

DOER AMP Straw Proposal Stakeholder Questions Responses from Fourth Power, Inc.

Fourth Power's grid-scale, thermal energy storage technology harnesses excess energy, stores it as heat in low-cost carbon blocks and delivers it back to the grid on-demand, at costs that beat traditional alternatives and electrochemical battery technologies. An MIT spin-out, Fourth Power is a Massachusetts-born technology, with HQ in Cambridge, MA and an R&D Facility in Middleton, MA.

General / All Subprograms

- 2) Are the rough maximum grant levels by subprogram and the estimated number of projects sufficient to motivate you to apply? If not, what would be?

Community Resilience	Safety & Education	LDES Commercialization
\$2.5 million	\$400-800 thousand	\$5 million

Fourth Power recommends no less than 5 projects for LDES Commercialization and no less than \$5 million/project given ambitious state LDES targets and desire to make MA a leading LDES state for economic development reasons, affordability, and decarbonization.

- 3) Based on the project milestones in the straw proposal, does the proposed timing of financial disbursements align with your project's needs? If not, how would you recommend the timeline be adjusted? In your response, please indicate the subprogram to which your comments refer.

LDES Commercialization subprogram: With regards to the proposed timing of financial disbursements and the projects in Fourth Power's pipeline, we recommend the allowance of **Pre-Award Spending**. Given the long lead time of parts that comprise LDES technologies, there should be some flexibility for meeting the milestones ahead of (up to 6mo) being notified of receiving an award, and then disbursing funding as soon as the recipient can provide proof of meeting the milestones. This is particularly relevant for the Major Equipment Delivery milestone. **Such an adjustment will ensure that funding is going to projects that are the most likely to get constructed.** The potential for receiving an award will increase the likelihood of projects getting built in the Commonwealth, but since speed-to-market is critical, companies will start incurring costs – for example, on **long-lead time materials and components** - on their pipeline projects even ahead of being notified of an award. Once they receive the award, they will have the financial security to finish the demonstration project. If DOER wants to ensure that the majority of funding goes toward expenses incurred after award notification, DOER could limit the amount of financial disbursements for pre-award activity to 45%.

- 4) Please provide comments on the following elements common to all subprograms. In your comments, please indicate the subprogram to which your comments refer

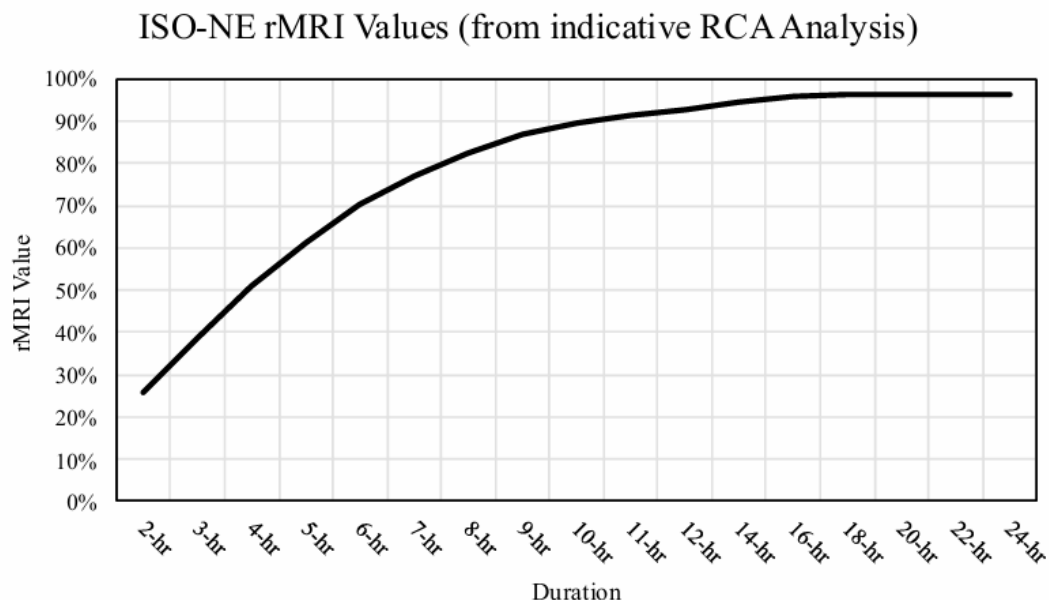
4a) Project eligibility

We support the project eligibility requirements, but for the following reasons, urge DOER to reduce the minimum round-trip efficiency to 40%, as long as companies have a viable pathway to reach 50%.

LDES projects can meet the “application evaluation criteria” even with an RTE below 50%, For instance, two criteria are the “ability to directly or indirectly replace fossil fuel peaker plants” and “benefits to ratepayers/local communities and customers.” As evidenced by [THIS \(LINK\)](#)

extremely detailed analysis of fossil peaker plants in MA, only three of the 17 peaking power plants in MA ran more than 100 times last year. In order for LDES to replace such peaking power plants, it wouldn't need to provide energy arbitrage and start multiple times a day. The priority should be on providing **capacity** to ISO-NE, as peaking power plants can provide full capacity due to their long run times (the analysis suggests the average run time is >20 hours for the 14 plants with reported run time data), even if they rarely start. For these peaker resources to retire without triggering a capacity shortfall and price spikes in the capacity market, the LDES would need to be capable of running for at least 10 hours.

