Office of Clean Energy Demonstrations
Request for Information #DE-FOA-0002777
BIL Section 41001 Energy Storage Demonstration Projects

ISSUE DATE: May 12, 2022
SUBJECT: Request for Information (RFI) on the Long Duration Energy Storage for Everyone, Everywhere (LD ESEE) Initiative
DUE DATE: June 16, 2022
SUBMIT TO: EnergyStorage41001RFI@ee.doe.gov

Description

This is a Request for Information (RFI) issued by the U.S. Department of Energy (DOE), on behalf of the Office of Clean Energy Demonstrations (OCED), and in collaboration with the Office of Electricity (OE) and Office of Energy Efficiency and Renewable Energy (EERE). This RFI seeks public input to help inform DOE's implementation of the Infrastructure Investment and Jobs Act, also commonly known as the Bipartisan Infrastructure Law (BIL).[1]

The BIL is a once-in-a generation investment in infrastructure, which will grow a more sustainable, resilient, and equitable economy through enhancing U.S. competitiveness in the world, creating good jobs[2], and ensuring stronger access to economic and other benefits for disadvantaged communities, including rural areas, and for geographic areas within Tribal jurisdictions. The intent of this RFI is to obtain public input regarding DOE's implementation of three energy storage demonstration programs (1) Energy Storage Demonstration Projects ("Demo Projects"); (2) Energy Storage Pilot Grant Program ("Pilot Grants"); and (3) Long-Duration Demonstration Initiative ("Demo Initiative"),[3] which are authorized under section

[1] Public Law 117-58 (November 15, 2021).
[2] DOE strongly supports investments that expand jobs with a free and fair chance to join or form a union, improve job quality through the adoption of strong labor standards, and support responsible employers. DOE also supports opportunities that improve job access, foster safe, healthy, and inclusive workplaces and communities, and strategies that develop a diverse workforce well-qualified to build and maintain the country's energy infrastructure and grow domestic manufacturing. The term "good jobs" is intended to broadly capture these concepts.
[3] See Energy Act of 2020, section 3201(c) and (d), as codified at 42 U.S.C. 17232(c) and (d).

3201 of the Energy Act of 2020[4,5]. The BIL appropriated $505 million "to advance energy storage systems toward widespread commercial deployment by lowering the costs and increasing the duration of energy storage resources."[6] While section 3201 of the Energy Act is the programmatic statutory authority, section 41001 of the BIL served to "authorize" appropriations for the three energy storage programs listed above. For purposes of this RFI, "41001" is used collectively to refer to the three energy storage programs referenced above.

Specifically, this RFI seeks input on:

- BIL 41001 Energy Storage Programs-Specific Requirements and Implementation Strategy
- BIL 41001 Energy Storage Programs Crosscutting Topics
- Employment: Expanding Union Jobs and Effective Workforce Development
- Equity, Environmental and Energy Justice (EEEJ) Priorities
- Additional Input

Information collected from this RFI will be used by DOE for planning purposes, which could include developing future Funding Opportunity Announcements (FOA) related to 41001 energy storage programs. DOE does not intend to publish the information collected in response to this RFI. However, responses to this RFI are subject to public disclosure under the Freedom of Information Act. For more information, see section titled, "Freedom of Information Act".

[4] Public Law 116-260, Div. Z, Title III, § 3201(c) and (d), as amended, Dec. 27, 2020; 42 U.S.C. § 17232(c) and (d). For ease of the reader, the RFI primarily cites to the relevant U.S.C. sections. DOE is implementing the Long-duration Joint Program, 42 U.S.C. § 17232(d), in consultation with DOD and is not seeking input on that program at this time.
[5] Public Law 116-260, Div. Z, Title III, § 3201, as amended, Dec. 27, 2020; 42 U.S.C. § 17232.
[6] 42 USC § 17232(b)(4)

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Background

On November 15, 2021, President Joseph R. Biden, Jr. signed the Infrastructure Investment and Jobs Act, also commonly known as the Bipartisan Infrastructure Law (BIL). The BIL is a once-in-a-generation investment in infrastructure, which provides the backbone for a more sustainable, resilient, and equitable economy through enhancing U.S. competitiveness in the world, diversifying regional economies to include supply chain and manufacturing industries, creating good union jobs, and ensuring stronger access to economic and other benefits for underserved communities, including rural areas, and for geographic areas within Tribal jurisdictions. The BIL appropriates more than $62 billion to DOE to ensure the clean energy future delivers true economic prosperity to the American people by:

- Investing in American supply chains, manufacturing, and workers, including good-paying jobs with the right to join a union, and effective workforce development to train and provide new skills for incumbent and dislocated workers.
- Expanding access to energy efficiency and clean energy for families, communities, and businesses.
- Delivering reliable, clean, and affordable power to more Americans.
- Building the technologies of tomorrow through clean energy demonstrations.

As part of this effort, the BIL appropriated $505 million for the 4-year period encompassing fiscal years (FYs) 2022 through 2025 for the development of grid-scale long-duration energy storage demonstrations to validate new technologies and enhance the capabilities of customers and communities to integrate grid storage more effectively. This will support the Biden Administration's goal to achieve a carbon-free electric grid by 2035 and a net zero emissions economy by 2050.[7]

Principles of equity and justice will guide BIL implementation, consistent with the Biden Administration's commitments to ensure that overburdened, underserved, and underrepresented individuals and communities have access to federal resources pursuant to EO 13985, *Advancing Racial Equity and Support for Underserved Communities*; EO 14020, *Establishment of the White House Gender Policy Council*; and EO 14008, *Tackling the Climate Crisis at Home and Abroad*. Under the Justice40 Initiative, or Justice40, implementation efforts will support the goal that 40% of the overall benefits from implementation of Federal investments in climate and clean energy, including these 41001 energy storage programs, flow

[7] FACT SHEET: President Biden sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies, https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/.

to disadvantaged communities (DACs),[8] and not exacerbate existing inequalities, including disproportionate exposure to environmental hazards and harms. Moreover, the BIL implementation process should advance equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.

Strengthening economic prosperity – by expanding good-paying, safe union jobs and supporting job growth through investments in supply chains and domestic manufacturing – is a key goal set by President Biden and is discussed in depth in his Executive Orders (EOs) on Ensuring the Future Is Made in All of America by All of America's Workers (EO 14005), Tackling the Climate Crisis at Home and Abroad (EO 14008), America's Supply Chains (EO 14017), Worker Organizing and Empowerment (EO 14025), and Promoting Competition in the American Economy (EO 14036). The projects and initiatives under section 41001 will support the creation of good-paying jobs with the free and fair choice to join a union, the incorporation of strong labor standards, and high-road workforce development programs that ensure equitable access to jobs, especially through registered apprenticeship and quality pre-apprenticeship programs.[9,10]

[8] The Justice40 initiative, established by E.O. 14008, sets a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities (DACs). DOE's definition of DACs, which should be used to determine benefits calculations, is available https://www.energy.gov/diversity/office-economic-impact-and-diversity.

[9] Registered Apprenticeship Program (RAPs) are a proven model of job preparation, registered by DOL or a DOL-recognized State Apprenticeship Agency (SAA), which employ workers and combine paid On-the-Job Learning (OJL) (also referred to as On-the-Job Training (OJT)) with Related Instruction (RI) to progressively increase workers' skill levels and wages. RAPs are also a business-driven model that provide an effective way for employers to recruit, train, and retain highly skilled workers. RAPs allow workforce partners, educators, and employers to develop and apply industry standards to training programs, thereby increasing the quality of the workforce and workforce productivity. RAPs offer job seekers immediate employment opportunities that pay sustainable wages and offer advancement along a career path as they complete their training. Registered Apprentice completers receive industry-recognized certificates of completion leading to long-term career opportunities. For more information on RAPs, please visit www.apprenticeship.gov.

[10] The US Department of Labor has developed a framework for Quality Pre-Apprenticeship Programs:

- Training and curriculum based on industry standards, approved by the Registered Apprenticeship sponsor with whom the pre-apprenticeship program is partnering.
  Strategies that increase Registered Apprenticeship opportunities for disadvantaged and under-represented individuals that will allow the participant to meet the entry requirements for a Registered Apprenticeship program upon completion. These involve:
  - » Strong recruitment efforts for populations under-represented in Registered Apprenticeship programs
  - » Educational and pre-vocational services that prepare participants to meet the minimum qualifications for entry into a Registered Apprenticeship program
  - » Activities introducing participants to Registered Apprenticeship programs and assistance in applying for those programs

Technology Goals

Through various DOE offices and as coordinated within the Energy Storage Grand Challenge[11], DOE is supporting many storage technologies (including electrochemical, thermal, and mechanical storage) that can potentially scale to the power and duration requirements required of the future grid. These technologies exhibit significant cost reduction potential, high materials availability, sufficient performance, societal and community benefits (such as reduced energy burden and equitable energy access), and in many cases flexible siting independent of geography. However, none of them are yet being deployed at sufficient scale, due to a range of technological, economic, institutional, and market barriers. The 41001 energy storage programs discussed in this RFI provide the opportunity to accelerate commercialization for some of these technologies by: (1) demonstrating the technologies at scale; and (2) partnering with community and industry stakeholders so they can best adopt and benefit from these technologies.

BIL section 41001 authorized appropriations for four energy storage programs:

- *Energy Storage Demonstration Projects ("Demo Projects") (41001(a))*: Program to fund at least 3 long-duration energy storage demonstrations, with one project of weekly to monthly or seasonal duration, and one a grid demonstration of end-of-life electric vehicle (EV) batteries.
- *Energy Storage Pilot Grant Program ("Pilot Grants") (41001(a))*: Program that aims to bring a range of benefits provided by storage to targeted recipients including States, Tribes, and utilities.
- *Long-Duration Demonstration Initiative ("Demo Initiatives") (41001(b))*: Flexible program that may target demonstrations for a range of long-duration technology types.

