

# Compilation of CFTI Advanced Storage and Efficiency Recommendations

## Advanced Energy Storage Recommendations

### Context

The IIJA included several provisions that will potentially support LDES, including:

**EIA Plan regarding the need/opportunity to update or further the capabilities of NEMS.** This plan (Section 40417), to be delivered within 180 days of enactment, will identify needs or opportunities to update or further the capabilities of NEMS on various topics, including:

- economic modeling of the role of electricity storage;
- modeling of wholesale market design and valuation of services that support electric grid reliability, including battery storage;
- tools to model energy systems that produce hydrogen.

The plan will also look at increasing the model resolution to represent all hours of the year and all electricity generators.

**Energy Storage Study.** The IIJA (Section 40111) authorizes a study to identify barriers, foster collaboration, increase conformity and support safe implementation related to use of emerging energy storage technologies.

**LDES Technology Demonstration.** During the four-year period from fiscal year 2022 to the end of fiscal year 2025, the IIJA (Section 41001) provides funds to support LDES demonstration initiatives, projects, and pilots which are anticipated to validate new technologies across several stages of technology readiness (STORE focus areas) and enhance the capabilities of pilot project customers and communities to integrate grid storage more effectively. These include:

- Long-Duration Demonstration Initiative (“Demo Initiatives”) (41001(b)): Flexible program that may target demonstrations for a range of long-duration technology types.
- Joint Program (41001(b)): Collaboration between DOE and the DOD for long-duration demonstrations on government facilities.
- 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.

The Department of Energy issued an [RFI](#) requesting input on several of these programs (all except the Joint Program).

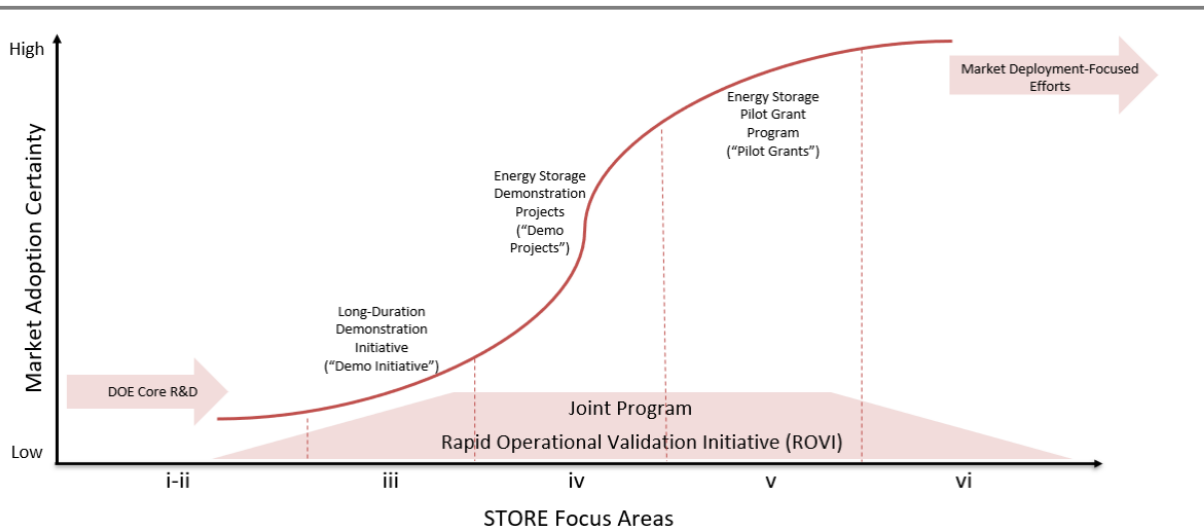


Figure 2: 41001 Programs Commercialization Segments

IRA has several provisions to assist energy storage, which complement storage funds in IIJA, for both storage projects, and for manufacture of storage components. Specifically:

- An **investment tax credit for storage projects**, in line with other section 48 credits (also enhancements for domestic content and energy community investments).
- An **advanced manufacturing tax credit** for energy storage battery cells and modules.

