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February 1, 2022

The Honorable Jennifer Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

Dear Secretary Granholm,

The Carbon Utilization Research Council (CURC) is an industry coalition focused on technology solutions for the responsible use of our fossil energy resources in a balanced, low-carbon electricity generation portfolio. CURC's members include electric utilities and power generators that rely upon diverse sources for their electricity production, equipment manufacturers and technology innovators, national associations that represent the power generating industry, labor unions, fossil energy producers, and state, university and technology research organizations. Members of CURC believe that American ingenuity in technology innovation will satisfy the world's growing appetite for affordable energy, improve energy security, create high-paying jobs, improve environmental quality, and greatly reduce carbon dioxide emissions.

International authorities recognize that fossil fuels will continue to be used both here in the U.S. and globally. It is how we manage the carbon dioxide produced from the use of fossil fuels that will determine whether we are able to cost-effectively achieve midcentury emissions reductions necessary to keep the effects of climate change to a minimum. To meet these important objectives, members of CURC are at the forefront of their industries and partnering with the Department of Energy (DOE) to develop and commercialize technologies that will transform the way the world uses our energy resources and simultaneously achieve global climate targets.

The recent enactment of P.L. 117-58, the Infrastructure Investment and Jobs Act (IIJA), represents a considerable opportunity for the United States to deploy clean energy technologies so that they can contribute to President Biden's electric sector decarbonization objectives and be relied on for deep decarbonization across other industrial sectors. One technology that has the ability to contribute to emissions reductions in multiple sectors is carbon dioxide capture, utilization, and storage (CCUS). The IIJA provides \$12.1 billion for CCUS-related programs with a focus on lowering costs and scaling CCUS technologies towards deployment so that they can be relied on to reduce emissions. In particular, the bill includes substantial funding for new CCUS demonstration and large-scale pilot programs that require industry to partner with DOE to demonstrate and deploy innovative technologies. Effective and

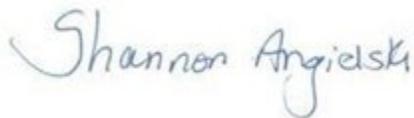
efficient deployment of these dollars will be needed to ensure that these new programs lead to successful CCUS deployment.

CURC has prepared the attached recommendations for implementation of a new CCUS commercial demonstration program for DOE consideration. These recommendations were developed through extensive engagement and assessment among CURC members from their own experiences in partnering with DOE and project development. The recommendations are focused on the following topics:

- Front End Engineering and Design (FEED) Studies
- Demonstration Award Funding and Federal Procurement
- Technologies to Consider in the Demonstration Program
- Large-Scale Pilot Projects
- Large-Scale CO₂ Commercial Storage Opportunities
- Financing CCUS Projects
- Loan Programs Office (LPO) Recommendations
- National Environmental Policy Act (NEPA) Considerations
- Environmental Justice Obligations

We would be happy to meet with you or members of your staff to discuss the proposed recommendations in greater detail and look forward to continued engagement with the Department to ensure the success of the Commercial CCUS Demonstration program that will be supported by the Department.

Sincerely,



Shannon Angielski
Executive Director
Carbon Utilization Research Council

CC:

David Turk, Deputy Secretary of Energy, U.S. Department of Energy
Brenda Mallory, Chair, White House Council on Environmental Quality
Jigar Shah, Director, Loan Programs Office, U.S. Department of Energy
Jennifer Wilcox, Acting Assistant Administrator for Fossil Energy and Carbon Management, U.S. Department of Energy

Attached:

The Carbon Utilization Research Council (CURC) is pleased to present the U.S. Department of Energy with the following recommendations to inform the implementation of a new Commercial CCUS Demonstration Program as required under the Infrastructure Investment and Jobs Act (P.L. 117-58). Members of CURC are at the forefront of the development of carbon capture, utilization, and storage (CCUS) technologies and have a long history of productive partnerships with the Department of Energy (DOE) across the technology development pipeline. These recommendations reflect the findings of CURC members following a thorough assessment of lessons learned from prior and ongoing project partnerships with the Department, current technology needs, project development experiences, and other considerations that will help inform the CCUS demonstration program. While the recommendations primarily focus on the Commercial Demonstration Program required under P.L. 117-58, they also include proposals for other CCUS programs funded in the bill that will also accelerate CCUS deployment.

The recommendations included herein cover the following subject areas:

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CURC thanks the Department for its consideration of these recommendations and looks forward to continued collaboration towards the substantial emissions reductions that can be achieved through CCUS deployment.

Front End Engineering and Design Studies.

