

The **Project Financing Plan** shall be based on a business plan for the development, construction, and operation of the project. Describe the strategies and tactics to be deployed to secure funding for the project. DOE notes that not all funding needs to be available at the start of the project, but the plan should clearly show when all funding will be available to meet project needs. The Plan must be based on assumptions that are consistent with other materials in the application.

If project finances are expected to include benefits from Section 45Q federal income tax credits (or other Federal or State tax credits), describe the way the value from the credits will be derived. State whether the credits will be used by the Applicant or an affiliate or if tax equity will be engaged to monetize the tax benefits for the benefit of the project. State whether any 45Q tax credits are planned to be allocated to the CO₂ storage site operator. Ensure the financial model appropriately shows the projected financial impacts of 45Q tax credits and other tax benefits through at least the end of the 45Q tax credit earning period, or the life of the project, whichever is longer.

Project Parties. A description of the main parties (developers, owners, investors) to the project, including background, ownership and experience, proposed financial contribution to project, and expected financial benefit to each party of the project.

Project Assumptions. A description and explanation for each of the financial, economic, and operating assumptions for the project. The assumptions should be consistent with and supported by other documents in the application materials.

Contracts and Agreements. A description of all contracts, agreements, permits, licenses, etc., that will need to be established or obtained to finance the project. Also describe agreements to be entered into regarding the operation of the project and any related responsibilities of the Project Parties.

Financial Projections. Financial projections should be presented on an annual basis, commence with the initial project Phase, and extend to the end of the life of the facility. Projections should include a statement of revenues and expenses (income statement), balance sheet, and cash flow statement (sources and uses of funds). In addition, a cashflow waterfall schedule should be included as well as projections of annual net cash flows (for purposes of calculating NPV and IRR). The projections should be adequately supported. The statements and schedules should be prepared using Excel software and the Excel-based model should be provided in electronic format including cell formulas so that review of the model assumptions and calculations may be facilitated. The financial model should be included in the application as an attachment named “PFP.pdf”.

Financial Commitments. The Applicant must discuss the priority placed by their teams’ respective management on financing the project. This should include a discussion of management’s decision to: (1) allocate internal resources, (2) obtain recourse financing, or (3) obtain limited or non-recourse project financing. The degree of commitment to the project will be measured in part by the level of financial commitment assumed by project team members. The project team can also demonstrate its commitment by: (A) sharing in project costs above the Government’s minimum requirements and (B) agreeing to cover potential project cost increases.

Limited Recourse Project Financing. For projects employing non-recourse or limited recourse debt financing, provide a description of the Applicant’s approach to, and the status of, such financing. Include copies of available funding commitments, draft Term Sheets, or expressions of interest from funding sources an attachment named “PFP.pdf”.

Equity: If tax credit equity is part of the financing plan, provide a description of the structure of the legal arrangements either in place or contemplated. Project when tax equity contributions to pay project costs will be made. List prospects for other equity investors and include progress to date in gaining interest in the project by such investors.

The Applicant should include commitment letters to provide funds in accordance with the terms of this funding opportunity announcement. Commitment letters must be issued by each organization that is slated to provide funding. The funds must be committed in accordance with the terms of this funding opportunity announcement and consistent with the application. The commitments should state the amount of funds to be provided, the fact that the funds are non-federal cost share, the relationship of the funding source to the Applicant, the timing of funding, and any caveats, restrictions, limitations or the like. Commitments to provide funds shall be submitted in a letter signed by an officer of the corporation or other entity that is qualified to commit the funding to the proposed project.

Commitment letters must identify the type of proposed cost sharing (e.g., cash, services, and/or property) to be contributed. If property or services are proposed, the Applicant should provide support for their valuation and explain how valuation was determined. If a property appraisal is used, the Applicant should provide a copy and an explanation of whether the property values used are acquisition, book, or replacement costs.

Commitment letters from the Applicant and third parties should be provided in an attachment named "CSCL.pdf". Save this information in a single file named "CSCL.pdf" and click on "Add Optional Other Attachment" to attach with OCED eXCHANGE.

Contract Bonding Practices. For proposed construction contracts or subcontracts, the Applicant must explain its contract bonding and/or surety/guarantor practices and how they will be applied if their application is accepted for Federal funding.

Financing Schedule. A tentative schedule of dates and events that comprise the financing efforts must be provided. The schedule shall include, to the extent possible, key project dates such as signing of the EPC contract, negotiating Purchase and Sale agreements, finalizing the Operations and Maintenance Agreement, and the target date for financial closing for construction.

Applicants are required to provide sufficient contingency reserve to support the project. The amount of contingency will be determined based on the quantitative risk analysis. Applicants must demonstrate that they can meet unexpected financial needs of the project. The full design package needed by the end of Phase 2 in order to advance to Phase 3 must also include documentation showing that the recipient has access to the required contingency. Typically, DOE expects contingency funds must be: (a) liquid, (b) immediately available, and (c) unrestricted funds dedicated exclusively to the project for the purpose of mitigating project performance baseline risk. Resources that have other requirements that must be met or subject to other constraints, such as performance guarantees, cannot count towards the contingency requirement. The contingency reserve is in addition to total project costs and cannot count towards cost share, until expended and with DOE's consent. If expended, the contingency will not result in reimbursement by DOE above the total federal share approved in the award. DOE discourages Applicants from reducing scope to comply with the contingency reserve requirement.

APPENDIX J: LIFE CYCLE ANALYSIS

Applicants will submit an initial Life Cycle Analysis (LCA) with their application. An updated LCA is required at the end of Phase 2.

