

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

Bipartisan Infrastructure Law Carbon Capture Large-Scale Pilot Projects

Funding Opportunity Announcement Number: DE-FOA-0002963

Type: Mod 000003

Assistance Listing Number:

81.089, Fossil Energy Research and Development 81.255, Clean Energy Demonstrations

Funding Opportunity Announcement Issue Date:	02/23/2023
Submission Deadline for Concept Papers:	04/05/2023,
	5:00pm ET
Submission Deadline for Applications:	<mark>07/07/2023</mark> ,
	5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	<mark>09/08/2023,</mark>
	<mark>5:00pm ET</mark>
Expected Date(s) for Pre-Selection Interviews:	October 2023
Expected Date(s) for Selection Notifications:	November 2023
Expected Timeframe for Award Negotiations:	Fall <mark>/Winter</mark> 2023

Modifications

Modifications to this Funding Opportunity Announcement (FOA) are [HIGHLIGHTED] in the body of the FOA and described below.

Mod. No.	Date	Description of Modification
000001	3/29/2023	 Revised section 1.3 – Topic Areas to clarify that coal, natural gas, or other fossil-derived hydrocarbon feedstock must be used to some extent in the process that produces the gas
		 stream targeted in the large-scale carbon capture pilot project. Revised section 1.3.1 – Applications Specifically Not of Interest to delete "only" from the following applications specifically not

Questions about this FOA? Email <u>CCpilotsprogram@hq.doe.gov</u> Problems with OCED eXCHANGE? Email <u>OCED-ExchangeSupport@hq.doe.gov</u> Include FOA name and number in subject line.



		 of interest: "Applications proposing carbon capture from refining applications (TA-1) only from dedicated hydrogen production (e.g., SMR units)." Revised section 4.6.2.13 – Disclosure of Lobbying Activities to clarify that the SF-LLL form is required if any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the applicant (including with non-federal funds) with respect to this funding opportunity. Revised section 8.1 – Treatment of Application Information to add guidance for company submitters regarding how DOE will address FOIA requests.
000002	5/18/2023	 Submission Deadline for Full Applications has been extended to 5:00 pm ET on 7/7/2023.
000003	[program to insert]	 Revised the cover page to provided updated estimated date(s) for the submission deadline for replies to reviewer comments, expected date(s) for pre-selection notifications, expected date(s) for selection notifications, and expected timeframe for award negotiations. Revised information about the Environmental Health and Safety Assessment and the State-Point Data Table in section 4.6.2.2d), 4.6.2.2f), Appendix A, and Appendix E to clarify that page limits for these documents has been updated to N/A and these files are separate from the Technical Volume. Revised Appendix A to clarify that the page limit for the Workplan is 6 pages maximum and to clarify that the Techno-Economic Analysis and Life Cycle Analysis Projections PDF is 10 pages maximum.

Table of Contents

Table	e of Contents	i
1.0	Funding Opportunity Description	4
1.1	1 Background and Context	4
1.2	2 Program Purpose	5
1.3	3 Topic Areas	10
	1.3.1 Applications Specifically Not of Interest	13
1.4	4 Award and Project Management Approach	13
2.0	Award Information	
2.1	1 Responsiveness Criteria	21
3.0	Eligibility Information	
3.1	1 Eligible Applicants	22
3.2	2 Cost Sharing	24
3.3	3 Limitation on Number of Concept Papers and Applications Eligible for Review	24
4.0	Application and Submission Information	
4 1	1 Application Package	25
4.2	2 Application Submission	25
	4 2 1 OCED eXCHANGE	26
	4.2.2 Unique Entity Identifier and System for Award Management	
	4.2.3 FedConnect	
	4.2.4 Grants.gov	
	4.2.5 Electronic Authorization of Applications and Award Documents	
4.3	3 Application Forms	
4.4	4 Submission Dates and Times	27
4.5	5 Requirement for Full and Complete Disclosure	27
4.6	6 Proposal Content	27
	4.6.1 Concept Paper	
	4.6.2 Application	29
4.7	7 Replies to Reviewers Comments	62
4.8	8 Intergovernmental Review	63
4.9	9 Funding Restrictions	63
	4.9.1 Allowable Costs	63
	4.9.2 Pre-Award Costs	63
	4.9.3 Buy America Requirements for Infrastructure Projects	64
	4.9.4 Davis-Bacon Act Requirements	64
	4.9.5 Risk Assessment	65
	4.9.6 Human Subjects Research	65
	4.9.7 Performance of Work in the United States (Foreign Work Waiver)	66
	4.9.8 Prohibition related to Foreign Government-Sponsored Talent Recruitment Programs	66
	4.9.9 Affirmative Action and Pay Transparency Requirements	67
	4.9.10 Post Submission Materials and Just-In-Time Documents	67
	4.9.11 Administrative and National Policy Requirements	67
5.0	Application Review Information	68
5.1	1 Compliance Criteria	68



J.2	2 Technical Review Criteria	69
	5.2.1 Concept Papers	69
	5.2.2 Applications	70
	5.2.3 Criteria for Replies to Reviewer Comments	73
5.3	3 Standards for Application Evaluation	74
5.4	Evaluation and Administration by Non-Federal Personnel	74
5.5	5 Other Selection Factors	74
	5.5.1 Program Policy Factors	74
5.6	5 Evaluation and Selection Process	75
	5.6.1 Overview	75
	5.6.2 Pre-Selection Interviews and Site Visits	75
	5.6.3 Pre-Selection Clarification	76
	5.6.4 Recipient Integrity and Performance Matters	76
	5.6.5 Selection	77
	5.6.6 Program Downselect	77
5.7	7 Anticipated Notice of Selection and Award Negotiation Dates	77
6.0	Arrivate Administration Information	77
6.0		
6.1	L Notifications	77
	6.1.1 Ineligible Submissions	77
	6.1.2 Concept Paper Notifications	78
	6.1.3 Application Notifications	78
	6.1.4 Successful Applicants	78
	6.1.5 Alternate Selection Determinations	78
	6.1.6 Unsuccessful Applicants	79
6 7	2 Award Conditions and Reporting	79
0.2		
7.0	Questions/Agency Contacts	
7.0	Questions/Agency Contacts	
7.0 8.0	Questions/Agency Contacts	
7.0 8.0 8.1	Questions/Agency Contacts Other Information	79 79 79
7.0 8.0 8.1 8.2	Questions/Agency Contacts Other Information L Treatment of Application Information 2 Retention of Submissions	79 79
7.0 8.0 8.1 8.2 8.3	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information	79 79
7.0 8.0 8.1 8.2 8.3 8.4	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar	
7.0 8.0 8.1 8.2 8.3 8.4 8.4 8.5	Questions/Agency Contacts Other Information L Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List	
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements	79 79 79 79 81 82 82 82 82 82
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.6 8.7	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment	79 79 79 79 81 81 82 82 82 82 82 82 83
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 6 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions	79
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.4 8.5 8.6 8.7 8.8 8.5 8.6 8.5	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions	79 79 79 81 81 81 82 82 82 82 82 82 82 83 83 83 85
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.5 8.5 8.5 8.5 8.5	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data	79 79 79 81 81 81 82 82 82 82 82 82 83 83 83 85 85
7.0 8.0 8.1 8.2 8.3 8.2 8.5 8.6 8.7 8.6 8.7 8.6 8.7 8.6 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data	79 79 79 81 81 81 82 82 82 82 83 83 83 83 85 85 86
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.4 8.5 8.6 8.7 8.8 8.1 8.1 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse	79 79 79 81 81 81 82 82 82 82 82 83 83 83 83 85 85 86 86
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.5 8.6 8.7 8.6 8.1 8.1 8.1 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 6 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse 13 U.S. Manufacturing Commitments	79 79 79 81 81 81 82 82 82 82 83 83 83 85 85 86 86 86
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.4 8.5 8.6 8.7 8.8 8.5 8.1 8.1 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse 13 U.S. Manufacturing Commitments 14 Government Right to Reject or Negotiate	79 79 79 79 81 81 81 82 82 82 82 83 83 83 85 85 85 86 86 86 86 86 87
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.6 8.7 8.6 8.7 8.1 8.1 8.1 8.1 8.1	Questions/Agency Contacts. Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 6 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse 13 U.S. Manufacturing Commitments 14 Government Right to Reject or Negotiate 15 Export Control	79 79 79 81 81 81 82 82 82 82 83 83 83 83 85 85 86 86 86 86 87
7.0 8.0 8.1 8.2 8.3 8.4 8.5 8.4 8.5 8.4 8.5 8.4 8.5 8.4 8.1 8.1 8.1 8.1 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 5 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 3 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse 13 U.S. Manufacturing Commitments 14 Government Right to Reject or Negotiate 15 Export Control 16 Interim Conflict of Interest Policy for Financial Assistance	79 79 79 81 81 81 81 82 82 82 82 82 83 83 83 85 86 86 86 86 86 87 88 88
7.0 8.0 8.1 8.2 8.3 8.2 8.2 8.2 8.2 8.2 8.2 8.2 8.2 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1	Questions/Agency Contacts Other Information I Treatment of Application Information Retention of Submissions Personally Identifiable Information Informational Webinar Teaming Partner List Uniform Commercial Code Financing Statements Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment Title to Subject Inventions Government Rights in Subject Inventions In Rights in Technical Data Subject Inventions In Copyright In Subject or Negotiate Subject Inventions In Rights in Technical Data In Copyright In Subject or Negotiate In Subject Inventions In Rights to Reject or Negotiate In Subject Inventions In Rights In Technical Data In Copyright In Export Control In Interim Conflict of Interest Policy for Financial Assistance Interim Conflict of Interest Checklist	79 79 79 81 81 81 82 82 82 82 83 83 83 83 83 83 85 86 86 86 86 86 86 87 88 88 88 88
7.0 8.0 8.1 8.2 8.3 8.2 8.3 8.4 8.5 8.4 8.5 8.4 8.5 8.4 8.5 8.4 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1	Questions/Agency Contacts. Other Information I Treatment of Application Information 2 Retention of Submissions 3 Personally Identifiable Information 4 Informational Webinar 5 Teaming Partner List 6 Uniform Commercial Code Financing Statements 7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment 8 Title to Subject Inventions 9 Government Rights in Subject Inventions 10 Rights in Technical Data 11 Copyright 12 Fraud, Waste, and Abuse 13 U.S. Manufacturing Commitments 14 Government Right to Reject or Negotiate 15 Export Control 16 Interim Conflict of Interest Policy for Financial Assistance 16 Interim Conflict of Interest Policy for Financial Assistance 16 Interim Conflict of Interest Checklist 17 This of Acronyms	79 79 79 81 81 81 82 82 82 82 82 83 83 83 83 83 83 83 83 83 83 83 83 83



Appendix D – Basis for Techno-Economic Analysis	92
Appendix E – State-Point Data Tables	
Appendix F – Basis for Carbon Capture Technology EH&S Assessment	103
Appendix G – Life Cycle Analysis	105
Appendix H – Waiver Requests for Foreign Entity Participation and Foreign Work	110



1.0 Funding Opportunity Description

1.1 Background and Context

The Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED), in collaboration with the Office of Fossil Energy and Carbon Management (FECM) and National Energy Technology Laboratory (NETL), is issuing this Funding Opportunity Announcement (FOA) for Carbon Capture Large-Scale Pilot Projects. 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 chance to join a union, tackle the climate crisis, and ensure stronger access to economic and other benefits for <u>disadvantaged communities</u>. The BIL appropriates more than <u>\$62</u> <u>billion to DOE</u> 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 <u>equitable energy</u> <u>economy</u> 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 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 funding for this FOA is authorized under Section 41004(a) of the BIL and appropriated by Title III of Division J of BIL. The programmatic authorizing statute is Section 962(b)(2)(B) of the Energy Policy Act of 2005¹ (42 U.S.C. § 16292(b)(2)(B)). There is a total appropriation of \$937 million for fiscal years (FY) 2022 through 2025 for carbon capture large-scale pilot projects designed to accelerate the development, deployment, and commercialization of innovative and transformative technologies that capture carbon² emissions. Awards made under this FOA are part of a broader government-wide approach to maximize the benefits of the clean energy transition.

¹ Section 962 of the Energy Policy Act of 2005 was amended by Section 4002 of Title IV of Division Z (Energy Act of 2020) of the Consolidated Appropriations Act, 2021 (Pub. L. 116-260) to establish the carbon capture technology program that is currently at Section 962 of the Energy Policy Act of 2005 (42 U.S.C. § 16292) and is referred to throughout this FOA. ² In this FOA, carbon emissions include both carbon monoxide (CO) and carbon dioxide (CO₂) emissions.



1.2 Program Purpose

The electricity generation and industrial sectors account for roughly half of all United States (U.S.) carbon emissions³. Those carbon emissions can be reduced through approaches like electrification or fuel switching in some industries or by transitioning to renewable or nuclear energy in the electricity generation sector. To reach the President's ambitious domestic climate goal of net-zero emissions economy-wide by 2050, the United States will likely 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, carbon capture, utilization and sequestration (CCUS) technologies and permanent sequestration are likely needed to prevent the worst impacts of climate change. CCUS deployment can and should reduce emissions of other kinds of pollution in addition to carbon pollution, protect communities from increases in cumulative pollution, and maintain and create good, union-friendly jobs across the country.

There are different types of point sources of CO₂. CCUS can apply to the power sector (e.g., coal- and natural gas-fired power plants), as well as the industrial sector (e.g., cement, steel, paper mills). There are some industrial processes that already capture CO₂ as part of normal operations (e.g., natural gas processing or fossil-fuel based hydrogen production) and others that yield a high purity stream of CO₂ (e.g., ethanol or nitrogenous fertilizer production). The technologies for CCUS already exist, with a reported 26 commercial-scale projects in operation globally, and an estimated 45 CCUS facilities in operation or in development in the United States today⁴. Because these systems vary significantly (e.g., a carbon capture project at a natural gas plant in one place versus a carbon capture facility in another), careful attention to the conditions under which specific projects can be implemented, while protecting people and the environment, is critical. The United States is to achieve its climate goals, research suggests that CCUS deployment should increase tenfold over the next decade.

The U.S., where CCUS already plays an important role, is in a unique position to drive innovation and benefit from the economic opportunities that stem from wider national and global deployment of CCUS. Decades of government and private investment in the underlying technologies, favorable geology for secure geological storage of carbon emissions, technical expertise in subsurface injection, and recent increases in funding and tax incentives through the BIL and Inflation Reduction Act (IRA) all cast the U.S. in a role of continued global leadership in carbon management.

However, transformational, more efficient CCUS technologies, including for sectors where carbon emissions are harder and more expensive to capture, will provide more alternatives for decarbonization, reduce costs, and facilitate faster decarbonization. Expanded use of CCUS will also require further expanding the transportation and storage infrastructure to safely store the much larger quantities of CO₂ in cases where it cannot be utilized as an input to another process. The maps below illustrate the geographic and sectoral diversity of U.S. carbon emissions across various industrial and power generation activities.

³ https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

⁴ <u>CEQ-CCUS-Permitting-Report.pdf (whitehouse.gov)</u>



178

107

77

72

67

60

44



Figure 1: U.S. industrial point-source emissions by industry^{5,6}



Figure 2: U.S. power point-source emissions by fuel⁷

⁵ EPA GHGRP FLIGHT database 2019; additional public information on smaller point source emitters; additional estimated emissions from ethanol facilities in EIA ethanol plant database.

⁶ It is expected that net-zero carbon emissions by 2050 for the industrial sector will be achieved through implementing a variety of approaches including, but not limited to, increased process energy efficiency, utilization of low or zero carbon fuel, electrification, transformational carbon capture systems, or other carbon dioxide removal (CDR) technologies (e.g., Direct Air Capture (DAC), biomass with carbon capture (BECCS)).

⁷ EPA GHGRP FLIGHT database 2019; additional public information on smaller point source emitters



While CCUS may not be the first priority solution for all of these sectors,⁹ further developments in carbon capture technologies will help CCUS become a decarbonization option in more sectors over time. Although certain carbon capture technologies are already well-demonstrated and in deployment in some sectors, a new generation of transformational carbon capture technologies that demonstrate improvements in the efficiency, effectiveness, cost, and environmental performance over existing technologies are now emerging from research and development, alongside efforts to apply existing technologies to new emitting sectors.

Since DOE-FECM R&D efforts for carbon capture technologies began in the early 2000s, improvements in energy and process efficiencies have led to a reduction in both capital and operating costs. Supporting carbon capture large-scale pilot projects under field settings before advancing to commercial-scale demonstration and deployment will benefit entities intending to commercialize and deploy integrated CCS projects. Successful execution of these pilots can help to accelerate CCS deployment to achieve U.S. climate goals while achieving other societal objectives. Also, this FOA further allows development of these technologies in different industrial and hard to decarbonize sectors.

Carbon capture large-scale pilot projects will provide the support needed to test transformational technologies (i.e., novel technologies or applications) at intermediate scale and under relevant conditions in both the power and industrial sector to:

- 1. De-risk transformational carbon capture technologies⁸ and through meaningful engagement and robust analysis of impacts, risks and benefits such as emissions, water usage, and jobs; and
- 2. Catalyze significant follow-on investments from the private sector for first-of-a-kind (FOAK) commercial-scale demonstrations on carbon emission sources across the power and industrial sectors.

Through this FOA, DOE makes available up to \$820 million of federal funding at a maximum of 70% federal cost share for up to ten (10) carbon capture large-scale pilot projects designed to further the development of transformational technologies that capture carbon emissions from existing coal or natural gas electric generation facilities and existing industrial facilities not purposed for electric generation.

These carbon capture large-scale pilot projects must be integrated with commercial plant operations and conducted in the United States. DOE may issue additional carbon capture largescale pilot FOAs in the future. Using multiple FOAs can help enable the validation of transformational carbon capture technologies with different maturation timelines in a large-scale pilot project once they reach the appropriate technology readiness level (TRL).