While IIJA and IRA are expected to drive substantial new investment in advanced energy storage, the funds are insufficient to demonstrate the full range of advanced storage technologies. Additionally, funds and measures are needed to create market demand, enhance the market value of LDES, and encourage early deployment.

## High Priority

### Recommendations to support more and larger-scale demonstration projects

**Increase investment in storage demonstration projects.** Additional funds \$10B are needed over the next 5 years to fill gaps in earlier advanced storage demonstration programs. Dedicated funds are needed to target large, capital-intensive mechanical storage projects that do not scale down well and do not fit the IIJA demonstration program as defined. Recommended changes include 1) allocating a larger amount of funding for the federal government cost-share consistent with funding requirements for larger-scale storage projects, and 2) prioritizing larger storage locations over multiple smaller sites. Additionally, funds should be made available to target 6-8 hour storage solutions, such as advanced battery chemistries.

*Rationale: Funds allocated to date are insufficient to demonstrate all types of storage.*

1. Some technologies (e.g., mechanical solutions) don't scale down well and require large, capital-intensive projects. \$10B will support 20-40 projects with a 50% cost share and allow more long duration energy storage technologies to compete. For example, Duke Energy anticipates spending \$300M for one project; more than twice the size of the FOA released. Some projects are on the order of \$500-700M to take advantage of economies of scale.
2. The FOA out on the street for demonstration projects is disappointing in that it limits the field of applicants. A preference for smaller sites, aggregated to a total, expresses preference for

smaller demonstrations. This won't work for mechanical solutions. New funding is needed that doesn't have these constraints to target solutions missed in the FOA.

3. There is interest in looking not just at 10-12+ hour storage, but also at the 6–8 hour range. In many climates there are only 6-8 hours of strong solar generation, so there is a mismatch for projects seeking to time-shift solar energy and the expected storage duration (12 hours) called for in the FOA. Further, analysis indicates that the system is going to need these sorts of use cases well before it needs significant 12-hour, 24-hour, or multiday/seasonal applications. The cost effective technology for a 6-8 hour solution may not be the same as for a 12 or 24- hour application, so it's not necessarily the case that the 12-hour funded technologies will simply scale down to 6-8 hour cost effectively. There should be dedicated funding.
4. There are a lot of potential storage technologies, and many are still risky and require testing. Utilities are concerned about how long the storage will last and the cost to customers. This is part of the risk they are trying to mitigate.

### **Recommended improvements to the DOE funding process**

**Ask DOE to deliver funds on a consistent and staggered schedule.** DOE funding programs for advanced carbon-free electricity technologies should be offered on a well-defined and staggered schedule, with longer application windows, and ideally remaining consistent (from a timing standpoint) from year-to-year.

*Rationale: A consistent and staggered schedule will enable utilities to participate in the application process by allowing them to plan for staffing and investments and appropriately consider applications within Integrated Resource Planning processes. In the past, utilities haven't looked at government cost share; it's a different way of doing business. Investments still need to go through the regulatory environment and rate recovery processes. Utilities lack the knowledge base of writing proposals. Lining up timelines is a hurdle. DOE drops funding opportunities as they are able, with tight turnarounds. There is no standardization of the process and timeline. They want to be able to anticipate funding opportunities (e.g., every March). While DOE did release a slide deck with a timeline at the 6-month update, some funding opportunities didn't come as scheduled. It is hard to align capital forecasts with DOE projects; timelines are in years, not months.*

**Ask DOE to share details on the Energy Storage Pilot Grant Program ("Pilot Grants") (41001(a)) ahead of the application period.**

*Rationale: Potential owners need more information ahead of time to properly plan to participate in the call for proposals. This program remains nebulous in terms of timing, budget, and mechanisms.*

### **Recommendations on DOE implementation of IJJA and/or IRA**

**DOE leadership around energy storage needs to be better coordinated, with clear directives, appropriations, and scope for various groups and research laboratories.** There should be one voice describing how the objectives of the Energy Storage Grand Challenge, which should be continually reviewed and updated, will be achieved.