- Access to support services that help participants remain in the program (such as childcare, transportation, counseling and ongoing career services).
- Collaboration with Registered Apprenticeship sponsors to promote apprenticeship to other employers as a quality approach to attain and retain a skilled workforce.
- Hands-on experience that simulates the work performed in the Registered Apprenticeship, while observing proper supervision and safety protocols.
- Formal agreements, wherever possible, with Registered Apprenticeship sponsors for entry into Registered Apprenticeship programs upon successful completion of the pre-apprenticeship program.

For additional information on pre-apprenticeship, please review USDOL's Training and Employment Notice 13-12.

[11] The Energy Storage Grand Challenge is a comprehensive program to accelerate the development, commercialization, and utilization of next-generation energy storage technologies and sustain American global leadership in energy storage. https://www.energy.gov/energy-storage-grand-challenge/energy-storage-grand-challenge

- *Joint Program (41001(b))*: Collaboration between DOE and the DOD for long-duration demonstrations on government facilities. There are no Joint Program-specific questions in this RFI.

These four programs are structured and summarized in Figure 1.

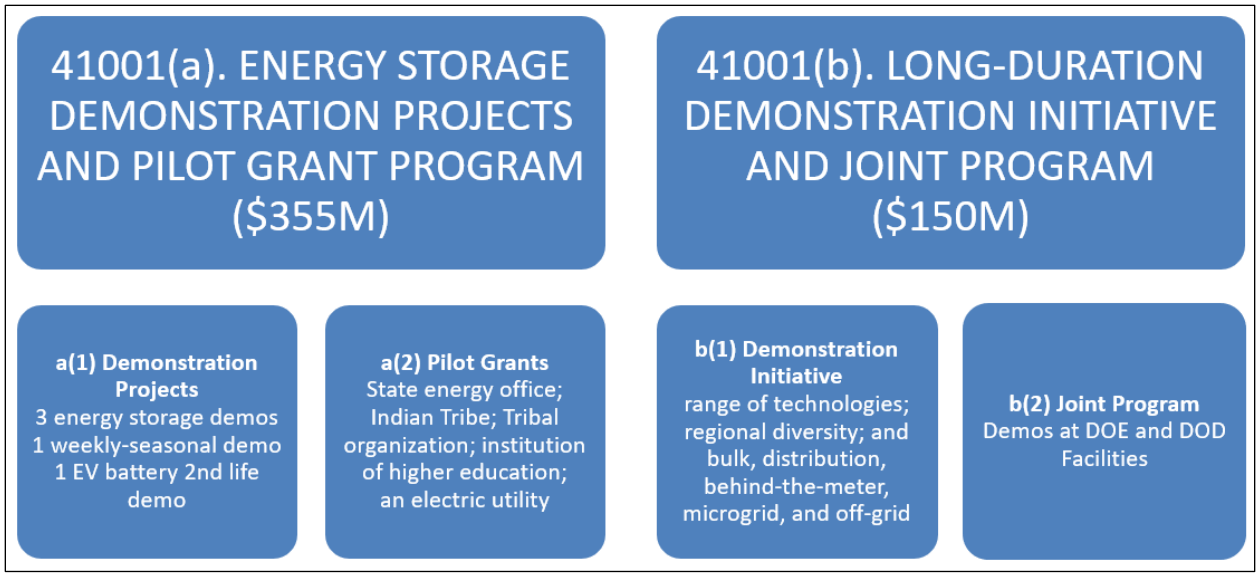

Figure 1: BIL 41001 Program Structure

DOE's Draft Strategy for BIL *41001 Implementation*

This section provides a high-level draft plan for DOE's current vision to meet the statutory requirements by conducting a competitive solicitation to select and demonstrate energy storage technologies. Please note this is a preliminary plan and it will evolve as DOE gathers feedback through this RFI and other stakeholder processes.

Figure 2 shows the high-level strategy for each of the four specific 41001 programs, overlaid on a general technology commercialization curve. To the left of these provisions (and out of scope of this RFI and the 41001 programs) is "DOE Core R&D", which includes the earlier-stage R&D activities supported through DOE's technology office energy storage programs. To the right of the BIL provisions is "Market Deployment-Focused Efforts" which addresses mature commercialization factors such as managing market uncertainty and optimizing operations.

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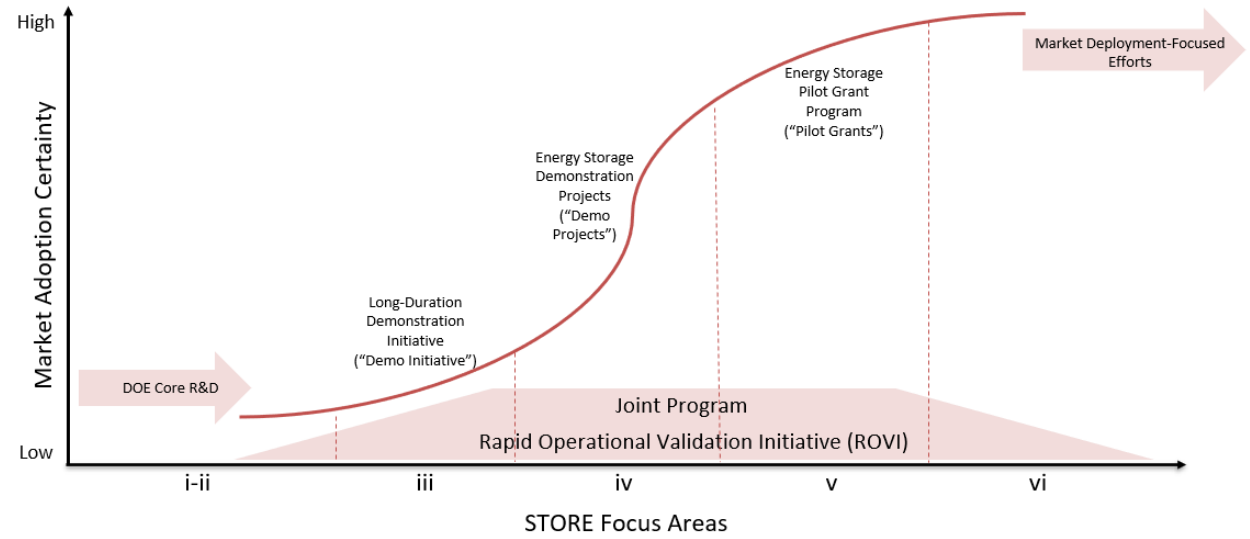

Figure 2: 41001 Programs Commercialization Segments

To define each area of interest, Figure 2 references a "Storage Technology Opportunity Readiness Evaluation" (STORE) scale. This scale lays out specific technical guidelines for the maturity of a storage technology. While the purpose of STORE is similar to that of other numerical maturity scales like technology readiness level (TRL) or commercial readiness index (CRI), STORE assigns quantitative metrics to describe energy storage technologies specifically. STORE Stages iii through v are represented by BIL 41001, while Stages i-ii are seen in "DOE Core R&D" and Stage vi is in "Continued Market Development." The STORE scale intends to differentiate the expected stages of storage technology maturity, and DOE intends to operate programs within assigned STORE stages.

Storage Technology Opportunity Readiness Evaluation (STORE)

i. **R&D**: This stage includes a broad set of activities culminating in laboratory data establishing a proof of concept. These activities include market need and problem identification, technology market research, design conception, impact evaluation (e.g., economic, environmental, emissions), mock-up, improvements on proven technologies, and simulations.

ii. **Concept Design:** This stage culminates with a technology that is validated in the lab at a small scale (< 10 kW), but not validated at scale for its proposed application. By the end of this stage, such a technology should validate sufficient integration, controls, and power conversion equipment (if applicable) for DC input and output.

iii. **Prototype Demonstration – *Demo Initiative***: This stage culminates with a small (50 – 100 kW or greater) lab-scale system that has been tested under controlled environments and conditions with sufficient data to justify a larger, more robust future system demonstration (as described in Stage iv). A prototype demonstration at this

stage should include the testing and analysis to understand implications regarding performance, reliability, lifetime, and systems/components integration of the design. Systems at this stage should contain sufficient integration, controls, and power conversion equipment (if applicable) for low-voltage (<1000V) AC input and output in a moderately complex environment (such as a campus microgrid).

iv. **Utility-Scale Validation – *Demo Projects***: This stage culminates with a 1st-of-a-kind system, > 5 MW, that is deployed in the field or grid-connected. Such a system, at the end of this stage, has been tested and integrated in a limited commercial operational environment after previous validation in a controlled environment (Such as in Stages ii and iii). This utility-scale test should yield data describing realistic operating conditions and accelerate the feasibility of the system to enable increasingly routine commercial deployment. Proposed systems at this stage should include plans for sufficient integration, controls, and power conversion equipment (if applicable) for medium voltage (up to 20kV) AC input and output to the bulk power system (or aggregated equivalent), and be prepared to comply with all applicable reliability, market, and operational requirements.

v. **Market Creation – *Pilot Grants***: This stage culminates with the demonstration of a system that is 1st-of-a-kind, or subsequently improved from 1st-of-a-kind in a second- or third- generation architecture with 1-100 MW of pre-existing deployments, and is demonstrated for a specific innovative application to meet a market need. Such a system in this stage will be de-risked through multiple demonstrations for comprehensive validation in its target application or to facilitate institutional reforms, with available data to further technology development. Concurrently, capabilities are being developed around this technology for industry to sustain investment. Systems at this stage may utilize technologies that have been fully commercialized for applications other than the target application.

vi. **Continuing Market Development**: This stage captures a broad set of activities including sustainable and reliable supply chain development, addressing market uncertainty, enabling broader deployment, optimizing siting, developing operations, and addressing regulatory barriers. Such a technology has over 100 MW deployed or represents a third-generation or subsequent, system design.

