U.S. Department of Energy

Office of Clean Energy Demonstrations

Long Duration Energy Storage Demonstrations

NATIONAL LABORATORY CALL FOR PROPOSALS

This Lab Call is being issued by the U.S. Department of Energy's Office of Clean Energy Demonstrations (OCED)

Table of Contents

I. Overview and Purpose

Executive Summary

The Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) was established in December 2021 with the mission 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. 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.

Long Duration Energy Storage (LDES) has the potential to play a significant role in the decarbonization of the US power grid – up to 470 GW ($330B in cumulative capital) of LDES capacity may be deployed between now and 2050 to meet the needs of a net-zero grid. However, LDES will need to scale quickly to reach the 2030-2035 technology "liftoff" conditions that will enable LDES to play this significant role. This "liftoff threshold" is contingent on three conditions to create sufficient standalone demand:

1. **Technology performance and cost curves** must come down by 40-60% within a decade to make projects attractive for mainstream investors. Both the performance of LDES technologies and the working lifetime of LDES technologies must improve.
2. **Market and regulatory mechanisms** through state, regional and national interventions must adapt to ensure that LDES is valued for the benefits it provides to energy markets and infrastructure utilization (e.g., dynamic capacity markets, differentiated capacity products, and a recognition of storage for its dual role in generation and transmission systems).
3. **Supply chain formation** must quickly follow the above two conditions to meet up to 10GW of annual LDES manufacturing by 2035. Planning will be needed to meet this manufacturing demand with domestic resources or from geographies without access issues.

Near term technology demonstration and deployment opportunities exist at Department of Energy (DOE) and Department of Defense (DOD) facilities to prove out LDES technology performance, market, regulatory, and supply chains to support "market liftoff". The Infrastructure Investment and Jobs Act (IIJA), 42 USC § 17232(d), created and the Bipartisan Infrastructure Law (BIL) provided funding for a new Joint Program that requires DOE, in consultation with DOD, to leverage existing test bed infrastructure at DOE and DOD facilities/installations to demonstrate LDES technologies. These projects will demonstrate the resiliency advantages of LDES technologies in lab and military installations at a range of scales. Projects will help accelerate the commercial viability of innovative, state-of-the-art technologies and effectively demonstrate their benefits to facilitate wider commercial adoption for stakeholders that have similar energy goals for their facilities or campuses. By advancing the viability of LDES technologies, these projects can also enable delivering benefits to communities—especially underserved and overburdened communities—such as reducing energy burden, increasing clean energy access and adoption, resilience, and energy democracy.

The $30 million from BIL for a portfolio of projects demonstrated under this lab call is only for the portion of this program that will be led by DOE National Labs. Implementation of this program for projects sited at DOD facilities and installations will come later**.** This lab call emphasizes funding a group

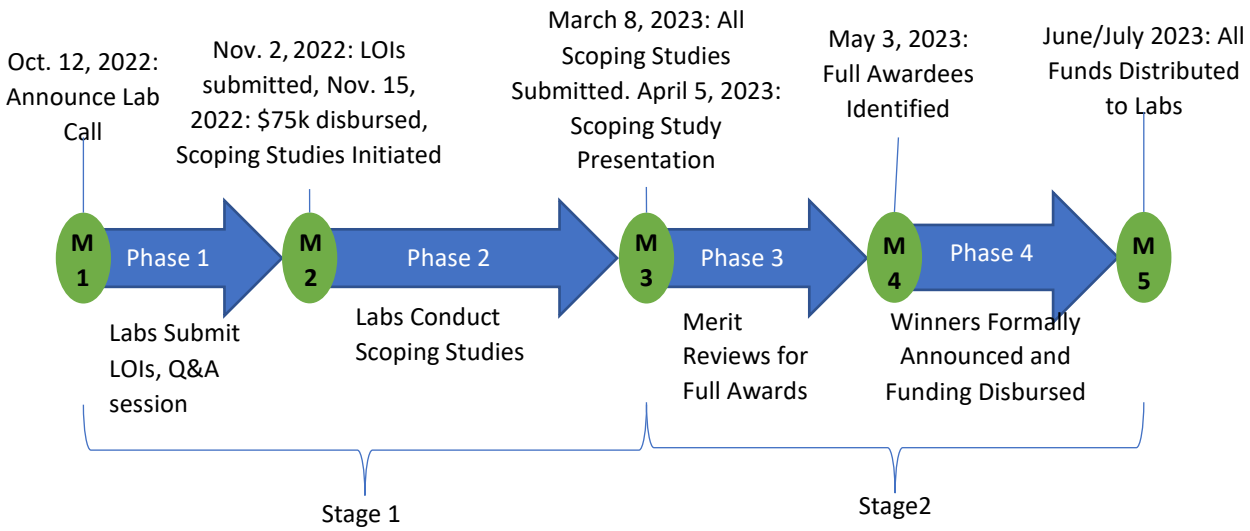
of demonstration projects that represent different technology types, different stages of technology maturity, varying scales of deployment, and use in multiple unique applications or operating conditions.