Pursuant to section 962(a)(1) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16292(a)(1)), the term "large-scale pilot project" means a pilot project that:

⁸ <u>42 USC 16292</u>



- (A) represents the scale of technology development beyond laboratory development and bench scale testing, but not yet advanced to the point of being tested under real operational conditions at commercial scale;
- (B) represents the scale of technology necessary to gain the operational data needed to understand the technical and performance risks of the technology before the application of that technology at commercial scale or in commercial-scale demonstration; and
- (C) is large enough-
 - (i) to validate scaling factors; and

(ii) to demonstrate the interaction between major components so that control philosophies for a new process can be developed and enable the technology to advance from large-scale pilot project application to commercial-scale demonstration or application.

The carbon capture large-scale pilot projects funded under this FOA will generate operational data for verification and validation of the commercial potential of innovative technologies, including data on technology performance, non-CO₂ air emissions, process models, life cycle impacts, costs, scaling factors, and community benefits or negative impacts of carbon capture technologies. These pilots will help mitigate risks and aid in commercial adoption as learnings obtained from these pilots are expected to inform subsequent large-scale demonstration or commercial deployment plans.

Applicants have access to <u>Carbon Matchmaker</u>, which may be utilized to facilitate the formation of new project teams for this FOA. Carbon Matchmaker is an online information resource to connect users across the carbon capture, utilization, and storage and carbon dioxide removal supply chains.

DOE is aware of the concerns from environmental justice and climate organizations about how carbon capture projects could negatively affect communities, local environmental quality, and the overall climate mitigation effort if not developed with appropriate safeguards and deployed responsibly in alignment with Federal and state regulations intended 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. 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, highwage jobs across the country.⁹

⁹ <u>https://www.federalregister.gov/documents/2022/02/16/2022-03205/carbon-capture-utilization-and-sequestration-guidance</u>



This FOA provides an opportunity to gather the data necessary to understand these impacts across a wide variety of technologies and operating conditions needed for commercial deployment.

Therefore, applications to this FOA are required to 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 the carbon capture large-scale pilot projects.

For example, DOE will require pilot projects to track and report on outcomes and outputs related to workforce and environmental impacts -- such as, but not limited to, reporting on changes to non-CO₂ pollution and water usage. Prior to beginning construction, as part of the National Environmental Policy Act (NEPA) process, DOE will require projects to complete an in-depth environmental pollution impact assessment (including cumulative pollution impacts) of any installation of large-scale pilot and balance of plant systems at the host site. The results of the completed assessment, as well as plans for instrumentation, data collection, and analysis to elucidate potential community impacts of commercial-scale carbon capture projects, will inform Go/No-Go and downselect decisions that occur between and within phases.

While the scale and scope of carbon capture large-scale pilot projects is dependent on the type of technology being deployed, applicants to this FOA should have already validated technical success of the integrated components at the small-pilot scale. Specifically, the FOA will focus on carbon capture technologies that have completed a TRL of at least 5, preferably 6, for the proposed large-scale pilot project at the time of application and have completed a successful validation of an integrated small-pilot scale prototype capturing a minimum of 1,000 tonne CO_2/yr for the proposed process or a process having a similar composition, impurities/contaminant profile, temperature, and pressure. It is expected that, once validated, the technologies funded under this FOA will achieve at least TRL 7, and can be readily scaled up to FOAK commercial demonstrations in electricity generation or industrial sectors. TRL definitions are available in <u>Appendix C</u>.

Applicants must demonstrate their ability to achieve at least 90% carbon capture efficiency and CO₂ product purity of at least 95% by end of the project period. The funding under this large-scale pilot projects FOA is focused on developing carbon capture technologies towards market liftoff. However, the applicants are strongly encouraged to look for opportunities to securely geologically store or utilize or monetize the captured carbon. Funding for those activities will be outside the scope for this FOA. Detailed technical descriptions of the specific Topic Areas are provided in Section 1.3. 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 large-scale pilot projects FOA (FOA Number: DE-FOA-0002963) and a carbon capture demonstration projects program FOA (FOA Number: DE-FOA-0002962), available on OCED Exchange.



In general, technologies of interest for the carbon capture large-scale pilot projects FOA are less technologically mature (TRL 5-7) than technologies of interest for the carbon capture demonstration projects FOA (TRL 7-8). The large-scale pilot projects FOA focuses on technologies that have completed, at the time of application, an integrated small-scale pilot prototype for the proposed process or a process having a similar composition, impurities/contaminants, temperature, and pressure 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.

While the present FOA focuses on transformational large-scale pilot projects to advance carbon capture technologies only, the carbon capture demonstration projects FOA instead focuses on transformational commercial scale, integrated demonstration projects designed to further advance the development, deployment, and commercialization of technologies to capture, transport, and securely store carbon emissions from both industrial and electric generation facilities.

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. DOE will not select the same project for both this FOA and the above-referenced carbon capture demonstration projects Program FOA or projects that are interdependent between these two FOAs.

1.3 Topic Areas

There are two Topic Areas (TAs) in this FOA:

- Carbon Capture Large-Scale Pilot Projects at Industrial Facilities Not Purposed for Electric Generation (TA-1); and
- Carbon Capture Large-Scale Pilot Projects at Coal or Natural Gas Electric Generation Facilities (TA-2).

The overall objective of a project under **TA-1** is to test a transformational carbon capture technology that (i) separates carbon emissions from a stream at an industrial facility and (ii) has the ability to validate at least 90% carbon capture efficiency and 95% CO₂ purity under real exhaust conditions. DOE will preference applications that propose transformational technologies with documented potential to achieve greater than 90% carbon capture efficiency during the proposed large-scale pilot project. Note that coal, natural gas, or other fossil-derived hydrocarbon feedstock must be used to some extent in the process that produces the gas stream targeted in the large-scale carbon capture pilot project.

The industrial sectors of interest for TA-1 include but are not limited to: (i) chemical production (e.g., petrochemicals) excluding ethanol and hydrogen production, (ii) mineral production (e.g., cement, lime, and glass), (iii) pulp and paper production, (iv) iron and steel production, and (v) refining (e.g., catalytic cracker, hydrocracking, process furnaces, etc.). Applications proposing carbon capture in natural gas processing facilities are not of interest.



Large-scale pilot projects under TA-1 are pilot facilities with a design capacity to capture a recommended minimum of 75,000 tonnes CO₂/yr from a stream at an existing domestic industrial facility not purposed for electric generation.

Applications are preferred that propose carbon capture from unit operations from industrial facilities where it is known to be difficult to decarbonize and require further technology development.

If a pilot scale of less than 75,000 tonnes CO₂/yr is proposed AND the projected commercial scale is more than 10X, the applicant must clearly explain why a future scale-up from pilot to commercial scale (with no intervening scale-ups) could be done with acceptable risks. Likewise, if the proposed pilot scale is more than 10X greater than the largest scale at which the proposed carbon capture system has been previously tested and validated, the applicant must clearly explain why scaling up directly to the pilot scale (with no intervening scale-ups) could be done with acceptable risks.

The overall objective of a project under TA-2 is to test a transformational carbon capture technology that (i) separates carbon emissions from a flue gas stream at an electric generation facility and (ii) has the ability to validate at least 90% carbon capture efficiency and 95% CO₂ purity under real flue gas conditions. Large-scale pilot projects under TA-2 are pilot projects with the documented potential to achieve a 90% carbon capture efficiency from a recommended minimum 25 MWe slipstream at an existing domestic coal electric generation or natural gas (NG) electric generation facility. NG electric generation facilities include both simple cycle and combined cycle (NGCC) plants, combined heat and power plants, and steam methane reformers that produce hydrogen from natural gas for use in the production of electric energy.¹⁰

If a pilot scale of less than 25 MWe slipstream is proposed AND the projected commercial scale is more than 10X, the applicant must clearly explain why a future scale-up from pilot to commercial scale (with no intervening scale-ups) could be done with acceptable technical risks. Likewise, if the proposed pilot scale is more than 10X greater than the largest scale at which the proposed carbon capture system has been previously tested and validated, the applicant must clearly explain why scaling up directly to the pilot scale (with no intervening scale-ups) could be done with acceptable risks.

At the time of the application, carbon capture technologies proposed for both TA-1 and TA-2 under this FOA are expected to (i) have achieved TRL 5, preferably 6, for the proposed process and (ii) have completed a successful validation of an integrated small-pilot scale prototype capturing a minimum of 1,000 tonnes CO₂/yr for the proposed process or a process having a similar composition, impurities/contaminant profile, temperature, and pressure.

DOE will preference applications that propose carbon capture technologies that have already achieved TRL 6. It is expected that the projects, if awarded, will achieve TRL 7 at the completion of the project performance period. TRL definitions are provided in Appendix C.

¹⁰ Section 962(a)(3) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16292(a)(3)).



Regarding the DOE definition of TRL 7 included in Appendix C, note that as a technology is developed, multiple prototypes of increasing scales may be tested and validated, which often conclude with a prototype with a scale that is approaching, but could still be less than, the anticipated scale of the commercial application.

For the purpose of this FOA, a prototype full-scale system corresponds to a prototype that has sufficient scale to: a) gain the operational data needed to understand the technical and performance risks of the technology before the application of that technology at commercial scale or in commercial-scale demonstration; b) validate scaling factors; and c) demonstrate the interaction between major components so that control philosophies for a new process can be developed and enable the technology to advance from large-scale pilot project application to commercial-scale demonstration.

For both TA-1 and TA-2, Carbon Capture Large-Scale Pilot Projects under this FOA are expected to:

- i. Have a design life of around 5 years, with plans to decommission or operate after the award period is completed,
- ii. Achieve at least 90% capture efficiency,
- iii. Achieve at least 95% purity in the product oxides stream,
- iv. Complete at least one (1) year of large-scale pilot testing of a carbon capture technology under actual exhaust conditions (e.g., normal steady-state and flexible operations) covering the full spectrum of performance conditions, parametric variable studies, meeting key technical performance targets, and collect required data to quantify other project benefits or negative impacts,
- v. Achieve at least 2,000 hours of continuous operation under stable conditions at performance targets that can enable validation of commercial scale process using Technoeconomic Analysis (TEA), Life Cycle Analysis (LCA) models that are informed with data from the testing,
- vi. Collect and report the inlet and outlet criteria pollutants (e.g., NOx, SOx, PMs) and technology related emissions (e.g., solvent/sorbent losses and their degradation by-products such as potential formation of nitrosamines) during the large-scale pilot testing to assess the co-benefit emissions reduction of installing carbon capture technology,
- vii. Develop and utilize first-principles based, multi-scale process and scale-up models to guide pilot scale experiments and parametric variable studies to reduce the technical risks in scale-up and further deployment,
- viii. Collect data sufficient to validate scaling factors, process models and demonstrate major component interactions to support future technology scale up and application in a variety of potential commercial environments,
- ix. Demonstrate significant progress towards commercial applications via final TEA and LCA analyses that incorporate large-scale pilot data and can support scaling to commercial scale demonstration or commercial applications, and



x. Collect data to demonstrate sufficient understanding of surrounding community and workforce impacts of the pilot project construction, operations, and decommissioning.

1.3.1 Applications Specifically Not of Interest

The following applications are not of interest under this FOA:

- Applications proposing lab/bench-scale research and development (R&D), and small-scale pilotscale activities with less than 1,000 tonne/yr of CO₂ capture capacity;
- Applications proposing laboratory or bench-scale testing to develop carbon capture material composition(s), or materials system(s) (e.g., membranes modules);
- Applications proposing CO₂ capture materials screening (computational or experimental) of novel sorbents, solvents, membrane or electrochemical materials;
- Applications proposing R&D of individual process steps, materials, or chemistries (e.g., solvent reclamation, carbon capture material manufacturing, monoliths, carbon oxides compression technologies) rather than a complete and fully integrated carbon capture large-scale pilot system;
- Applications to advance the maturation of carbon storage technologies;
- Applications to advance the maturation of carbon oxides conversion technologies;
- Applications to advance the maturation of technologies to increase carbon oxides concentration in the flue gas (e.g., exhaust gas recirculation), other than engineering analysis;
- Applications to utilize algae-based carbon capture technologies;
- Applications to advance the maturation of direct air capture technologies;
- Applications proposing carbon capture large-scale pilot projects at hydrogen production, ethanol production and natural gas processing facilities (TA-1).
- Applications proposing carbon capture from refining applications (TA-1) from dedicated hydrogen production (e.g., SMR units).

1.4 Award and Project Management Approach

Awards selected under this FOA for carbon capture large-scale pilot projects will adhere to a fourphased structure for managing scope, schedule, deliverables, and budget, with a competitive (down)-selection ("downselect") between Phases 1 and 2:

Phase 1: Detailed Plan and Front-End Engineering Design (FEED) Studies (18 months); Phase 2: Project Development, Permitting, and Financing (up to 12 months); Phase 3: Procurement, Construction, and Integration (up to 24 months); and Phase 4: Ramp-Up and Pilot Operations (up to 24 months).

Table 1 shows an example of the expected activities and deliverables for each phase. Items listed under the "Application" phase are indicative of the type and scope of activities DOE will require applicants to submit for consideration of Phase 1 funding. Items listed under Phases 1-4 are indicative of the type and scope of activities applicants should plan to execute in each phase if continued into that phase of funding. These activities will also be further defined during award negotiations and subsequent negotiations between phases. DOE review and evaluation of



deliverables reflecting activities in each phase will inform downselect and Go/No-Go decisions that occur between and within phases.

	Application Phase	Phase 1: Detailed Plan & FEED Studies (18 months)	Phase 2: Project Development, Permitting, and Financing (Up to 12 months)	Phase 3: Procurement, Construction, and Integration (Up to 24 months)	Phase 4: Ramp-up & Pilot Operations (Up to 24 months)
Business Development & Management	 Financial Plan (FP) Business Plan (BP) including preliminary host site selection Project Management Plan (PMP) 	 Final Site Proposal Updated PMP, BP, FP for Phase 2-4 Feedstock, Supply Chain Assessment Intellectual Property Management Plan 	 Teaming & feedstock agreements Sites access secured Confirmed project financing, including contingency funding PMP and FP for Phase 3-4 Labor agreements 	 Regular progress/status reporting for all agreements Regular financial status reports Updated BP, PMP, FP, teaming, labor agreements & feedstock agreements 	• Future plans for commercial deployment
Engineering, Procurement, Construction & Operations	 Technology Description & TRL Assessment Scale Up Pathway Description Conceptual Engineering Designs TPC Estimate Level 2 Phase 1 Schedule Level 1 Integrated Project Schedule (IPS) 	 Scale up Analysis & Explanation Engineering & Design documents (30%)⁽²⁾ Class 3 Cost Estimate⁽¹⁾ Level 3 Phase 2 Schedule Level 2 full project IPS 	 CC & BOP: Engineering & design (90%)⁽¹⁾ and Class 1 TPC Level 3 full project IPS Level 4 schedules as needed 	 Progress execution reporting Integrated project completion testing Updated TPC Procurement, installation, and commissioning Preliminary design validation run(s) Updated Level 3 IPS, Level 4 schedules as needed 	 Regular operation status reporting Validated performance model Final TPC Plans for Pilot disposition or decommissioning, if applicable
Safety, Security & Regulatory Requirements	 Permitting workflow overview Initial Environmental Health & Safety (EH&S) Assessment Assessment of potential cybersecurity threats or vulnerabilities 	 Environmental Information Volume (EIV) Updated EH&S Assessment Cybersecurity Plan Initial safety plan 	 Execution ready safety plans Final Cybersecurity Plan Updated EH&S Assessment All permits for construction NEPA complete 	 All permits for execution Safety & security incident reporting & audits 	Ongoing permits, safety & security reporting
Risk Analysis & Mitigation (as Part of PMP)	 Preliminary Risk Management Plan (RMP) Preliminary Risk Register 	 Updated RMP Update Risk Register 	 Quantitative RMP Update Risk Register to inform contingency funds Assessment and mitigation of construction project risks 	 Quantitative RMP as needed Update Risk Register 	 Tech risk updated for operations Ongoing risk reporting Failure root cause analysis and abatement implementation
Technical Data & Analysis	 Data tables for carbon capture technology validated in integrated pilot scale system at min 1000 tonne CO₂/yr Preliminary process model, TEA, LCA 	 Revised/Updated TEA and LCA analyses including commercial application scenario analyses Process and scale-up models 	 Technical Verification and Validation (V&V) plan Process and scale-up models 	 V&V data collection & analysis Updated TEA and LCAs Process and scale-up models 	 Ongoing data collection LCA incorporating operation data Process and scale-up models TEA incorporating operation data
Community Benefits	 Community Benefits Plan, including: Community & Labor Engagement; Investing in 	 Implement Phase 1 scope of CBP Update CBP for Phases 2-4 based on Phase 1 activities 	 Implement Phase 2 scope of CBP Update CBP for Phases 3-4 based on Phase 2 activities 	 Implement Phase 3 scope of CBP Update CBP for Phase 4 based on Phase 3 activities 	 Implement Phase 4 scope of CBP Update CBP based on activities and findings

Table 1. Carbon Capture Large-Scale Pilots: Example Phase Activities and Deliverables



American Workforce; DEIA; Justice40 Initiative			from ramp-up and pilot-scale operations
---	--	--	---

⁽¹⁾Cost Estimate Maturity as referenced in Table 4 and <u>DOE's Cost Estimating Guide</u>; ⁽²⁾Maturity level project definition as referenced in Table 4 and DOE's Cost Estimating Guide

This phased approach is designed to guide projects through the project development process incrementally and allow DOE to evaluate project merit and progress at each phase transition to ensure broad goals remain achievable. Each phase is structured to ensure that projects meet a standard level of maturity, employ a robust execution approach, and that technical and non-technical project risks are adequately and appropriately managed throughout DOE's award.