The Life Cycle Analysis (LCA) shall be conducted to demonstrate the potential environmental impacts of capturing a minimum of 90% of unit-wide carbon dioxide (CO₂) emissions and storing the captured CO₂ in secure subsurface geologic formations. The scope of the LCAs for areas TA-1 and TA-2 is cradle-to-delivered electricity, inclusive of transmission of the electricity to the final customer. For combined heat and power (CHP) facilities, the scope will also include the exported heat.

Under TA-3, the scope of LCA is cradle-to-gate, where the gate is defined as the production of industrial products ready for transport from the industrial facility.

Initial LCA Guidance

1. Applicants shall provide a screening-level, greenhouse-gas only analysis with scopes and functional units as defined above for TAs 1, 2, and 3 and a contribution analysis showing at a minimum the impacts from fuel extraction and delivery, plant direct emissions, and CO₂ transport and storage.
2. The documentation and report do not necessarily need to follow the [NETL CO2U LCA Guidance Document](#), but all sources of life cycle inventory should be clearly documented in the application.
3. Applicants must use NETL data where possible. Any alternative sources of life cycle inventory will need to be justified. The following is a list of NETL life cycle inventory data sources:
 - a. [Upstream dashboard version 3](#)
 - b. [Grid Mix Explorer 4.2](#)
 - c. [NETL CO2U openLCA LCI Database Version 2.1 \(or latest\)](#)
 - d. [NETL CO2U Documentation Spreadsheet](#)

LCA Guidance

1. TA-1 and TA-2
 - a. Required life cycle inventory data:
 - i. Energy inputs to the facility including fuels and electricity
 - ii. Combustion emissions at the facility
 - iii. Chemical inputs to the facility

- iv. Construction of the facility and manufacturing impacts for the required materials/equipment (e.g., structural steel, concrete, etc.)
- v. Carbon dioxide transport and saline aquifer storage life cycle inventory values (gate-to-grave emissions data to be used for all projects using saline storage) are available in the [NETL CO2U openLCA LCI Database \[Version 2.1 \(or latest\)\]](#) and the [NETL CO2U Documentation Spreadsheet](#) as “Saline aquifer transport and storage”
- vi. Electricity transmission and distribution life cycle inventory values (gate-to-gate emissions data to be used for TA-1 and TA-2 life cycle modeling projects):
 1. Sulfur Hexafluoride 7.87E-05 kg/kg CO₂ stored
 2. Electricity transmission and distribution electricity loss rate to be used for TA-1 and TA-2 life cycle modeling projects are determined by state from the table below (derived from [EIA State Electricity Profiles](#)):

| State | T&D Loss Rate | State | T&D Loss Rate | State | T&D Loss Rate |
|-------|---------------|-------|---------------|-------|---------------|
| AL | 3.5% | LA | 5.3% | OH | 5.3% |
| AK | 5.5% | ME | 5.2% | OK | 4.3% |
| AZ | 4.2% | MD | 5.3% | OR | 4.5% |
| AR | 4.7% | MA | 5.3% | PA | 3.5% |
| CA | 5.3% | MI | 4.9% | RI | 4.7% |
| CO | 5.3% | MN | 5.3% | SC | 4.4% |
| CT | 3.7% | MS | 4.0% | SD | 5.0% |
| DE | 5.3% | MO | 5.3% | TN | 5.3% |
| FL | 5.3% | MT | 3.5% | TX | 5.2% |
| GA | 5.3% | NE | 4.8% | UT | 4.8% |
| HI | 5.6% | NV | 5.3% | VT | 1.8% |
| ID | 5.3% | NH | 3.7% | VA | 5.3% |
| IL | 4.4% | NJ | 5.3% | WA | 4.0% |
| IN | 5.3% | NM | 4.1% | WV | 3.2% |
| IA | 4.9% | NY | 5.2% | WI | 5.3% |
| KS | 4.0% | NC | 5.3% | WY | 2.1% |
| KY | 5.3% | ND | 2.4% | | |

- b. LCA results:
 - i. TAs 1 and 2 shall be normalized to 1 MWh of electricity.
 - ii. A contribution analysis shall be provided so that impacts can be differentiated by major operation/input.

- iii. A sensitivity analysis shall be provided for key model inputs with known technical variability and/or expected variability from different site-specific commercialization scenarios.
- c. Emissions scope:
 - i. The scope of environmental impacts shall include all the additional impact categories listed in Section 2.1.8.2 of the [NETL CO2U LCA Guidance Document](#). To accomplish this the environmental inventory will need to include data beyond greenhouse gas emissions, as discussed in Section 2.2.2.2 of the [NETL CO2U LCA Guidance Document](#).
 - ii. For GHG emissions, the global warming potential shall be reported using the 100-year global warming potential (GWP) characterization factors as the default values from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) and the Fifth Assessment Report (AR5), sensitivity cases using the 20-year GWP values is encouraged:

Table J.1. GWP Characterization Factors

| GHG | AR4 (IPCC 2007) ¹² | | AR6 (IPCC 2013) ¹³ | |
|------------------|-------------------------------|---------|-------------------------------|---------|
| | 100-year (Default) | 20-year | 100-year (Default) | 20-year |
| CO ₂ | 1 | 1 | 1 | 1 |
| CH ₄ | 25 | 72 | 36 | 85 |
| N ₂ O | 298 | 289 | 298 | 264 |
| SF ₆ | 22,800 | 16,300 | 23,500 | 17,500 |