This lab call is divided into two topics: Topic 1: Testing and Validation of Early Stage LDES Systems, and Topic 2: Installation of LDES for Resiliency. To support statutory requirements for having a diverse portfolio of projects, **each National Lab may only submit one letter of intent (LOI) under each topic**. In the cases that labs want to partner with other labs they must jointly submit a LOI which must list each of the labs that will be involved in the project. Labs that are listed in a joint LOI for a topic will be counted as having reached their submission limit for that specific topic and may not submit another LOI either individually or with other labs unless it is for a different topic. In between the announcement of the lab call and the deadline to submit the LOI, labs will have the opportunity to ask questions regarding the details of this lab call.

This lab call will consist of two stages. In the first stage, a lab or group of labs that are interested in this opportunity will submit a LOI and receive $75,000 to conduct a scoping study for their proposed demonstration project. In the second stage, once scoping studies have been completed, lab teams will present a summary of the scoping studies to a review panel. Reviewers will then conduct a merit review to determine at least one winning lab or group of labs for each topic that will receive funding to carry out the proposed demonstration.

Timeline and Process Logistics

Lab Call Announced:	10/12/2022
Lab Call Q&A Session	10/19/2022
LOI Submission Deadline:	11/2/2022
Funds for Scoping Study Disbursed By:	11/11/2022
Scoping Study Submission Deadline:	3/8/2023
Scoping Study Presentation and Review Panel:	4/5/2023
Reviews Completed and Selections Announced:	5/3/2023
Award Issued by:	7/31/2023



- **PROPOSAL SUBMISSSIONS:** Letters of intent and completed feasibility studies should be submitted to ESEELabCall@hq.doe.gov. DOE strongly encourages all applicants to submit the required information at least 24 hours in advance of the submission deadline.
- **QUESTIONS DURING THE OPEN LAB CALL PERIOD:** Specific questions about this Lab Call should be submitted via e-mail to ESEELabCall@hq.doe.gov prior to the Lab Call Q&A Session. Questions will be compiled and responses will be provided, if deemed appropriate, during the Lab Call Q&A Session. Applicants are responsible for meeting the submission deadlines.

Key Considerations

- **AVAILABLE FUNDING:** There is approximately **$30 million in total funding** from BIL for all scoping studies and projects solicited in this Lab Call. The amount of funding given to fully awarded labs will be a maximum of $4 million per project for Topic 1 and $10 million per project for Topic 2.
- **CRADA:** The call for proposals below should NOT be construed as requiring the renegotiation of an existing Cooperative Research and Development Agreement (CRADA) in which the lab is a prime or sub-recipient. Labs with CRADAs addressing any of the topic areas below may incorporate that work in proposals they submit in response to the Lab Call to demonstrate existing capability and leverage existing partnerships with industry and other partners. If the proposal is not selected for funding under this Lab Call, the work under the CRADA will continue—there is no additional risk to the provision of DOE funding.
- **ELIGIBILITY:** Any DOE National Lab may submit a LOI to conduct a scoping study under the topic(s) of their choosing. Each national lab may only submit one LOI per topic and are permitted to collaborate on a single proposal that involves multiple labs.
- **DEMONSTRATION PHASES:** In line with OCED's project management oversight approach, projects will adhere to a four-phased structure for managing scope, schedule, deliverables, and budget. This approach will be negotiated after selection.
- **COMMUNITY BENEFITS PLAN:** To support the goal of building a clean and equitable energy economy, the BIL-funded projects are expected to support meaningful community and labor engagement; invest in America's workforce; advance diversity, equity, inclusion, and accessibility; and contribute to the President's goal that 40% of the overall project benefits flow to DACs (the Justice40 Initiative). To ensure these goals are met, applications must include in their scoping study information that describes how the proposed project would advance the four objectives stated above as applicable.