Applications to this FOA will be considered only for Phase 1 funding. However, DOE will evaluate projects against their detailed Phase 1 proposals as well as their plans to carry out the subsequent phases, the nature of the proposed transformational technology¹¹ and the potential viability of its commercial adoption beyond the carbon capture large-scale pilot project. The requirements for Phases 2–4, including the competitive downselect criteria, will be contained in Phase 1 awards.

Phase 1 – Detailed Plan and Front-End Engineering Design (FEED) Studies

Phase 1 activities will focus on completing specific details about the overall carbon capture largescale pilot 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, environmentally, financially, and legally viable, with adequate plans to assess community and workforce impacts and engage relevant stakeholders. FEED Studies and construction plans for the proposed largescale pilot projects will be completed in Phase 1 in accordance with the award terms.

Furthermore, the Phase 1 projects will need to update the Project Management Plan (PMP), preliminary test plans, the Risk Management Plan (RMP), the Intellectual Property Management Plan (IPMP), the financial plan for the phases 2-4 efforts and finalize the site selection for large-scale pilot project. The Project Management Plan should also identify if there are any critical materials or supply chain risks in their technologies and the plans to overcome them in the project. Phase 1 recipients will also need to complete and submit an Environmental Information Volume (EIV).

Phase 1 should also include a continuation of analysis activities to refine and update Life Cycle Analysis (LCA) and techno-economic analysis (TEA) data and analysis provided in the application, as well an updated Environmental Health and Safety (EH&S) assessment consistent with Appendix F.

In addition to project-specific analyses, DOE may require recipients to complete scenario analyses across a range of commercial applications to support assessment of the potential impact the large-scale pilot project may have on the broader economy. In addition to updating engineering, technology, and business plans, Recipients will also update and begin implementing Community

¹¹ Section 962(a)(5) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16292(a)(5)).



Benefits Plan activities to advance the assessment of potential impacts to the human environment and begin producing required safety, security, and regulatory documents.

If an applicant has already conducted or is currently conducting activities required under Phase 1 of this FOA, the status of such activities must be clearly described in the Application. DOE will not fund completed or redundant work. Applicants should propose only new work that falls under Phase 1 activities. DOE expects Phase 1 activities to take 18 months including the competitive downselect process for all awards selected from this FOA.

Phase 2 – Project Development, Permitting, and Financing

Phase 2 encompasses advanced planning activities. Following Phase 1 downselect, successful 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 should 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. If necessary, third-party financing agreements should be completed. Risk management plans should be revised and updated to reflect progress made and risks mitigated as well as new or emerging risks and corresponding management plans.

By the end of Phase 2, safety and security plans should be finalized and execution ready. All necessary permits and approvals should be in place to prepare for construction, including completion of required NEPA reviews. Relevant LCA and TEA analyses should be completed to DOE expectations and corresponding verification and validation (V&V) plans should be in place. Relevant plans for community and labor engagement and partnerships should be finalized and implemented.

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

Phase 3 – Procurement, Construction, and Integration

Phase 3 activities will focus on implementation. DOE expects this phase to take up to 24 months and to be the most cost intensive. Recipients 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 recipients 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 activities may vary significantly for each award as there will be varying amounts of construction and retrofitting. Recipients should propose a funding level that is appropriate for the scale of the technologies and infrastructure being installed and constructed, within the limits outlined in <u>Section 2.0</u>.

Phase 4 – Ramp Up and Pilot Operations

In Phase 4, recipients will transition to pilot operations. Phase 4 activities will focus on executing the integrated pilot system performance and data collection plans. By the end of Phase 4, each project will have demonstrated integrated, large-scale pilot system operations running various parametric tests over an extended period (at least 1 year). The pilot should achieve a minimum of 2,000 continuous operational hours, consistent with the operating performance of the underlying asset. Operational data should cover the full range of anticipated operating conditions and confirm key technical performance targets. Additional data collection may be necessary to adequately understand the surrounding community impacts resulting from the large-scale pilot operations and potential impacts of commercial-scale carbon capture.

Recipients must propose a funding level that is appropriate for the large-scale pilot project rampup and operations using DOE funding within the limits outlined in <u>Section 2.0</u>. A contingency reserve will also be required for Phase 4 to account for operations and also for decommissioning. At the completion of Phase 4 activities, DOE will require the recipient to submit either a plan for the decommissioning and disposition of the large-scale pilot facilities or a plan for its continued use. Costs associated with decommissioning and disposition or its continued use are not part of the project cost.

Transitions between Phases (Phases 2-4)

Upon Phase 1 award, DOE will only commit to funding Phase 1 activities. Additional funding for subsequent phases (Phases 2-4) will require successful completion of a competitive downselect after Phase 1 and Go/No-Go reviews at the end of Phase 2 and Phase 3. During the competitive downselect process following Phase 1, each recipient will be evaluated against a defined set of downselect Merit Review Criteria (MRC). These downselect MRC will be communicated to recipients during the Phase 1 award negotiation process and documented in the final agreements. Successful projects will receive Phase 2 funding.

Starting with Phase 2, transitions between budget periods or phases will be evaluated through a Go/No-Go decision format in which the projects are evaluated against the progress they have made against their plans and the agreed upon Go/No-Go criteria. This may include a requirement to submit a standardized set of data to provide quantitative and qualitative insight on metrics spanning the technological, environmental, economic, market, community benefits, and other components of the project's analysis activities. DOE may also require the negotiation of



additional Go/No-Go decision points within any phase (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 appropriate, qualitative criteria may be proposed in addition to but not in place of quantitative criteria. Examples of potential criteria may include (anonymized) vendor quotes and lead/delivery times for critical items to help understand supply chain complexity, detailed data on awardee overruns to clarify demonstration readiness, etc.

If DOE determines that a recipient 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.

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.

DOE will require access to project performance and financial data necessary to track progress against a project baseline (or similar). As these projects are large-scale pilots, to the greatest extent possible, project progress and information will be shared with interested stakeholders. At the completion of the carbon capture large-scale pilot test operation, DOE will require the plans for decommissioning and disposition of the pilot test facilities or for its continued use.



2.0 Award Information

Anticipated Type of Award:	Cooperative Agreement
Application Types Allowed:	New
Estimated Number of Awards:	0-10
Anticipated Funding Amount:	\$820,000,000 (Total)
Award Budget:	Application budgets are limited to the maximum amounts listed in Table 2.
Award Project Period:	The maximum project period is 78 months, and the scope of the proposed project would determine the specific project period within the maximum project period.

DOE may issue awards in one, two, or neither of the following Topic Areas: Table 2: Financial Table

Topic Area Number	Topic Area (TA)	Anticipated Number of Awards	Maximum Total Federal Funding Available Per Award	Maximum Total Federal Funding Available for All Awards
		Phase 1		
	TA-1: Carbon Capture Large-Scale Pilots at Industrial Facilities Not Purposed for Electric	0–6	\$4,000,000	\$24,000,000
	Generation			
	TA-2: Carbon Capture Large-Scale Pilots at Electric Generation Facilities	0-4	\$6,000,000	\$24,000,000
Total Phase 1		0-10		\$48,000,000
		Phases 2-4	4	
	TA-1: Carbon Capture Large-Scale Pilots at Industrial Facilities Not Purposed for Electric Generation	0-4	\$91,000,000	\$364,000,000
	TA-2: Carbon Capture Large-Scale Pilots at Electric Power Generation Facilities	0-3	\$136,000,000	\$408,000,000
Total Phase 2-4		0-7		\$772,000,000
Total FOA				\$820,000,000



Table 3. FOA Schedule	Tab	le 3.	FOA	Schedu	le
-----------------------	-----	-------	-----	--------	----

Phase 1: Detailed Plan & FEEDs	Phases 2–4: Project Development, Permitting, and Financing (Phase 2), Procurement, Construction, and Integration (Phase 3), and Ramp-up and Operations (Phase 4)			
Phase 1	Phase 2 Phase 3		Phase 4	
18 months	Up to 12 months	Up to 24 months	Up to 24 months	

DOE has substantial involvement in work performed under Cooperative Agreements made as a result of this FOA. In addition to normal Federal stewardship responsibilities, 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 the decision point, DOE may conduct unscheduled reviews, if necessary, 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;

(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, fit within funding and schedule constraints.

The applicant will establish 4 (four) phases for the proposed project. DOE will initially fund Phase 1. Subsequent funding for Phases 2-4, after competitive downselect at the end of Phase 1, is dependent on Go/No-Go determinations and recipient performance.

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



Recipients 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.

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. The contingency reserve is in addition to total project costs and does not count toward the minimum 30% 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 recipients from reducing scope to comply with the contingency reserve requirement.

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 fall under the purview of 2 C.F.R. Part 200 and 2 C.F.R. Part 910.

2.1 Responsiveness Criteria

The following types of applications will be deemed nonresponsive and will not be reviewed or considered:

- Applications that request federal funds that exceed maximum federal cost share of 70% or the maximum Federal funding amounts available per award (listed in Table 2);
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics);
- 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 before the end of 2030; and
- Applications that do not include a State-Point Data Table or include an incomplete State-Point Data Table, as stated in <u>Section 4.6.2.2.f.</u>

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 applicant and subrecipient(s) must be domestic entities except as stated below. The following types of entities are eligible to participate as an applicant or subrecipient of this FOA.

- 1. Institutions of higher education;
- 2. Non-profit entities;
- 3. For-profit entities;
- 4. Tribal Nations;
- 5. State and local governmental entities;
- 6. Incorporated Consortia; and
- 7. Unincorporated Consortia

Federal agencies and instrumentalities (other than DOE), DOE/NNSA Federally Funded Research and Development Centers (FFRDCs)¹², and Non-DOE/NNSA FFRDCs, are eligible to participate <u>only</u> <u>as a subrecipient</u>, 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 Contracting 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.

¹² 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/.



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 Full 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.

<u>Appendix H lists the information that must be included in a foreign entity waiver request</u>. 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. <u>See Appendix H.</u>

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 <u>Appendix H</u>.



3.2 Cost Sharing

Applicants are bound by the cost share proposed in their applications if selected for award negotiations. DOE is requiring that the non-federal cost share be at least **30% of the total project costs**¹³ for carbon capture large-scale pilot projects.¹⁴ 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 <u>Section 2.0</u>. Neither contingency funds nor any program Income should be included as cost share in the applicant's 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 non-federal cost share requirement applies to the project as a whole, including work performed by members of the project team other than the applicant, the applicant is legally responsible for paying the entire cost share.

If the funding agreement is terminated prior to the end of the project period, the applicant is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination. The applicant is solely responsible for managing cost share contributions by the project team and enforcing cost share obligations assumed by project team members in subawards or related agreements.

3.3 Limitation on Number of Concept Papers and Applications Eligible for Review

An entity may submit more than one Concept Paper and Application to this FOA, provided that each Application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Application.

If an entity submits more than one Concept Paper and one Application to the same Topic Area, DOE will require a determination as to the uniqueness of each concept and that the project, if funded, can progress independent of any other applications or awards. This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential subrecipient or partner).

¹³ Total project costs are the sum of the government share, including FFRDC costs if applicable, and the recipient share of project costs.

¹⁴ Section 962(d)(2) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16292(d)(2)); Section 988(b) of the Energy Policy Act of 2005 as amended (42 U.S.C. § 16352(b)). *See also* 2 C.F.R. § 200.306 and 2 C.F.R. § 910.130 for additional cost sharing requirements.



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_Full 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 <u>https://oced-exchange.energy.gov</u>. See detailed instructions at <u>Financial Opportunities: Manuals (energy.gov</u>).

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 (<u>OCED-exchangeSupport@hq.doe.gov</u>).

4.2.2 Unique Entity Identifier 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 (EBiz POC) and obtaining a special password called a Marketing Partner ID Number (MPIN) 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. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: <u>GSAFSD Tier 0 Knowledge Base - Validating your Entity</u>.

4.2.3 FedConnect

Register in FedConnect at <u>https://www.fedconnect.net</u>. 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 <u>https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pd</u>



4.2.4 Grants.gov

Register in Grants.gov (<u>http://www.grants.gov</u>) to receive automatic updates when modifications to this FOA are posted. However, please note that 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

Further information and detailed instructions regarding application forms is available on OCED eXCHANGE. To access this information, please 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 multiple phases: Concept Paper and Application. Additionally, in-person interviews may be required.



4.6.1 Concept Paper

Each Concept Paper must be limited to a single unique concept or technology for the specific Topic Area. The Concept Paper must conform to the requirements listed below, including the stated page limits with a total of 10 pages maximum.

DOE makes an independent assessment of each Concept Paper based on the criteria in <u>Section</u> <u>5.2.1.</u> of the FOA. DOE will encourage a subset of Concept Papers to submit Applications. Other applicants will be discouraged from submitting an Application (see <u>Section 6.1.2</u>). An applicant who receives a "discouraged" notification may still submit an Application. DOE will review all eligible Applications. However, by discouraging the submission of an Application, DOE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an Application that is unlikely to be selected for award negotiations.

Each applicant must provide the following information as part of the Concept Paper:

Cover Page (1 page maximum): The cover page should include the project title, the specific announcement Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, the potential project location(s), and any statements regarding confidentiality as described in <u>Section 8.1</u>.

Large-Scale Pilot Project Development Plan & Project Team Description (5 pages maximum): Applicants are required to describe succinctly -

- The proposed carbon capture large-scale pilot project, including a high-level description of the integrated design and scale of the technology to be developed, constructed, and operated at the host site (e.g., the intended industrial or electricity generation location).
- Description of the current state-of-the-art in the applicable field, the specific innovation of the proposed carbon capture technology, how the proposed technology would demonstrate significant improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture 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.
- The proposed technology's readiness level of the key unit operations (e.g., absorption, regeneration, reclamation, manufacturing process to produce carbon capture material) to move to a fully integrated, carbon capture large-scale pilot.
- Preliminary description of technology development and commercialization strategy including validation of scaling factors, interaction between major components, and risk mitigation strategies to advance from a large-scale pilot to a commercial-scale demonstration or commercial application.
- A preliminary development plan and timeline, including the key technical risks and challenges that will be addressed in the large-scale pilot operations.



- A high-level overview of the key technical performance, environmental, cost, and other targets that need to be demonstrated through data generated in the large-scale pilot plant operations to inform commercial scale up efforts and achieve market liftoff, with follow-on funding from the private sector.
- The potential impact that the proposed technology, if successfully piloted and commercially deployed, would have on meeting the FOA objectives and decarbonization goals for the industrial or electricity generation sector.

Management and Organization (2 pages maximum): Applicants should succinctly describe the qualifications, experience, and capabilities of the proposed Project Team, including:

- Evidence the Lead Project Manager (LPM) and Project Team have the skill and expertise needed to successfully design, develop, and operate the proposed plan.
- Evidence the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity.
- Evidence the applicant has worked together with its teaming partners on prior projects or programs.
- Evidence the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities.
- A summary organization chart of the team.
- Other graphs, charts, or data to supplement their large-scale pilot plan and Project Team Descriptions.

Community Benefits Plan (2 pages maximum): Applicants are required to describe succinctly the approach to be taken with addressing the four elements below, clearly specifying plans to address the impacts of the pilot project itself and plans for instrumentation, data collection, and analysis to assess impacts of commercial-scale carbon capture demonstrations or deployments:

- Community and labor engagement;
- Investing in the American workforce;
- > Advancing diversity, equity, inclusion, and accessibility; and
- > Advancing Energy and Environmental Justice in support of the Justice40 Initiative.

4.6.2 Application

Only applicants who have submitted an eligible Concept Paper will be eligible to submit an Application.

Applicants will have approximately 45 days from receipt of the Concept Paper Encourage/Discourage notification on OCED eXCHANGE to prepare and submit a Phase 1 Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.



All Application documents must be marked with the control number issued to the applicant. Each Application must be limited to a single concept. 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 in the Proposal Contents. However, DOE and reviewers are under no obligation to review cited sources.

The application content requirements checklist is provided in <u>Appendix A</u>.

4.6.2.1 Application for Federal Assistance (SF-424)

The Standard Form 424 (<u>SF-424</u>) 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 <u>http://energy.gov/management/office-</u> <u>management/operational-management/financial-assistance/financial-assistance-forms.</u> Note: The dates and dollar amount on the SF-424 are for the complete project.

4.6.2.2 Technical Volume

An application must include the Technical Volume, which includes the following components that are further detailed below: a) Project Summary; b) Business Development and Management; c) Engineering, Procurement, Construction, and Operations; d) Safety, Security, and Regulatory Requirements; e) Risk Analysis and Mitigation; f) Techno-Economic Analysis and Life Cycle Analysis Projections; and g) Workplan. The Technical Volume may not be more than [50] 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 (see <u>Section</u> <u>5.2.2</u> of the FOA) when preparing the Project Execution Plan.

a) Project Summary	
(PDF, 2 page maximum)	File Naming Convention: ControlNumber_LeadOrganization_Project_Summary

The project summary 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 for each location where project work will be performed by the applicant or subrecipient(s).



Also provide and any statements regarding confidentiality as described in <u>Section 8.1</u>. For each proposed prime recipient and subrecipient(s) that meets the criteria for domestic entity as stated in <u>Section 3.1</u>, 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 <u>Section 3.1</u>, the applicant must state the entity's status as a foreign entity and submit a foreign entity waiver request as specified in Appendix H.

b) Business Development and Management	
(PDF, 10 page maximum)	File Naming Convention: ControlNumber_LeadOrganization_BDM
<mark>(MS Excel)</mark>	File Naming Convention: ControlNumber_LeadOrganization_BusinessCase

The Business Development and Management document must include the Carbon Capture Large-Scale Pilot Plan Summary, Business Plan (BP), Project Management Plan (PMP), and Financial Plan (FP) as necessary elements detailed below. The project's level of development and level of detail within these plans will evolve over the four phases as detailed in **Table 1**.

Large-Scale Pilot Project Plan Summary

This summary should describe the overall team, scope, and objectives of the project. The applicant should explain the impact of DOE funding and how the DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives. The applicant should also discuss how, if successful, the awardee will unlock follow-on funding from the private sector.