Front-End Engineering and Design (FEED) studies are a prerequisite to construction of any large-scale carbon capture and storage (CCS) project. While funding provided for FEED studies is appropriated separately from the commercial demonstration program under P.L. 117-58, targeting FEED studies towards projects that are candidates for future demonstration projects or commercial early-mover projects that would benefit CCUS deployment. CURC recommends that the Department take the following actions for the new appropriations for the FEED study program:

1. The Department should limit FEED studies to technologies that have been tested at pilot scale, at commercial scale, or that use data from pilot-scale testing while FEED studies are being developed. This will help ensure that the FEED studies incorporate sufficient operational data such that technical and performance risks can be assessed. Should the project that is the subject of the FEED study subsequently become a DOE cost-shared demonstration project, having a comprehensive FEED study will reduce both the financial and technology risk for the project and increase the DOE's program success level.
2. The scope and deliverables of FEED studies will be important to advancing demonstration projects. Within the prescribed limits of the authorizing and appropriating language, DOE should interpret FEED to include all engineering studies and planning to move a project from concept to a financial close. Being comprehensive will manage DOE's program risks and increase the likelihood of successfully constructed projects. Commercial experience suggests that the cost of a FEED study for a smaller, less complex project might cost several million dollars, whereas for a larger, complex project, the cost of a detailed FEED might exceed \$50 million. Project cost estimates prepared as part of the FEED need to be all inclusive (not simply engineering construction estimates). This includes all project development costs, construction costs, commercial guarantee and warranty costs, start-up costs, contingencies and reserves, owners' costs, operating costs, and any other costs that bear on project finance-ability. Additionally, there may be some field activities, such as geologic test wells, environmental surveys, NEPA support, or permitting activities that are included in a broadly defined FEED. The Department should ensure flexibility in the contract vehicle to refine the list(s) of deliverables over the course of a FEED study award as the design studies continue to define the scope of a project. This may require one or more prudent modifications to contracts or cooperative agreements during the course of a FEED. Finally, referencing industry standard metrics will help to avoid confusion on deliverables. As a general rule, FEED studies should require 20% non-federal cost-share. However, depending upon the nature (e.g., risk and public benefit) a lower percentage may sometimes be warranted.
3. When considering host sites, CURC recommends that DOE consider funding FEED studies that may include the integration of carbon capture with new natural gas combined-cycle power (NGCC) plants. New NGCC plants are more likely to deploy CCS than existing NGCC plants due to cost and life of the investments being made.

Demonstration Award Funding and Procurement.

In order for CCS to be a technology solution that can be timely deployed to meet the President's electric sector decarbonization objectives by 2035, CURC recommends the following considerations to ensure

streamlined application review and distribution of award funding, including timely procurement timelines:

1. The Department should provide award funding to projects in a manner that anticipates the availability of additional, future funds spread over the 5-year appropriation period of the IJJA. As an example, for simplicity, out of the \$500 million of FY 2022 funding that is appropriated, DOE could select five projects that each will be awarded a total of \$500 million, but in year one receives \$100 million each, with DOE providing a firm commitment in the award to provide an additional \$100 million per year through FY 2026. Certainty upfront about the total amount of funds that a project will be provided over the 5-year period will be needed to attract private sector investment in the projects. This approach also ensures multiple projects are able to be selected with sufficient funding to successfully operate the projects. Distributing funds in this way also allows the Department to efficiently reallocate unused funding to other applicants if a project does not proceed. DOE should recognize that demonstrations involving commercial debt/equity financing are unlikely to reach financial close absent a firm (not conditional) DOE funding commitment backed by in-hand appropriations.
2. DOE should prioritize funding demonstration projects that have completed substantial project development work, whether that work was DOE-funded or privately funded. This will increase the likelihood that DOE demonstration projects, once awarded, reach construction in a reasonable period of time with much of the upfront development work completed. In a recent report, the Government Accountability Office (GAO) identified that DOE had awarded demonstration funding to projects that had not conducted any prior development work. When multiple projects did not reach construction, this created misperceptions about program success. By selecting demonstration projects with substantial project development work completed, DOE will reduce demonstration project risk and facilitate project success. The success of CCS demonstration projects will also depend on their ability to connect to a carbon dioxide storage facility. For some CCS projects, that facility may be integrated with the carbon capture project itself and, for others, carbon dioxide may be transported to a separate storage facility that is being used as a storage hub for multiple projects.
3. Cooperative agreements should be structured to better align with the pace of project development timelines. Cooperative agreements typically have milestones and budget periods through which funds are released to a project. Maintaining a level of flexibility for projects through the award instrument is important to meet private sector and project development timelines, which may be quicker or slower depending on timelines of permitting requirements, the ability of markets to support equipment procurement and other services, etc. When executing cooperative agreements, utilization and modification of existing cooperative agreements can enable efficient distribution of award funding. Modifying existing contract vehicles can also streamline and accelerate cooperative agreement timelines. Flexibility should also be reflected in a broader pre-award authorization phase, which is an approach used in the past that is helpful to project developers.
4. Given the number of new Department staff that will be needed to review applications and negotiate cooperative agreements, utilization of outside contractors, like those used during the

American Reinvestment Act (ARRA) implementation, can be helpful to expedite the procurement process.