While a wide range of technologies fit into the STORE scale, DOE proposes some exclusions from 41001 programs. While Energy Storage Grand Challenge technologies can include Hydrogen-based technologies, DOE proposes to support such technologies with Hydrogen-specific provisions in the BIL (See, e.g., BIL sections 40313, 40314, and 40315). Furthermore, while Energy Storage Grand Challenge technologies can include non-bidirectional storage technologies that increase flexibility for generating stations (such as nuclear or fossil energy), DOE proposes to redirect such technologies to generation-specific provisions in the BIL (See, e.g., BIL sections 41002 and 41004). In evaluating projects otherwise eligible for Sec. 41001

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funding, DOE intends to preference projects that have the greatest greenhouse gas mitigation impact. DOE seeks feedback in the **BIL Provision-Specific Requirements and Implementation Strategy** section on the appropriateness of these exclusions.

Program Timeline and Strategy

In line with the high-level strategy, Figure 3 outlines the proposed timeline for executing each of the four provisions. The Rapid Operational Validation Initiative (ROVI) crosscuts all programs.

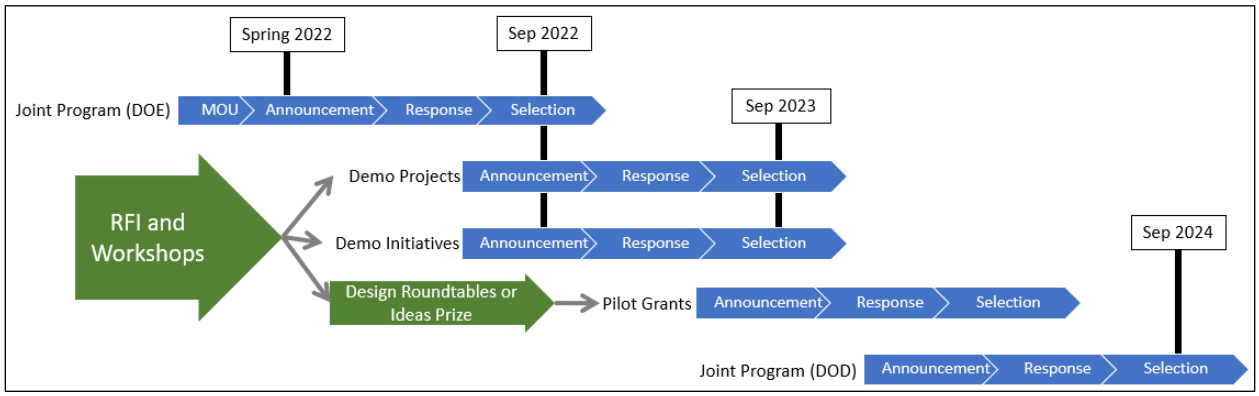

Figure 3: BIL 41001 Programs Expected Timelines

Purpose

The purpose of this RFI is to solicit feedback from industry, government agencies, Tribes, state and local coalitions, academia, research laboratories, labor unions, community-based organizations (CBOs),[12] and other stakeholders on DOE's strategy to implement the Demo Initiative, Demo Projects, and Pilot Grants under the 41001 energy storage programs. This is solely a request for information and not a funding opportunity. DOE is not accepting applications for funding. Please be advised that responses to this RFI are subject to disclosure under the Freedom of Information Act (FOIA).

You may answer as few or as many of the questions below as you would like. Please use the bolded Category numbers and sub-numbers as headings in your response to the greatest extent possible and refer to the questions (1.a, 2.b etc.) in the body of your responses. This helps save time both for the responder and DOE.

This RFI is divided into several sections, with many opportunities for input. Specifically, DOE is requesting input on the following categories and questions:

[12] Community-Based Organizations (CBOs) are public or private not-for-profit resource hubs that provide specific services to the community or targeted population within the community.

- Category 1: BIL 41001 Energy Storage Program-Specific Requirements and Implementation Strategy
- Category 2: BIL 41001 Energy Storage Program Crosscutting Topics
- Category 3: Employment: Expanding Union Jobs and Effective Workforce Development
- Category 4: Equity, Environmental and Energy Justice (EEEJ) Priorities
- Category 5: Additional Input

Category 1: 41001 Energy Storage Program-Specific Requirements and Implementation Strategy

Category 1A. Long-Duration Demonstration Initiative ("Demo Initiative")

As part of its overall energy storage portfolio, DOE's Long-Duration Demonstration Initiative (also referred to as the "Demo Initiative") will be "composed of demonstration projects focused on the development of long-duration energy storage technologies."[13]

As part of the Long Duration Storage Shot™, DOE defines long duration storage as systems capable of delivering 10 or more hours in duration. This functionality is a key enabler for grid decarbonization and for powering remote communities.[14] As noted in the Energy Storage Grand Challenge roadmap, long duration storage can also enable many other use cases, such as Electrified Mobility (e.g., charging infrastructure for electric vehicles) and Critical Services (e.g., storage to maintain power to healthcare facilities during an outage).

The strategy of the Demo Initiative, aligned with the "Prototype Demonstration" stage of the STORE scale, is to prepare a cohort of promising technologies for utility-scale demonstration through lab, behind-the-meter, or campus demonstrations. Specifically, these demonstrations are intended for field demonstrations at the scale of under 100 kW of small, lab-scale technologies that have already been proven at under 10 kW. Such demonstrations should gather sufficient data to validate operational characteristics and accelerate the feasibility of utility-scale demonstrations (such as what is outlined for Demo Projects).

In selecting projects for funding under the Demo Initiative, DOE will ensure a range of technology types; ensure regional diversity among projects; and consider bulk power level, distribution power level, behind the meter, microgrid, and off-grid applications.[15] In addition, DOE will consider the GHG mitigation impact as an important factor in project selection.

[13] 42 USC § 17232(d)(2)
[14] https://www.energy.gov/sites/default/files/2021-07/Storage%20shot%20fact%20sheet_071321_%20final.pdf
[15] The programmatic statutory authority requires DOE to consider these elements, "[t]o the maximum extent possible" in making project selections. Energy Act 2020, section 3201(d)(3). Codified at 42 USC § 17232(d)(3).

The primary risk for the Demo Initiative is that of supporting unvalidated technology, mitigated through development and validation. DOE typically addresses this barrier with traditional mechanisms often used for R&D projects, including cost-share grants and prizes. Cost-share grants give industry the opportunity to develop and demonstrate a higher-risk idea, while prizes could provide a wide range of eligible companies a lower barrier to entry and the opportunity to compete with their specific technology through a multi-stage, iterative structure.

The following questions are specific to the Demo Initiative.

1. *Demo Initiative*: The goal of this program is to prepare a cohort of promising technologies for eventual utility-scale demonstration. Successful projects will gather sufficient data to validate operational characteristics in the field and accelerate the feasibility of utility-scale demos. DOE anticipates that projects in this program will be small (< 100 kW) lab-scale systems that have proven operation in a controlled, behind-the-meter environment. Such projects will have sufficient integration, controls, and power conversion equipment (if applicable) for low-voltage (< 1000 V) AC input and output in moderately complex operational conditions. Please comment on the appropriate criteria for technology maturity at this stage.
    a. DOE is evaluating funding mechanisms for the Demo Initiative in accordance with the BIL. DOE is interested in removing barriers to participation for key communities, particularly underrepresented communities and individuals; DACs as defined by DOE's Justice40 guidance; and fossil energy communities in transition, as well as organizations or institutions that represent them. Please comment on the ways different funding mechanisms may contribute to equitable selection and community engagement for the Demo Initiative. Specifically, as it relates to the Demo Initiative, please consider the following mechanisms:
        i. DOE is considering cost-share grant awards and cooperative agreements[16] as mechanisms to fund long-duration demonstration projects. Please comment on the effectiveness of cost-share grants and cooperative agreements to achieve the objectives of the Demo Initiative.
        ii. As part of the Demo Initiative, DOE is considering a prize mechanism. Please comment on the effectiveness of prizes or challenges.
        iii. DOE is considering funding technical assistance for long-duration energy storage. Please comment on the effectiveness of technical assistance. Explain what technical areas of long-duration energy storage would benefit the most from technical assistance. What kinds of technical assistance would be most beneficial?

[16] For more information about Cooperative Agreements, see the DOE Guide to Financial Assistance: https://www.energy.gov/management/articles/department-energy-guide-financial-assistance

iv. As an alternative to grants and cooperative agreements, DOE is considering Technology Investment Agreements[17] (TIA) or Partnership Intermediary Agreements[18] (PIA), to remove barriers and reach underrepresented or disadvantaged groups. Please comment on the effectiveness of a TIA or PIA structure for Demo Initiative projects.

v. Please comment on the aspects of the listed funding mechanisms that may impede removing technology barriers to broader deployment, and could potentially be addressed in an alternate funding mechanism to the ones described.

b. What is a sufficient individual award size to make a significant difference for its targeted technologies? DOE is interested in understanding the award size required across several project sizes and durations that may be required for different applications.

c. What portfolio of projects (technology, use case, location, community engagement, etc.) would constitute successful implementation? How can success be measured?

d. DOE defines long duration storage as systems capable of delivering 10 or more hours in duration. Which use cases and application areas may be most relevant for an applicant with a proposed low-maturity, long-duration technology demonstration?

e. DOE proposes requiring technologies to substantiate a pathway to a levelized cost of storage (LCOS) of $0.05/kWh-cycle by 2030, using a methodology similar to https://arpa-e.energy.gov/sites/default/files/documents/files/DAYS_ProgramOverview_FINAL.pdf.

i. What level of analysis is appropriate for applicants to provide in order to show the likelihood, timeline, and major milestones for achieving the LCOS goal?

ii. What alternate approaches exist, not based on LCOS, that enable the development of robust storage market? For example, capacity costs or a

[17] 10 CFR part 603. Technology Investment Agreements are the implementation of DOE's Other Transactions Authority from 42 U.S.C. § 7256 and is a contracting mechanism intended to reduce barriers that prevent some for-profit firms from participating in DOE's research, development, and demonstration (RD&D) programs and broaden the technology base available to meet DOE mission requirements. A TIA requires substantial federal involvement and may be either a type of cooperative agreement or a type of assistance transaction other than a cooperative agreement, depending on the intellectual property provisions.