Applications should describe the overall long-term vision and strategy for the project, detailed plans for Phase 1 activities, and higher-level plans for Phase 2 through 4 activities along with planned partnerships and financing strategies/commitments.

Applicants should thoroughly describe the rationale for the proposed site location, pilot system design, and initial pilot testing plan over two years to include parametric testing of key performance targets and continuous testing targets for 2,000 hours. DOE understands that some applicants will be unable to initially provide a complete, detailed plan for all activities beyond Phase 1 and that certain partnering agreements and financing details will emerge during the early phases. Additionally, the applicant should explain the geographic region and preliminary site proposed.

This summary should also include a high-level schedule for executing the project (i.e., Phases 1-4). Applicants are encouraged to include a summary schematic (e.g., Process Flow Diagram) that depicts the project and a high-level Gantt Chart for the schedule. Note that the Gantt Chart should be consistent with the Integrated Project Schedule discussed in the Engineering, Procurement, Construction & Operations section below.

Business Plan (BP)

The business plan should include key success metrics and high-level milestones to be completed during each phase (Table 1), such as signing key contracts and agreements, securing permits,



completing NEPA reviews, executing financial close, pilot plant site preparation and construction, and evaluating/analyzing commercial scale up potential.

It should also address the items listed below and any other pertinent information to understand the project business plans. The information presented in the Business Plan should be consistent with the overall Workplan.

<u>Commercial Feasibility</u>: The plan should describe the long-term commercial feasibility of the proposed technologies and related infrastructure and how the applicant intends to leverage the results of the proposed large-scale pilot project to accelerate future technology demonstration and deployment.

<u>Key Contracts, Permits, and Agreements</u>: The plan should provide a top-level description, schedule, and status, of all critical path contracts and agreements relevant to the project, encompassing permits, NEPA, design, engineering, technology licensing, financing, construction, startup, commissioning, shakedown, operations, maintenance, and decommissioning and/or longer-term plans for utilization of the pilot equipment after the DOE award period of performance.

<u>Preliminary Host Site Selection</u>: Applicants are required to select an existing host site (i.e., electric generating facility, industrial facility) that is located in the United States. Applicants must discuss the adequacy of the proposed host site for the carbon capture large-scale pilot project. Applicants must also discuss the fit of the site from a social and environmental justice standpoint (including social characterization of nearby communities, community support for the project, and workforce availability), with reference to the CBP as appropriate. Applicants are encouraged to include any additional sites under consideration that can be potential alternatives, if needed. The plan should describe the rationale for selection of the project site and contain evidence of control or access over the site or the plan to establish control or access over the site to enable project implementation. Recipients are encouraged to leverage and repurpose/retrofit existing facilities and infrastructure to the greatest extent possible to minimize environmental impacts. In addition, site selection should consider regional specific resources, supply chains, as well as climate and physical risks (e.g., fire, flood) to ensure resilience/sustainability.

For the purpose of Phase 1 application, "site selection" refers to the site chosen for the purpose of the detailed planning and FEED studies and other work within the proposed project (i.e., Phase 1); project siting decisions cannot be finalized prior to successful completion of National Environmental Policy Act (NEPA) reviews, as well as any other applicable processes such as satisfactory progress of CBP work. The host site letter of commitment to participate in the Phase 1 project is due at the time of Application submission.

<u>Market Analysis and Competitive Assessment</u>: The plan should include a comparative analysis of the current and projected carbon capture markets for the proposed and competing technologies. The plan should include a thorough competitive assessment on how the proposed transformational technology would demonstrate improvements in the efficiency, effectiveness, cost, and environmental performance over existing carbon capture technologies for electric generation or industrial applications. The analysis should also describe the projected customer



base. The applicant should provide preliminary revenue and cost projections (price and volume) and impact of tax benefits or other government policies and incentives.

<u>Host Site Arrangements</u>: The plan should provide a description for ensuring adequate utilities, services, human resources, equipment, supplies, and other items for successful planning, design, build, construction, and operations of the project at the host site. This includes involvement of the host site in safety related hazardous operations reviews and pilot plant design reviews during Phase 1. The letters of commitment should be submitted in a separate attachment in OCED eXCHANGE (see Section 4.6.2.6. Letters of Commitment for more information).

<u>Growth Plan</u>: The plan should describe the potential for expanding the proposed project beyond the award performance period. While the proposed funding is to design, build, and operate a carbon capture large-scale pilot project, DOE will encourage applications to consider opportunities that extend the life of the large-scale pilot facilities beyond the project funding period and/or that have plans to store/utilize the captured carbon oxides. The plan should also discuss how the proposed project will facilitate market liftoff, including the ability to attract follow-on private sector investments beyond the award performance period.

Business Case Analysis: The business plan must include a pro forma which quantifies the projected financial parameters such as operating costs, operating revenues, financing cash flows, EBITDA, tax credits/liabilities, and expected ROI over the project lifespan. This business case should be submitted as a separate MS Excel that includes key assumptions as a separate tab.

Project Management Plan (PMP)

This plan should describe 1) the Applicant's and project partners' organizational structure, capabilities, and operations plan; 2) the financial strength of the applicant and any major project partners; and 3) prior experience of the senior/key personnel in similar or related undertakings. Senior/key personnel includes the leadership/management team and other project personnel who contribute in a substantive, and meaningful way to the successful execution of the project.

<u>Organizational Structure</u>: As part of the PMP, the applicant must provide an organizational chart of key entities and senior/key personnel. The organizational chart and related description should show the applicant and any major project partners, subsidiaries, affiliates, parent organizations, or joint ventures associated with the project as well as an explanation of the legal structure (e.g., corporation, partnership, LLC). The application must describe the applicant and any major project partners' business relationship(s) and the various roles and responsibilities held by each organization. The applicant must also identify any entities involved in the project that do not meet the definition of domestic entity in <u>Section 3.1</u>.

Applicants are required to propose project teams that demonstrate the capability to complete the proposed work. Applicants must submit a letter of commitment from each team organization that agrees to participate in the proposed project (see <u>Section 4.6.2.6</u>). The letter is required and must be signed by the person authorized to commit resources on behalf of that team member's organization. Letters should demonstrate the team member's level of commitment to the project, such as host site access, data access, advisory services, etc. Applicants shall submit commitment letters as separate documents to the FOA Technical Volume.



<u>Management</u>: The Applicant must provide a description of the management and operations strategies to be employed in executing on the proposed pilot plant plan. The Application must list the names of senior/key personnel as well as their positions or titles and the percentage of their time dedicated to executing on the project. If any key management and staff are not expected to spend 100 percent of their time executing on the project, the plan must provide a brief description of their other responsibilities or other activities outside of the award. <u>Experience</u>: PMP must describe in detail the unique capabilities and expertise of the Applicant and any major project partners or subrecipients, debt or equity sponsors, contractors/vendors (if known), and every other counterparty that the prime applicant believes will enable the project to be successful. In addition, the plan must summarize the prior experience of the prime applicant and any major project partners in similar undertakings (in both technical scope and financial size) and current or previous energy infrastructure projects. The plan must describe the following:

- Examples of at least two projects in the sector similar in nature and scope to the project being proposed that have been completed (developed, financed, and managed construction) by the Applicant or project partners.
- Examples of at least two projects in the sector for which the Applicant or project partners were responsible for managing the operations and maintenance of a similar project for a minimum of two years. Note, each project example must be a project for which construction has been completed.

Applicants that are not able to include examples of two projects in their description of current and previous experience in the energy infrastructure sector should provide a detailed description of the facts that they believe are sufficient to demonstrate to DOE that they have the expertise that would be evidenced in current or previous experience in the energy infrastructure sector by including examples of two projects.

<u>Pending Investigations</u>: The plan must provide a summary of any pending or threatened (in writing) action, suit, proceeding, or investigation, including any action or proceeding by or before any governmental authority, that relates to the senior/key personnel, and the status of any appeals.

Financial Plan (FP)

The Financial Plan (FP) must provide a description of the following elements for the proposed project. The funding plan including the total amount for funding for project development in Phases 1, and the preliminary funding for Phases 2-4.

Cost share commitment letter(s) are required from any party (other than the organization submitting the application) proposing to provide all or part of the required cost share (including sub-recipients) for Phase 1. If applicable, the letter should identify the name of the organization, state the party is committed to providing a specific minimum dollar amount of cost share or value of in-kind contributions allocated to cost sharing, identify the type of proposed cost share (e.g., cash or in kind contribution) to be contributed, and be signed by the person authorized to commit the expenditure of funds by the entity. The Applicant should submit the


letter(s) in PDF format. Save the cost share commitment letters in a single PDF file using the following convention for the title "CSCL.pdf" and click on "Add Optional Other Attachment" to attach.

As described in <u>Section 2.0</u>, contingency funding including the source should also be detailed in the financial plan. Note, contingency funding does not count toward non-Federal cost share.

<u>Applicant and Project Partners</u>: In line with the Organization Structure in the PMP section, the Application must describe the financial relationship of the applicant to major project partners including entities that are not domestic entities as defined in <u>Section 3.1</u> who are contributing cost share and/or performing work. It must include a table that identifies the name of the organization or entity that are expected to contribute debt or equity financing and any person, organization, or entity who owns or will own five percent (5%) or more of the project. The plan must indicate the applicant, project partners, and other debt or equity contributors by listing the organization or entity name, website address, mailing address, city and state, and postal code.

<u>Financial Strength</u>: The plan must describe the applicant's and major project partner's financial strengths, as well as the project's strategic significance to the applicant and major project partner involved. Applicants should include financial ratings, a narrative description of their most recent audit conducted, and findings where available.

<u>Other Federal Support</u>: Federal financing, such as grants or loan guarantees from federal agencies, cannot be leveraged by applicants to provide the required cost share or to otherwise support the same scope of the award. However, other federal support may be used for activities that fall outside of the award scope/budget. The financial plan must identify whether the award will benefit directly or indirectly from other forms of federal support, such as grants, loan guarantees, tax credits, having federal agencies or entities as a customer or offtaker of the project's products or services, or other federal contracts, including acquisitions, leases, and other arrangements, that may indirectly support the award.

<u>Non-Federal Support</u>: The plan must identify other non-federal governmental (including state or local) incentives or other assistance on which the proposed project relies, including grants, tax credits and loan guarantees to support the financing, construction, and operation. It must indicate the terms of such support which could result in termination or reduction of anticipated/actual non-Federal support, and whether any such incentives or assistance are subject to clawback and the circumstances under which a clawback could occur.

c) Engineering, Procurement, Construction, and Operations		
(PDF) 10 page maximum	File Naming Convention: ControlNumber_LeadOrganization_EPCO	

Applications must include plans for Engineering, Procurement, Construction and Operations (EPC&O) project documents described in the subsections below. These documents should meet a minimum level of maturity, as described below, but may be more advanced. During each phase,



selected projects will further develop this set of documents. Within phases, recipients will report on execution status and progress to DOE and its third-party representatives.

The EPC&O category of requirements focuses on the project development process. Data, information, and related documents will cover (1) technology, (2) performance projections, (3) engineering, design, and procurement (4) cost estimates, (5) execution schedules, (6) operating and disposition and/or decommissioning plans, (7) construction risks, including availability of a skilled workforce.

Applicants will be required to provide estimated values of key parameters that influence project performance and financial viability, including but not limited to capital costs, tax credits, operating costs, and revenue streams. The recipients will provide revised data of increasing fidelity based on the best information available at the time. In Phase 4, DOE will require the recipients to provide detailed operational, environmental, and financial data for technology and business case validation, along with other data such as socio-economic data for Justice40 and jobs goals. DOE will specify additional details for recipients' performance validation upon successful completion of Phase 3.

Carbon Capture Technology

<u>Carbon Capture Technology Description</u>: The applicants are required to describe key parameters of the transformational carbon capture technology, or how the parameters will be developed. All claims should be substantially supported with actual field test data at the minimum TRL 5 scale to allow the evaluator to arrive at the same conclusion as the applicant has claimed. The description of the system should include, but is not limited to, the following:

- Preliminary process flow diagrams,
- Mass and energy balances, with stream identification (stream tables) corresponding to preliminary process flow diagram(s),
- Steam and power requirements, and
- Description of technology, including chemistries, kinetics, process conditions (cycles, temperature, pressure), and transport mechanisms.

<u>Carbon Capture Technology Readiness Level Evaluation:</u> The applicant must provide a discussion of the proposed carbon capture large-scale pilot project from technical, environmental, cost effectiveness, and integrated systems perspectives. Scientific, engineering, and technical information and data must be provided to support evidence of TRL of proposed unit operations and overall technology for large-scale pilot operations. The data must also include any carbon capture materials production and reclamation aspects. It is expected that the applicants have already validated all the key unit operations for their integrated carbon capture large-scale pilot plant at TRL 5, with TRL 6 preferred. Additionally, it is expected that applicants have completed an integrated pilot testing capturing at least 1000 tonne CO₂/yr with flue gas/process exhaust produced in the proposed application or in a process having a similar composition, impurities/contaminant profile, temperature, and pressure. Definitions of TRLs can be found in the <u>Appendix C</u>.



The performance of the proposed carbon capture technology must be substantiated by providing experimental evidence measured under actual application conditions or in a process having similar composition, impurities/contaminants, temperature and pressure at sufficient scale and any modeling evidence in its support. Furthermore, the Applicants must discuss the specific impurity/contaminant profile in the selected application, and its expected short- and long-term effects on the overall carbon capture system performance. DOE will preference applications that propose carbon capture technologies that can achieve greater than 90% carbon capture efficiency and at least 95% CO₂ purity with the large-scale pilot project.

Each application will be required to contain a technology plan that includes the following:

- Description of all non-commercial technologies and any key commercial technologies to be employed in the project, including existing equipment, facilities, and infrastructure,
- Description of, and path to secure, required intellectual property rights,
- Assessment of the integrated system and component level TRLs,
- Detailed analysis used to justify TRLs and commercial status if relevant, and
- Description of technology-based risks and how they will be managed.

<u>Carbon Capture Technology Development and Deployment Pathway</u>: Applicants are required to describe their plans to scale and commercialize their technology. Applicants should 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. The applicants are expected to develop and utilize first-principles based, multi-scale process and scale-up models to guide pilot scale experiments and parametric variable studies to reduce the technical risks in scale-up and further deployment. Plans on how the models will be developed and utilized through the phases should be described. The applicant should provide:

- Supporting data and justification how they plan to leverage the large-scale pilot to scale to a demonstration sized plant.
- Description of all technology maturation needs and corresponding maturation plans.
- Insight into how and where they foresee deploying the technology commercially moving forward.
- The technology's portability to and estimated performance in other power generation or industrial applications.
- Performance relative to commercially available carbon capture processes.

<u>Host Site Description and Carbon Capture Process Integration</u>: Applicants are required to describe the existing host site facility, including, but not limited to, process diagrams, emissions profiles, and availability and quality of steam and/or waste heat (as applicable). A corresponding narrative is required to provide application reviewers a clear understanding of the proposed capture process and project from technical, cost effectiveness, and integrated systems perspectives. At a minimum, the description shall include the following:



- Anticipated feed conditions and availability. The applicants should describe availability of flue gas and its conditions (e.g., pressure, temperature, flow rate, gas composition, and contaminant levels, host site capacity factors) and how it will be managed in the proposed engineering scale project.
- Utilities. The applicant should describe how utilities such as electricity, steam, water, instrument gas etc. will be managed in the proposed engineering scale project and tied into the existing host facility. Also, the applicant should describe the carbon emissions associated with the utilities.
- Waste management. The applicants should describe how any waste generated during the operations (e.g., wastewater, spent solvent or sorbent) and CO₂ product streams will be characterized, measured, monitored and managed in the proposed engineering scale project and tied into the existing host facility.
- Contaminants Controls. The applicants should describe how the flue gas contaminants (e.g., NOx, Sox, PMs) are measured and managed in the existing host facility and their potential effect on the carbon capture system.
- Environmental co-benefits. The applicants should discuss (i) the environmental cobenefits of installing the carbon capture system as it relates to emissions of criteria pollutants and other contaminants as well as (ii) a description of how those benefits will be measured and quantified during large-scale pilot testing.
- Secondary Emissions. The applicants should describe how technology related emissions (such as solvent/sorbent losses and their degradation byproducts) are going to be measured and managed in the proposed pilot facility.

Applicants must ensure technology descriptions, TRL assessments, maturation needs, technical risks, and supporting analyses described in this section correspond to the proposed conceptual design plans, project schedules, and analyses required under the <u>Techno-Economic Analysis and</u> <u>Life Cycle Analysis Projections</u> section and the Community Benefits Plan section below.

Projects selected for award will be expected to execute the technology maturation and technical risk management plans described in the application. Analyses and documents included in the Technology section of the application will be updated and revised as needed through each phase. Quantitative and qualitative analysis of remaining risks will inform subsequent phase negotiations including for contingency, budget, and cost share.

DOE will assess progress made as part of the competitive downselect at the end of Phase 1 and Go/No-Go decision points between and within Phases 2-4. Adequate progress made in technology maturation and risk management activities, as well as an overall acceptable technology risk exposure will be required for projects to advance through phases.

<u>Performance Projections</u>: Understanding performance assumptions, risks, uncertainties, and variabilities is critical for individual project viability. Applications should include detailed information about performance projections and supporting information. These projections should correspond to data, information, and assumptions provided in response to requirements



described in the Business Development and Management as well as the <u>Techno-Economic</u> <u>Analysis and Life Cycle Analysis Projections</u> sections of this FOA. If not already available, applicants must develop a detailed performance model in Phase 1.

Engineering, Design, and Procurement

Engineering, design, and procurement information must be provided as part of the Application. DOE expects applications will reflect a spectrum of project maturities.

At a minimum, the applications should include a conceptual design for the proposed large-scale pilot facility and designed for at least a carbon capture efficiency of 90% and purity of 95%, that is consistent with information provided in response to requirements described in other sections of the Application.

