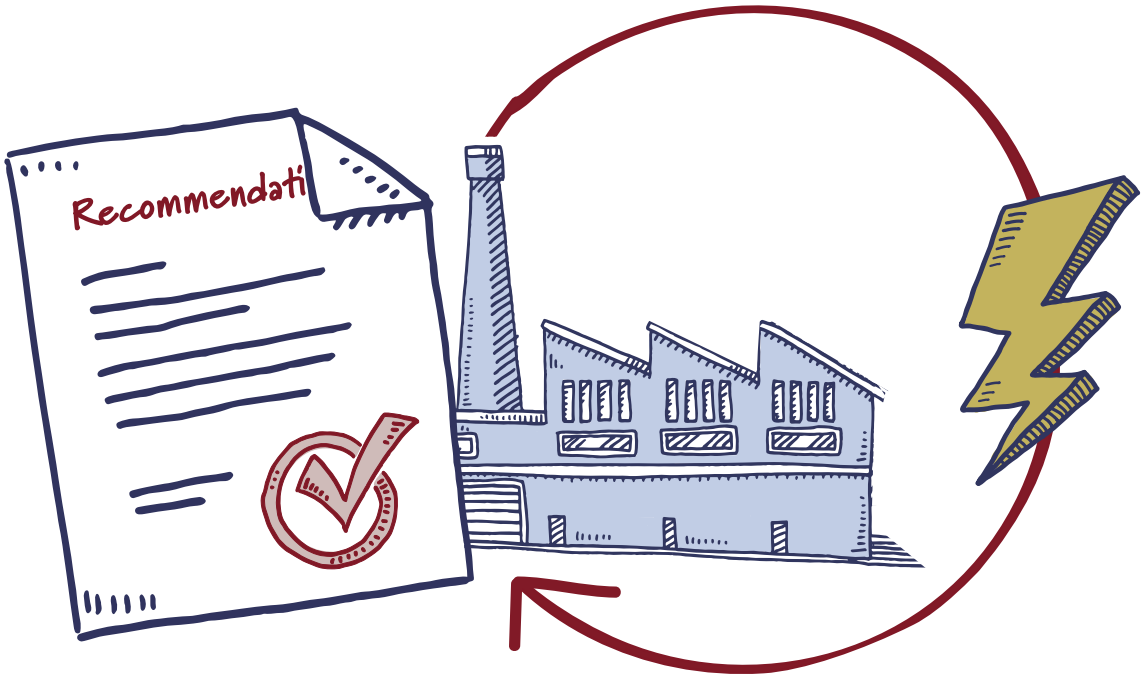

Recommendations for Implementing a Carbon Capture Demonstration Program

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Purpose

The purpose of this white paper is to provide recommendations for implementation of a carbon capture, utilization, and storage (CCUS) demonstration program within the Department of Energy (DOE).

Background

CCUS is a suite of clean energy technologies that are critical to meeting global decarbonization goals. Without prioritizing clean energy innovation and acceleration, meeting global decarbonization goals will not be achievable.[1] A key step in the innovation process is the demonstration phase, which is when technology is introduced at the size of a full-scale commercial unit. The demonstration phase is essential to reduce risks and instill confidence in stakeholders that a technology will perform predictably both technically and economically and facilitate learning on how to bring the technology to market.[3]

The passage of the Infrastructure Investment and Jobs Act (IIJA) infused nearly $12 billion into CCUS programs, with nearly $2.54 billion specifically allocated for a demonstration program originally authorized by the Energy Act of 2020. The funds for the demonstration program are to be made available in the following amounts:

- Fiscal year 2022 - $937,000,000;
- Fiscal year 2023 - $500,000,000;
- Fiscal year 2024 - $500,000,000;
- Fiscal year 2025 - $600,000,000.[4]

It is imperative that this demonstration program be implemented efficiently to lower the cost of CCUS technology, successfully prove out the technology at commercial scale, and ensure prudent stewardship of taxpayers' dollars.

Recommendations

The recommendations provided below are focused on funding projects with the lowest risk and ability to deliver on time and on budget to ensure successful demonstration of CCUS technology.

Diversity of Projects

The Energy Act of 2020 authorized the construction and operation of six carbon capture demonstration facilities – two each of coal electric generation facilities, natural gas electric generation facilities, and industrial facilities outside of the power sector. The Energy Act also directed DOE to ensure a broad geographic distribution of project sites, a broad selection of electric generation facilities, and a broad selection of technologies are represented.[6]

In addition to the direction provided by the Energy Act, projects selected for the program should represent a diversity of disposal or end-use applications. Projects that will geologically sequester, use or sell for enhanced oil recovery (EOR), and/or use or sell for another utilization method should be represented in awardees.