[18] A Partnership Intermediary Agreement is a non-FAR-based contracting mechanism authorized by 15 U.S.C. § 3715. Using this mechanism, a federal laboratory can authorize a partnership intermediary to perform services for the Federal laboratory that increase the likelihood of success in the conduct of cooperative or joint activities of such Federal laboratory with small business firms, institutions of higher education. More information on how this mechanism has been used at the Department of Defense may be found here: https://www.ida.org/research-and-publications/publications/all/o/op/opportunities-to-advance-dod-technology-transfer-with-partnership-intermediary-agreements

combination of capital cost and round trip efficiency (RTE) may be more appropriate for a given situation.

f. Which technology families or types may be most applicable for consideration?
g. What regional factors should be considered when identifying and selecting applicants (e.g., economic and market considerations, policy considerations, environmental and energy justice considerations, geology and geography, workforce availability and skills, existing workforce training systems including apprenticeships and pre-apprenticeships, industry partners, Historically Black Colleges and Universities and other Minority-Serving Institutions, minority-owned businesses, regional specific resources, all-hazards resilience, climate risk, etc.)? DOE is also interested in understanding what parameters constitute go/no-go decision points related to these factors.
h. To maximize the impact of a technology under the Demo Initiative, what partnerships (directly or indirectly in the project team) are most critical? Example partners may include engineering/procurement/construction (EPC) firms, facility managers, universities, community and labor representatives, or others.
    i. Who are the most appropriate labor unions or other workforce organizations to engage in this work (federal, state, or local)?
    ii. Which organizations effectively engage with innovators and entrepreneurs in underserved communities related to Demo Initiative projects?
i. What considerations should be given to the manufacturing/ supply chain needs and RD&D opportunities for a technology? For example, the availability of a domestic, secure, and ethical source of materials; the ability to use underutilized manufacturing capacity including buildings and infrastructure; and the speed at which manufacturing can be scaled to meet future demand?
    i. What level of analysis would an applicant be able to provide to demonstrate the supply chain criteria listed above?
j. What cybersecurity considerations, opportunities, barriers, and metrics are most relevant for Demo Initiative projects?
k. The Justice40 Initiative sets a goal that 40% of the overall benefits of certain federal investments will flow to disadvantaged communities (DACs). The Justice40 Interim Guidance defines benefits as direct and indirect investments (and program outcomes) that positively impact disadvantaged communities and provides examples[19] and DOE's Justice40 Guidance sets forth DOE's policy priorities for DACs[20]. What selection criteria can be established and what data can be collected

[19] Page 4: https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf

[20] DOE's policy priorities for DACs include:
i. Decrease energy burden in disadvantaged communities (DACs);
ii. Decrease environmental exposure and burdens for DACs;
iii. Increase parity in clean energy technology (e.g., solar, storage) access and adoption in DACs;

throughout the life of a project to understand progress towards the Justice40 policy priorities?

l. In establishing its application process, what approaches can DOE most usefully take to solicit and evaluate information relating to a – k above? How can a "concept paper" element to the application be useful in presenting the integrated view of the value of the proposal? How can an "equity, justice, and benefits paper" element to the application be useful in presenting the case of how the proposal – if ultimately successful and replicated – would yield meaningful benefit to historically burdened communities, or communities most negatively affected by the energy transition? How can "milestone" requirements be useful, that describe what outcomes critical to ultimate commercialization/deployment that will be accomplished by the work proposed to be funded?

Category 1B. Energy Storage Demonstration Projects ("Demo Projects")

As part of Demo Projects, DOE is required to fund three energy storage system demonstration projects by September 30, 2023. [21] Congress provided specific direction on the target use cases with the following language:

- At least 1 project must be designed to further the development of technologies – "(v) for weekly or monthly durations, which have the capacity to discharge energy for 10 to 100 hours, at a minimum," **OR** "(vi) for seasonal durations, which have the capability to address seasonal variations in supply and demand."[22]
- At least 1 project must "demonstrate second-life applications of electric vehicle batteries as aggregated energy storage installations to provide services to the electric grid[.]"[23]

Congress appropriated additional funding for implementation consistent with Demo Projects in the Consolidated Appropriations Act, 2022[24], enacted on March 15, 2022.

- The 2022 Consolidated Appropriations Act provides DOE with $20M for implementation consistent with "section 3201 of the Energy Act of 2020 for energy storage projects that

iv. Increase access to low-cost capital in DACs;
v. Increase clean energy enterprise creation and contracting (MBE/DBE) in DACs;
vi. Increase clean energy jobs, job pipeline, and job training for individuals from DACs;
vii. Increase energy resiliency in DACs; and
viii. Increase energy democracy, including community ownership, in DACs.

[21] 42 USC § 17232(c)(1)
[22] 42 USC §§ 17232(c)(1)(A) and 17232(b)(2)(A)
[23] 42 USC §§ 17232(c)(1)(B) and 17232(c)(3)
[24] Public Law 117-103 (March 15, 2022).

are U.S-controlled, U.S.-made, and North American sourced and supplied. The Department is directed to include in this program large scale commercial development and deployment of long cycle life, lithium-grid scale batteries and their components."[25]

Given the similar project size (capacity and cost) required from both the large-scale demonstrations specified in both BIL 41001(a) and the 2022 Consolidated Appropriations Act, DOE intends to include all three required projects listed above in the same overarching funding structure under Demo Projects (but under different subtopics, for example). DOE expects that the funding from the 2022 Consolidated Appropriations Act ($20M) will likely fund one distinct project. Consistent with implementation of BIL 41001(a), DOE will consider the GHG mitigation impact as an important factor in project selection.

The strategy of Demo Projects, which corresponds to the mid-maturity "Utility-Scale Validation" phase of the STORE scale, is to enable first-of-a-kind technologies at utility scale by mitigating technology risk to potential buyers, or offtakers. The targeted technologies are within the steepest portion of the commercialization curve and represent final technical validation point before wider deployment. These large, long-duration storage demonstrations should have the capacity to discharge energy for a duration of >10 hours at rated power and sufficient third-party testing/ validation to substantiate a pathway to a levelized cost of storage of $0.05/kWh.

The objective of "utility-scale validation" is most likely to be accomplished with projects that are grid connected in a semi-commercial setting. The project team will likely require multiple partners, including storage technology vendors, EPC companies, and the offtaker. Other project partners may include the surrounding community for engagement and benefit, the approving authority, and the finance enabler. DOE will prioritize the participation of diverse and underrepresented suppliers, including minority business enterprises, as prime applicants and project partners.

DOE is considering other creative contractual mechanisms, beyond cost-share grants and cooperative agreements, to maximize the Demo Projects program objectives.

The following questions are specific to Demo Projects.

2. *Demo Projects*: The goal of this program is to utilize BIL funding to deploy first-of-a-kind technologies at utility scale which might not otherwise proceed given potential technology risk. Such technologies should have the capacity to discharge energy for a duration of >10 hours at rated power, with sufficient third-party testing/ validation to

[25] Joint Explanatory Statement for the Consolidated Appropriations Act, 2022, Division D - Energy and Water Development and Related Agencies Appropriations Act, BILLS-117RCP35-JES-DIVISION-D.pdf (house.gov).

substantiate a pathway to a levelized cost of storage of $0.05/kWh-cycle by 2030. DOE proposes that projects in this program be 1st-of-a-kind MW-scale systems, with sufficient integration, controls, power conversion equipment (if applicable), and interconnection to the bulk power system. Please comment on the appropriate criteria for technology maturity at this stage.

a. DOE is evaluating funding mechanisms for Demo Projects in accordance with the BIL. DOE is interested in removing barriers to participation for key communities, particularly underrepresented communities and individuals; DACs as defined by DOE's Justice40 guidance; and fossil energy communities in transition, as well as organizations or institutions that represent them. Please comment on the ways different funding mechanisms may contribute to equitable selection and community engagement for Demo Projects. Specifically, as it relates to Demo Projects, please consider the following mechanisms:
    i. DOE is considering cost-share grants and cooperative agreements as a mechanism to make awards. Please comment on the effectiveness of cost-share grants and cooperative agreements to achieve the objectives of the Demo Projects.
    ii. DOE is interested in learning more about offtake agreement mechanisms, where DOE could fund an "adder" incremental to market payment, effectively funding just the innovative piece of a project (beyond standard market cost). The benefit of such an agreement for DOE is that the company is only funded if the project is successful; otherwise, DOE may reclaim the funds for use on other projects. Please comment on the effectiveness of this mechanism to achieve the objectives of Demo Projects.
    iii. Please comment on how an "anchor tenant" mechanism[26] could be structured and incorporated into a demonstration under Demo Projects, and how that approach would benefit the project objectives.
    iv. What funding mechanisms other than cost-share grants and cooperative agreements, offtake agreements, and anchor tenants are best suited to achieve the purposes of Demo Projects?
    v. As an alternative to grants or cooperative agreements, DOE is considering alternate funding mechanisms, such as Technology Investment

[26] Under an anchor tenant, DOE purchases capacity on a new resource, enabling companies to afford the upfront cost of a project, then resells once fully operational.