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

- d. Resources – NETL has tools that may be helpful in completing the LCA requirement. These tools are not exhaustive but can be used to provide some life cycle inventory data for some energy and material inputs. The following resources are recommended:
 - i. General LCA guidance – [NETL CO2U LCA Guidance Document](#)
 - ii. NETL Life Cycle Inventory Data – [NETL CO2U openLCA LCI Database](#)
 - iii. Electricity Consumption LCI Data – [NETL Grid Mix Explorer](#)

¹² IPCC (2007). *Climate Change 2007: The Physical Science Basis*. New York: Cambridge University Press: Intergovernmental Panel on Climate Change Retrieved December 16, 2020, from <https://www.ipcc.ch/report/ar4/wg1/>

¹³ IPCC. (2013). *Climate Change 2013 The Physical Science Basis*. New York: Cambridge University Press: Intergovernmental Panel on Climate Change Retrieved December 12, 2013, from <https://www.ipcc.ch/report/ar5/wg1/>

- e. LCA Submission Requirements for Final Project Deliverables
 - i. LCA Report – see [NETL CO2U LCA Guidance Document](#), Chapter 6 “Completing the NETL CO₂U LCA Report Template”
 - ii. LCA Model with Life Cycle Inventory Data – see [NETL CO2U LCA Guidance Document](#), for modeling guidance (no specific LCA software type is required)
 - f. List of all licensed LCA data used within the model with external reviewer limited-license access for DOE review
- 2. TA-3 for Industrial Facilities
 - a. System Boundary: cradle-to-gate where the gate is defined as the production of industrial products ready for transport from the industrial facility. The transport and geologic storage of captured carbon dioxide is included within the system boundary of TA-3. The transportation, use, and end-of-life management of the industrial products is excluded from the life cycle system boundary for TA-3.
 - b. Reporting Metric: kg of CO₂e/unit of industrial product produced.
 - i. “unit of industrial product produced” shall be replaced with quantity of products produced from the industrial operation referenced to 1 unit of the primary product of interest. This will result in multi-product functional unit.
- 3. Assignment of environmental burdens to a single product of value may be reported as secondary reporting metric. The method for assigning environmental burdens to multiple products shall be clearly documented and follow the guidance outlined in the [NETL CO2U LCA Guidance Document](#), see Guidance Document Appendix C “Alternative Co-product Management Methods”.

APPENDIX K: PROJECT MANAGEMENT PLAN GUIDANCE

A Project Management Plan is required for implementing the proposed project and achieving the objectives of the Announcement. The Project Management Plan establishes the baseline for the scope, schedule, and budget for the project and shall include the information given below.

- A Work Breakdown Structure to at least four levels identifying tasks to be performed;
- A Project Schedule for the entire project at the task level of detail. The Project Schedule shall follow the task structure of the Work Breakdown Structure. The schedule should include technical, business, financial, permitting and other factors to substantiate that the project will achieve the objectives of the Announcement in a timely manner. The schedule should include milestones and decision points; including a Milestone Plan to serve as the baseline for tracking performance of the project and will identify critical path project milestones for the entire project;
- A Baseline Cost Plan to establish the budget for accomplishing the planned work. The Baseline Cost Plan should identify the planned cost for each task on a monthly basis. The Baseline Cost Plan should follow the task structure of the Work Breakdown Structure;
- A description of the project management system to be used for monitoring and control of scope, schedule, and cost including the methodology and implementation of reporting earned value;
- Project Communication Protocol, to establish the frequency and type of communication between the Recipient and DOE, dependent on the complexity, value, and program significance of the project, to ensure the team has the information necessary to affect timely and effective project management. Under the award, DOE will require specific periodic technical and financial reporting as part of its Substantial Involvement;
- A Risk Management Plan that includes a summary description of the proposed approach to identify, analyze, and respond to perceived risks associated with the proposed project. Project risk events are uncertain future events that, if realized, impact the success of the project. As a minimum, include the initial identification of significant technical, resource, and management issues that have the potential to impede project progress and strategies to minimize impacts from those issues;
- An Environmental Management Plan (EMP) to establish a protocol for managing the potential environmental impacts of the project. The EMP shall establish protocols for monitoring, and reporting the potential environmental impacts to air, land and water resources, and potential impacts of waste production.

APPENDIX L: BLOCK FLOW DIAGRAM AND SUPPLEMENTAL DATA INSTRUCTIONS OVERVIEW

NOTE: The Block Flow Diagram (BFD) & Supplemental Data (SD) template is provided as a convenient method of documenting the information required to accurately assess the projects proposed in response to this FOA. Some of this information may already be present in pre-FEED and FEED studies, it should be extracted and compiled here for assessment. The use of the BFD & SD template is not required, but the data elements presented within the BFD & SD template are required.

Instructions and Overview:

The purpose of the BFD & SD is to assess the merits of the selected technology and the status of the process technology in order to gain an understanding of project risks and the potential viability of the proposed project. Please answers all questions as thoroughly as possible based on current knowledge.

Please include a BFD for the entire proposed project. Similarly, please provide the filled out Supplemental Data Template (or equivalent data) for the unit operation(s) that are detailed in the proposed project's BFD.

It is expected that Applicants describe previously collected data from pilot-scale testing that will be utilized during the proposed project to design, construct, and operate the proposed commercial-scale demonstration. Pay particular attention to the proposed engineering-scale equipment when answering the questions below for each unit operation. The attached BFD & SD should relate to the proposed project.

