

Long-Duration Energy Storage and Advanced Demand Efficiency Recommendations

As higher volumes of variable renewable electricity are supplied to the energy grid, additional technologies are needed to take full advantage of those generation sources and to maximize their value in achieving deep carbon reductions and delivering benefits to customers:

Advanced energy storage: Beyond the energy storage technologies available commercially today, “advanced” energy storage options—defined as those with next-generation cost, reliability, and safety and those with medium- and long-term storage duration that can last days, weeks, months, and across seasons—will be needed to supply stored zero-carbon generation when the availability of wind and solar declines.

Demand efficiency: Demand efficiency is defined as a range of new hardware and software solutions that can be deployed with high-voltage transmission and distribution systems by grid operators and behind-the-meter customers. Demand efficiency technologies include advanced metering infrastructure (AMI), behind-the-meter smart devices with aggregation and control capabilities, power flow control and voltage management capabilities, dynamic line rating (DLR), and dynamic transformer rating (DTR). When properly utilized, demand efficiency has the potential, and will be needed, to increase grid efficiency and to optimize customer demand as needed by grid operators, particularly to align with the availability of variable renewable supply.

FY22 (Authorized Funding Levels and Programs)	FY22 (Recommended Funding Levels for Current and New Program Authorizations)	FY22-25 (Cumulative Recommended Funding Levels for Current and New Program Authorizations)
\$648,000,000	\$648,000,000	\$2,646,000,000

To advance these technologies further and to enable commercialization, federal programs that conduct research, development, and demonstration (RD&D) of longer-duration storage should be a priority in the next few years. Incentives will be necessary to increase deployment of demand efficiency technologies.

Research, Development, & Demonstration

- Increase appropriations for RD&D for longer-duration storage.
- Amend the focus of, and maintain or increase funding to, existing federal programs that support energy storage RD&D, such as Energy Storage Grand Challenge, Grid Storage Launchpad, HydroWIRES, and ARPA-E DAYS.
- Increase appropriations for programs such as the Department of Energy's (DOE's) Grid Modernization Initiative (GMI) and ARPA-E's Green Electricity Network Integration (GENI) and encourage new efforts to form public-private partnerships to accelerate the RD&D of grid efficiency technologies.
- Establish a DOE financial assistance program to support demand efficiency R&D and pilot demonstrations involving upgraded software platforms, power system planning tools and modeling platforms, cyber and physical security upgrades, and resiliency upgrades.
- Direct DOE to utilize existing grant funding programs to prioritize pilot demonstration projects involving the integration of demand efficiency technologies.

Deployment

- Establish federal economic incentives to support the deployment of different demand efficiency technologies.
- Establish energy-storage-inclusive federal tax incentives.
- Develop and apply methodologies and protocols to validate energy storage performance, reliability, and safety.
- Develop modeling that enables a comparison of the grid benefits from deploying short-duration storage versus medium- and long-term duration storage.
- Direct DOE to help inform, with relevant data, the development of a technical standard that covers the safety of energy storage systems and to support standards-setting entities in developing a standard related to storage system safety.
- Redevelop, benchmark or validate, and standardize storage modeling tools (e.g., NEMS) to increase alignment among electric companies, state planners, and National Labs.
- Review permitting and licensing constraints for storage projects, particularly compressed air energy storage (CAES), pumped-storage hydropower (PSH), and long-duration hydrogen and hydrogen carrier storage systems.
- Direct DOE to help inform and to convene stakeholders for the development of a technical standard that covers communications protocols used by demand efficiency technologies.
- Direct DOE to establish a new initiative to prepare reports and recommendations on (1) how to improve the modeling, operational, and planning practices used for the bulk electric system to better account for the integration of advanced demand efficiency technologies, and (2) whether existing regional and interregional transmission planning and siting processes are adequate with respect to the deployment of demand efficiency technologies.

About the Carbon-Free Technology Initiative

The Carbon-Free Technology Initiative (CFTI) is focused on implementation of federal policies that can help ensure the commercial availability of affordable carbon-free, 24/7 power technology options by the early 2030s to help the electric power industry meet net-zero carbon reduction commitments. Participants in the CFTI include the Edison Electric Institute (EEI) and its member companies, Clean Air Task Force, Bipartisan Policy Center, Center for Climate and Energy Solutions, ClearPath, Great Plains Institute, Information Technology & Innovation Foundation, Nuclear Energy Institute, and Third Way.

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