Agreements[27] (TIA) or Partnership Intermediary Agreements[28] (PIA), to remove barriers and reach underrepresented groups and DACs. Please comment on the effectiveness of a TIA or PIA structure for Demo Projects.

vi. Please comment on the aspects of the listed funding mechanisms that may impede removing technology barriers to broader deployment, and could potentially be addressed in an alternative funding mechanism to the ones described.

vii. DOE is interested in using funding mechanisms to rapidly commercialize new technologies, assist industry in learning how to structure performance and technology risk in future agreements, and incentivize project performance. Please comment on the optimal funding mechanisms, from those described or others, that DOE can use to achieve these goals and what other goals should be of interest.

b. One of the projects must supply power "(v) for weekly or monthly durations, which have the capacity to discharge energy for 10 to 100 hours, at a minimum," OR "(vi) for seasonal durations, which have the capability to address seasonal variations in supply and demand."[29] What are the key barriers (technical, institutional, regulatory, etc.) and opportunities associated with a demonstration of this type, and which funding mechanisms can DOE use to overcome these barriers?

c. One of the projects must "demonstrate second-life applications of electric vehicle batteries as aggregated energy storage installations to provide services to the electric grid."[30] What are the key barriers (technical, institutional,

[27] 10 CFR part 603. Technology Investment Agreements are the implementation of DOE's Other Transactions Authority from 42 U.S.C. § 7256 and is a contracting mechanism intended to reduce barriers that prevent some for-profit firms from participating in DOE's research, development, and demonstration (RD&D) programs and broaden the technology base available to meet DOE mission requirements. A TIA requires substantial federal involvement and may be either a type of cooperative agreement or a type of assistance transaction other than a cooperative agreement, depending on the intellectual property provisions.

[28] A Partnership Intermediary Agreement is a non-FAR-based contracting mechanism authorized by 15 U.S.C. § 3715. Using this mechanism, a federal laboratory can authorize a partnership intermediary to perform services for the Federal laboratory that increase the likelihood of success in the conduct of cooperative or joint activities of such Federal laboratory with small business firms, institutions of higher education. More information on how this mechanism has been used at the Department of Defense may be found here: https://www.ida.org/research-and-publications/publications/all/o/op/opportunities-to-advance-dod-technology-transfer-with-partnership-intermediary-agreements

[29] 42 USC §§ 17232(b)(2)(A) and 17232(c)(1)(A)

[30] 42 USC § 17232(c)(1)(B)

regulatory, etc.) and opportunities associated with a demonstration of this type, and which funding mechanisms can DOE use to overcome these barriers?

   i. How can this demonstration best complement BIL Sec. 40208 Electric Drive Vehicle Battery Recycling and Second Life Applications program?

d. The Consolidated Appropriations Act, 2022 provides DOE with $20M for implementation consistent with "section 3201 of the Energy Act of 2020 for energy storage projects that are U.S-controlled, U.S.-made, and North American sourced and supplied. The Department is directed to include in this program large scale commercial development and deployment of long cycle life, lithium-grid scale batteries and their components."[31] What are the key barriers (technical, institutional, regulatory, etc.) and opportunities associated with a demonstration of this type, and which funding mechanisms can DOE use to overcome these barriers?
e. What is a sufficient individual award size to make a significant difference for its targeted technologies? DOE is interested in understanding the award size required across several project sizes and durations that may be required for different applications.
f. What portfolio of projects (technology, use case, location, community engagement, etc.) would constitute successful implementation? How can success be measured?
g. DOE defines long duration storage as systems capable of delivering 10 or more hours in duration. DOE is considering evaluating technologies for use on a daily, diurnal cycle (i.e., charging during the daytime and discharging at night).
   i. Which other use cases and application areas could be relevant for an applicant applying to Demo Projects with a proposed large-scale, mid-maturity, long-duration technology demonstration?
h. DOE proposes requiring technologies to substantiate a pathway to a levelized cost of storage of $0.05/kWh-cycle by 2030, using a methodology similar to https://arpa-e.energy.gov/sites/default/files/documents/files/DAYS_ProgramOverview_FINAL.pdf.
   i. What level of analysis is appropriate for applicants to provide in order to show the likelihood, timeline, and major milestones for achieving the LCOS goal?
   ii. What alternate approaches exist, not based on LCOS, that enable the development of robust storage market? For example, capacity costs or a

[31] 2022 Energy and Water Development and Related Agencies Appropriations Bill, House Report 117-98.

combination of capital cost and round trip efficiency (RTE) may be more appropriate for a given situation.

i. What project sizes and power ratings should be targeted for optimal demonstration under Demo Projects?
j. Which technology families or types are most applicable for consideration under Demo Projects?
k. What regional factors should be considered when identifying and selecting applicants (e.g., economic and market considerations, policy considerations, environmental and energy justice considerations, geology and geography, workforce availability and skills, existing workforce training systems including apprenticeships and pre-apprenticeships, industry partners, Historically Black Colleges and Universities and other Minority-Serving Institutions, minority-owned businesses, regional specific resources, all-hazards resilience, climate risk, etc.)? DOE is interested in understanding what parameters constitute go/no-go decision points related these factors.
l. To maximize the impact of a technology, what partnerships (directly or indirectly on the project team) are most essential (e.g., technology vendor, EPC, offtaker, community, labor unions, etc.)?
    i. Who are the most appropriate labor unions or other workforce organizations to engage in this work (federal, state, or local)?
    ii. Which organizations effectively engage with innovators and entrepreneurs in DACs related to projects under Demo Projects?
m. DOE proposes giving priority to technologies that leverage a secure supply chain. What considerations should be given to the manufacturing/supply chain needs, challenges and RD&D opportunities for a technology? For example, the availability of a domestic, secure, and ethical source of materials; the ability to use underutilized manufacturing capacity, and/or the speed at which manufacturing can be scaled to meet future demand.
    i. What level of analysis would an applicant be able to provide to demonstrate the supply chain criteria listed above?
n. What cybersecurity considerations, opportunities, barriers, and metrics are most relevant for Demo Projects?
o. The Justice40 Initiative sets a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities (DACs). The Justice40 Interim Guidance defines benefits as direct and indirect investments (and program outcomes) that positively impact disadvantaged communities and provides examples[32] and DOE's Justice40 Guidance sets forth DOE's policy

[32] Page 4: https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf

priorities for DACs[33]. What selection criteria can be established and what data can be collected throughout the life of a project to understand progress towards the Justice40 policy priorities?

p. In establishing its application process, what approaches can DOE most usefully take to solicit and evaluate information relating to a – o above? How can a "concept paper" element to the application be useful in presenting the integrated view of the value of the proposed Demo Project? How can an "equity, justice, and benefits paper" element to the application be useful in presenting the case of how the proposed Demo Project – if ultimately successful and replicated – would yield meaningful benefit to historically burdened communities, or communities most negatively affected by the energy transition? How can "milestone" requirements be useful, that describe what outcomes critical to ultimate commercialization/deployment that will be accomplished by the work proposed to be funded?

Category 1C. Energy Storage Pilot Grant Program ("Pilot Grants")

The Energy Storage Pilot Grant Program ("Pilot Grants") will provide support to eligible entities to carry out demonstration projects for pilot energy storage systems.[34]

The strategy of Pilot Grants, corresponding to the "Market Creation" stage of the STORE scale, is to build enduring capabilities (institutional, analytical, financial) for targeted communities to invest in storage resources that provide local benefits (including resilience, decarbonization, and economics).

While the Demo Initiative and Demo Projects address pilot demonstration and utility-scale validation, Pilot Grants is an opportunity to address institutional barriers to storage technology adoption in the marketplace. Such barriers can be easier to resolve when a technology has been installed, operated, de-risked, and shown to provide benefit to users, communities, or the power system. However, few entities have the financial capability to invest in such a pilot. By

[33] DOE's policy priorities for DACs include:
i. Decrease energy burden in disadvantaged communities (DACs);
ii. Decrease environmental exposure and burdens for DACs;
iii. Increase parity in clean energy technology (e.g., solar, storage) access and adoption in DACs;
iv. Increase access to low-cost capital in DACs;
v. Increase clean energy enterprise creation and contracting (MBE/DBE) in DACs;
vi. Increase clean energy jobs, job pipeline, and job training for individuals from DACs;
vii. Increase energy resiliency in DACs; and
viii. Increase energy democracy, including community ownership, in DACs.

[34] 42 USC § 17232(c)(2)(B)

pairing a pilot demonstration with a commitment to pursue institutional or regulatory reforms, Pilot Grants can provide significant leverage in accelerating storage deployments.

The following entities are eligible under Pilot Grants:

(i) a State energy office (as defined in section 15821(a) of this title);
(ii) an Indian Tribe (as defined in section 4103 of title 25);
(iii) a Tribal organization (as defined in section 3765 of title 38);
(iv) an institution of higher education (as defined in section 1001 of title 20);
(v) an electric utility, including-
  (I) an electric cooperative;
  (II) a political subdivision of a State, such as a municipally owned electric utility, or any agency, authority, corporation, or instrumentality of a State political subdivision; and
  (III) an investor-owned utility; and
(vi) a private energy storage company."[35]

Each pilot project must aim to mitigate GHG emissions and include at least one of the following objectives:

1. "To improve the security of critical infrastructure and emergency response systems.
2. To improve the reliability of transmission and distribution systems, particularly in rural areas, including high-energy cost rural areas.
3. To optimize transmission or distribution system operation and power quality to defer or avoid costs of replacing or upgrading electric grid infrastructure, including transformers and substations.
4. To supply energy at peak periods of demand on the electric grid or during periods of significant variation of electric grid supply.
5. To reduce peak loads of homes and businesses.
6. To improve and advance power conversion systems.
7. To provide ancillary services for grid stability and management.
8. To integrate renewable energy resource production.
9. To increase the feasibility of microgrids (grid-connected or islanded mode).
10. To enable the use of stored energy in forms other than electricity to support the natural gas system and other industrial processes.
11. To integrate fast charging of electric vehicles.