Unit Operation Step: Unit operation steps are defined as the areas in the facility where a change occurs, such as reactions, physical changes to materials including materials handling, or chemical conversions. (A physical step physically alters material, and a chemical conversion step involves changes in the molecular form of a material.) Some examples of items to be included as unit operation steps appear below:

Production and Capture Systems

| | | |
|--------------|----------------|-------------|
| Reactors | Filters | Drying |
| Distillation | Ion Exchange | Gas Cleanup |
| Aerators | Gas Absorption | Separations |

Pipeline and Reservoir

Compressors
Separators

Pumps
Wellbore

Drying
Reservoir Segments

Use a unique number for each unit operation in the BFD. Show recycle loops and waste streams as well. The characteristics of each output should directly tie to input of the respective unit operation in the process. If additional processing is required before the output of one unit can be used as the input to another, an additional unit operation should be included to describe how the stream is altered. It is particularly important to focus on the energy and material balance of each block step. The description of the process should begin with the first manipulation of the process feed in its as-received condition, such as exhaust gas following any pre-existing (non-project related) treatment operations already in line at a facility. CCS deployment has the potential to reduce emissions of other kinds of pollution in addition to CO₂ pollution, so data related to this effort should be captured where applicable. Sources of energy inputs should be identified whether it is coming from heat integration, grid, solar, etc.

Block Flow Diagram & Supplemental Data Template

Provide the following information for the entire process shown in the BFD

1. How and why were the proposed process and operating locations chosen? Discuss technical and business risks, benefits and opportunities associated with the process and operating locations.
2. Describe the history of pilot scale development performed by the Applicant for the proposed process including scale, duration of runs, type of data collected, etc. For the most relevant pilot test, describe the carbon capture technology components that were tested [i.e., both the equipment and capture media (e.g., the specific solvent, sorbent, or membrane)], the degree to which they were integrated during testing, and how the components differ (or not) from the components that would be tested under the proposed demonstration,"
3. Describe the reservoir characteristics and production history of the site.

Answer the following questions for each unit operation in your BFD

1. Name or title (as shown in the BFD)
2. Description of the PROPOSED unit operation

For each unit operation include operating conditions including (but not limited to):

- 1) Materials of construction
- 2) Capacity and/or throughput
- 3) Operating Temperature
- 4) Operating Pressure
- 5) Residence Time
- 6) Yields (theoretical and actual)
- 7) Conversion efficiency (theoretical and actual)

- 8) Material(s) of construction for key pieces of equipment
- 9) Expected life expectancy and expected maintenance cycles
- 10) Mode of operation (batch, semi-batch, plug flow, continuous flow, etc.)
- 11) Describe any known causes and the impacts of system upsets and contaminants (including the source(s) of the contaminants), include mitigative strategies utilized to address process upsets
- 12) Waste Streams

For each unit operation include mass and energy balance information for each process stream entering or leaving the unit operation including (but not limited to):

- 1) Pressure
- 2) Temperature
- 3) Mass Flow Rate
- 4) Composition by mol%
- 5) Phase (gas, vapor, liquid, slurry, solid, etc.)

4. Current state of technology of PROPOSED unit operation

- 1) Is the technology used for this unit operation based on commercially available equipment? If so, is the proposed design and use within the manufacturer's normal operating parameters? Attach available manufacturers specifications for proposed equipment as appendices to the BFD package.
- 2) Provide the following scale up information
 - a. What was the previous scale the unit operation / technology has been tested?
 - b. What is the proposed scale up factor for the unit operation?
 - i. $Scale\ Up\ Factor = \frac{Proposed\ Scale\ or\ Capacity}{Previous\ Scale\ or\ Capacity}$
 - c. How many tests/runs were performed at the previous scale?
 - d. What was the longest continuous test/run at the previous scale? Include manufacturers recommended schedules for routine maintenance and discuss any necessary deviations based on the proposed process
 - e. When was the most recent test run completed at the previous scale?
 - f. Summarize the results of the pilot tests and discuss how the original goals and objectives were met or not met. Describe the quality and replicability of the results. (If data quality objectives were used to set minimum data quality standards, briefly describe them.)
 - g. Is further R&D required prior to scaling up this unit operation / technology? Describe the goal and summarize the work needed to obtain the needed information.
 - h. Provide evidence that prior test data and experience will result in a design that adequately addresses scale-up challenges, such as how non-linear scale-up parameters (e.g., surface area to mass/volume ratios) could affect fluid dynamics, mixing, reaction kinetics, heat transfer, and chemical equilibrium; how scale-up could affect the buildup of trace impurities; and how scale-up could require additional waste recovery or heat recovery to attain economic feasibility.

- 2) Calculate any unique Key Performance Indicators (KPI), in addition to estimated upper and lower tolerances, for each unit operation commenting on both the values observed to date as well as targets for the envisioned commercial-scale facility. The following are given as examples only, Applicant technology pathways are not limited to them:
 - a. Carbon Capture: Solvent Based System
 - i. Pure Solvent Characteristics
 - ii. Working Solvent Characteristics
 - iii. Solvent Reclaiming/Disposal
 - b. Filtration and Transport: Pipeline
 - i. Route and Length
 - ii. Tolerances for Contaminants
 - iii. Flows and Velocities
 - iv. Phase
 - v. Pipeline Diameter and Wall Thickness
 - vi. Flow assurance mitigation strategies
 - vii. Expected leak rate
 - viii. Distance between control points
 - c. STORAGE FIELD DEVELOPMENT
 - i. Reservoir Pressure and Reservoir Fluids
 - ii. Reservoir Units and Modelling Approach
 - iii. Injection Rate and Mass Over Time
 - iv. Injectivity
 - v. Stratigraphy
 - vi. Structure and Dip
 - vii. Porosity
 - viii. Permeability
 - ix. Lithology
 - x. Estimated connected pore volume
 - xi. Fluid composition(s) and Saturations
 - xii. In-Situ stress state
 - xiii. Geochemical conditions
 - xiv. Fault zone presence
 - xv. Aquifer strength
 - xvi. Fracture pressure
 - xvii. Cap rock integrity (max injection pressure) and extent
 - xviii. Water salinity
 - xix. Residual reservoir impurities (in either the gas, oil, or water phase)
 - xx. Flow assurance mitigation strategies