The conceptual design of the proposed carbon capture large pilot shall cover both the carbon capture system and required BOP. BOP 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 that are necessary to power the carbon capture system and their associated carbon emissions. If available, high-level schematic, technical specifications, equipment supplier and vendor information for all technologies, systems should be included in the application.

The Applicant should also describe the mass and energy balance of any major supply chain elements or unit operations, relevant system capacities, and projected availabilities. Engineering designs will evolve and be revised in the early phases of the project and will be monitored and reviewed as part of the Phase 1 downselect and Go/No-Go decisions between Phases 2-4.

Applications should include a description of the proposed procurement plan in accordance with 2 C.F.R. §§ 200.317-327 as available including, but not limited to, the following:

- Long lead items and critical equipment and connective infrastructure;
- Potential or planned major equipment providers;
- Procurement timelines and/or critical path procurements; and
- Third-party contracting plans
- Availability of required skilled labor.

The application must also describe the awardee's strategy to leverage existing U.S. manufacturing and supply chains and support the growth of these domestic capabilities in keeping with U.S. job creation and the Buy America goals of the BIL and related executive orders. Applications should clearly identify any known supply chain risks and plans for timely procurement of supplies from underdeveloped supply chains. See <u>Section 4.9.3</u> for additional information on Buy America requirements.

Cost Estimates

Applicants will be expected to include an initial cost estimate with the applications and, if awarded, to develop detailed cost estimates that meet industry standards for the size and complexity of the



proposed project. The expected estimate class for the application is Class 5 or better. Subsequent phases will require more refined estimates: Class 3 by end of Phase 1 and Class 1 by end of Phase 2. Cost estimates should be consistent with other financial data and analysis provided as part of the application, such as those elements described in the Business Development and Management and <u>Techno-Economic Analysis and Life Cycle Analysis Projections</u> sections of the FOA. DOE expects that recipients will employ industry standard cost estimating methodologies and tools. Cost estimates should correspond to the project design maturity and reflect appropriate uncertainties. While DOE is not requiring its use, applicants are encouraged to review <u>DOE's Cost Estimating Guide</u>.



	Primary Characteristic		Secondary Character	istic
ESTIMATE CLASS	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Table 4: Cost Estimate Classification for Process Industries

Applications must include a current total project cost (TPC) estimate that covers the entirety of the project, including construction and pilot operations. All project costs falling within the project must be included, including capital, labor, finance, and other cost categories as appropriate for individual plans. Any costs associated with Community Benefits Plan activities should also be included in the TPC estimate. Narratives accompanying cost estimates should include an explanation of the estimate class and/or maturity, a description of the methodology employed, and the uncertainty or accuracy range.

While DOE is not requiring specific escalation assumptions be used for the application TPC, cost estimate narratives should explain what assumptions were used and why they were deemed appropriate. DOE may require use of standard cost estimating assumptions, including escalation assumptions in future phases.

Cost estimates should include itemized breakdowns that reflect at a minimum capital, labor, and financing costs. An overview of the project's current TPC estimate should be included in the application and supporting itemized data can be provided as part of the Preliminary TEA and LCA. Note, during award negotiations DOE will conduct a third-party review of the TPC.



Execution Schedules

An Integrated Project Schedule (IPS) that reflects all elements of the overall project should be included in the application (as part of the Workplan, see <u>Section 4.6.2.</u>2.g). The initial IPS should include all major project activities and milestones (consistent with the overall Workplan), including technology maturation, engineering, design, procurement construction, pilot plant operations (parametric testing, continuous testing, etc.), and Community Benefits Plan activities. A minimum Level 1 IPS for the full project and a minimum Level 2 IPS for proposed Phase 1 activities should be provided with the application. The IPS should be provided as part of the Workplan when submitting applications.

- Level 1: Summary schedule including major project milestones, deliverables, and related activities.
- Level 2: A more detailed version of the Level 1 schedule that should include a breakdown into major project categories such as engineering, design, construction, procurement, permitting and regulatory, Community Benefits plan implementation, and others as appropriate.
- Level 3: Integrated roll up of Level 4 schedules. Should reflect breakout of activities underlying elements of the Level 2 schedule including anticipated start and finish dates for each activity. Often developed by the executing contractor using detailed information from project and/or construction managers and is used for project progress reporting.
- Level 4: Detailed working schedule used to manage day-to-day activities or other near term work plans. Should be resource loaded. Often called Execution or Working schedule or similar.

This IPS will be revised, expanded, and updated in future phases. By the end of Phase 2 it is expected that the IPS will be execution ready and reflect comprehensive schedule risk and uncertainty analyses. During each phase, recipients will report actual progress against their execution schedule or schedules as part of regular project management reporting requirements.

Pilot Plant Operating, Decommissioning and Disposition Plans

A high-level description of pilot plant operating, decommissioning, and disposition plans must be included with the application. It is expected that this conceptual plan will be developed into a fully implementable Operations & Maintenance (O&M) plan prior to completion of Phase 3.

Upon completion of the large-scale pilot plant testing campaign, Recipients must develop and appropriately fund a disposition and decommissioning (D&D) plan. It should be described if the pilot plant facilities are expected to be operational beyond the DOE award period. The application must include a high-level description of the proposed D&D approach. It is expected that this approach will be fully developed, including cost estimates, prior to completion of Phase 2 and with appropriate funding plans in place prior to completion of Phase 3. DOE expects the applicant to seek and maintain community and labor input of the eventual site end-state of the pilot plant.



d) Safety, Security, and Regulatory Requirements	
(PDF) 6 page maximum	File Naming Convention: ControlNumber_LeadOrganization_SafetySecurity

The Safety, Security, and Regulatory Requirements document must include Safety, Cybersecurity, Permitting, and National Environmental Policy Act requirements detailed below.

Safety

Applications should include a detailed description of safety culture that includes a five-year construction/operations safety performance history (such as an OSHA 300A form or Experience Modification Rating) of the entities and management involved in the award.

Environmental Health and Safety (EH&S) Assessment.

Applicants are required to submit an initial EH&S assessment of the proposed technologies in accordance with the format provided in <u>Appendix F</u>. Applicants shall submit the initial EH&S Assessment as a separate document (see <u>Appendix A</u>). The Environmental Health and Safety Assessment is a separate document in the application and is not included in the 50-page Technical Volume page limit.

Cybersecurity

While a cybersecurity plan is not required as part of the application submission for this FOA, applications should include an assessment of potential cybersecurity threats or vulnerabilities and address cybersecurity challenges in their work scope.

If selected for award negotiations, recipients must submit an initial cybersecurity plan during the award negotiations phase (prior to the issuance of an award). Recipients must develop tailored cybersecurity plans outlining the specific plan to secure the project according to the unique needs of the proposed plan and its associated technologies as applicable. Further development/refinement of the cybersecurity plan will be a required component of Phase 1 activities. Recipients must deliver a final plan to DOE by the end of Phase 2 for review as part of the advancement to Phase 3.

Permitting

Applications must include a permitting workflow overview that identifies anticipated federal, state, and local codes, regulations, and permitting requirements applicable to siting, construction, and operation of the proposed project. Additionally, the integrated project schedule should clearly identify and incorporate timelines for application and expected completion or receipt of all required federal, state, or local permits, approvals, or reviews.

National Environmental Policy Act

DOE's decision of 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., which requires federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional information, visit the <u>DOE NEPA Website</u>.



While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all recipients selected for negotiation of an award will be required to assist in the timely and effective completion of the NEPA process. If DOE determines certain records or studies must be prepared to complete the NEPA review process (e.g., a biological assessment or other environmental baseline studies), the recipient may be required to prepare the records and studies; costs required to prepare the necessary records and studies may be included as part of the project costs. Proposed projects that include new construction or significant modification of existing facilities and/or infrastructure will likely require preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS). NEPA compliance activities should be accounted for in the project scope, schedule, and budget.

If an application is selected for negotiation of award, applicants will be required to complete an Environmental Questionnaire.

If an application is selected and an award is successfully negotiated, recipients will complete an Environmental Information Volume (EIV) during Phase 1.

Other Considerations

Applicants are encouraged to undertake a thorough review of all relevant Federal, State, and Local statutory and regulatory authorities. Knowledge of these authorities and associated processes will aid applicants in developing their proposed projects both in the application and award phases. Relevant federal statutes and authorities could include, but are not limited to: Clean Air Act, Clean Water Act, Endangered Species Act (ESA), and National Historical Preservation Act (NHPA).

DOE strongly encourages applicants to include in their proposals frequent and extensive consultation with local community and labor stakeholders with a potential interest in the proposed site(s), aligned with activities in the Community Benefits Plan. Applications should also include plans for monitoring their sites and the environmental effects of their projects from site assessment through commissioning and throughout the entire life of the project.

e) Risk Analysis and Mitigation		
(PDF) 6 page maximum	File Naming Convention: ControlNumber_LeadOrganization_RiskAnalysis	

The Risk Analysis and Mitigation document must include a Risk Management Plan, and a Risk Register as necessary elements. DOE expects recipients to understand and actively manage risks. The applicant must provide a comprehensive Risk Management Plan (RMP) that is accompanied by a corresponding risk register that can be used for ongoing risk management. The RMP must provide a narrative that analyzes the commercial, technical, construction, schedule, regulatory, permitting, safety, scale-up, infrastructure, financial, management, organizational, and market related risks. Each identified risk in the RMP should be clearly described, including its probability of realization, potential impacts, and proposed mitigations.



As appropriate, identified risks should be incorporated into other project documentation, such as execution schedules, cost estimate maturity, and contingency. The risk management plan and risk register will be revised and updated as needed throughout the project life cycle. At a minimum, they will be reviewed and assessed for accuracy and adequacy as part of each transition between phases. Where and when appropriate, quantitative risk analyses may be required and subsequently incorporated into relevant risk management plans and contingency evaluations and will be used to inform negotiations with DOE.

f) Techno-Economic	Analysis and Life Cycle Analysis Projections

(PDF) 10 page maximum File Naming Convention: ControlNumber_LeadOrganization_TEA_LCA

The document must include a Preliminary Techno-Economic Analysis Narrative (Generally Accepted Accounting Principles analyses) and a Life Cycle Analysis Narrative as necessary elements. In addition to the PDF, applicants may also submit an accompanying excel file.

State-Point Data Table

The state-point data table lists both measured and projected performance data for the proposed carbon capture technology. The measured data, which could include pilot scale test data, is intended to help demonstrate that the required technology readiness level has been attained, and what, if any, important differences exist between the environments of the prior tests and the proposed project. The projected performance data is intended to show what improvements, if any, still need to be attained for success at the next scale (which may be commercial scale). The data tables are customized for solvent-, sorbent- and membrane-based carbon capture systems and include key physical and thermodynamic properties as well as information to describe the pilot test and its performance. Applicants are required to complete a State Point Data Table for their carbon capture technology. Applicants shall prepare the State Point Data Table for flue gas conditions similar to the ones in the proposed host site, in the format provided in <u>Appendix E</u>. Any notable differences between the flue gas conditions used in prior scale work and the conditions expected in the proposed host site should be discussed.

Applicants shall submit the State Point Data Table as a separate document to the FOA technical volume. The State Point Data Table will not be included in the 50-page limit for the Technical Volume. Note that the State-Point Data Table is required to be completed and submitted with the application. Applications that do not include a State-Point Data Table or include an incomplete State-Point Data will also be considered nonresponsive and will not be reviewed or considered.

Preliminary Process and Scale-up Models

Applicants are expected to provide a summary of the process and scale-up models developed todate for the proposed carbon capture technology, including but not limited to: (i) model assumptions, (ii) kinetics, mass-transfer, and heat-transfer correlations and their validation, (iii) model predictions for temperature/concentration profiles for major unit operations (e.g., absorber, desorber) and their validation with the experimental data.



Successful recipients are expected to update their process model throughout the project to develop rigorous, first-principles, multi-scale, models to guide pilot scale test conditions such that technical risk will be reduced for further deployment.

Preliminary Techno-Economic Analysis

A preliminary Techno-Economic Analysis (TEA) is necessary to assess the long-term financial viability of the proposed technology. TEA should be conducted with the best available information for the proposed technologies, systems, and infrastructure. This information should come from prior testing of the same integrated technology system, with a preference for using data from prior tests that captured carbon oxides from process streams that are as similar as possible to the proposed industrial process in terms of composition, temperature, pressure and impurities/contaminants. TEAs throughout the project are to be performed on proposed commercial-scale plants.

Under **TA-1** (industrial facilities), TEA should be conducted for the proposed carbon capture technology to achieve 90% capture efficiency. The proposed commercial-scale plant should be what the applicant considers as a leading candidate for the initial CCUS deployment, use the same industrial processes as the pilot plant, and produce the same end-product (e.g., the pilot and the reference plant both produce Portland Cement). The TEA analysis should also include a comparison with the state-of-the-art carbon capture technology alternative in the same industrial process as proposed. Applicants will need to provide justification for scaling factors between the pilot plant and their selected reference plant. If the applicant envisions different conditions for the technology that deviate from the large-scale pilot plant, a clear justification should be provided.

Under **TA-2** (coal or natural gas electric generation facilities), TEAs should be conducted for the proposed carbon capture technology to achieve 90% capture efficiency. The applicant should use the appropriate reference plant described in NETL's "Cost and Performance Baseline for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity", aka the Bituminous Baseline Study (BBS).¹⁵ If the applicant envisions a different commercial scale and conditions for the technology that deviate from the reference plant, a clear justification should be provided. The TEA analysis should also include a comparison with the state-of-the-art carbon capture technology alternative in the same power generation area as proposed.

Applicants are required to submit summary results of a preliminary TEA for the proposed reference plant including: (i) mass and energy balances, (ii) estimates of heating and cooling duties and electric power requirements covering the carbon capture system and balance-of-plant, (iii) the cost of the proposed carbon capture system, (iv) the cost of product (for **TA-1**) or Levelized cost of electricity (for **TA-2**), as well as (v) the cost of carbon capture. TEA at application may leverage proprietary and published data, existing DOE tools, estimates or quotes from industry representatives, or any other sources as needed.

15

https://netl.doe.gov/projects/files/CostAndPerformanceBaselineForFossilEnergyPlantsVolume1BituminousCoalAndNatur alGasToElectricity 101422.pdf



Preferably, applicants will use a multi-year GAAP financial articulation for the TEA, using nominal dollars for financial inputs. Applicants should provide key outputs from their TEA, and the information described in <u>Appendix D</u> for DOE to verify the TEA and consistently evaluate applications. For specific TEA requirements and guidance, refer to <u>Appendix D</u>. Updates to the TEA will be repeated in future phases as more refined performance data and cost estimates become available.

Preliminary Life Cycle Analysis

Applicants are required to conduct a preliminary Life Cycle Analysis (LCA) that includes a screening level, greenhouse-gas only analysis, and a contribution analysis showing at a minimum the impacts from fuel extraction and delivery, plant direct emissions, and carbon oxides transport and storage from the proposed project. Emissions associated with equipment manufacturing are not included in the system boundary.

Applicants should clearly state the estimated cradle-to-gate emissions for **TA-1** and cradle-todelivered-electricity emissions for **TA-2** and the assumptions made to derive these estimates. LCAs are to be conducted on the same reference plant that applicants use for TEAs. Applicants are encouraged to describe goals or strategies on how emissions can be further reduced into the future in their LCA narrative. DOE will utilize LCA to evaluate the decarbonization potential of each project relative to incumbent technologies. For specific LCA requirements and guidance, refer to <u>Appendix G</u>.

g) Workplan	
(PDF) 6 page maximum	File Naming Convention: ControlNumber_LeadOrganization_Workplan

The Workplan must include the Project Objectives, Technical Scope Summary, Work Breakdown Structure (WBS) and Task Description Summary, Downselect Point, Go/No-Go Decision Points, End of Project Goal, and Integrated Project Schedule as necessary elements. The Workplan will form the basis of the Cooperative Agreement that will be negotiated if selected for award.

Project Objectives

The applicant must provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes.

Buy America Requirement for Infrastructure Projects: Within the first 2 pages of the proposed workplan or project description, include a short statement on whether the project will involve the construction, alteration, maintenance and/or repair of public infrastructure in the United States. See <u>Section 4.9.3</u> for more information on Buy America.



Technical Scope Summary

The applicant must 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.

WBS and Task Description Summary

The Workplan must describe the work to be accomplished and how the applicant will achieve the project schedule, 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 (including project construction and operations). 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.

If selected for award negotiations, the summary will be incorporated into the WorkPlan, which will contain a more detailed description of the WBS and tasks.

Go/No-Go Decision Points

Provide a summary of project-wide Go/No-Go decision points at appropriate points in the project schedule. The applicant should also provide the specific technical criteria to be used to evaluate the project at each Go/No-Go decision point.

End of Project Goal

The applicant must provide a summary of the project's end of project goal(s), including successfully demonstrating large-scale carbon capture pilot performance objectives including TEA, LCA, obtain and validate scaling factors, contributing to the decarbonization of multiple sectors, providing positive community benefits, and the ability to achieve market liftoff and catalyze follow-on investments beyond the award.

Integrated Project Schedule

As described in <u>Section 4.6.2.2</u> under the "Engineering, Procurement, Construction, and Operations" subsection, the applicant must provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.



4.6.2.3 Community Benefits Plan: Job Quality and Equity

(PDF, 12 page 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 point-source carbon capture specifically, DOE has received many questions and concerns related to potential benefits or negative impacts of carbon capture technologies on 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 the 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. Specific requirements are intentionally flexible to generate the best approaches from project teams that are responsive to communities, workers, and impacted groups. Because the scope of this FOA is large-scale pilots, the CBP should contain significant detail on plans for data collection and analysis focused on assessing potential impacts of future deployment of the proposed technology on the surrounding communities and workforce—including specifically changes to non-GHG air pollution.

