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

# Point Source Carbon Capture Large-Scale Pilots, Commercial Demonstrations, and Networked Demonstration Commercialization

# Appendix A
# Carbon Capture FEED Guidance

**Funding Opportunity Number:** DE-FOA-0003474

**Carbon Capture Demonstration Projects Program**

*Topic Area 1 and Topic Area 3*

**Concept Papers due:** March 1, 2025, 5:00pm ET

**Application due:** July 1, 2025, 5:00 pm ET

**Carbon Capture Large-Scale Pilot Projects Program**

*Topic Area 2*

**Concept Papers due:** March 1, 2025, 5:00 pm ET

**Application due:** July 1, 2025, 5:00 pm ET

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# Carbon Capture FEED Study Guidance

The carbon capture FEED study is a required deliverable. Activities proposed should include, but are not limited to, those listed below:

1. **Project Scope and Design** that includes deployment/business objectives and the summary of the proposed project. The roles and scope of work for the different parties involved in the project must be clearly delineated. The arrangement with the base plant/facility during the planning/construction phase and capture plant operation phase should be made clear.

2. **Project Design Basis** including, but not limited to site characteristics and ambient conditions, fuel feedstock and flue gas characteristics, flue gas quality controls, $CO_2$ offtake specifications, safety requirements, process life expectancy, high-level testing requirements, commissioning requirements, code of records, and host site environmental requirements. The design basis shall clearly identify all permits and environmental reviews necessary to initiate construction. All internal or corporate approvals required by the host site to initiate construction shall be identified. If after completing the FEED, it is decided that a different plant configuration should be considered, and that the reported design is not viable, this information should be communicated clearly up front. If major design changes are required, this should be reflected in the project timeline, and a path forward clearly outlined.

3. **Engineering Design Package** shall meet AACE Class 3 estimates. The package shall include design of the carbon capture system that shall result in equipment sizing fully substantiated with kinetic, heat and mass transfer data, as well as justification for choice of materials of construction. The cost estimate shall include preparation of a capital cost estimate, including the cost of capture in $/tonne carbon oxides captured, operations and maintenance costs, and levelized cost of electricity (electric generation sites) or levelized cost of product (industrial/commercial sites). The FEED shall include, at a minimum: block flow diagram, process flow diagrams; carbon capture process model scaled up for the proposed powerplant or industrial facility; utility flow diagrams; piping and instrumentation diagrams; heat and material balances; site plan; final layout drawings; complete engineered process and utility equipment lists with all major equipment with specifications and sizing; single line diagrams for electrical; electrical equipment and motor schedules; vendor quotations; detailed project execution plans; resourcing and workforce plans; a hazard and operability study (HAZOP) review; and a constructability review. The FEED shall incorporate all engineering disciplines necessary to perform the final design and construction, which include, but are not limited to process, civil, architectural, structural, mechanical, piping, electrical, and control systems engineering. A list of all referenced work should be provided.

   Engineering design shall cover both the carbon capture system and BoP. BoP includes, but is not limited to, utilities necessary to power the carbon capture system and final delivery for offtake such as: compression, cooling water, water treatment, waste treatment, and the sources of energy, electricity, and/or steam. The latter may include integration of an external energy source (e.g., natural gas-fueled, solar, wind, geothermal). All BoP components shall be incorporated in the updated Cash Flow Model (and/or TEA) and LCA. If the carbon capture

system is designed to purchase renewable electricity or to generate it on site, then the plant must include a method of energy storage or back-up power generation to supply electricity when renewable electricity is not available. If the carbon capture system requires a cogeneration system and/or an auxiliary boiler for generation of steam, then the CapEx, OpEx (fixed and variable, including fuel costs) and relevant cost inputs should be included in the Cash Flow Model and/or TEA. Similarly, $CO_2$ emissions produced from the unit should be accounted for in the LCA.

The engineering design package shall also cover the integration of the carbon capture process within the power or industrial facility, including but not limited to the following: novel approaches to recover waste heat from the facility and integrate it with the carbon capture system; pressure drop controls; and design of pollution control and monitoring systems encompassing upstream/downstream of the carbon capture system. Details of the base plant shall be highlighted before and after retrofit. This includes the year the plant was built, expected plant life, any plans for extension of plant life; and the current and expected capacity factor and operational mode (base load or flexible operation).

Applicants are required to integrate FEED study activities with relevant Community Benefit Plans as appropriate for the project into an overall integrated project schedule.

It is understood that the FEED study package content is tailored to the type of project and the needs of the owner. The goal of the FEED study is for the owner and EPC firm to collaboratively define as much of the project's scope as possible to reduce risk and uncertainty prior to executing the project.