Technologies to Consider in the Demonstration Program

The projects that will be supported by the DOE Commercial Demonstration Program must be successful for CCS to be a compelling technology solution that will attract private sector investment and be deployed at scale. As such, CURC recommends that the program fund technologies that are at Technology Readiness Level (TRL) 6 and above, and that have already prepared substantial project development work to ensure the demonstration projects inherently carry lower risk. The program should focus on lowering the cost and improving the technical performance of the demonstrated technologies through learned experience. The demonstration should further clarify and validate the full system operation, which up to the point of demonstration may only have validated the performance of sub-systems. This approach will minimize commercial-scale project risk, establish likely real costs, and define a commercial business case for more substantial investments for near-term deployment.

Technologies at TRL 5 or below should continue to be explored within the Large-Scale Pilot Program required under P.L. 117-58 as well as the Department's lab- and bench-scale research and development activities, which serve a critical purpose in advancing lower TRL technologies. These technologies can provide important new options and opportunities for even further cost reductions and/or delivered improved performance for carbon capture projects in the future.

Large-Scale Pilot Projects

P.L. 117-58 provides \$937 million over five years to conduct a Large-Scale CCUS Pilot Program. When considering the size of large-scale pilot projects, the Department should focus on projects that are large enough to provide confidence in the technology being demonstrated. Projects should be of a size to validate scaling factors and demonstrate the interaction between major components so that control philosophies for a new process can be developed and enable the technology to advance to commercial-scale demonstration or application. Large-scale pilot projects should be funded at no less than the statutory 80% federal (and 20% private cost-share) under Section 988(b) of the Energy Policy Act of 2020.

Large-Scale CO₂ Storage Commercialization Program

The IJA provides \$2.5 billion over five years to develop new and expand existing CO₂ storage projects, including for associated CO₂ transport infrastructure, site characterization, permitting, and construction stages of project development. DOE should prioritize funding storage sites that are located near large and/or multiple sources of CO₂ to ensure those sites will be commercially viable storage solutions. DOE should also consider funding CO₂ storage facilities that may not, initially, have finalized commercial contracts with sources of CO₂ for the full storage capacity of the facility. Identifying storage facilities that have high likelihood of sufficient nearby CO₂ capture sources should be sufficient for DOE to ensure the storage facilities will become a commercial proposition, which will help address the chicken-and-egg challenge between capture, transport, and storage projects.

Financing CCUS Projects.

Securing commercial financing for CCS projects is difficult, but it is essential if CCS is to be deployed widely and if the Administration's climate objectives are to be met. It will be an enormous DOE program

success if the Department supports CCS projects that successfully demonstrate they can navigate the commercial financing landscape. Similar to other novel energy technologies, first-mover CCS projects may need to pursue a combination of federal, state, and private financing options to be financially viable. For CCS, at the federal level this includes both funding through the DOE demonstration and large-scale pilot plant programs as well as the Section 45Q tax credits and/or carbon trading and/or revenue from enhanced oil recovery (EOR). CURC provides the Department with the following observations related to project financing:

- For CCS to be widely deployed, CCS must become commercially financeable by debt/equity markets. It cannot be a technology that has its deployment limited to companies that can self-finance projects on their balance sheets. While the federal government may consider a demonstration project a “demonstration”, securing commercial financing involves guaranteed levels of technological performance and financial returns. The DOE grant helps to buy down the technology and performance risk needed for corporate investors to consider investment. However, there is also a cost gap (i.e., the difference between what the market will bear and what technology can deliver with certainty) that needs to be closed for a demonstration project to secure financing. If the Department wants to maximize the number of successful projects, when deciding on the appropriate level of support for a project, the Department should consider the size of the “commercial cost and technology risk gap” and determine its financial support in order to close the gap. Uniformly spreading demonstration funding across projects or allocating what is clearly insufficient to close those gaps will not lead to successful projects. However, if the gaps can be closed through 45Q tax credits or CO₂ offset credits and DOE funding, DOE will dramatically increase the number of fully successful demonstration projects.
- CCS projects that have multiple revenue streams (e.g., electricity, hydrogen, EOR, or chemicals production, etc.) are often seen by commercial lenders as more complicated as each added revenue stream brings complexity and often market risk. Financiers need certainty for every revenue stream coming into a project. Unless projects can sign long-term power purchase agreements or pricing contracts, those revenue streams are not deemed certain and can complicate the ability to access private capital or debt. Within the federal government’s existing statutory authorities, DOE should consider how these risks might be mitigated if it would like to accelerate CCS deployment.
- The Office of Fossil Energy and Carbon Management (FECM) has been an excellent resource for project development, capital, and startup funds. However, the timelines associated with the disbursement of funds can be challenging if a project needs to progress at commercial timelines and align with the needs of commercial lenders. As stated previously under the procurement section, CURC recommends that DOE ensure a level of flexibility through the award instrument to meet commercial financing expectations in addition to taking into consideration variations in project development timelines that do not always align with timing of milestones or funding needs through a cooperative agreement.