The CBP is therefore organized into two parts: Part A addresses the community and workforce impacts of the pilot project itself, and Part B addresses plans for instrumentation, data collection, and analysis to be done during pilot testing in order to elucidate how future demonstrations and deployments of carbon capture will impact communities and workers.

Within the Community Benefits Plan, the applicant is encouraged to provide specific detail on how to ensure feedback mechanisms and accountability, including for data collection and analysis activities. As applicable, applicants are encouraged to use negotiated agreements between the applicant and relevant community and labor unions referred to collectively here as "Workforce and Community Agreements".¹⁶

¹⁶ Workforce and Community Agreements include good neighbor agreements, community benefits agreements, community workforce agreements, project labor agreements, and other collective bargaining agreements.



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 IPS and Workplan. 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 awardees 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 and awardees 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. DOE will assess progress made as part of the competitive downselect at the end of Phase 1 and Go/No-Go decision points between and within Phases 2-4. Adequate progress made in implementing the community benefits plan will be required for projects to advance through phases.

Applicants may provide Community and Labor Partnership Documentation from representative organizations reflecting substantive engagement and feedback related to the applicant's approach to community benefits. These letters of support should be submitted under the Community Partnership Documentation (see <u>Section 4.6.3.4</u>) 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.

This Plan must address the technical review criterion titled, "Community Benefits Plan: Job Quality & Equity." See <u>Section 5.2.2</u> of the FOA.



<u>Community Benefits Plan Part A: Impacts during pilot construction, operation, and</u> <u>decommissioning.</u> Part A of the Community Benefits Plan should_address the community and workforce impacts of the pilot project construction, operation, and decommissioning at and around the proposed host site(s).

 Community and Labor Engagement: The Community Benefits Plan must describe the applicant's actions to date and future plans to engage with labor unions, Tribal governments, and community stakeholders from the proposed host site – such as local governments and community-based organizations that support or work with underserved communities, including Disadvantaged Communities as defined for purposes of the Justice40 Initiative. By facilitating 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. Engagement can lay groundwork for eventual negotiation of Workforce and Community Agreements. Registered apprenticeship programs, labor-management training partnerships, quality pre-apprenticeship programs, card check neutrality, and local and targeted hiring goals are all examples of provisions that Workforce and Community Agreements could cover that would increase the success of a DOE-funded project.

If awarded and in conjunction with DOE, recipients will also identify to DOE any federally recognized Indian Tribes, including 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, including Alaska native village or regional or village corporations about the proposed project.

This section should include the following elements:

- Background and Experience. A summary of any prior and ongoing efforts by the project team to engage communities, Tribes, and workforce organizations including labor unions relevant to and/or impacted by the proposed site(s) for the pilot. This discussion should include any engagement activities done for the ongoing operation of the proposed site(s) and/or engagement specifically related to this pilot proposal.
- 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 pilot test itself.



- Engagement plan for impacts of pilot construction, operation, and decommissioning. The application must include a plan for engaging groups and communities impacted by the pilot construction, operation, and decommissioning. This plan must include objectives for the engagement and when and how the project teams will engage stakeholders, labor unions and workforce organizations including joint labor-management training programs, and communities. Applicants should describe how they will extend these methods to include traditionally excluded stakeholders, especially those in the vicinity of the host site(s). If awarded, awardees will work in conjunction with the Department of Energy to develop a Tribal engagement plan as appropriate. <u>At minimum, this section should include</u> <u>a discussion on how surrounding communities will be engaged if there are significant</u> <u>impacts from the pilot project including changes in emissions or construction activities,</u> <u>and strategies to mitigate the impacts, including alternate site selection</u>. If the applicant is planning on pursuing formal Workforce and Community Agreements, those plans can be discussed here.
- **Resource Summary**. The application should describe the resources dedicated to implementing the plan including staff with relevant expertise and budget.
- 2. 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 the pilot construction, operation, and decommissioning to attract and retain the skilled workforce needed for project success, mitigate health and safety issues, and invest in workforce development.

This 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 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.
- **Pilot project workforce impacts**. Applicants should identify the potential impacts of the project on the workforce for construction, operation, and decommissioning phases of the pilot, including but not limited to:
 - An explanation of whether workers can form and join unions of their choosing, and how they will have the opportunity to organize with the purposes of exercising collective voice in the workplace for each phase of the project;
 - An assessment of the jobs that will be created and their occupational distribution;
 - Changes to the knowledge, skills, and abilities needed within the workforce and, if applicable, the training programs with whom the applicant could work to fill those gaps;
 - Changing industry structures leading to different employer/employee relationships or changes to collective bargaining agreements; and
 - Any changes to job quality, wages, fringe benefits, and job security.



- **Implementation strategies.** A description of plans to invest in workforce development and the retention or creation of quality jobs related to the pilot project.
- **Resource Summary.** The application should describe the resources dedicated to implementing the plan including staff with relevant expertise and budget.
- 3. **DEIA:** To build a clean and equitable energy economy, it is important that there are opportunities for people of all racial, ethnic, socioeconomic and geographic backgrounds, sexual orientation, gender identity, persons with disabilities, and those re-entering the workforce from incarceration. This section of the plan must demonstrate how DEIA is incorporated in the project objectives. The plan must identify the specific actions the applicant would undertake that integrate into the project goals and teams—for example, 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. Submitting an institutional DEIA plan without specific integration into the project will be deemed insufficient.

Elements of the DEIA plan should include the following:

- **Background and Experience**. Describe prior and ongoing efforts by the project team relevant to DEIA.
- Strategies, Milestones, and Timelines. Describe 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 in and access to the project's construction jobs.
- **Resource Summary**. Describe project resources dedicated to implementing DEIA activities including staff with relevant expertise and budget.
- 4. 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, where they flow and the extent the benefits will flow to disadvantaged communities and plans to mitigate any negative impacts.

Specifically, the Justice40 Initiative section must include:

- **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 carbon capture.
- Assessment of pilot project impacts and where they flow. A description of how the pilot construction, operation, and decommissioning will impact the surrounding community and other relevant groups. This should include, at a minimum:



- A description of all applicable communities or groups which could experience impacts from the construction, operation, and decommissioning of the pilot.
 Applicants should identify which of these are considered disadvantaged communities¹⁷ and characterize the existing burdens they are facing using EJSCREEN¹⁸, disadvantaged community definition tools, or other analytic tools.
- A description of what benefits¹⁹ and negative impacts²⁰ each group will experience due to pilot project construction, operation, and decommissioning. This should include at a minimum discussion of anticipated changes to air pollution and truck traffic. Impacts should be quantifiable, measurable, and trackable.
- Plan to maximize benefits and minimize negative impacts. Provide a plan to minimize any negative impacts and ensure delivery of benefits of the project to surrounding communities, workers, Tribes, and other impacted groups. This plan should include strategies, methods and milestones to maximize benefits, minimize negative impacts and measure, track, and report impacts.

Applicants should clearly describe how the plan includes accountability, feedback, and transparency mechanisms with impacted groups, such as community agreements and access to project data.

• **Resource Summary**. Describe project resources dedicated to implementing Justice40 activities including staff with relevant expertise and budget.

07/Final%20DOE%20Justice40%20General%20Guidance%20072522.pdf

¹⁷ 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 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 <u>https://www.energy.gov/sites/default/files/2022-</u>

¹⁸ <u>https://www.epa.gov/ejscreen</u>

¹⁹ 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.

²⁰ 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. In this section, Applicants should 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 or spent solvent, solvent degradation products; water use; and consumer energy prices. Applicants must also specifically address safety risks from CO2 transport and storage.



<u>Community Benefits Plan Part B: Plans for instrumentation, data collection, and analysis to</u> <u>assess potential community and workforce impacts of commercial-scale carbon capture</u> <u>demonstration and deployment.</u> This part of the CBP should addresses plans for instrumentation, data collection, and analysis to be done during pilot testing in order to elucidate how future demonstrations and deployments of carbon capture will impact communities and workers.

- Instrumentation, data collection, and analysis to determine potential local impacts of commercial-scale carbon capture. Applicants should provide a comprehensive and detailed description of their plans to collect and analyze data to assess how carbon capture impacts surrounding communities. This should include at a minimum plan to assess:
 - Non-CO₂ air pollution, emissions, or discharges, including criteria air pollutants and materials used in the capture unit such as solvents;
 - Water use;
 - Waste streams, including wastewater, spent solvent, and solvent degradation products;
 - Any other process or construction inputs or outputs that could cause positive or negative environmental, health, economic, or other impacts; and
 - Changes to consumer energy prices.

These assessments should be done at the parametric and steady-state conditions reflected in other technical sections. This section can reference and should be consistent with information contained in other sections, including the Host Site Description and Carbon Capture Process Integration section.

- Workforce data tracking and assessment. Applicants should provide plans to assess longterm workforce impacts and opportunities of commercial-scale carbon capture and identify how the project is designed to include an understanding of the future workforce needs should the resulting innovation be successful. Specifically, applicants should discuss their plans to track, assess, and report knowledge, skills, and abilities required to successfully implement carbon capture projects.
- Engagement plan for data collection and analysis to inform future carbon capture deployment. Applicants should clearly describe how they will engage communities and labor to provide input to the plans for instrumentation, data collection, and analysis described in this part of the CBP. This section should also describe when and how workforce and community impact data collected will be made publicly available. This section should include clear objectives, milestones and timelines for such engagement. This section can reference the Part A community and labor engagement section as appropriate.



4.6.2.4 Community Partnership Documentation

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

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

A resume must be provided for all senior and key personnel. A resume provides information that can be used by reviewers to evaluate the individual's relevant skills, experience of the personnel. Applicants must submit a two-page resume for each project manager and senior and key personnel that includes the following:

- 1. Contact Information, organization, title, address, phone, email;
- 2. Education: Include all academic institutions attended, major/area, degree;
- 3. Training: For example, certifications or credentials from a Registered Apprenticeship or Labor Management Partnership
- 4. Professional Experience: Beginning with the current position, list professional/academic positions in chronological order with a brief description;
- 5. List all current academic, professional, or institutional appointments, foreign or domestic, at the applicant institution or elsewhere, whether or not remuneration is received, and, whether full-time, part-time, or voluntary.
- 6. There should be no lapses in time over the past ten years or since age 18, which ever time period is shorter.

4.6.2.6 Letters of Commitment

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

Submit letters of commitment from all subrecipient and 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). Each letter must not exceed 1 page.

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	Budget and Budget Justification
---------	---------------------------------

(MS Event) File Naming Convention:	
(IVIS EXCEI)	ControlNumber_LeadOrganization_Budget_Justification
	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification

The Budget and 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 <u>https://OCED-exchange.energy.gov/</u>. Applicants must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the applicant 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 autopopulate 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 applicant and FFRDC are responsible for entering into an appropriate sub-agreement that will govern, among other things, the funding of the FFRDC portion of the work from the applicant under its DOE award. Such an agreement must be entered into before any project work begins.



The applicant should 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.

4.6.2.8 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/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), major participants (for collaborative projects), 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. The summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file.

4.6.2.9 Summary Slide Deck

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

Applicants must provide a slide deck summarizing the proposed project. The Summary Slide template must include the following information:

- Project title, applicant, Lead Project Manager, and senior/key personnel information
- Requested DOE funds and proposed applicant cost share;
- A summary of the carbon capture large-scale pilot plant technology;
- A description of the industrial or electric generation site where the pilot plant will be located;
- A description of the technology's decarbonization potential in the industrial or electricity generation sector;
- Proposed project goals including key technical and cost targets to be tested/validated in the pilot plant; and
- Any key graphics (illustrations, charts and/or tables);
- Topline community benefits.



4.6.2.10 Current and Pending Support Disclosures

(PDF, 2 pages)

File Naming Convention: ControlNumber_LeadOrganization_CPS

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.

This includes full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or inkind; 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, 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.

PIs 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.

Save the Current and Pending Support in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_CPS".

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.²¹

4.6.2.11 Potentially Duplicate Funding Notice		
(PDF, 2 pages)	File Naming Convention: PDFN.pdf	

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 Contracting Officer in writing of the potential duplication and eliminate any inappropriate duplication of funding.

4.6.2.12	Transparency of Foreign Connections		
(PDF, 2 pag	(es)	File Naming Convention:	

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

ControlNumber LeadOrganization TransparencyFC.pdf

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;

²¹ 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. 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 5year 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.

4.6.2.13	Disclosure of Lobbying Activities		
(PDF)		File Naming Convention: ControlNumber_LeadOrganization_LLL.pdf	

Prime recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, any officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress, in connection with any Federal contract, grant, loan, or cooperative agreement. In addition, if any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the applicant (including with non-federal funds) with respect to this funding opportunity, the applicant must complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html).

(https://www.grants.gov/web/grants/forms/si-424-individual-ramity.htm

4.7 Replies to Reviewers Comments

DOE will provide the Applicants with reviewer comments following the evaluation of all eligible Applications. Applicants will have a brief opportunity to prepare a short Reply to Reviewer Comments (Reply). The Reply must not exceed three (3) pages. If a Reply is more than three (3) pages in length, DOE will review only the first three (3) pages and disregard any additional pages. Applicants may use the Reply to respond to one or more comments or to supplement their Application. The Reply may include text, graphs, charts, or data.

DOE will post the reviewer comments in OCED eXCHANGE. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor OCED eXCHANGE in the event that the expected date changes.



The deadline will not be extended for applicants who are unable to timely submit their Reply due to failure to check OCED eXCHANGE or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit a Reply.

Applicants are not required to submit a Reply to Reviewer Comments. DOE will review and consider each eligible Application, even if no Reply is submitted or if the Reply is found to be ineligible.

4.8 Intergovernmental Review

This funding announcement is not subject to Executive Order 12372 - Intergovernmental Review of Federal Programs.

4.9 Funding Restrictions

4.9.1 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.

4.9.2 Pre-Award Costs

Applicants selected for award negotiations must request prior written approval to charge preaward 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.



4.9.3 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 <u>Build America, Buy America</u> webpage.

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



4.9.5 Risk Assessment

Pursuant to <u>2 C.F.R.</u> § <u>200.206</u>, 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 <u>2 C.F.R. Part 200</u> as amended and adopted by <u>2 C.F.R. Part 910</u>;
- 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 and 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 <u>2 C.F.R. Part 180</u> 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.

4.9.6 Human Subjects Research

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



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

1. 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.

2. 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.

3. Waiver

To seek a foreign work waiver, the applicant must submit a written waiver request to DOE. Appendix H lists the information that must be included in a request for a foreign work waiver.

4.9.8 Prohibition related to Foreign Government-Sponsored Talent Recruitment Programs

4.9.8.1 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.

4.9.8.2 Definitions

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 United States 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.

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.

4.9.9 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.

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 <u>Technical</u> <u>Assistance Guide</u> should be consulted to gain an understanding of the requirements and possible actions the recipients, subrecipients, contractors and subcontractors must take. 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 <u>Mega Construction Project Program</u>. DOE, under relevant legal authorities including Sections 205 and 303(a) of Executive Order 11246, will require participation as a condition of the award. This program offers extensive compliance assistance with EO 11246.

4.9.10 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.

4.9.11 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

5.0 Application Review Information

5.1 Compliance Criteria

All applicant submissions must:

- comply with the applicable content and form requirements listed in <u>Section 4.0.</u> of the FOA;
- include all required documents;
- be successfully uploaded in OCED eXCHANGE <u>https://OCED-exchange.energy.gov</u>, 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 Concept Papers

Concept Papers are evaluated based on consideration the following factors. All sub-criteria are of equal weight.

Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed scope of the carbon capture large-scale pilot including the transformative and innovative nature of the technology and advantages over competing technologies.
- The proposed project, if successful, could ultimately facilitate decarbonization of the industrial or electricity generation sectors in the U.S.
- The proposed total project costs are reasonable, and DOE funding will have a significant impact on the success of the project.
- The applicant has identified a realistic preliminary project development plan and timeline, including a finance plan, key risks, challenges, and possible mitigation strategies.
- The proposed technology development, deployment, and commercialization plan is reasonable, including validation of scaling factors, and has the potential to successfully deploy a transformational carbon capture technology.
- The applicant and proposed team have the qualifications, experience, capabilities, and other resources needed to design, develop, build, operate, and disposition and/or decommission the proposed large-scale pilot project.
- The proposed work, if successfully accomplished, would meet the objectives as stated in the FOA, including achieving market liftoff and attracting follow-on investments from the private sector.
- A description of strategies to ensure meaningful community and labor engagement; quality jobs and workforce development; EEJ and the Justice40 Initiative; and diversity, equity, inclusion, accessibility—related to both pilot project impacts and instrumentation, data collection, and analysis plans.



5.2.2 Applications

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

Criterion 1: Technical Merit, Innovation, and Impact (35%)

This criterion involves consideration of the following factors:

- Extent to which the application specifically and convincingly demonstrates the transformative and innovative nature of the technology and/or its applications and how it can ultimately facilitate decarbonization of the industrial or electricity generation sectors in the U.S. (Note: DOE will give preference to applications that propose carbon capture from unit operations where it is known to be difficult to decarbonize and require further technology development).
- The applicant clearly describes how the proposed carbon capture technology would demonstrate significant improvements over competing technologies in metrics such as efficiency, effectiveness, cost, and environmental performance and how it addresses hard to decarbonize unit operations in the topic area.
- Extent to which the application specifically and convincingly demonstrates how the proposed project will be capable of meeting the stated objectives, application requirements and technical specifications of the FOA and applicable Topic Area.
- Evidence that the project is proposed at an appropriate scale based on past, current and planned technology development activities, technology scaling methodology, and scaling factor analysis. Degree to which the Applicant provided technical detail (i.e., experimental results, diagrams, and graphs from their previous and active research, conceptual designs) to support the readiness of the proposed carbon capture technology for large pilots. (Note: DOE will give preference to applications that propose carbon capture technologies that achieved TRL 6.)
- The degree to which the proposed technologies and integrated systems are clearly described in the application. This includes the sufficiency of technical detail provided in the application addressing whether the proposed technologies and systems have the potential to be commercially viable (i.e., able to deploy at scale) beyond the large-scale pilot plant operations and a clear path to scale-up and commercialization are laid out.
- Adequacy and completeness of information provided to justify the selection for the specific host site; and how the carbon capture technology will be integrated within the host site, and site-related considerations and any risk-mitigation strategies are clearly described.
- Adequacy and completeness of information provided to support the TEA, performance target projections in the proposed large-scale pilot project, including 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. (Note: DOE will give preference to applications that propose carbon capture technologies with greater than 90% carbon capture efficiency.).