Example: Block Flow Diagram showing unit operations that will be part of the proposed project.
Block flow diagram courtesy of NETL (Laumbet. al. 2019)

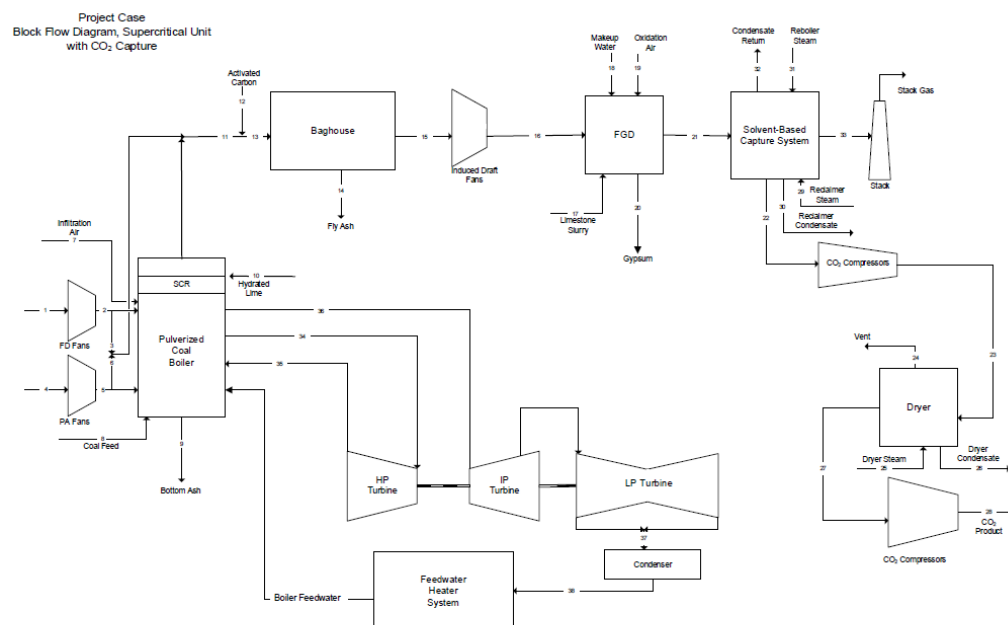


Figure L1. Block Flow Diagram

Table 1. Project Case Stream Table, Supercritical Unit with CO₂ Capture

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------------------|-----------|-----------|---------|-----------|-----------|---------|--------|---------|--------|--------|-----------|--------|-----------|--------|
| V-L Mole Fraction | | | | | | | | | | | | | | |
| Ar | 0.0092 | 0.0092 | 0.0092 | 0.0092 | 0.0092 | 0.0092 | 0.0092 | 0.0000 | 0.0000 | 0.0000 | 0.0087 | 0.0000 | 0.0087 | 0.0000 |
| CO ₂ | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.1372 | 0.0000 | 0.1372 | 0.0000 |
| H ₂ | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| H ₂ O | 0.0099 | 0.0099 | 0.0099 | 0.0099 | 0.0099 | 0.0099 | 0.0099 | 0.0000 | 0.0000 | 0.0000 | 0.0855 | 0.0000 | 0.0855 | 0.0000 |
| N ₂ | 0.7732 | 0.7732 | 0.7732 | 0.7732 | 0.7732 | 0.7732 | 0.7732 | 0.0000 | 0.0000 | 0.0000 | 0.7326 | 0.0000 | 0.7326 | 0.0000 |
| O ₂ | 0.2074 | 0.2074 | 0.2074 | 0.2074 | 0.2074 | 0.2074 | 0.2074 | 0.0000 | 0.0000 | 0.0000 | 0.0336 | 0.0000 | 0.0336 | 0.0000 |
| SO ₂ | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0020 | 0.0000 | 0.0020 | 0.0000 |
| Total | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 |
| V-L Flow Rate, kmol/hr | 61,725 | 61,725 | 1828 | 18,961 | 18,961 | 2610 | 1348 | 0 | 0 | 0 | 86,737 | 0 | 86,956 | 0 |
| V-L Flow Rate, kg/hr | 1,781,130 | 1,781,130 | 52,754 | 547,141 | 547,141 | 75,301 | 38,904 | 0 | 0 | 0 | 2,573,171 | 0 | 2,583,413 | 0 |
| Solids Flow Rate, kg/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 223,848 | 3460 | 4530 | 22,776 | 131 | 22,907 | 22,907 |
| Temperature, °C | 19 | 23 | 23 | 15 | 24 | 24 | 15 | 15 | 149 | 27 | 222 | 27 | 222 | 169 |
| Pressure, MPa, abs | 0.10 | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Enthalpy, kJ/kg ^a | -93.5 | -89.3 | -89.3 | -97.5 | -88.6 | -88.6 | -97.5 | - | - | - | -2328.8 | - | -2328.8 | - |
| Density, kg/m ³ | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 | 1.3 | 1.2 | - | - | - | 0.7 | - | 0.7 | - |
| V-L Molecular Weight | 28.856 | 28.856 | 28.856 | 28.856 | 28.856 | 28.856 | 28.856 | - | - | - | 29.67 | - | 29.67 | - |
| V-L Flow Rate, lb mol/hr | 136,081 | 136,081 | 4030 | 41,802 | 41,802 | 5753 | 2972 | 0 | 0 | 0 | 191,223 | 0 | 191,706 | 0 |
| V-L Flow Rate, lb/hr | 3,926,720 | 3,926,720 | 116,302 | 1,206,240 | 1,206,240 | 166,011 | 85,769 | 0 | 0 | 0 | 5,672,870 | 0 | 5,695,450 | 0 |
| Solids Flowrate, lb/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 493,500 | 7629 | 9988 | 50,213 | 288 | 50,501 | 50,501 |
| Temperature, °F | 66 | 73 | 73 | 59 | 75 | 75 | 59 | 59 | 300 | 80 | 432 | 80 | 432 | 337 |
| Pressure, psia | 14.5 | 15.2 | 15.2 | 14.7 | 15.8 | 15.8 | 14.7 | 14.7 | 14.4 | 14.7 | 14.4 | 14.7 | 14.4 | 14.7 |
| Enthalpy, Btu/lb ^a | -40.2 | -38.4 | -38.4 | -41.9 | -38.1 | -38.1 | -41.9 | - | - | - | -1001.2 | - | -1001.2 | - |
| Density, lb/ft ³ | 0.074 | 0.076 | 0.076 | 0.076 | 0.080 | 0.080 | 0.076 | - | - | - | 0.044 | - | 0.044 | - |