While ISO-NE has temporarily paused their review of capacity accreditation, the [materials \(LINK\)](#) they have provided to date (see Figure below) indicate that batteries could need durations of 10-hours or more to earn 90% capacity value (rMRI stands for Marginal Reliability Impact). Please note that this is preliminary analysis, but still worth noting.



In other words, a battery with a nameplate capacity of 100 MW and 85% round-trip efficiency, but with only 4-hours of duration, could only be able to sell 55 MW. But if a 100 MW battery had 10-hours of duration but only 40% round-trip efficiency, they would be able to sell 90 MW. **The duration of the storage determines its capacity value, not the round-trip efficiency.**

Therefore, **at least 10 hours of duration should be an eligibility requirement, and not 50% round-trip efficiency.** LDES can replace these peaker plant, which would benefit ratepayers and local communities through increased reliability, meeting the region's capacity needs, lower costs, and reduced emissions in local communities compared to peaker plants.

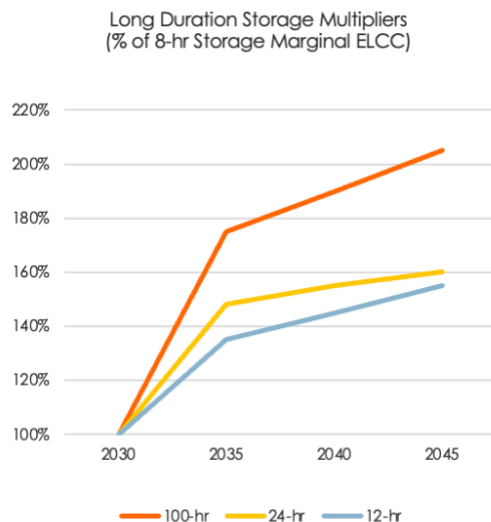
Finally, given that the funding here is most relevant to demonstration projects, these projects still have room for significantly improving their round-trip efficiency. The demonstration projects will further that improvement, and so as long as projects have a path toward a 50% round-trip efficiency, they should be eligible.

4b) Project evaluation criteria

We recommend MA DOER add a criteria for LDES that the “Company developing the project has the potential to add duration to future projects at a low cost.” As explained above, providing high capacity value to ISO-NE will be critical to facilitate the retirement of peaking power plants. The amount of duration needed to provide “perfect capacity” to ISO-NE could change from one year to the next, and therefore, the potential for a company to **be able to add duration at a low cost** should be a criteria. If a **project cannot add duration at a low cost, ratepayers could see declining benefits over time for a project, and then have to find expensive replacement capacity.**

For example, in the graphic below from a [report \(LINK\)](#) from the California Public Utilities Commission (Slide 131), you can see that over time, adding more duration significantly increases the capacity value of storage, thereby reducing the need for replacement capacity. If that duration can be added at a lower cost than replacement capacity, it will save ratepayers significant money. In the graphic below, a 100 MW project has the same value at the beginning regardless of whether it is 8-hours, 12 hours, 24 hours, or 100-hours, so it might not make sense for customers to pay for the 100-hour storage if it is more expensive than the 8-hour storage. But over time, being able add duration each year to the project can more than *double* its capacity value. **Customers see declining value from the projects that cannot add duration.**

Therefore, we recommend that DOER inquire and evaluate a company based on their ability to add duration in the future at a lower cost than replacement capacity.



4c) Project requirements

Flexible Interconnection: Considering the subprogram objective to de-risk non-commercialized technologies, we urge **flexibility in how a project qualifies as “grid-connected”**. For example, if the local distribution utility has agreed to allow a demonstration project (a critical step for de-risking technologies and unlocking commercialization) to connect to the grid without a formal Interconnection Service Agreement, then written approval from the local distribution utility should satisfy the “Interconnection Service Agreement” milestone. This could be relevant

for a demonstration-sized LDES project that is behind-the-customer meter where the municipal utility doesn't have a formal process.

- 5) For Community Resilience and LDES Commercialization projects, what is reasonable to expect around interconnection status at the time of application? What are typical determinants of longer interconnection processes? (please indicate the subprogram to which your comments refer)

Please note Fourth Power's response to Q 4c). Furthermore, companies should be eligible for disbursement of meeting the interconnection milestone even if the milestone was reached before the award was given.

LDES Commercialization Subprogram

- 17) Based on your experience, what scale or type of LDES project (e.g. system size, duration, customer class) can realistically be developed with \$5M in grant funding, assuming it covers up to 50% of costs? Please consider both capital and soft costs in your response

We believe that \$5M in funding is the bare minimum to fund a demonstration project of 10 hour duration or more, including both capital costs and soft costs. Given that the Commonwealth will be procuring 1.5 GW of LDES 10 hours and up, we recommend against funding projects less than 10 hours.

- 18) Do you currently have LDES (10+ hr.) projects in Massachusetts in your development pipeline? Please only share non-confidential information and remember that DOER makes all comments received publicly available.
- a. What is the scale and timeframe of those projects to achieve deployment?
 - b. Please describe the purpose of the project. If it is a demonstration project, please describe the objectives and goals for the project and how it will further technology commercialization. If it is a commercial project, please describe the use case and sources of revenue.

Yes, Fourth Power has both demonstration and commercial projects in our development pipeline in MA. We look forward to providing more detail in the application, but wish to keep additional details confidential at this time.