- Adequacy of the initial Environmental Health and Safety (EH&S) assessment of the proposed technologies. Completeness of the discussion regarding air emissions, water utilization, solid and liquid waste streams, and potential environmental impacts of the technology including toxicological effects and hazards of emissions and waste streams and evaluation of criteria pollutant co-benefits.
- Adequacy and completeness of information provided in the State Point Data Table.
- Adequacy of the preliminary LCA to meet FOA objectives and the degree to which a complete description of the preliminary LCA was provided. The degree to which the proposed carbon capture technology will have a positive life-cycle impact such as reducing greenhouse gas emissions, criteria pollutants, water usage, and other environmental considerations across the full life cycle compared to current/conventional technologies and processes.

Criterion 2: Financial and Market Viability (15%)

This criterion involves consideration of the following factors:

- The degree to which the application justifies the proposed project's economic viability, environmental benefits, and how the success of the large-scale carbon capture pilot will catalyze market liftoff through subsequent deployments in the industrial sector addressed by the large pilot.
- The degree to which the proposed project utilizes and leverages available host site's and other regional resources to meet the required FOA objectives.
- The adequacy and justification of the proposed budget and spend plan covering both DOE funding and non-federal cost share. This includes applicant's ability to provide contingency to meet unknown project cost overruns often seen with large-scale pilot projects during construction and operations.
- 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 with state and local incentives and private financing.
- The degree to which the applicant addresses each key participating organization's financial commitment to the proposed project including overall financial strength and financial capability to implement the proposed plan.
- The adequacy of the business plan for developing key project agreements such as financing, acquisition strategies, power purchase agreements, supply chain, offtake (sales) agreements, and other relevant project documents.

Criterion 3: Workplan (15%)

This criterion involves consideration of the following factors:

• The overall reasonableness and completeness of the Integrated Project Schedule based on the associated complexity of the proposal. incorporating and showing interrelationships among all technical, financial, NEPA, CBP, and permitting and other appropriate factors.



- The degree to which the proposed Workplan and critical path have been clearly and thoroughly described and thoughtfully considered.
- The degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan will succeed in meeting the project goals.
- The strength and level of clarity in the definition of the project phases, metrics, critical path schedule with milestones and decision points, and Go/No-Go criteria.
- The strength of the deliverables as defined in the application, such that DOE and independent experts will be able to review key technical, environmental, financial, regulatory, permitting, and community benefit milestones at appropriate project Go/No Go decision points to mitigate project risk and enable the successful design, procurement, construction, operation, and decommissioning of the proposed project.
- That the preliminary pilot plant operations plan (i.e., parametric testing and continuous operations targets) has set relevant performance targets and will address the necessary data gaps to make meaningful advancements to de-risking the technology in order to advance to FOAK demonstration, beyond the DOE award performance period.
- The extent to which the Community Benefits Plan is integrated into the project management schedule and provides mechanisms with measurable actions that enable impacts to project direction in a timely manner.

Criterion 4: Management Team and Project Partners (15%)

This criterion involves consideration of the following factors:

- The capability of the applicant, the proposed team, and key personnel to manage and address all aspects of the proposed work with a high probability of success.
- The qualifications and relevant experience, including number of years, demonstrated safety performance history, and specific project experience, of the key project participants in performing similar projects and the allocation of responsibility commensurate with this experience.
- The reasonableness of the time commitment from key personnel to successfully manage a project of this size and complexity.
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan.
- The degree to which existing facilities and/or infrastructure provided by the applicant team are leveraged to support the project.
- The degree to which the applicant has defined and described a project management structure that addresses interfaces with DOE and key team members.
- The clarity and appropriateness of the roles of the team members.
- Adequacy and clarity of the risk management discussion as it pertains to the project team and project management aspects of the proposed project.
- A demonstrated understanding of key team and project management risks involved in the proposed work; as well as the quality of the mitigation strategies to address them.



Criterion 5: Community Benefits Plan (20%)

This criterion involves consideration of the following factors:

Community and Labor Engagement

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

Investing in the American Workforce

- Extent to which applicant demonstrates the creation and retention of quality jobs sufficient to attract and retain a skilled workforce; ready access to a sufficient supply of appropriately skilled labor and investments in training; and an effective plan to minimize the risk of labor disputes or disruptions.
- Extent to which the approach to document the knowledge, skills, and abilities of the workforce required for this project will result in improved understanding of the workforce implications related to the commercial deployment of the carbon capture technology.

Diversity, Equity, Inclusion, and Accessibility

- Extent to which the Community Benefits Plan 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, and other DEIA commitments.
- 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

- Extent to which the Community Benefits Plan identifies specific and measurable impacts of the pilot project, the extent they flow to disadvantaged communities, and provides an actionable plan for how to deliver benefits and mitigate negative impacts; and
- Extent to which the plans for data collection and analysis related to community impacts including changes to non-CO₂ air and water pollution—will result in improved understanding of public impacts related to carbon capture technology.

5.2.3 Criteria for Replies to Reviewer Comments

DOE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Application.



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 <u>https://www.energy.gov/management/articles/merit-review-guide-financial-assistance-and-unsolicited-proposals-current</u>

5.4 Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the competitive downselect, 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. Nonfederal 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:

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available DOE funding to achieve programmatic objectives;
- The degree to which the proposed project improves the environmental co-benefits to the surrounding communities;
- The degree to which the proposed project achieves carbon storage and/or utilization in addition to its capture;
- The degree to which the proposed project enables broader deployment of the carbon capture technology, i.e., in industrial sectors that differ from the sector addressed by the large-scale pilot project ;
- The level of industry involvement and ability to accelerate scale-up beyond the large-scale pilot to successful demonstration, replication, and wide-spread commercialization;
- The degree to which the proposed project is likely to lead to increased high-quality employment and manufacturing in the United States;
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty;



- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
- The degree to which the proposed project incorporates 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; and
- The degree to which the proposed project, when compared to the existing DOE project portfolio and other projects to be selected from the subject FOA, contributes to the total portfolio meeting the goals reflected in the Community Benefits Plan criteria.
- The degree to which the proposed project will employ procurement of U.S. iron, steel, manufactured products, and construction materials.

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 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. Pre-selection interviews are distinct from and more formal than pre-selection clarifications (See <u>Section 5.6.3.</u>). 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. 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.



5.6.3 Pre-Selection Clarification

DOE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application. The preselection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written response to DOE's written clarification questions or video or conference calls with DOE representatives.

The information provided by applicants to DOE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and DOE's selection decisions. If DOE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

DOE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

5.6.4 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 Fed<u>eral Awardee Performance and Integrity Information System (FAPIIS)) (</u>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.



5.6.5 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.

5.6.6 Program Downselect

OCED will conduct a competitive project review (downselection process) upon the completion of Phase 1. Recipients will present their projects to DOE individually (not to other recipients). The competitive downselect criteria will be contained in Phase 1 awards. Note that requirements for Phases 2 -4 will also be negotiated in Phase 1 awards.

Upon completion of the competitive project review (downselection process), DOE will select which projects will receive Federal funding beyond Phase 1. Due to the availability of funding and program considerations, only a portion of the recipients will be selected to receive funding for project continuation.

As a result of this downselect process, certain projects will not receive federal funding under this FOA beyond Phase 1 even if the project meets the negotiated deliverables.

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.

6.0 Award Administration Information

6.1 Notifications

6.1.1 Ineligible Submissions

Ineligible Concept Papers and 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 Concept Paper or the Application is ineligible and not considered for further review.



6.1.2 Concept Paper Notifications

DOE will notify applicants of its determination to encourage or discourage the submission of an Application. DOE will post these notifications to OCED eXCHANGE. DOE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notifications.

Applicants may submit an Application even if they receive a notification discouraging them from doing so. By discouraging the submission of an Application, DOE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing an Application that is unlikely to be selected for award negotiations.

6.1.3 Application Notifications

DOE will notify applicants of its determination via a notification letter 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 on particular Applications will be made at a later date, subject to the availability of funds or other factors.

6.1.4 Successful Applicants

Receipt of a notification letter selecting an Application for award negotiations does not authorize the applicant to commence performance of 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 applicant 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.

6.1.5 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 performance of the project. DOE may ultimately determine to select or not select the Application for award negotiations.

6.1.6 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

Recipients 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. Recipients must require subrecipients' compliance with all applicable requirements. Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement.

7.0 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: CCpilotsprogram@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: <u>https://OCED-exchange.energy.gov</u>. 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: <u>OCED-ExchangeSupport@hq.doe.gov</u>. Include FOA name and number in subject line.

8.0 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 FOA. 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.

Important Guidance for Company Submitters:



As per DOE's FOIA regulations and Department of Justice FOIA guidance, if DOE receives a FOIA request the following general steps will be taken:

- DOE will review the request to determine whether your company's information is subject to the request. Only federal records are subject to FOIA requests. Depending on the circumstances, information submitted by an outside entity may be considered "federal records" for purposes of FOIA.
- If your company information is determined to be a federal record and responsive to a FOIA request, DOE will review what is submitted in order to determine if DOE can make a determination whether the information is legally exempt.
 - a. If DOE determines your information is fully exempt under an exemption and that it will not be released, DOE may not contact you.
 - b. If DOE is unable to determine whether the information is exempt under an exemption or is planning on releasing some or all of your information, DOE will first contact you in order for you to have an opportunity to respond and provide additional justification as to why it may be exempt. DOE will do all that it can to work with company submitters to be in compliance with the law and maintain positive relations with company submitters.
 - c. It is critical if DOE or DOE's contractors who are processing your FOIA contact you that you respond in a timely manner. DOE is under strict deadlines when processing a FOIA request.

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 the 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 Informational Webinar

DOE may conduct one informational webinar during the FOA process. If planned, it will be held after the initial FOA release but before the due date for Concept Papers.

Attendance is not mandatory and will not positively or negatively impact the overall review of any applicant submissions. As the webinar will be open to all applicants who wish to participate, applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

8.5 Teaming Partner List

DOE is compiling a Teaming Partner List to facilitate the formation of new project teams for this FOA. The Teaming Partner List allows organizations who may wish to participate on an application to express their interest to other applicants and to explore potential partnerships.

Updates to the Teaming Partner List will be available in OCED eXCHANGE. The Teaming Partner List will be regularly updated to reflect new teaming partners who provide their organization's information.

SUBMISSION INSTRUCTIONS: Any organization that would like to be included on this list should submit the following information: Organization Name, Contact Name, Contact Address, Contact Email, Contact Phone, Organization Type, Area of Technical Expertise, Brief Description of Capabilities, and Area of Interest. Interested parties should email the information to <u>CCpilotsprogram@hq.doe.gov</u> with the subject line "Teaming Partner Information."

DISCLAIMER: By submitting a request to be included on the Teaming Partner List, the requesting organization consents to the publication of the above-referenced information. By facilitating the Teaming Partner List, DOE is not endorsing, sponsoring, or otherwise evaluating the qualifications of the individuals and organizations that are self-identifying themselves for placement on this Teaming Partner List. DOE will not pay for the provision of any information, nor will it compensate any applicants or requesting organizations for the development of such information.

8.6 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.

8.7 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

As set forth in 2 C.F.R. § 200.216, recipients 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.

8.8 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 DECs prior to the issuance of awards under this FOA. DOE may require additional submissions or requirements as authorized by any applicable DEC.



8.9 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.

8.10 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 awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., nonprotected 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.

8.11 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.

8.12 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 <u>2 C.F.R.</u> § <u>200.113</u>. 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.

8.13 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 <u>here</u>.

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 <u>DOE Financial Assistance Letter</u> on this topic. Additional information on DOE's Commitment to Domestic Manufacturing for DOE-funded R&D is available <u>here</u>.

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. <u>See Section</u> <u>8.8</u> Title to Subject Inventions for more information on the DEC and DOE Patent Waivers.

8.14 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.



8.15 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.

8.16 Interim Conflict of Interest Policy for Financial Assistance

The DOE Interim Conflict of Interest Policy for Financial Assistance (COI Policy) can be found <u>here</u>. 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 in the interim COI policy. The Recipient must certify that it is compliant with all 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
Project Summary	PDF	2 pages	ControlNumber_LeadOrganization_Project_Summary
Business Development and Management	PDF	10 pages	ControlNumber_LeadOrganization_BDM
Engineering, Procurement, Construction, and Operations	PDF	10 pages	ControlNumber_LeadOrganization_EPCO
Safety, Security, and Regulatory Requirements	PDF	6 pages	ControlNumber_LeadOrganization_SafetySecurity
Risk Analysis and Mitigation	PDF	6 pages	ControlNumber_LeadOrganization_RiskAnalysis
Techno-Economic Analysis and Life Cycle Analysis Projections	PDF, MS Excel	10 pages	ControlNumber_LeadOrganization_TEA_LCA
Workplan	PDF	<mark>6 pages</mark>	ControlNumber_LeadOrganization_Workplan
Environmental Health and Safety Assessment (not included in the 50-page Technical Volume limit)	PDF	N/A	Control Number_LeadOrganization_EHSA
State-Point Data Table (not included in the 50-page Technical Volume limit)	PDF	<mark>N/A</mark>	ControlNumber_LeadOrganization_StatePoint
Community Benefits Plan: Job Quality and Equity	PDF	12 pages	ControlNumber_LeadOrganization_CBP
Community Partnership Documentation	PDF	Each letter may not exceed 3 pages	ControlNumber_LeadOrganization_PartnerDoc
Resumes	PDF	2 pages each	ControlNumber_LeadOrganization_Resumes
Letters of Commitment	PDF	1 page each	ControlNumber_LeadOrganization_LOCs
Budget Justification Workbook	MS Excel	N/A	ControlNumber_LeadOrganization_Budget_Justificati on
Subrecipient Budget Justification	MS Excel	N/A	ControlNumber_LeadOrganization_Subrecipient_Bud get_Justification
Summary of Public Release	PDF	1	ControlNumber_LeadOrganization_Public_Release
Summary Slide	MS PowerPoint	5	ControlNumber_LeadOrganization_Slide
Current and Pending Support Disclosures	PDF	2	ControlNumber_LeadOrganization_CPS
Potentially Duplicate Funding Notice	PDF	2	ControlNumber_LeadOrganization_PDFN
Transparency of Foreign Connections	PDF	2	ControlNumber_LeadOrganization_TransparencyFC
Disclosure of Lobbying Activities	PDF	N/A	ControlNumber_LeadOrganization_LLL



APPENDIX B – LIST OF ACRONYMS

DEIA	Diversity, Equity, Inclusion, and Accessibility
DOE	Department of Energy
OCED	Office of Clean Energy Demonstrations
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
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
ОМВ	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
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 – DOE TECHNOLOGY READINESS LEVEL SCALE

Relative Level	Technology	TRL Definition	Description
of Technology	Readiness		
Development	Level		
	TRL 9	Actual system operated	Actual operation of the technology is in its final form,
System		over the full range of	under the full range of operating conditions. Examples
Operations		expected conditions	include using the actual system with the full range of
		Actual system completed	The technology has been proven to work in its final form
	INC 0	and qualified through	and under expected conditions. In almost all cases, this TRI
		test and demonstration	represents the end of true system development. Examples
			include developmental testing and evaluation of the
System			system with real waste in hot commissioning.
Commissioning	TRL 7	Full-scale, similar	Prototype full-scale system. Represents a major step up
		(prototypical) system	from TRL 6, requiring demonstration of an actual
		demonstrated in relevant	prototype system in a relevant environment. Examples
		environment	include testing the prototype in the field with a range of
		Engineering/nilot scale	Simulants and/or real waste and cold commissioning.
	TREO	similar (prototypical)	system which is well beyond the lab scale tested for TRI 5
Technology		system validation in	is tested in a relevant environment. Represents a major
Demonstration		relevant environment	step up in a technology's demonstrated readiness.
			Examples include testing a prototype with real waste and a
			range of simulants.
	TRL 5	Laboratory scale, similar	The basic technological components are integrated so that
		system validation in	the system configuration is similar to (matches) the final
		relevant environment	application in almost all respects. Examples include testing
Technology			with a range of real waste and simulated environment and/or
Development	TRL 4	Component and/or	Basic technological components are integrated to establish
		system validation in	that the pieces will work together. This is relatively "low
		laboratory environment	fidelity" compared with the eventual system. Examples
			include integration of "ad hoc" hardware in a laboratory
			and testing with a range of simulants.
	TRL 3	Analytical and	Active research and development is initiated. This includes
		function and/or	validate the analytical predictions of separate elements of
Research to		characteristic proof of	the technology Examples include components that are not
Prove		concept	yet integrated or representative. Components may be
Feasibility		•	tested with simulants.
	TRL 2	Technology concept	Invention begins. Once basic principles are observed,
		and/or application	practical applications can be invented. Applications are
	-	formulated	speculative, and there may be no proof or detailed analysis
Basic			to support the assumptions. Examples are still limited to
Technology	TDI 1	Basic principles observed	analytic studies.
Research		and reported	begins to be translated into applied R&D Examples might
			include paper studies of a technology's basic properties.



APPENDIX D – BASIS FOR TECHNO-ECONOMIC ANALYSIS

The Techno-Economic Analysis (TEA) required as part of the final deliverables for DE-FOA-0002963 shall follow the analysis procedures documented in NETL's "*Quality Guidelines for Energy System Studies: Performing a Techno-Economic Analysis for Power Generation Plants*"²² to the greatest extent possible.