II. Technical Requirements and Topics

Overall Objectives

Accelerating innovative demonstrations of LDES technologies is a key priority for DOE to achieve the Biden-Harris Administration goals to decarbonize the grid by 2035 and economy wide by 2050.[1] LDES is a key enabler of these goals as cheaper, 10+ hour storage is necessary to capture, store, and dispatch

[1] Executive Order (EO) 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

electricity that will increasingly be generated by renewable energy resources and ensure that the grid is reliable, clean, and affordable[2].

The following topics represent new projects and are open to all national laboratories. Each topic focuses on one of the two distinct objectives described in the Joint Program statutory language, Topic 1: Testing and Validation of Early Stage LDES Systems, and Topic 2: Installation of LDES for Resiliency. Both topics will require demonstration projects that use specific lab facilities for testing, validation, analysis, or other identified activities conducted on an LDES system of their choosing subject to requirements outlined in this section. OCED may select multiple projects in these two topic areas to ensure a portfolio of projects cover a range of system scales, technology types, and deployment conditions as required by statute.

Project Budget and Partnership Requirement

The amount of funding given to fully awarded labs will be a maximum of $4 million per project for Topic 1 and $10 million per project for Topic 2. In the scoping study, labs will identify necessary project partners such as technology vendors, facility owners (including military installations), utilities, private sector investors, universities (including Minority Serving Institutions, Historically Black Colleges and Universities, and Tribal Colleges and Universities) and businesses (including Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, businesses with union membership) and community organizations that will have a role in this demonstration.

This lab call supports investments and opportunities that improve employer-worker relations and inclusive workplaces. It is the responsibility of the awardee lab to negotiate any cost-sharing, sub-contracts, or other required agreements with these partners and how much of the awarded funding will go to each of these partners. It is also the responsibility of the lab to factor in project costs other than the capital expenditures of the demonstration system including but not limited to staffing and labor, system operations and maintenance, facility operations and maintenance, system delivery and end of life needs, and necessary infrastructure upgrades. Labs may contribute their own additional funding and/or resources to this project as they deem necessary and may leverage resources or funding contributions from project partners.

Demonstration System General Requirements

The topic descriptions will have more specific requirements for what each project should look like but in general a demonstrated LDES system must consist of the following:

- Must be a **bidirectional electrical system** meaning the input energy for charging must be electricity and output energy from discharging must also be electricity (this includes but is not limited to electrochemical technologies such as batteries and electromechanical technologies such as liquid air energy storage systems);
- A minimum rated electrical power output of **100 kW;**
- Capable of between **10-100 hours** of storage duration at the rated power;
- Required to interface either physically or virtually with an identified lab facility which includes testbeds, buildings, laboratories, or other infrastructure at a campus; and

[2] Long Duration Storage Shot Fact Sheet

- Certain data from these demonstrations must be made available to the public or available to other organizations through adherence to the Rapid Operational Validation Initiative (ROVI) program[3] and the investment performance tracking requirements outlined in this document.

Optionally, labs may use funding to conduct a full feasibility study if they feel that it would be required to sufficiently de-risk and/or increase the likelihood of a successful demonstration or testing activity. If a lab decides that they intend to conduct a full feasibility study, they must provide justification and a description in the scoping study. Labs may also use funding to make decisions around end of testing or system life considerations including whether to recycle, dispose of, continue operation of, or other end-of-life activity for the demonstration system.

Community Benefits Plan Requirements

Applicants for both topics are required to describe how Community Benefits Plan (CBP) objectives will be incorporated in the project.

For both Topic Areas, applicants should describe the activities they plan to complete during the project duration. This should include targeted outcomes and implementation strategies, including milestones, schedules, and accountability measures, associated with the CBP. Applicants must also describe project resources dedicated to implementing activities including staff, facilities, capabilities, and budget. Applicants should propose metrics to measure the success of the Community Benefits Plan. If available, applicants can describe how the CBP aligns with and builds on existing laboratory plans (e.g., lab-wide DEIA plan). For more information on CBPs, see "Community Benefits Plan Frequently Asked Questions (FAQs)".[4]

If awarded, at project completion, applicants must write a report including actions, outcomes and lessons learned related to CBP activities. This report should include and an assessment of potential CBP impacts and suggested CBP strategies that could apply for further demonstrations of the technology outside of the national lab facility.