^a Reference conditions are 77°F and 14.696 psia.

Figure L2. Supplemental Data¹⁴

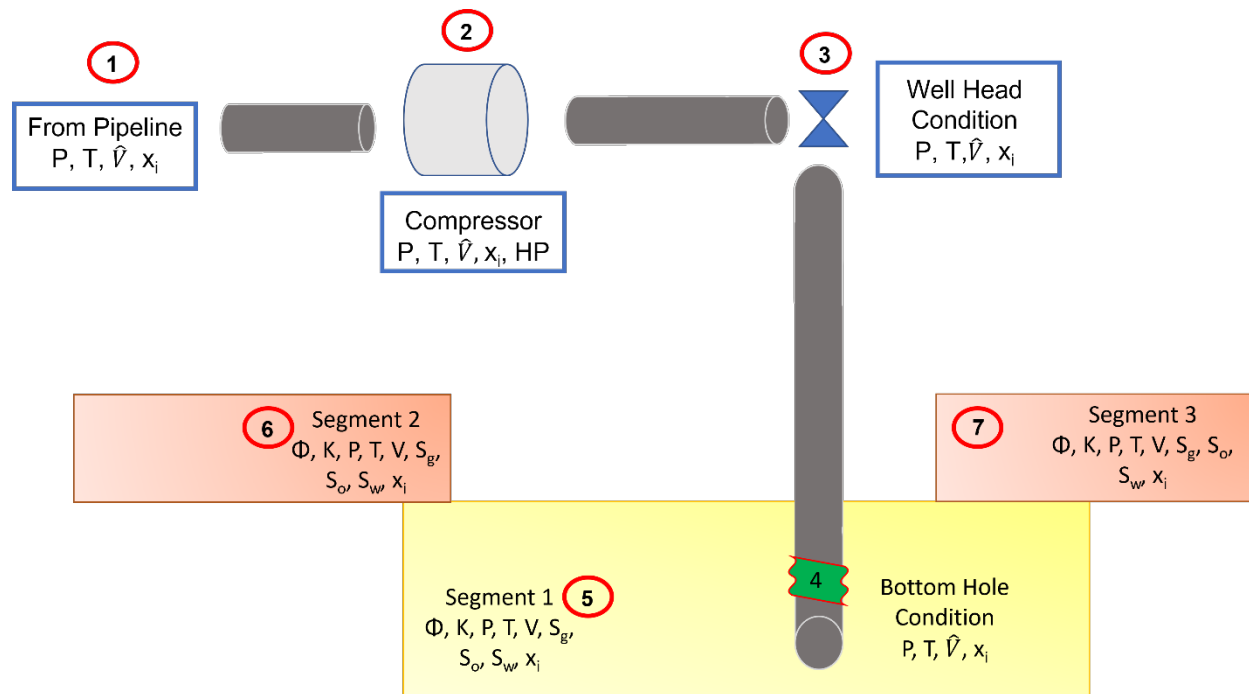


Figure L3. Example of a simple reservoir BFD

¹⁴ Laumbet, J.; Jensen, J.; Kay, J.; Dunham, D.; Folkedahl, D.; Azenkeng, A. AOI2 – INITIAL ENGINEERING, TESTING, AND DESIGN OF A COMMERCIAL-SCALE POSTCOMBUSTION CO₂ CAPTURE SYSTEM ON AN EXISTING COAL-FIRED GENERATING UNIT (PROJECT CARBON). Cooperative Agreement No.: DE-FE0031602. Pittsburgh, PA: National Energy Technology Laboratory, December 2019. <https://www.osti.gov/servlets/purl/1581444>

APPENDIX M: GLOSSARY

Applicant – The lead organization submitting an application under the FOA.

