10 November 2022

Dear Ms Edington,

Thank you for the opportunity to provide feedback on the DOER LDES study outline. Here are some thoughts for your consideration.

Scope should include (but not be limited to) these topics:

* Fire safety.
* Expected lifetime or warranty period.
* Upgradability during life of system (e.g., replacing components with new, improved versions without replacing the entire system)
* Recyclability at end of life.  (Avoid problems experienced with early solar panels and wind turbine blades.)
* Location in transmission and distribution networks as well as behind the meter (commercial and residential).
* Impact of DOE research programs such as Hydrogen Shot, which aims to reduce cost of hydrogen.
* Impact of Inflation Reduction Act and other federal and state legislated incentives.

Objectives:

* Minimize emissions by balancing and maximizing use of renewable energy.
* Minimize costs for ratepayers.
* Create jobs in Massachusetts in manufacturing, construction, installation, maintenance, decommissioning and recycling of LDES.
* Use cases should include intraday supply shifting as well as multi-day or multi-week dunkelflaute (dark doldrums) and system outages. Massachusetts should be able to endure extreme weather without relying on fossil-fueled plants, including peakers. This study should estimate how much storage is required to complement the expected fleets of wind, solar, and hydro generation.
* EPRI and ISO-NE are doing a joint study, as described in the ISO-NE Annual Work Plan for 2023, to characterize expected extreme weather in New England. Your LDES study should consider the performance of storage systems and the renewable energy fleets under those extreme conditions.

Datasets:

Data supplement in Mark Jacobson et al’s study (Stanford, 12/2021) “Zero air pollution and zero carbon from all energy at low cost and without blackouts in variable weather throughout the U.S. with 100% wind-water-solar and storage”, available at

<https://web.stanford.edu/group/efmh/jacobson/Articles/I/21-USStates-PDFs/21-USStatesPaper.pdf>

Partners/stakeholders to interview:

* Massachusetts companies making LDES (e.g. Form, Ambri, Malta).  Why did they do field trials and pilots outside Massachusetts?  What would it take to make Massachusetts an attractive market for them?  How can they help Massachusetts meet its climate targets?
* ISO-NE system modelers and study authors:
* Future Grid Reliability Study Phase 1 (2022), by Patrick Boughan, Steven Judd et al), Phase 2 and Completion (forthcoming)
* Economic Planning for Clean Energy Transition (forthcoming), Ben Wilson and Steven Judd
* Pathways Study: Evaluation of Pathways to a Future Grid (2022):, by Analysis Group (Todd Schatzki et al)

Stakeholder process:

* Conduct another public input session in mid-2023.

Thank you for your consideration.

Best regards,

Roy Harvey

Life Member, IEEE

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