[35] 42 USC § 17232(c)(2)(A)

12. To improve energy efficiency."[36]

In selecting projects under Pilot Grants, DOE must, to the maximum extent practicable –

i. "ensure regional diversity among the selected applicants, including ensuring participation of rural States and States with high energy costs;
ii. ensure the selected projects –
    I. expand on the existing technology demonstration DOE programs;
    II. are designed to achieve 1 or more of the objectives described above; and
    III. inject or withdraw energy from the bulk power system, electric distribution system, building energy system, or microgrid (grid-connected or islanded mode) where the project is located;
iii. give consideration to proposals for securing energy storage through competitive procurement or contract for service; and
iv. prioritize projects that leverage matching funds from non-Federal sources."[37]

Potentially, the eligible entity selected for funding under Pilot Grants need not be the same entity that builds, owns, or operates an energy storage service. The entities selected for funding could potentially use creative contractual mechanisms to structure their energy storage projects.

The following questions relate to Pilot Grants.

3. *Pilot Grants*: The goal of this program is to build enduring capabilities for targeted communities to invest in storage resources that provide local benefits (including resilience, decarbonization, and financial). Please comment on the appropriate criteria for technology maturity at this stage.
    a. What portfolio of projects (technology, use case, location, community engagement, etc.) would constitute a successfully implemented pilot project? How can success be measured?
    b. DOE is required to establish a "competitive grant program … to carry out demonstration projects for pilot energy storage systems." The direction also specifies giving consideration to "proposals from eligible entities for securing energy storage through competitive procurement or contract for service." DOE is evaluating funding mechanisms for Pilot Grants in accordance with the BIL, including investigating innovative structures to fund states and communities, so they can further invest in energy storage. DOE is interested in removing barriers to participation for key communities, particularly underrepresented communities and individuals; DACs as defined by DOE's Justice40 guidance; and

[36] 42 USC § 17232(c)(2)(D)
[37] 42 USC § 17232(c)(2)(C)

fossil energy communities in transition, as well as organizations or institutions that represent them. Please comment on the ways different funding mechanisms may contribute to equitable selection and community engagement for Pilot Grants. Specifically, as it relates to Pilot Grants, please consider the following mechanisms:

i. DOE is considering a competitive grant program. Please comment on the effectiveness of a competitive grant program to achieve the objectives of Pilot Grants.
ii. DOE may consider a Partnership Intermediary Agreements[38] to set up a mechanism to make competitive grant program awards. Please comment on the effectiveness of partnership intermediary agreements for Pilot Grants.
iii. Credit enhancement mechanisms may manage the high upfront cost of deploying proven technologies, opportunities are targeted at improving an individual's creditworthiness. This may be done by providing seed funding to eligible entities (states, Tribes, higher education) to use for raising credit to purchase more storage. Please comment on the effectiveness of a credit enhancement mechanism to support the objectives of Pilot Grants.
iv. An energy storage subscription model may enable users to obtain energy storage functions on a trial or part-time basis. This model could be particularly useful with the combination of mobile storage architectures and users that only have a seasonal need for storage. Please comment on the effectiveness of an energy storage subscription model to support the objectives of Pilot Grants.
v. Even for validated ("off the shelf") technology, a deployment and use case may represent a new application for storage. Institutional support to address regulatory or permitting restrictions may be needed to enable greater deployment of previously proven technologies, building capabilities for that technology (and future ones) in a given use case. Please comment on the effectiveness of institutional support.
vi. A warranty backstop is a mechanism to guarantee the performance of a system and enable an affordable way to facilitate deployments of new

[38] A Partnership Intermediary Agreement is a non-FAR-based contracting mechanism authorized by 15 U.S.C. § 3715. Using this mechanism, a federal laboratory can authorize a partnership intermediary to perform services for the Federal laboratory that increase the likelihood of success in the conduct of cooperative or joint activities of such Federal laboratory with small business firms, institutions of higher education. More information on how this mechanism has been used at the Department of Defense may be found here: https://www.ida.org/research-and-publications/publications/all/o/op/opportunities-to-advance-dod-technology-transfer-with-partnership-intermediary-agreements

technologies with limited operational records. Please comment on effectiveness of a warranty backstop to support the objectives of the Pilot Grants.

vii. Please comment on the barriers to achieving the stated goals of Pilot Grants under mechanisms listed above, and what other mechanisms could be considered.

c. What is a sufficient individual award size for a pilot project to make a significant difference for its targeted use and technologies? DOE is interested in understanding the award size required across several project sizes and durations that may be required for different applications.

d. Given the wide potential for creativity, DOE may consider developing an initial "prize" stage or a competition for ideas on how eligible entities could use funds for leveraged demonstrations. DOE could then incorporate the prize-winning ideas into one or more distinct solicitations. There are numerous mechanisms, factors, and combinations that would go into program design, so thoughtfully selecting the most impactful elements could make a major difference for the technologies and the institutional capabilities that are "learned."

   i. How can the prize competition be structured to maximize innovation in the proposed ideas? What eligibility requirements and design criteria are needed to increase participation and feasibility of ideas for DOE?

   ii. What amount would be sufficient to allocate to the prize competition stage? How much does one prize award need to be to incentivize the most creative mechanisms?

e. Which use cases and application areas, including the objectives listed in 42 USC § 17232(c)(2)(D) and copied above in this section, are most relevant for Pilot Grants, which targets late-stage, mature technologies that predominately need to address non-technical barriers for wider deployment?

f. What are the major institutional and regulatory barriers preventing wider energy storage deployment? How can proposed projects under Pilot Grants be structured to address these barriers?

g. How might an entity create structures that address barriers to storage deployment in a leveraged manner, potentially enabling many repeatable deployments?

h. Which technology families or types are most applicable for consideration under Pilot Grants?

i. What regional factors should be considered when identifying and selecting applicants (e.g., economic and market considerations, policy considerations, environmental and energy justice considerations, geology and geography, workforce availability and skills, existing workforce training systems including apprenticeships and pre-apprenticeships, industry partners, Historically Black

Colleges and Universities and other Minority-Serving Institutions, minority-owned businesses, regional specific resources, all-hazards resilience, climate risk, etc.)? DOE is interested in understanding what parameters constitute go/no-go decision points related these factors.

j. To maximize the impact of a technology, what partnerships (directly or indirectly in the project team) are most essential? (e.g., states, Tribes, technology vendor, EPC, offtaker, community, labor unions, etc.)
    i. Who are the most appropriate labor unions or other workforce organizations to engage in this work (federal, state, or local)?
    ii. Which organizations effectively engage with innovators and entrepreneurs in DACs related to projects under Pilot Grants?
    iii. How may small utilities be optimally engaged, either as recipients or project partners/ stakeholders?
k. What considerations should be given to the potential supply chain for a technology? For example, the availability of a domestic, secure, and ethical source of materials; the ability to use underutilized manufacturing capacity, and/or the speed at which manufacturing can be scaled to meet future demand.
    i. What level of analysis would an applicant be able to provide to demonstrate the supply chain criteria listed above?
l. What cybersecurity considerations, opportunities, barriers, and metrics are most relevant for Pilot Grants?
m. The Justice40 Initiative set a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities (DACs). The Justice40 Interim Guidance defines benefits as direct and indirect investments (and program outcomes) that positively impact disadvantaged communities and provides examples[39] and DOE's Justice40 Guidance sets forth DOE's policy priorities for DACs[40]. What selection criteria can be established and what data can be collected throughout the life of a project to understand progress towards the Justice40 policy priorities?
n. In establishing its application process, what approaches can DOE most usefully take to solicit and evaluate information relating to a – m? How can a "concept

[39] Page 4: https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf

[40] DOE's policy priorities for DACs include:
i. Decrease energy burden in disadvantaged communities (DACs);
ii. Decrease environmental exposure and burdens for DACs;
iii. Increase parity in clean energy technology (e.g., solar, storage) access and adoption in DACs;
iv. Increase access to low-cost capital in DACs;
v. Increase clean energy enterprise creation and contracting (MBE/DBE) in DACs;
vi. Increase clean energy jobs, job pipeline, and job training for individuals from DACs;
vii. Increase energy resiliency in DACs; and
viii. Increase energy democracy, including community ownership, in DACs.

paper" element to the application be useful in presenting the integrated view of the value of the proposed Pilot Grant project? How can an "equity, justice, and benefits paper" element to the application be useful in presenting the case of how the proposed Pilot Grant pilot – if ultimately successful and replicated – would yield meaningful benefit to historically burdened communities, or communities most negatively affected by the energy transition? How can "milestone" requirements be useful, that describe what outcomes critical to ultimate commercialization/deployment that will be accomplished by the work proposed to be funded?

Category 1D. Rapid Operational Validation Initiative (ROVI)
Every 3 years, DOE must provide report to Congress that describes the performance of the energy storage programs. In addition, DOE must give priority consideration for long-duration energy storage demonstration projects that will make project information publicly available.

To fulfill these requirements, DOE proposes leveraging a program known as the Rapid Operational Validation Initiative (ROVI). DOE is contemplating a requirement that all demonstrations be required to participate in (i.e., share data with) ROVI.