*Rationale: Energy storage is a cross-cutting effort within DOE and leadership around it can be a bit muddled.*

## Recommendations to create market demand and enhance the market value of LDES

**Direct RTOs to value services delivered by energy storage.** Direct Regional Transmission Organizations (RTOs) to provide value in markets for storage-related benefits, such as capacity (where applicable), line support and other ancillary benefits, including inertia. This could be done through FERC rulings on RTO tariffs, or through legislation. Value could be structured to preference resources that can operate for a longer duration and/or resources that can meet reliability and stability services with low/zero emissions<sup>1</sup>.

*Rationale: As we shutter fossil fuel generation, the grid will lose the services that fossil energy currently provides, including capacity, line support and inertia. For example, to the extent that inertia, which currently is assigned a value of zero, can be encouraged through valuation, there will be a preference for energy storage and other resources capable of delivering inertia services. Having more inertia will enable the addition of more intermittent renewable energy to the grid, bringing us closer to net zero goals.*

*Because a lot of the work to meet reliability goals and drive energy storage deployment in the United States will be done by States or regions, Regional Transmission Organizations (RTOs) can be particularly influential. Rules at the RTO level had set a price signal that values the reliability benefits of storage could encourage deployment in regions where such services are most needed.*

**Enable 24/7 carbon-free energy by ensuring data availability.** Direct RTOs to supply the data required to enable 24/7 clean energy goals and power purchases. This could entail development and implementation of accounting rules and procedures that would facilitate within each RTO region: 1) hourly tracking of energy sources (including fossil fuel and zero-carbon resources), 2) tabulation of emissions from fossil-fired energy sources, 3) tracking of energy sources subject to contracts (PPAs, RECs/EACs), and 4) quantification of “residual mix” emissions from energy sources that are not assigned to contracts. These data would make it possible for energy users to purchase 24/7 carbon-free energy to meet growing shares of their electricity needs, matched on an hourly basis.

*Rationale: Enabling a 24/7 clean energy data system would facilitate large energy buyers to support long-term climate and grid stability goals via purchases of power from LDES and other 24/7 carbon-free solutions. Current annual tracking systems mainly reward renewable energy; because matching is on an annual basis, there is no direct incentive to invest in 24/7 carbon-free technologies needed to displace unabated natural gas and coal-fired power during times of day (and longer periods) when renewable energy is not available.*

## Recommendations to encourage early deployment

**Investment Tax Credit.** Support the investment tax credit provisions for energy storage facilities proposed through budget reconciliation, including provisions offering incentives for storage when coupled with wind and solar energy in low-income communities, offshore wind, and advanced energy projects (for manufacturing facilities).

**Include LDES as part of Federal Clean Energy Commitments.** Direct the federal government to utilize LDES as part of its 24/7 clean energy commitments. This could be through a PPA for carbon-free electricity that includes LDES.

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<sup>1</sup> The 4th energy package titled “Clean energy for all Europeans” disallows capacity payments to new capacity, and starting July 2025, for existing generation capacity that emits more than 550 kg/MWh. [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.158.01.0054.01.ENG&toc=OJ:L:2019:158:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0054.01.ENG&toc=OJ:L:2019:158:TOC)

## Preliminary Advanced Efficiency Recommendations

### ***Require electrical equipment to be equipped with technology to facilitate demand response.***

- Establish a standard/requirement for CTA-2045 ports on all Thermostats, Water Heaters, Pool Pumps, and other major appliances. This would accelerate the utilities' ability to cost-effectively manage load. Washington State law requires new electric storage water heaters to include a CTA-2045 Communications port.
- Support states adopting laws or building code standards that make Wi-Fi-enabled water heaters the only type that can be sold or installed in the state.