Topic 1: Testing and Validation of Innovative LDES Systems at National Lab Facilities

Available Funding: $4,000,000 per award

Eligible Labs: All DOE National Labs

Number of Awards: 2

Description

Under this topic, a proposed project would conduct testing and validation, using a lab facility, for an innovative LDES demonstration system that is considered an early-moderately mature technology. An early-moderately mature technology can be characterized by the following guidelines:

[3] If the ROVI program requirements have not been finalized at the start of the scoping study development, then the lab will acknowledge that it will adhere to any data sharing requirements outlined by ROVI once it is finalized.

[4] https://www.energy.gov/bil/community-benefits-plan-frequently-asked-questions-faqs#:~:text=Community%20Benefits%20Plan%20Frequently%20Asked%20Questions%20%28FAQs%29%20What,accompany%20all%20agency%20funding%20opportunity%20announcements%20%28FOAs%29.-related%20projects.

- A technology that is non-commercial or not currently deployed at the necessary scale or level of integration required for its intended application. The expected commercialization timeframe is 5 -10 years; and
- A technology that has yet to demonstrated under realistic conditions and a prototype demonstration is required to advance the concept through testing and analysis to understand implications regarding characteristics of the system such as performance, reliability, lifetime, and systems/components integration of the design.

Project Outcome Requirements

The following are the required project outcomes:

- Recipient lab must demonstrate an early-moderately mature technology, as described above, that fulfills all of the minimum LDES criteria as defined in the "Demonstration System Requirements" section of this document;
- Demonstration system must have a power rating of **at least 100 kW** and must be capable of **at least 10 hours** of storage duration;
- Recipient lab must perform testing, validation, or analysis on the demonstration system using a specified facility, testbed, or other capability currently present at the lab;
- The recipient lab must be able to explain why the testing, validation, or analysis activity will assist in the commercialization of the LDES technology by outlining how this overall project will make progress in achieving important performance metrics for a specific end use-case (e.g., reliable backup power to critical loads on military installations, x-hours of dispatchable power to meet utility requirements, transportable power for emergency response.) that will unlock future private sector investment;
- The recipient lab must identify how this activity would address a major technology barrier, and how the activity would accelerate the technology towards commercialization;
- The lab should show how partnerships or collaborations will help facilitate further demonstration and scale up for this technology by the private sector as well as disseminate the results and achievements of this activity in a way that is beneficial to future commercialization;
- The recipient lab must host a "Demo Day" no less than three months before the award ends to bring potential investors (or licensees, if applicable) in to evaluate the systems being tested and to meet with the project teams/developers;
- The demonstration project must follow the data sharing requirements outlined by ROVI[5] and the investment performance tracking requirements outlined in this document; and
- The lab should provide a report of activities, outcomes, and lessons learned related to CBP during their project. This report should also include and an assessment of potential CBP impacts and suggested CBP strategies that could apply for further demonstrations of the technology outside of the national lab facility.

Topic 2: Installation of LDES for Resiliency

Available Funding: $10,000,000

[5] If the ROVI program requirements have not been finalized at the start of the scoping study development, then the lab will acknowledge that it will adhere to any data sharing requirements outlined by ROVI once it is finalized.

Eligible Labs: All DOE National Labs

Number of Awards: 2

Description

Under this topic, a proposed project will conduct testing, validation, or analysis, using a lab facility for a nearly mature LDES energy storage technology that will support energy resiliency objectives for the host site. A nearly mature technology can be characterized by the following guidelines:

- A technology that was previously demonstrated at the early-moderately mature stage but is still considered precommercial for an intended, at scale end-use (the expected commercialization timeframe is 2-5 years); and
- A technology that could leverage this demonstration opportunity to go through comprehensive validation that will de-risk its use and encourage further investment and deployment from industry.

Labs must clearly state how this project supports energy resiliency objectives; however, the labs have the flexibility to identify unique or locally relevant resiliency requirements or metrics so long as they are properly justified as being broadly applicable. Examples of resilience metrics include:

- DOD: Critical mission continuity of operations for a minimum of 14 days[6,7]
- FEMA: Defines a "long-term" outage as 72+ hours[8]
- NFPA: Secondary power supplies for alarm systems are designed to provide enough capacity to power the entire system for 24 hours on standby[9] and facilities such as hospitals should have a minimum of 96 hours of fuel supply stored for emergency standby[10]

Project Outcome Requirements

The following are the required project outcomes:

- Recipient lab must demonstrate a nearly mature technology, as described above, that fulfills all of the minimum LDES criteria as defined in the "Demonstration System Requirements" section of this document;
- Demonstration system must have a power rating of **at least 500 kW** and must be capable of **at least 24 hours** of storage duration, must have an expected operational lifetime of at least **15 years**;
- Recipient lab must perform testing, validation, or analysis on the demonstration system using a specified facility, testbed, or other capability currently present at the lab;
- Recipient lab must identify a lab facility and justify the deployment of the LDES system by identifying specific energy resilience goals or metrics that are of value to the host site or surrounding stakeholders that the proposed LDES system can support;