ROVI harnesses capabilities from across the National Laboratory Complex and U.S. industry to shift the deployment paradigm from a decades long development and validation process to one that can be accomplished in a few years. On the validation aspect alone ROVI looks to provide at least a 15-year technology life and performance prediction using 1-year or less of data. ROVI will do this by using state-of-the-art data-science to create artificial intelligence (AI)/ machine learning (ML) tools for rapid life prediction in complex situations and by continuously refining use-case scenarios – both with quantified uncertainty that is useful for commercial investing.

ROVI is envisioned as a cross-cutting analytical framework that can support faster validation of technologies currently being developed within DOE's Office of Electricity as well as the other relevant DOE and BIL programs. ROVI will use a combination of laboratory physical characterization and performance data, data generated from physics-based models and digital twins, and field deployment data: the field deployment data is especially crucial as it enables tools which predict authentic life in the field. Providing this critical field data is therefore key to unlocking the power of this transformational paradigm. Key technologies and outcomes which will be developed as part of ROVI to directly accelerate routine, commercial energy storage deployment include:

- TOOLS
    - Machine Learning and domain-based tools for rapid prediction of life, using scarce data, in complex use-cases.

  - Robust digital twins to support industry deployment which can be used to jointly predict performance and life for a fully developed system including controls.
  - New tools which generate and use physics-based synthetic data across multiple length scales.
  - Tools which allow collection, convergence and use of data from different length scales and different sources.
- USE CASES: Use cases which reflect how storage will function to meet future demand.
- TESTING: New accelerated laboratory test methods which directly stress failure modes at the boundary conditions of performance (different than today's accelerated tests).
- DATA STORAGE: A set of cross technology, secure datahubs that will provide storage of varied data streams, protect intellectual property, and enable analysis which ultimately will provide tools for use by both researchers and industry.

The data, models, and projections from the ROVI framework will include mechanisms to gauge technological progress of new technologies, which will help accelerate commercialization of the technologies to be demonstrated by the storage provisions. These outputs will be a key component in satisfying the performance reporting requirements for these programs.[41]

4. DOE seeks comment on the how the ROVI program could be structured or revised to maximize the objective of enabling commercial financing and adoption of technologies that would not otherwise have robust performance projections.
    a. Please comment on the kinds of data that project performers would be required to provide, as well as any necessary safeguards.
        i. Technical Performance: basic performance characteristics at most basic repeat unit, module, and system level. E.g., for battery storage systems the expected duty cycle, current, voltage, temperature, round trip efficiency, depth of discharge, maximum charge capacity, discharge rates for cells, modules, and system.
        ii. Frequency of collection: live feed to secure database or weekly, monthly, quarterly upload of data. Differentiation of scheduled maintenance/calibration vs. unscheduled shutdown.
        iii. Data ownership/anonymity: best methods to protect proprietary data while providing technical performance specifications needed for ROVI development tools. Export control and US competitiveness needs for data management.
    b. Please comment on how the tools and technical outputs from ROVI could be made most useful for US industry. How could ROVI tools and advances impact commercial transactions, such as for use in determining power purchase

[41] 42 U.S. Code § 17232(c)(3)

agreement performance parameters, establishing warranty backstops, or facilitating debt financing? How could ROVI tools facilitate better informed resilience planning and future grid design?

c. How may the outputs from ROVI track or facilitate achievement of DOE policy priorities for Justice40, including increasing access to clean energy, low-cost capital, enterprise creation, and clean energy jobs and training?
d. Please comment on any other considerations with respect to ROVI.

Category 2: BIL 41001 Energy Storage Programs Crosscutting Topics

This category and questions are cross-cutting and generally applicable to each of the Energy Storage programs: Demo Initiative; Demo Projects and Pilot Grants. Some of the questions in this category may overlap with Category 1. You may respond to these questions in each category, or in one category.

Category 2A. Storage Technology Opportunity Readiness Evaluation (STORE)

5. DOE is seeking input on the clarity of the STORE scale as it relates to the energy storage programs described above and additional metrics to further define the technology and community acceptance landscape for long-duration storage.
    a. Please comment on how effectively or thoroughly the STORE scale can be used when describing the major barriers to commercialization of new innovative storage technologies.
    b. Based on the STORE scale described in the section *DOE's Draft Strategy for BIL 41001 Implementation* and summarized in Figure 2, how clearly can an applicant find and know which program or solicitation to apply to?
    c. What additional details could be present in a funding opportunity announcement to increase applicant confidence in which program to apply to?
6. What specific metrics or criteria should be added to the STORE scale for further robustness and clarity about which technologies and maturity levels fit into which provisions?

Category 2B. BIL Provision, Requirements and Proposed Implementation

7. What policies, infrastructure, or other considerations could be put in place to enable implementation of the energy storage programs to be more successful?
8. How should the teams be asked to describe how their projects are consistent with and support the Administration's goal of transforming the economy by 2050 to achieve net-zero emissions goals (e.g., measuring clean energy deployments, emissions reductions, etc.)? Please be as specific as possible.

9. How should the climate benefit of different aspects of long-duration energy storage, and the demonstrations possible under 41001, be considered? Metrics of interest include air emissions and environmental impacts of deployments.
10. DOE is evaluating funding mechanisms for the energy storage projects covered in this RFI. Across all the programs, what applicable funding mechanisms are best suited to achieve the purposes of the energy storage programs (e.g., cooperative agreements, grants, Other Transactions Authority, prize competitions, technical assistance, etc.)? Any comments on program-specific mechanisms should be submitted within the appropriate section of this RFI.
11. What environmental reviews and permitting challenges might the projects funded under the energy storage programs encounter? Please provide examples of how community consultation, consent-based siting, and community benefits agreements or good neighbor agreements can successfully be included in the environmental and permitting review process.
12. Based on EPAct 2005, Section 988, the cost share requirement for demonstration and commercial application projects is 50% cash and/or in-kind and must come from non-Federal resources (i.e., the total project cost includes both a 50% DOE share and a 50% recipient cost share). For example, a $25M award will require $12.5M in matching non-Federal cost share to the $12.5M Federal share. Is it feasible for projects to meet this 50% cost share requirement on an invoice-by-invoice basis?
13. How could funding under other BIL provisions (e.g., 40101, 40103, 40207…) be leveraged to maximize the impact of BIL funding for the energy storage programs?
14. Are the proposed funding levels for the various phases appropriate/adequate?
15. For a given technology demonstration, what draft or final federal NEPA documents (e.g., environmental assessments or environmental impact statements) could inform DOE NEPA reviews for the energy storage programs?
16. What supportive activities would make energy storage programs successful and sustainable? (e.g., workforce development, community-based organization engagement, domestic manufacturing, etc.)
17. What types of outreach and engagement strategies are needed to make sure all relevant project stakeholders are involved for each provision? Are there best practices for equitably and meaningfully engaging stakeholders?
18. What policies, infrastructure, or other considerations could be put in place to enable implementation of the energy storage programs (of a specific program or general across the programs) to be more successful?
19. What incentives/programs exist or can be put in place to encourage and foster U.S. supply chain development and manufacturing for different energy storage

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technologies? What potential challenges or opportunities might exist to meet the new Buy American requirements in the BIL?[42]

20. What types of cross-cutting support (e.g., technical assistance) would be valuable from the DOE/national laboratories, and/or from other federal agencies, to provide in proposal development or project execution? Are there other entities that DOE could fund to provide technical assistance for the energy storage programs?
21. What data should DOE collect from the energy storage recipients to evaluate the impact of the programs? How should this data and the program outcomes be disseminated to the public?
22. What cybersecurity considerations, opportunities, barriers, and metrics are most relevant for long-duration storage demonstrations under 41001?
23. While Energy Storage Grand Challenge technologies can include Hydrogen-based technologies, DOE proposes to redirect such technologies to Hydrogen-specific provisions in the BIL (including sections 40313, 40314, and 40315). Please comment on the impacts of excluding such technologies from the 41001 energy storage programs discussed in this RFI.
24. While Energy Storage Grand Challenge technologies can include non-bidirectional storage technologies that increase flexibility for generating stations (such as nuclear or fossil energy), DOE proposes to redirect such technologies to generation-specific provisions in the BIL (including sections 41002 and 41004). Please comment on the impacts of excluding such technologies from the 41001 energy storage programs discussed in this RFI.
25. As relevant to Demo Projects and the Demo Initiative, for a cost-shared grant or cooperative agreement, DOE retains a property interest in property acquired under the project. To what extent would DOE's property interest create barriers to project financing or otherwise?

Category 3: Employment: Expanding Union Jobs and Effective Workforce Development

In keeping with the administration's goals, and as an agency whose mission is to help strengthen our country's energy prosperity, the Department of Energy strongly supports investments that create and retain good-paying jobs, where workers are properly classified as employees, free from discrimination and harassment, with a free and fair chance to join, form, or assist a union, improve job quality through the adoption of strong labor standards, increase job access, strengthen local economies, and develop a diverse workforce for the work of building and maintaining the country's energy infrastructure and growing domestic manufacturing. Respondents to this RFI are encouraged to include information about how these energy storage programs can best support these goals.