## Medium Priority

### **Recommendations on DOE implementation of IIJA and/or IRA**

#### ***Ensure EIA's Plan to update the capabilities of NEMS (per IIJA Section 40417) considers a wide range of annual weather patterns.***

*Rationale: Given the increasing impact of variable renewable energy on the electric system, the NEMS must consider different annual weather patterns to capture unusually poor renewable resource periods. This includes the range of weather patterns that could be expected to result from climate change.*

#### **The IIJA Long-Duration Demonstration Initiative ("Demo Initiatives") program (described in 41001(b)) should be implemented separately from the Energy Storage Demonstration Projects (41001(a)).**

*Rationale: DOE's FOA has combined the two programs, which risks deemphasizing long-duration storage projects.*

### **Recommendations to create market demand and enhance the market value of LDES**

***Increase DOE technical assistance to states.*** Congress should allocate more fundings to DOE to provide technical assistance to help States better understand the potential role of advanced storage, including LDES, in decarbonized markets; the forms it might take (combined with generation, for example); and approaches to include LDES in energy modeling forecasts.

*Rationale: Currently, States need capacity to work on any number of issues of importance to DOE, including (but not limited to) transmission, energy generation sources, storage, interconnection, and others. This technical assistance can create interest in pilot projects and the IIJA Pilot Grants and support integration of LDES in state/regional planning towards net-zero goals.*

## Preliminary Advanced Efficiency Recommendations

***Prepare a guide on integrating novel advanced efficiency technologies.*** Ask DOE to develop a guide that identifies the challenges, barriers, and system risks to integrating demand efficiency technologies. For example, what changes would need to be made regarding telemetry systems, operating tools, protocols, or modelling? This guide would also address how, when, and where to apply these technologies to facilitate deployment.

*Rationale/context:*

- *In IIJA, demand efficiency/grid enhancing technology is eligible for funding in a few Grid Infrastructure resilience and reliability programs.*

- *Additionally, FERC order 881 requires ISOs/RTO to make their systems and procedures compatible with dynamic line rating technology that transmission owners could adopt. In their recent NOPR, they also included a proposed policy that would require the consideration of grid enhancing/demand efficiency technology in long-term regional planning.*
- *Uptake of these technologies is minimal, so utilities and other transmission providers have a gap in experiential knowledge. A DOE-developed guide would bridge this gap and help ensure that utilities receiving funds to implement these technologies are well informed to do so effectively.*

## **Low Priority**

### **Recommendations to encourage early deployment**

**Coal-to-solar and/or storage.** Direct the Department of Energy (DOE) to provide grants to communities, universities, municipal utilities, public service commissions, and other small entities to conduct studies to assess the financial viability of replacing coal-fired power plants with renewable energy coupled with LDES.

*Rationale: Funding or incentives are needed soon as the window/opportunity to do something useful with existing coal-fired power plant sites and maintain jobs in affected regions is closing rapidly. Solar plus storage could offer a viable solution in communities with scheduled coal plant retirements.*

*NOTE: The above language is modeled on a recommendation from the nuclear workgroup. If we want to go further, we could look to the **Illinois Climate and Equitable Jobs Act**, which dedicates funds for renewable energy credits to bidders seeking to invest in renewable energy and/or storage at existing coal plants that are closing. This Act will support the installation of renewable energy/storage at three plants in the MISO portion of Illinois, and two plants in the PJM region. DOE funds could help fund similar credits.*

### **Additional Notes on Possible Next Steps:**

- Meet with DOE offices (e.g., ARPA-E, PNNL, LBNL) to understand their existing LDES funding and modeling priorities.
- Follow implementation of IIJA 40417 (EIA's plan for the National Energy Modeling System) and advocate for better modeling of LDES.
  - Do we have specific recommendations other than highlighting the need for updates that further the capabilities of NEMS with respect to LDES?
  - How does EIA's plan for NEMS address economic modeling of the role of electricity storage, including LDES?
  - How does it address wholesale market design and valuation of services that support reliability of electricity grids, including LDES? (Note that only battery storage is specified in IIJA 40417, as an example.)
- Input to the Energy Storage study on the study design and to ensure that LDES is included.
- Consider engaging CPUC/CAISO and WRP discussions on market value for services delivered by storage.
- There is interest in H storage (at a microgrid scale). We should review the ZCF workgroup recommendations to see if they are complete from a storage standpoint.