---

[6] Metrics and Standards for Energy Resilience at Military Installations Memorandum

[7] Army's Pivot to Resilience (energy.gov)

[8] Power Outage Incident Annex to the Response and Recovery Federal Interagency Plans (fema.gov)

[9] NFPA Journal, NFPA 72 In Compliance, Summer 2021

[10] NFPA 110's Fuel Requirements Can Help Guide Backup Power Plan For Hospitals - Facilities Management Insights (facilitiesnet.com)

- The recipient lab must be able to explain how the testing, validation, or analysis activity will assist in the commercialization of the LDES technology by outlining how this overall project will make progress in achieving important performance metrics for a specific end use-case (e.g., reliable backup power to critical loads on military installations, x-hours of dispatchable power to meet utility requirements, transportable power for emergency response, etc.);
- A technology used in this demonstration opportunity should obtain enough evidence to justify a future demonstration for a larger, more robust system design;
- The recipient lab must identify how this activity would address a major technology barrier, and how the activity would accelerate the technology towards commercialization;
- The lab should show how partnerships or collaborations will help facilitate adoption or dissemination of the results of this activity;
- The recipient lab must host a "Demo Day" no less than three months before the award ends to bring potential investors (or licensees, if applicable) in to evaluate the systems being tested and to meet with the project teams/developers;
- The demonstration project must follow the data sharing requirements outlined by ROVI[11] and the investment performance tracking requirements outlined in this document; and
- The lab should provide a report of activities, outcomes, and lessons learned related to CBP during their project. This report should also include and an assessment of potential CBP impacts and suggested CBP strategies that could apply for further demonstrations of the technology outside of the national lab facility.

III. Application Submission

Letters of Intent will be submitted to ESEELabCall@hq.doe.gov by the submission deadline of 5:00 pm ET November 2, 2022.

The scoping study will be submitted via OCED Exchange by the submission deadline of 5:00 pm ET on March 8, 2022.

All submissions for the letters of intent and scoping studies must conform to the guidelines and format outlined in the following sections of this document. In general, proposal materials should be formatted for 8.5 x 11 paper, single spaced, and have 1-inch margins on each side. Typeface size should be 11-point font, except tables and figures, which may be in 10-point font.

Letter of Intent (LOI)

All LOIs will be no longer than 1-page and must contain the following:

- A statement of confirmation that the applicant has read the entirety of this document and understands all the objectives, procedures, and requirements involved for this lab call opportunity;
- The specific topic area the applicant is responding to;
- Names of participating lab or labs if it is a collaboration;

[11] If the ROVI program requirements have not been finalized at the start of the scoping study development, then the lab will acknowledge that it will adhere to any data sharing requirements outlined by ROVI once it is finalized.

- A listed point of contact and recipient for the scoping study funding for the amount of $75k; if this LOI has multiple labs, please list a point of contact and recipient for each lab to receive the amount of $75k divided by the number of labs listed; and
- A listed point of contact for each LOI for non-national lab organizations that are interested in being a partner on one of these demonstrations.

Scoping Study

The scoping study will be no longer than 30 pages. Teams will also be required to give a 15-20 minute presentation to a panel of merit reviewers during the proposal development/review process. The scoping study must contain the following:

- Executive Summary: Introduce project objectives, proposed partnerships, and anticipated broader impacts if project is successful.
- Description of Technology: Technical description of the proposed LDES technology, its current state of the art, and why it is ideal for this demonstration opportunity.
- Description of proposed testing, validation, or analysis: A comprehensive description of what testing, validation, or analysis the integrated system will go through. This will include identifying what facilities at the lab will be leveraged, as well as any other equipment or expertise that will be required. This section will list all milestones and deliverables that will come out of these proposed activities.
- Preliminary Design of Demonstration: Include descriptions, visual renderings, schematics, or other materials that will provide a detailed look as to what the project will look like and consist of.
- Supporting Analysis and Anticipated Benefits: Preliminary techno-economic analysis and life cycle assessment simulation results, or other analyses/studies that support the design decisions or give insights into the anticipated results or impacts that would come out of this project. If the lab decides they will want to conduct a full feasibility study, this is where they will describe the objectives and the justification for it.
- Budget and Scope of Work: Detailed list of all anticipated deliverables, milestones, as well as a proposed overall timeline and project management plan for the project. Will list all project partners and indicate any cost-share, sub-contracts, or other agreements anticipated. This section will also include a proposed budget and requested amount of funding coming from this lab call to carry out the project. In this section, the study will describe the engineering and design scope of work in detail including justification as to what roles the identified project partners such as specific lab staff, EPC firms, vendors, or utilities will have.
- Community Benefits Plan: Description of how this demonstration could lead to benefits related to advancing diversity, equity, inclusion, and accessibility; contributing to the President's goal that 40% of the overall project benefits flow to disadvantaged communities (the Justice40 Initiative); providing meaningful community and labor engagement; and investing in America's workforce. Include implementation strategies, resources, and metrics or qualitative descriptions on how this project will advance these goals.