Continuation application – A non-competitive application for an additional budget period within a previously approved project period. At least ninety (90) days before the end of each budget period, the Recipient must submit to OCED its continuation application, which includes information such as but not limited to, the following:

- i. A report on the Recipient’s progress towards meeting the objectives of the project, including any significant findings, conclusions, or developments, and an estimate of any unobligated balances remaining at the end of the budget period. If the remaining unobligated balance is estimated to exceed 20 percent of the funds available for the budget period, explain why the excess funds have not been obligated and how they will be used in the next budget period.
- ii. A detailed budget and supporting justification if there are changes to the negotiated budget, or a budget for the upcoming budget period was not approved at the time of award.
- iii. A description of any planned changes from the negotiated Statement of Project Objectives (SOPO) and/or Milestone Summary Table.

Federally Funded Research and Development Centers (FFRDC) - As specified in the Federal Acquisition Regulation (FAR) 35.017(a)(2), a FFRDC “meets some special long-term research or development need which cannot be met as effectively by existing in-house or contractor resources.” A FFRDC is “operated, managed, and/or administered by either a university of consortium of universities, other not-for-profit or nonprofit organization, or an industrial firm, as an autonomous organization or as an identifiable separate operating unit of a parent organization.” FAR 35.017(a)(3). A list of FFRDCs can be found at <http://www.nsf.gov/statistics/ffrdclist/>.

Go/No-Go Decision Points – A decision point at the end of a budget period that defines the overall objectives, milestones, and deliverables to be achieved by the recipient in that budget period. As of a result of OCED’s review, OCED may take one of the following actions: 1) authorize federal funding for the next budget period; 2) recommend redirection of work; 3) discontinue providing federal funding beyond the current budget period; or 4) place a hold on federal funding pending further supporting data.

Project – The entire scope of the cooperative agreement which is contained in the recipient’s Statement of Project Objectives.

Recipient or “Prime Recipient” – A non-federal entity that receives a federal award directly from a federal awarding agency to carry out an activity under a federal program. The term recipient does not include subrecipients.

Subrecipient – As specified in 2 C.F.R. § 200.331(a), a subaward is for the purpose of carrying out a portion of a Federal award and creates a Federal assistance relationship with the subrecipient. Characteristics which support the classification of the non-Federal entity as a subrecipient include when the non-Federal entity:

- (1) Determines who is eligible to receive what Federal assistance;
- (2) Has its performance measured in relation to whether objectives of a Federal program were met;
- (3) Has responsibility for programmatic decision-making;
- (4) Is responsible for adherence to applicable Federal program requirements specified in the Federal award; and
- (5) In accordance with its agreement, uses the Federal funds to carry out a program for a public purpose specified in authorizing statute, as opposed to providing goods or services for the benefit of the pass-through entity.

Also, a DOE/NNSA and non-DOE/NNSA FFRDC may be proposed as a subrecipient on another entity's application. See [Section 3.0](#). Refer to [§ 200.331 Subrecipient and contractor determinations](#). To assist Applicants in determining the difference between a subrecipient and a contractor, please refer to the "[Subrecipient vs. Contractor Checklist](#)," developed by the Association of Government Accountants.

Contractor/Vendor – As specified in 2 C.F.R. § 200.331(b), a contract is for the purpose of obtaining goods and services for the non-Federal entity's own use and creates a procurement relationship with the contractor. See the definition of contract in § 200.1 of this part. Characteristics indicative of a procurement relationship between the non-Federal entity and a contractor are when the contractor:

- (1) Provides the goods and services within normal business operations;
- (2) Provides similar goods or services to many different purchasers;
- (3) Normally operates in a competitive environment;
- (4) Provides goods or services that are ancillary to the operation of the Federal program; and
- (5) Is not subject to compliance requirements of the Federal program as a result of the agreement, though similar requirements may apply for other reasons.

APPENDIX N: DOE TECHNOLOGY READINESS LEVEL SCALE

| Relative Level of Technology Development | Technology Readiness Level | TRL Definition | Description |
|--|----------------------------|---|---|
| System Operations | TRL 9 | Actual system operated over the full range of expected conditions | Actual operation of the technology is in its final form, under the full range of operating conditions. Examples include using the actual system with the full range of wastes. |
| System Commissioning | TRL 8 | Actual system completed and qualified through test 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 real waste in hot commissioning. |
| | TRL 7 | Full-scale, similar (prototypical) system demonstrated in relevant environment | Prototype full scale system. Represents a major step up from TRL 6, requiring demonstration of an actual prototype system in a relevant environment. Examples include testing the prototype in the field with a range of simulants and/or real waste and cold commissioning. |
| Technology Demonstration | TRL 6 | Engineering/pilot-scale, similar (prototypical) system validation in relevant environment | Representative engineering scale model or prototype system, which is well beyond the lab scale tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype with real waste and a range of simulants. |
| Technology Development | TRL 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 system in a simulated environment and/or with a range of real waste and simulants. |
| | TRL 4 | Component and/or system validation in laboratory environment | 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. |
| Research to Prove Feasibility | TRL 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. Components may be tested with simulants. |
| | TRL 2 | Technology concept and/or application formulated | Invention begins. 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. |
| Basic Technology Research | TRL 1 | Basic principles observed and reported | Lowest level of technology readiness. Scientific research begins to be translated into applied R&D. Examples might include paper studies of a technology's basic properties. |

APPENDIX O: WAIVER REQUESTS FOR FOREIGN ENTITY PARTICIPATION AND FOREIGN WORK

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 United States national and economic security.¹⁵ For projects selected under this FOA, 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 Application.