[42] New Buy American requirements are located in Division G – Other Authorizations; Title IX – Build America, Buy America of the Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58, which was enacted into law on November 15, 2021. https://www.congress.gov/bill/117th-congress/house-bill/3684

26. In what ways, if any, do you anticipate 41001 energy storage programs could impact the workforce? For example:
    a. To what extent do you anticipate job creation, loss, or changes in job quality?
    b. To what extent do you anticipate the creation of construction jobs? Ongoing operations and maintenance jobs? Other jobs across the supply chain?
27. What tools should the energy storage programs utilize to meet the goal of creating work opportunities for local residents in the construction phase and long-term operations phase of the project (e.g. Project Labor Agreements, Community Benefits Agreements, etc.)? How should short-term build-out (i.e., construction phase) employment and long-term operational employment opportunities be measured and evaluated? This question may be more relevant for certain energy storage programs.
28. What specific labor unions do you recommend that DOE engage with in implementation of 41001 energy storage programs?
29. What activities and engagement (e.g., with Historically Black Colleges and Universities (HBCUs) and other Minority-Serving Institutions (MSIs)), community-based organizations, registered apprenticeship programs, joint labor-management partnerships, women and minority-owned contractor capacity building, and community-based quality pre-apprenticeship programs) would make 41001 energy storage programs successful and sustainable in terms of workforce development; worker recruitment; improved diversity, equity, and inclusion across the workforce; and the creation of good union jobs?
30. What labor standards be incorporated in project planning stages to support the creation of high-quality, good-paying jobs?
31. In a competitive labor market, what will energy storage projects need to do to attract, train, and retain a skilled workforce?
32. If you are a potential applicant, would you consider signing a card-check labor neutrality agreement, collective bargaining agreement, and/or establishing a labor-management partnership? Why or why not?
33. What existing workforce education and training efforts (e.g., specific registered apprenticeship programs, labor management training programs, community college or technical school programs, etc.) are preparing workers for this industry? How can those efforts be best supported or augmented for ensure success of 41001 energy storage programs?
34. What tools should 41001 energy storage programs utilize to meet the goals of providing opportunities for workers displaced from fossil industries and resource-based industries in decline?
35. What would be the most effective workforce development activities to both ensure employers have access to qualified workers and ensure that workers are broadly qualified for good-paying jobs across the industry?

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36. How should the quality of and access to construction phase employment and operations and maintenance phase employment be measured and evaluated?

Category 4: Equity, Environmental and Energy Justice (EEEJ) Priorities

Equity, Environmental and Energy Justice (EEEJ) benefits will also be a high priority as the BIL provisions are implemented. This provision hopes to align with the Justice40 Initiative which was outlined in Presidential Executive Order 14008 and establishes a goal that at least 40 percent of the overall benefits of certain Federal investments flow to disadvantaged communities (DACs). For the purposes of this RFI, DOE has identified the following non-exhaustive list of policy priorities as examples to guide DOE's implementation of Justice40[43] in disadvantaged communities (DACs): (1) decrease energy burden;[44,45,46] (2) decrease environmental exposure and burdens;[47] (3) increase access to low-cost capital; (4) increase clean energy jobs, clean energy job pipeline, and job training for individuals;[48] (5) increase clean energy enterprise creation and contracting (e.g., minority-owned or diverse business enterprises); (6) increase energy democracy, including community ownership; (7) increase parity in clean energy technology access and adoption; and (8) increase energy resilience.

Through each BIL 41001 energy storage program, there are opportunities for extensive community engagement. Benefits from federal investment in energy storage include grid resilience, reduced energy prices, equitable access to clean energy, and job opportunities. Ensuring projects align with Justice40 criteria is a priority of these programs.

37. How could the 41001 energy storage programs show progress towards the Justice40 policy priorities? What data could be tracked?
38. How can selection criteria prioritize benefits to Justice40 communities?
39. How can DOE incentivize partnerships with community-based organizations, who may have been historically excluded from energy investments in their space?

[43] The Justice40 initiative, established by E.O. 14008, sets a goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities (DACs). The Justice40 Interim Guidance provides a broad definition of DACs (Page 2): https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf

[44] The Initiative for Energy Justice https://iejusa.org/glossary-and-appendix/#glossary_of_terms
[45] DOE's LEAD tool illustrates energy burden in U.S. https://www.energy.gov/eere/slsc/maps/lead-tool
[46] Drehobl, A., Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: ACEEE.
[47] Tessum, C., et al., 2019. Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure. Proceedings of the National Academy of Sciences.
[48] DOE's US Energy & Employment Jobs Report (USEER), https://www.energy.gov/us-energy-employment-jobs-report-useer; Department of Labor, Civilian Labor Force by Sex, https://www.dol.gov/agencies/wb/data/facts-over-time/women-in-the-labor-force

40. DOE wants to ensure that minority-owned businesses have the opportunity, access, and support necessary to be competitive for 41001 and 41001 applicant coalitions. What barriers face minority-owned businesses in this circumstance, and how can DOE facilitate their/your participation?
41. How can DOE improve partnerships with, and accessibility to, MSIs, HBCUs, community colleges, and Tribal Colleges? How can DOE better support these institutions in applying for funding and shaping the funding process?
42. What EEEJ concerns or priorities are most relevant for 41001?
43. What strategies, policies, and practices can 41001 energy storage programs deploy to support EEEJ goals (e.g., Justice40)? How should these be measured and evaluated?
44. How can applicants ensure community-based stakeholders/organizations (especially underserved communities) are engaged and included in the planning, decision-making, and implementation processes (e.g., including community-based organizations on the project team)?
45. If DOE asks for a market analysis as part of the application process, what community attributes, proposed community benefits, or stakeholder engagement activities should the analysis include so that DOE can be confident that a proposed project will be successful?
46. What can DOE provide/do that would be helpful to a project to facilitate its collaborations with potential financing partners?
47. How can DOE support the applicants in working together to increase competitiveness and scale?
48. Which regional and location-specific metrics should DOE track to estimate the environmental, social, and economic impact related to 41001 energy storage programs?
49. Other than greenhouse gas emissions, what sustainability metrics (e.g., air emissions, pollutants) should DOE include in evaluating 41001 energy storage programs?
50. DOE's goal is for the clean energy technology to be sustainable beyond the BIL funding (i.e., without additional government funding). To what extent will the storage technologies be capable of demonstrating a path to economic viability after the BIL funded phases, and how should the FOA and project (once awarded) be structured to ensure this outcome?
51. What criteria can be used to ensure ethical sourcing of materials used in storage?
52. What might make 410001 energy storage programs more accessible to rural & remote communities?
53. How can 41001 energy storage programs be strategically deployed to best support communities or regions transitioning from fossil fuels?
54. How can 41001 energy storage programs be more accessible to community-owned microgrids, publicly owned utilities, and utility cooperatives? What are the specific needs of community ownership models?

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Category 5: Additional Input

55. Please provide any additional information or input not specifically requested in the questions above that you believe would be valuable to help DOE develop 41001 funding announcements and opportunities, including any specific criteria that DOE may take into consideration in implementing 41001 energy storage programs.

Statutory Authorities

To carry out a program, DOE must have both programmatic statutory authority and available appropriations. Section 3201 of the Energy Act of 2020, as amended, is the programmatic statutory authority for several programs related to energy storage demonstrations, including the programs specifically referenced in this RFI: the Long-Duration Demonstration Initiative; the Energy Storage Demonstration Projects; and the Energy Storage Grant Program.[49] Section 3201 of the Energy Act of 2020 is codified at 42 U.S.C. 17232; for ease of the reader interested in the statutory citations, the RFI primarily uses the U.S.C. citations.

Section 41001 of the BIL authorized funding for the Energy Storage Demonstration Pilot Grant Program and the Long Duration Initiative and Joint Program[50]. In addition, section 40112 of the BIL amended the section 3201(c) of the Energy Act to add the authority for an energy storage demonstration project related to second-life applications of electric vehicle batteries.

Through Title III, of Division J of BIL, Congress appropriated $355,000,000 to "carry out the Energy Storage Demonstration Pilot Grant Program, as authorized under section 3201(c) of the Energy Act of 2020." Congress further appropriated "$150,000,000 to carry out the Long-duration Demonstration Initiative and Joint Program." Then through the Consolidated Appropriations Act, 2022[51], enacted on March 15, 2022, Congress appropriated an additional $20M for implementation consistent with section 3201 of the Energy Act of 2020 for energy storage projects that are U.S-controlled, U.S.-made, and North American sourced and supplied. The Department is directed to include in this program large scale commercial development and deployment of long cycle life, lithium-grid scale batteries and their components."

Disclaimer and Important Notes

This RFI is not a Funding Opportunity Announcement (FOA); therefore, DOE is not accepting applications at this time. DOE may issue a FOA in the future based on or related to the content and responses to this RFI; however, DOE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not

[49] Sections 3201(d)(2), (c)(1), and (c)(3) of Energy Act of 2020, as amended by section 40112 of BIL, authorize the Long-Duration Demonstration Initiative; the Energy Storage Demonstration Projects, respectively. (codified at 42 U.S.C. 17232(d)(2); (c)(1); and (c)(3).

[50] The Joint Program is not a topic of this RFI.

[51] Public Law 117-103 (March 15, 2022).

provide any advantage or disadvantage to potential applicants if DOE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of DOE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

Freedom of Information Act
Responses received under this RFI are subject to public disclosure under the Freedom of Information Act. Because information received in response to this RFI may be used to structure future programs and funding opportunity announcements and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

> **Notice of Restriction on Disclosure and Use of Data:**
> Pages [List Applicable Pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI [Enter RFI Number]. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

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In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure" and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Evaluation and Administration by Federal and Non-Federal Personnel

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to DOE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to EnergyStorage41001RFI@ee.doe.gov no later than 5:00pm (ET) on June 16, 2022, with subject line **"BIL 41001 RFI response**." Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) or Adobe PDF (.pdf) attachment to the email, and no more than 20 pages in length, 12-point font, 1-inch margins. Only electronic responses will be accepted. For ease of replying and to aid categorization of your responses, **please copy and paste the RFI questions, including the question numbering, and use them as a template for your response.** Respondents may answer as many or as few questions as they wish.

DOE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name
- Company / institution contact
- Contact's address, phone number, and e-mail address

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