Review Process

The review process will first consist of a review of the letters of intent by DOE-HQ staff, these will only be reviewed to check to ensure that they are responsive and to notify applicants if their LOIs have been deemed not responsive with provided feedback. Once the scoping studies have been completed, applicant teams will make a presentation on the scoping to the merit review panel and have an opportunity to answer questions. A full merit review will determine which applicants will be awarded the requested amount of funding to carry out the proposed demonstration projects.

Selection Criteria

The selection committee will consider the follow factors when evaluating scoping studies:

1. Technology (40%)
    a. Appropriate level of maturity: Study indicates that the demonstration will target the appropriate level of technology maturity as required by the desired outcomes for the topic.
    b. Level of benefit that provided to the technology: Study indicates the benefits that the demonstration will provide to the LDES technology being used in terms of addressing specific commercialization barriers, demonstrating technology maturation or scale-up, or dissemination of information/knowledge useful to other stakeholders.
    c. Path to commercialization: Study will indicate how if the proposed demonstration is successful, what resulting impacts there will be for the commercialization of the technology.
    d. Preliminary techno-economic analysis and life cycle cost projections: Scoping study will have a detailed analysis to understand the cost and performance implications of the anticipated demonstration system based on the application it intends to be used, tested, or analyzed for.
    e. Acknowledgement or connection to ROVI: Study indicates or acknowledges that it agrees to sharing certain data and shows that it is adhering or intends to adhere to ROVI (if the framework has not been finalized by the beginning of the scoping study phase).
2. Partnerships (30%)
    a. Technology suppliers and Private Sector Investors: Scoping study describes the technical merit, provided benefits and value proposition, and agreements made with regards to the intended partners that will be involved in the design, construction, installation, and financing of the demonstration system.
    b. (If applicable) Host site and offtaker: Scoping study indicates the benefits, and agreements with host-site owner or off taking organization.
3. Execution (20%)
    a. Project management: Study indicates that the team can manage the project and involved partners, ensuring quality deliverables, and communicating information to lab call staff at DOE/OCED.
    b. Qualifications: Study sufficiently describes the knowledge, skills, and experience of the key team members that are relevant to the success of the project.
    c. Costs: Study details an anticipated budget that provides a breakdown for costs including key staff, use of facilities/testbeds, labor, feasibility studies, equipment, engineering, procurement, construction, and other subcontracts.

4. Community Benefits Plan (10%)
    a. The extent to which the Community Benefits Plan includes specific and high-quality actions to advance DEIA, the Justice40 Initiative, Community and Labor Engagement, and Investing in the American Workforce (as applicable).
    b. The extent to which the project includes sufficient milestones, metrics, resources, and accountability measures to ensure adequate implementation of the CBP.
    c. The extent to which the project includes plans for technical, analysis and/or engagement efforts to advance CBP priorities that exceed the requirements for technical, analytical, performance, or regulatory compliance.

IV. General Requirements

Data Collection for BIL Investment Performance Tracking

Specific reporting requirements apply to projects funded by BIL. As part of tracking progress toward key departmental goals – ensuring justice and equity, creating jobs, boosting domestic manufacturing, reducing greenhouse gas emissions, and advancing a pathway to private sector – DOE may require specific data collection. Examples of data that may be collected in this lab call include:

- Justice and Equity data, including;
    - Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses and Veteran Owned Businesses acting as vendors and sub-contractors for bids on supplies, services and equipment;
    - Value, number, and type of partnerships with MSIs; and
    - Stakeholder engagement events, consent-based siting activities
- Storage capacity installed; and
- Funding leveraged, follow-on-funding, Intellectual Property (IP) Generation and IP Utilization