Waiver Criteria

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

- a. Its participation is in the best interest of the United States industry and United States 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 United States 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. Competitiveness Provisions (see Section 8.11); and
- e. The foreign entity will satisfy other conditions that may be deemed necessary by DOE to protect United States 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 in the project;

¹⁵ See [Critical and Emerging Technologies List Update \(whitehouse.gov\)](https://www.whitehouse.gov/critical-emerging-technologies/).

- b. Country of incorporation, the extent of the ownership/level of 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(s) or foreign individual(s);
- c. The rationale for proposing that a foreign entity participate (must address the criteria above);
- d. A description of the project's anticipated contributions to the United States economy;
- e. A description of how the foreign entity's participation is essential to the project, including;
 - How the project will benefit the United States, including manufacturing, contributions to employment in the United states and growth in new markets and jobs in the United States;
 - How the project will promote manufacturing of products and/or services in the United States;
- f. A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
- g. Countries where the work will be performed (Note: if any work is proposed to be conducted outside the United States, the applicant must also complete a separate foreign work waiver request).

DOE may also require:

- A risk assessment with respect to IP and data protection protocols that includes the export control risk based on the data protection protocols, the technology being developed and the foreign entity and country. These submissions could be prepared by the project lead (if not the prime recipient), 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 may be added to any agreement or subagreement to protect IP, mitigate risk, or other related purposes.
- DOE may require additional information before considering a waiver request.

DOE's decision concerning a waiver request is not appealable.

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

As set forth in Section 4.9.6, all work funded under this FOA 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 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 for a foreign work waiver must include the following:

1. The rationale for performing the work outside of the United States (“foreign work”);
2. A description of the work proposed to be performed outside the United States;
3. An explanation of how the foreign work is essential to the project;
4. A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the United States economy;
5. The associated benefits to be realized and the contribution to the project from the foreign work;
6. How the foreign work will benefit the United States, including manufacturing, contributions, to employment in the United States and growth in new markets and jobs in the United States;
7. How the foreign work will promote manufacturing of products and/or services in the United States;
8. A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
9. The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
10. The country(ies) in which the foreign work is proposed to be performed; and
11. The name of the entity that would perform the foreign work. Information about the entity(ies) involved in the work proposed to be conducted outside the United States (e.g., the entity seeking a waiver and the entity(ies) that will conduct the foreign work).

DOE may require additional information before considering a waiver request.

DOE’s decision concerning a waiver request is not appealable.

APPENDIX P: KEY PERFORMANCE PARAMETERS TABLE FOR CURRENT AND PRIOR DEMONSTRATIONS

Use the following table to describe current key parameters of your carbon capture system. Include one for your current process and an additional table for every relevant pilot or commercial demonstration of the technology. Submit one pdf document with all of the tables.

You may add up to five key performance parameters to the tables. These should be the same in every table. Do not add more than five. These rows could be used to capture key cost and performance parameters that, after the test, still required additional development and testing in order to validate them for commercial applications.

The Notes column is intended for brief notes only; do not extend the row height by adding excessive Notes. Failure to submit at least two tables (one for the current process and one for the prior pilot-scale demonstration) will result in the application being deemed noncompliant.

| Category | Value | Units | Notes |
|---|-------|---------|-------|
| Active Component (solvent, sorbent, membrane, etc.) | | - | |
| Source of flue gas (e.g., coal fired power plant, cement plant, etc.) | | - | |
| Inlet Flue Gas Temperature | | F | |
| Inlet Flue Gas Pressure | | Psia | |
| Inlet Flue Gas (Total flow) | | lb-mol | |
| Inlet Flue Gas Composition (including trace contaminants)* | | lb-mol% | |
| Inlet Flue Gas (Total flow) | | lbs | |
| Inlet Flue Gas Composition (including trace contaminants)* | | mass% | |

| | | | |
|--|--|---|--|
| Assumptions for unknowns in Inlet Flue Gas Composition (if applicable) | | - | |
| Observed Adverse Impacts of the contaminants on the Process Active Component and equipment | | - | |
| Reclaiming / Regeneration / Replacement time of the Active Component | | hrs | |
| Scale | | tons of CO ₂ captured per year | |
| Electrical Power consumption (mean) | | MW electricity consumed/ton of CO ₂ Captured | |
| Electrical Power consumption (std deviation) | | MW electricity consumed/ton of CO ₂ Captured | |
| Steam Power consumption (mean) | | MW electricity consumed/ton of CO ₂ Captured | |
| Steam Power consumption (std deviation) | | MW electricity consumed/ton of CO ₂ Captured | |
| Fresh water consumption (mean) | | lb water/ton of CO ₂ Captured | |
| Fresh water consumption (std deviation) | | lb water/ton of CO ₂ Captured | |
| Longest Time on Stream (continuous) | | hrs | |
| Total Time on Stream (cumulative) | | hrs | |

| | | | |
|---|--|------------------------------------|--|
| CO ₂ capture efficiency (mean) | | mass% | |
| CO ₂ capture efficiency (std deviation) | | mass% | |
| Waste Emissions from Process (e.g., nitrosamines, amines, heavy metals, PM, etc.) | | ppm | |
| Effluent stream CO ₂ purity | | mass% | |
| Non-CO ₂ components in effluent stream (list)* | | lb-mols | |
| Non-CO ₂ components in effluent stream (list)* | | lbs | |
| Cost of Capture (average) | | \$/ton of CO ₂ Captured | |
| Cost of Capture (std deviation) | | \$/ton of CO ₂ Captured | |

*Identify the analytical method to derive all compositions in the corresponding “Notes” space for that row.