Technology

The focus of this demonstration program should be on deploying low-risk technologies to ensure successful projects. Technology selected should be at least a technology readiness level (TRL) of 6, and projects should have already completed pilot-scale testing and a front-end engineering design (FEED) study. The demonstration program should be technology inclusive and support pre-combustion, post-combustion, and oxy-combustion technologies that meet these criteria. Technologies that have been previously demonstrated should not be disqualified as each project will have its own unique conditions and one project may not be enough to identify successful pathways to deployment or to de-risk the technology.[7]

The IIJA also appropriated $937 million for large-scale pilot projects. The pilot program should be where more innovative, higher risk technologies that are not yet advanced to the point of commercial scale are evaluated.

Cost-Share

Projects should be eligible to receive up to the 50% cost-share as authorized by the Energy Policy Act of 2005.[8] A recent analysis of global CCUS projects from the past 30 years determined that government support, defined as either the project execution being done through government or a government-affiliated body or having more than 50% of project funding done through government grant, of a CCUS project can significantly decrease the failure rates of projects.[9]

Size of Projects

Projects should be large enough to demonstrate commercial scale but not so large that the complexities from scaling up from pilot testing are not well understood. The demonstration projects should not introduce additional complexities or systems that were not present at the pilot scale. In addition, mandating a specific capture threshold may not be the best approach to selecting projects, but it is worth noting that projects that have targeted to capture more than 1 million tonnes of carbon dioxide (CO_2) per year have been shown to be more likely to fail unless the same technology was previously demonstrated at a smaller scale.[10]

Streamlined and Flexible Approach

Access to DOE funding and delivery of decarbonization projects should not be delayed due to administrative obstacles. Permitting processes can delay timelines and result in increased project costs. The IIJA appropriated funding through 2025 for the demonstration projects; therefore, it is imperative that funding and permitting timelines are expedited. Projects securing federal funding will likely trigger the National Environmental Policy Act (NEPA) process, and other permitting programs such as EPA's Underground Injection Control (UIC) Class VI requirements. Siting of these projects must also take into account local and state ordinances; therefore, these projects should be sited in locations where the existing regulatory regime facilitates timely deployment. These permitting processes can generate lengthy timelines, which are of significant concern if projects are to meet the funding timelines. DOE should also evaluate its merit review and contracting practices and identify opportunities to streamline the process to ensure quick distribution of funding.

Flexibility should also be a key component of the demonstration program. Budget periods and performance milestones should be in place to ensure that if a project is not able to move forward for some reason, the funding can be reallocated for additional projects.

Stability of Revenue Streams and Offtake Agreements

Early stage CCUS projects are complex and capital intensive; therefore, demonstration of stable revenue streams should be a focus of funding, e.g., access to tax credits, such as the Section 45Q carbon oxide sequestration credit, selling power, and/or selling captured CO_2 emissions or produced hydrogen. The Section 45Q tax credit is viewed as the single most useful tool in spurring the development of CCUS projects and will be an important complement to DOE funding.

Additionally, projects should have offtake agreements in place for either how to store or utilize the captured CO_2 emissions. Projects that will geologically sequester, use or sell captured CO_2 for enhanced oil recovery (EOR), or use or sell for another utilization method should be represented in awardees. It is recommended that projects demonstrate they have or are in the process of securing offtake agreements as part of the application process.

Stakeholder Engagement

The carbon capture demonstration projects will be funded through the Office of Clean Energy Demonstrations (OCED), a new entity that was also authorized by IIJA. As the OCED begins operations, robust stakeholder engagement will be critical to its success. DOE must ensure that OCED is engaging all relevant stakeholders throughout the demonstration process and provide clear guidance and expectations to project developers on stakeholder engagement, from the initial development of the funding opportunities through project selection, construction, and operation. Ensuring that project developers thoughtfully engage with host communities and ensure that communities directly benefit from these projects are of particular importance.

Synergy with other DOE Programs

The IIJA also provided $2.1 billion for the build-out of CO_2 transportation infrastructure, $2.5 billion for expansion of DOE's carbon sequestration program, $3.5 billion for the build-out of regional direct air capture (DAC) hubs, $500 million for industrial decarbonization demonstration projects, and $8 billion for the development of regional clean hydrogen hubs. DOE should evaluate how best to leverage opportunities across these programs to ensure maximum project delivery with a limited amount of funding as well as development of regional and interregional carbon capture, removal, transport, storage, and utilization networks to share infrastructure and realize economies of scale.

Conclusion

The CCUS investments in the IIJA provide a tremendous opportunity to advance CCUS technology. Implementing the demonstration program effectively and focusing on low-risk technology and projects will ensure success of this program and deployment of this crucial decarbonization technology.

Sources

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