Loan Programs Office (LPO) Recommendations

The Department’s Loan Programs Office (LPO) serves an important purpose by financing new energy technologies, serving as a bridge to bankability for new technologies and helping to de-risk them at early stages of investment so they can be developed at commercial scale and achieve market acceptance.

CURC is pleased to see that the LPO recently issued a “Tech Talk” on CCUS, indicating the LPO is prepared to help drive the industry’s commercial deployment of CCUS technologies to leverage their climate benefits. The LPO can also help projects bypass the need for private sector financing. However, DOE is statutorily prevented from being able to issue a federal funding award and a loan guarantee to the same project, which is unfortunate at a time when we need to deploy as many CCS projects as possible to meet the President’s 2035 decarbonization objectives.

With this in mind, CURC provides the following recommendations for the LPO based on previous experience with the program:

- The purpose of the LPO is to help technologies get over the “valley of death” period and avoid the need to access commercial markets to get financing, as those markets place a heavy premium on “riskier” early-stage technologies. While the LPO must evaluate risk assessments for projects, it should take on greater risk to help commercialize CCS technology. In the past, the LPO rejected projects based on risk, which is what the program is designed to support.
- The LPO should consider supporting smaller projects. LPO’s current approach to project financing posits that the time and effort needed for an application does not make sense unless a project will cost \$100 million or more. Smaller projects may be able to move more efficiently through the process because they have a smaller imprint, cost less, and therefore have less inherent risk. To support this, LPO should consider how to reduce timelines for due diligence in the application process.
- CURC recommends stronger DOE support of CCS through the LPO. Despite the availability of \$8 billion in existing loan guarantee authority, LPO has not yet backed an operational CCS project. Supporting the financing for commercial CCS projects will send a message to the rest of the world that the U.S. is serious in achieving its decarbonization targets by investing in the technology to do so.

National Environmental Policy Assessment (NEPA) Considerations

To demonstrate CCS technologies and enable widespread deployment consistent with the Biden Administration’s emissions reduction and environmental objectives, permitting processes under the National Environmental Policy Act (NEPA) need to be both timely and efficient while ensuring that the appropriate environmental safeguards are maintained.

While CURC agrees that appropriate processes for permitting must be in place, the Administration needs to make sure those processes are efficiently implemented in order to demonstrate CCS technology and enable it to be a pathway to meet the Administration’s 2035 decarbonization goals. The NEPA review process must be done in a way that recognizes the urgency of the Administration’s climate change goals, so that permitting and environmental reviews for these demonstration projects can be streamlined and be done without undue delay.

Inconsistent and inefficient permitting approaches both among and within federal agencies create uncertainty and confusion, delay development timelines, and add project costs. Lack of guidance for the environmental reviews required for CCS projects is also an issue that adds undue costs to projects. For projects to be delivered on time and on budget, additional certainty is required both initially and throughout the NEPA permitting process.

The White House Council on Environmental Quality (CEQ) issued a report in June 2021 that suggested a number of ideas to help ensure that CCS projects are planned and permitted soundly and efficiently, including:

- Development of programmatic environmental impact statements (EIS) or environmental assessments (EAs) covering environmental issues common to CCS projects;
- Use of categorical exclusions and EAs in lieu of EISs where possible;
- Development of CCS-specific NEPA guidance.

CURC members recommend CEQ, in consultation with the Department of Energy, begin progressing these items to streamline and expedite reviews.

Additionally, CEQ recently released a Notice of Proposed Rulemaking (NOPR) to revise its NEPA regulations. It is critical that the regulatory revisions promote certainty and efficiency and not impose additional burdens on CCS project deployment that could undermine the programs contained in the IJJA.

Environmental Justice Obligations

The Biden Administration's Justice40 initiative aims to ensure that communities disproportionately impacted by climate change and pollution are accounted for in the energy transition. As the Department considers how to implement the Justice40 criteria across its programs, CURC encourages the Department to provide clear guidance in its funding opportunity announcements and host public forums to ensure that applicants for federal funding are fully aware of the environmental justice considerations that will factor into award selections by the Department. Providing clarity of this nature will result in a broader range of applicants that adequately address important environmental justice issues in their funding submissions.