Adjustments to the guidelines can be made under **TA-1** (industrial capture) due to the nature of the industrial facility and capture technology being modeled. Industrial facilities that include power and heat production integrated with the industrial facility should include it in their TEA according to the guidelines. The TEA shall provide the cost of the proposed capture technology to achieve at least 90% carbon capture efficiency. It is highly recommended that the TEA present both the gross CO₂ removed from flue gas for the system configuration presented (relevant to equipment sizing), as well as the net CO₂ removed when accounting for other on-site emission point sources within the total plant boundary (informative for system efficiency relating to CO₂ captured). Applicants should include a general process flow diagram identifying all major process equipment for the plant including CO₂ capture and compression systems, separation vessels, heat exchangers, pumps, compressors, etc.

As specifically outlined in the document, required elements of a complete TEA (both **TAs**) include:

- Material and energy balances around the complete power plant and around all major pieces of equipment there in, including all heating and cooling duties, and electric power requirements
 - For Industrial Capture include material and energy balances around the complete capture system along with relevant integrations into the Industrial Facility.
- General block flow diagram identifying all major process equipment with complete stream tables showing operating pressures, temperatures, compositions, and enthalpies for all streams entering or leaving major process equipment
- Economic analysis that follows the NETL "Quality Guidelines for Energy System Studies: Cost Estimation Methodology for NETL Assessments of Power Plant Performance."²³ The code of accounts for the capital cost estimate will follow those used in the Cost and Performance Baseline for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity", aka the Bituminous Baseline Study (BBS). Operating and maintenance cost will be itemized and also follow the format used in the BBS.
 - Estimates for equipment and consumables unique to the process being developed. If possible, capital cost estimates for unique equipment will be made based on similar equipment that may exist for other type processes. If equipment analogs do not exist for unique equipment the developer must do a bottoms-up estimate.
- Final Summary report

²² Quality Guidelines for Energy System Studies: Performing a Techno-Economic Analysis for Power Generation Plants, National Energy Technology Laboratory, DOE/NETL-2015/1726, July 2015, <u>https://netl.doe.gov/energy-analysis/details?id=711</u>

²³ <u>http://www.netl.doe.gov/File%20Library/research/energy%20analysis/publications/QGESSNETLCostEstMethod.pdf</u>



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

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

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

Assumptions and methodology to be used for the study are discussed below.

System Boundaries (as/if applicable to the technology proposed):

- 1) Delivered coal or natural gas entering the power plant, through high-pressure, high-purity CO₂ stream crossing the plant boundary. For Industrial Capture, electricity source (either grid with price matching sources listed in LCA <u>Appendix G</u>) or system designed and accounted for within the system boundaries (i.e., natural gas combined cycle with carbon capture)
- 2) Combustion air or intake air to air separation unit
- 3) Ambient air conditions
- 4) Flue gas to stack
- 5) Net electricity conditioned and sent to electric grid
- 6) Raw make-up water
- 7) Waste streams generated by the plant, including the CO₂ capture system, shall be adequately treated on-site prior to disposal either by landfill or other commercial disposal options.

Process Design Assumptions (as/if applicable to the technology proposed):

The TEA study should include at a minimum the following:

- 1) Site Characteristics and Ambient Conditions for each location
- 2) Cryogenic Air Separation Unit Design (if incorporated)
- 3) Boiler or Gasifier Design (if incorporated)
- 4) Steam or Gas Turbine Cycle Conditions (if incorporated)
- 5) Energy storage Unit design (if incorporated)
- 6) Environmental Controls and Performance
- 7) Balance of Plant
- 8) Economic Assumptions and Methodology
- 9) Reporting Requirements (including significant process figures, stream and performance tables, equipment lists, and cost accounts)



Design Basis for CO₂ Capture and Compression:

CO ₂ Removal	90%
CO₂ Purity	Satisfy 'Conceptual Design Limits' for Enhanced Oil Recovery as listed in Exhibit 2-1 of the NETL "Quality Guidelines for Energy System Studies: CO ₂ Impurity Design Parameters."
CO ₂ Delivery Pressure	2,215 psia
CO ₂ Transport & Storage Cost	\$10/tonne CO ₂
Steam Extraction Location, if used	Give location from steam source design

Process Flow Diagram & Material Energy Balances:

To adequately provide reviewers a clear understanding of the proposed process and project, all applications (both **TA-1** and **TA-2**) must include a block flow diagram (.pdf file legible at 8.5 inches by 11 inches) and a corresponding process description. Any required integrations into power or balance of plant for the proposed CO₂ capture process so that it can be cost-effectively developed shall also be discussed. If alternative CO₂ utilization pathways are considered, all associated process steps should be included in the design.

There are no specific software requirements for developing the material and energy balances or costing the capture process. However, all material and energy balance calculations must be accurate, and equilibria, physical and thermodynamic properties must be calculated using rigorous models. Similarly, mass and heat transfer models employed must be based upon a rigorous mathematical description of transport phenomena. Methods and models used must be documented in the final report for the project.

Calculated Output from Analysis:

- 1) Block flow diagram and accompanying stream tables similar to Exhibits 4-32 and 4-33 of the BBS.
- 2) Performance Summary similar to Exhibit 4-34 and 4-35 of the BBS.
- 3) Air Emissions tables similar to Exhibits 4-36 of the BBS. At a minimum, the table should illustrate the CO₂ reduction in tonnes/year and ppm from NGCC or industrial facility and any other emissions that would be generated by the NGCC power plant or industrial facility or balance of plant systems. Values for CO₂ removal should be presented in gross and net terms.
- 4) Carbon, sulfur, and water balances similar to Exhibits 4-37, 4-38, and 4-39 of the BBS, if applicable. Carbon and water balances are likely to be needed for all processes.



- 5) Itemized equipment list for equipment unique to the capture and compression systems and other equipment required for the integration of the capture and compressions systems with the plant.
- 6) Itemized capital cost estimate of the plant with capture and compression system similar to Exhibit 4-43 and 4-44 of the BBS. The economic analysis will be performed nominal/present day cost basis. Account 5 should account for capture system on any fossil-based power on plant site while account 15 should be added for all components of the capture system. Costs should be broken down by carbon capture system component and not just as one lump sum.
- 7) Itemized operating and maintenance cost estimate similar to Exhibit 4-45 of the BBS. Cost of Capture and Cost of CO₂ Avoided should be calculated for gross CO₂ captured for the total plant, the gross CO₂ captured by the capture system and net CO₂ captured and removed from the flue gas.
- 8) Sensitivity analysis identifying critical CO₂ capture technology and operating parameters and their impact on overall plant performance and economics. This analysis shall include the sensitivity of cost of the product and breakeven CO₂ sales price to the capital cost of the capture and compression system, as well as carbon capture cost as a function of carbon capture efficiency, for every percent efficiency point from 90% to 99%. Carbon capture efficiencies in excess of the design basis can be achieved either by the proposed carbon capture system or in combination with negative emissions technologies (NETs) including, but not limited to, direct air capture (DAC), bioenergy with carbon capture and storage (BECCS), and enhanced weathering.
- 9) Maximum carbon capture efficiency achievable with the proposed carbon capture technology and the technology pathways to achieve higher capture efficiencies and zero net carbon emissions. In addition, a cost curve starting from the optimal carbon capture rate relative to cost (\$/tonne of CO₂ captured) for the proposed technology up to the maximum capture rate that is at least 90% will be provided.



APPENDIX E – STATE-POINT DATA TABLES

APPLICANT REMINDER: The State-Point Data Table is required to be completed and submitted with your application. Applicants that do not submit a State-Point Data Table or submit an incomplete table will be considered non-compliant and DOE will not review or consider noncompliant submissions. The State-Point Data Table is a separate document in the application and is not included in the 50-page Technical Volume page limit.

Instructions for completing data tables: The tables that follow in this attachment shall be populated with data provided by the applicant and included as part of an application's Scientific and Technical Merit section. 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. If there are any differences between the gas stream(s) used for the prior scale technology development and the gas stream(s) to be used in the proposed project, applicants must discuss these differences and any potential impacts on the proposed project.

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 flue 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 flue gas having a similar CO₂ concentration as to the one in the selected industrial application.

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 flue gas conditions. Applicants should substantiate performance of the proposed technology by providing pilot-scale validation (i.e., total system) with NG or coal relevant flue gas conditions.



	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	сР		
Surface Tension @ STP	dyn/cm		
CO ₂ Mass Transfer Rate [KL]	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	сР		
Desorption			
Pressure	bar		
Temperature	°C		
Equilibrium CO ₂ Loading	gmol CO2/kg		
Heat of Desorption	kJ/kg CO ₂		
Pilot Scale Data			
Location			
The following information should	d be provide	d for the longest stead	dy-state duration test
performed at pilot scale	I		
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 %		

Table 1. State-Point Data for Solvent Based Systems



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	Mol% (or	
Concentration	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 CO_2 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 bottom 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 CO_2 in equilibrium with the solution. If the vapor phase is pure CO_2 , this is the total pressure, and if it is a mixture of gases, this is the partial pressure of CO_2 .

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.

 CO_2 Reaction Rate – A characterization of the CO_2 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

 CO_2 Product Oxygen Concentration – Oxygen content of the CO_2 produced during the long-term testing



	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	m³/m³		
Packing Density	m²/m³		
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 CO2/kg		
Heat of Adsorption	kJ/gmol CO ₂		
CO ₂ Adsorption Kinetics	gmol/time		
Desorption			
Pressure	bar		
Temperature	°C		
Equilibrium Loading	gmol CO2/kg		
Heat of Desorption	kJ/gmol CO ₂		
CO ₂ Desorption Kinetics	gmol/time		
Pilot Scale Information			
Location			
The following information shou	uld be provide	d for the longest stead	dy-state duration test
performed at pilot scale	-		
Scale	tCO ₂ /year		
Duration of Long-Term Test	hrs		
(consecutive hours)			
CO ₂ concentration in feed	%		
stream (e.g, flue gas, process stream)			
Carbon Capture Efficiency	%		

Table 2. State-Point Data for Sorbent Based Systems



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	Mol% (or	
Concentration	ppm)	

Definitions for Table 2:

Attrition Index – For circulating sorbents, the attrition index includes the percentage and size of the fines generated.

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 CO_2 in equilibrium with the sorbent. If the vapor phase is pure CO_2 , this is the total pressure, and if it is a mixture of gases, this is the partial pressure of CO_2 .

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 CO_2 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



	Units	Measured/ Estimated Performance	Projected Performance
Materials Properties			
Materials of Fabrication for Se	lective Layer		
Materials of Fabrication for Su (if applicable)	pport Layer		
Nominal Thickness of Selective	e Layer (mm)		
Membrane Geometry			
Max Trans-Membrane Pressure	bar		
Hours tested without degradation	significant		
Membrane Performance			
Temperature	°C		
Pressure Standardized Flux for Permeate (CO ₂)	GPU or equivalent		
CO ₂ /H ₂ O Selectivity	-		
CO ₂ /N ₂ Selectivity	-		
Type of Measurement (Ideal or mixed gas)	-		
Proposed Module Design			
Flow Arrangement	-		
Packing Density	m²/m³		
Shell-Side Fluid	-		
Pilot Scale Information			
Location			
The following information should be provided for the longest steady-state duration test performed at pilot scale			dy-state duration test
Scale	tCO ₂ /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	%		

Table 3. State-Point Data for Membrane Based Systems



Ending CO ₂ Capture	%	
Efficiency		
Membrane Performance	%/year	
Degradation		
CO ₂ Product Purity	Mol % dry	
CO ₂ Product Oxygen	Mol% (or	
Concentration	ppm)	
Membrane Feed Pressure*	psia	
Permeate Pressure*	psia	

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 cm³/(cm²·s·cmHg) at 1 atm and 0 °C. For non-linear materials, the dimensional units reported shall be based on flux measured in cm³/(cm²·s) (at 1 atm and 0 °C) with pressures measured in cm Hg. Note: 1 GPU = $3.3464 \times 10-6$ kgmol/(m²·s·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 flue 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, cross-flow 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 CO_2 Capture Efficiency – Capture efficiency achieved in the last hour of long-term testing CO_2 Product Purity – Average purity of the CO_2 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 F – BASIS FOR CARBON CAPTURE TECHNOLOGY EH&S ASSESSMENT

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 initial assessment of EH&S risks is required with the application as well as a final version as an end of project deliverable. The final EH&S assessment shall be coordinated and consistent with the carbon oxides capture and Pipeline FEED Studies, and the Storage Field Development Plan. The EH&S assessment shall be conducted by qualified and experienced organizations and professionals (*e.g.,* environmental scientists, industrial hygienists, safety engineers).

The EH&S Assessment should include the following, at a minimum:

- 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, project teams should have already characterized any possible byproducts of side reactions that might also occur in the system and developed mitigation strategies, accumulated waste products, and the fate of contaminants from the feed gas stream. Environmental degradation products shall be addressed. Bioaccumulation, soil mobility, and degradability shall be considered. Conditions at the point of discharge shall be examined.
- 2) If possible, a concise but complete and comprehensible description of the various toxicological effects of the substances identified in (1) above shall be provided. A thorough literature search shall be conducted to examine potential human health effects and ecotoxicity. Where information is lacking for a particular material, it shall be compared to similar substances or classes of substances.
- 3) Properties related to volatility, flammability, explosivity, other chemical reactivity, and corrosivity shall also be collected from existing databases or if necessary, through direct measurement in cases where the substance is not in common use.
- 4) The compliance and regulatory implications of the proposed 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 (CERCLA), Toxic Substances Control Act (TSCA), Clean Water Act (CWA), Clean Air Act (CAA), Superfund Amendments and Reauthorization Act (SARA) Title III, and the Occupational Safety and Health Act (OSHA).



5) An engineering analysis shall be conducted for any potentially hazardous materials identified to look for ways their use can be eliminated or minimized. Less hazardous materials should be substituted where possible.

For any new materials being proposed, synthetic options shall be examined that may lead to similar, less-hazardous compounds with the required functionality. Possible engineering controls and other mitigation strategies shall be described as appropriate.

6) Precautions for safe handling and conditions for safe storage shall be identified, including any incompatibilities with other materials that may be used in the process. Waste treatment and offsite disposal options shall be examined. Accidental release measures shall also be discussed.



APPENDIX G – LIFE CYCLE ANALYSIS

Applicants will submit a preliminary Life Cycle Analysis (LCA) with their application. Recipients will submit an updated LCA as an end of project deliverable. LCAs are to be conducted on the same reference plant as used for the TEA analysis. The LCAs shall be conducted to demonstrate the potential environmental impacts of capturing at least 90% of unit-wide carbon oxides emissions and storing the captured carbon oxides in secure geologic formations.

The scope of the LCAs for **TA-1** is cradle to gate, where the gate is defined as the production of industrial products ready for transport from the industrial facility. **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.

Preliminary LCA Guidance

- 1. Applicants shall provide a screening-level, greenhouse-gas only analysis with scopes and functional units as defined above, and a contribution analysis showing at a minimum the impacts from fuel extraction and delivery, plant direct emissions, and carbon oxides transport and storage.
- While documentation and report do not necessarily need to follow the <u>NETL CO2U LCA</u> <u>Guidance Document</u>, 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** 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 storage of captured carbon oxides is included within the system boundary. The transportation, use, and end-of-life management of the industrial products is excluded from the life cycle system boundary.
 - 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.
- 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 <u>NETL CO2U</u> <u>LCA Guidance Document</u>, see Guidance Document <u>Appendix C</u> "Alternative Co-product Management Methods."

3. **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 <u>NETL CO2U openLCA LCI Database [Version 2.1 (or latest)]</u> and the <u>NETL CO2U Documentation Spreadsheet</u> as "Saline aquifer transport and storage."


- vi. Electricity transmission and distribution life cycle inventory values (gate-togate emissions data to be use for **TA-2** life cycle modeling projects):
 - 1. Sulfur Hexafluoride 7.87E-05 kg/kg CO₂ stored
 - Electricity transmission and distribution electricity loss rate to be used for TA-2 life cycle modeling projects are determined by state from the table below (derived from <u>EIA State Electricity Profiles</u>):

State	T&D Loss Rate	State	T&D Loss Rate	State	T&D Loss Rate
AL	3.5%	LA	5.3%	ОН	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%
СТ	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. TA-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:
 - The scope of environmental impacts shall include all the additional impact categories listed in Section 2.1.8.2 of the <u>NETL CO2U LCA Guidance Document</u>. 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 <u>NETL</u> <u>CO2U LCA Guidance Document</u>.
 - 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:

	AR4 (IPC	C 2007) ²⁴	AR6 (IPCC 2013) ²⁵		
GHG	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 DOE 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 <u>NETL CO2U LCA Guidance Document</u>
 - ii. NETL Life Cycle Inventory Data <u>NETL CO2U openLCA LCI Database</u>
 - iii. Electricity Consumption LCI Data <u>NETL Grid Mix Explorer</u>

²⁴ 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/

²⁵ 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
 - ii. Chapter 6 "Completing the NETL CO2U LCA Report Template"
 - iii. LCA Model with Life Cycle Inventory Data see <u>NETL CO2U LCA Guidance</u> <u>Document</u>, for modeling guidance (no specific LCA software type is required)

List of all licensed LCA data used within the model with external reviewer limitedlicense access for DOE review.



APPENDIX H – 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 economy security.²⁶ 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
- e. it has the intent and ability to comply with the U.S. Competitiveness Provisions (see <u>Section 8.13</u>); and
- f. The foreign entity will satisfy other conditions that may be deemed necessary by DOE to protect United States government interests.

²⁶ See <u>Critical and Emerging Technologies List Update (whitehouse.gov)</u>.



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;
- 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
- d. foreign entity participate (must address the criteria above);
- e. A description of the project's anticipated contributions to the United States economy;
- f. 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;
- g. A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
- h. 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 sub-agreement 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 <u>Section 4.9.7</u>, 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.