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March 7, 2025
[Submitted electronically]

Thomas Ferguson
Energy Storage Programs Manager
Massachusetts Department of Energy Resources (DOER)
100 Cambridge Street, Suite 1020
Boston, MA 02114

Subject: 83E Round 1 Comments - Hydrostor comments on future LDES procurements

Dear Dr. Ferguson,

Hydrostor, a leading developer and operator of long duration energy storage systems capable of delivering power to grids for eight hours or longer, is pleased to submit comments to support the Massachusetts Department of Energy Resources (DOER), the Massachusetts Electric Distribution Companies (EDCs), and the Attorney General's Office (AGO) (collectively "RFP Drafting Parties") efforts for future procurements of energy storage under section 83E, in particular for long-duration energy storage (LDES).

Although the RFP Drafting Parties are focused on the upcoming 83E Round 1 procurement, Hydrostor is using this opportunity to provide comments for future procurements as requested in the 83E Round 1 Request for Public Comment issued on Friday, February 21, 2025.

Hydrostor commends Massachusetts' leadership in recognizing the importance that LDES will play in maintaining reliability and cost-effectiveness for ratepayers as the grid continues to transition. The targets and procurement pathways established under section 83E represent an important first step in providing initial investment signals to developers of LDES technologies and facilities. Hydrostor looks forward to continuing to collaborate with the RFP Drafting Parties to achieve a successful future procurement for LDES as well as any additional efforts to strengthen these investment signals.

Sincerely,

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Hydrostor's Comments and Recommendations for LDES Procurement Submitted Under 83E Round 1 Request for Comments

In this document, Hydrostor submits comments and recommendations to support the Massachusetts Department of Energy Resources (DOER), the Massachusetts Electric Distribution Companies (EDCs), and the Attorney General's Office (AGO) (collectively "RFP Drafting Parties") efforts for future procurements of energy storage under section 83E, in particular for long-duration energy storage (LDES). This document includes the following sections:

- Section 1: About Hydrostor
- Section 2: Hydrostor's Comments and Recommendations for Future LDES Procurements under Section 83E
- Section 3: About Hydrostor's Advanced Compress Air Energy Storage (A-CAES) Facilities
- Section 4: Conclusion

Hydrostor appreciates this opportunity to comment and looks forward to ongoing engagement with the RFP Drafting Parties and other stakeholder on the design of the LDES procurement to support Massachusetts decarbonization, grid reliability, and affordability goals.

1. About Hydrostor

Hydrostor is a leading developer and operator of long duration energy storage systems capable of delivering power to grids for eight hours or longer. Hydrostor leverages our proprietary Advanced Compressed Air Energy Storage ("A-CAES") technology, a proven and commercially available solution that uses compressed air and water to store energy and traditional turbines to re-generate electricity when grids need it most. This patented technology allows grid operators to draw on stored clean energy, even when there is no sun to fuel solar panels and no wind to generate energy from turbines.

Hydrostor has a successful utility scale facility commercially contracted to the Independent Electricity System Operator (IESO) located in Goderich, Ontario, and two advanced projects under development in Kern County, California and New South Wales, Australia. Hydrostor has an extensive early-stage pipeline of projects in North America, Australia, and Europe. Hydrostor is backed by Goldman Sachs Asset Management, the Canada Pension Plan Investments, the Canada Growth Fund, and other forward-thinking institutional investors. Information about how our technology works and the benefits of our facilities are included in Section 3 below.

2. Hydrostor's Comments and Recommendations for Future LDES Procurements under Section 83E

In this section, Hydrostor responds to the sections outlined in the Request for Comments that are relevant for the LDES procurement. Given that the Request for Comment is focused on 83E Round 1 and not for the LDES procurement, Hydrostor's comments for each section are more general and may not necessarily respond directly to all the questions.

2.1. Procurement Schedule

Hydrostor recommends that the RFP Drafting Parties design the LDES procurement schedule by strategically balancing three main factors:

a. Providing an early and clear signal of the procurement date to spur LDES pre-development activity:

Hydrostor recommends providing a notice about the procurement date two to three years in advance. This would allow developers, especially those with cost-effective long lead time assets like A-CAES, the time needed to carry out pre-development activity. This in turn would ensure that projects that submit bids for competitive consideration have a minimum level of maturity. As an example of one of the pre-development considerations, an early signal is particularly important to align the projects with the ISO-NE interconnection process, especially given the current uncertainty due to FERC's delay in approving the ISO's interconnection process reform in compliance with Order 2023. If the LDES procurement takes place in 2030 to meet the legislated target to enter into contracts "no later than July 31, 2030", developers would likely wait until an ISO-NE interconnection window that aligns with that timeframe. On the other hand, if the procurement takes place earlier than 2030, as Hydrostor recommends in the next point, developers would need an earlier signal to enter the interconnection process soon. The decision on when to enter the ISO-NE process is crucial given the likely high deposits associated with the interconnection process reforms, driven by FERC Order 2023's objective to use high fees and deposits as a mechanism to reduce interconnection queue backlogs. Additionally, ideally the procurement schedule is designed so that awards are granted ahead of any deposits required in later stages of the Interconnection Process, as these deposits will likely be much greater at later stages on a per MW basis, which may be significant for an A-CAES project typically in the order of 500 MW.

b. Procuring LDES as early as possible and not delaying until 2030:

While the legislation directs contracting LDES "by July 31, 2030," there is no reason to wait until then. Hydrostor recommends carrying out the LDES procurement as early as 2028. If the procurement schedule is clearly provided to stakeholders in 2025 or 2026, a procurement in 2028 would allow for the needed pre-development activity discussed above. Additionally, it would help ensure that Massachusetts can benefit from LDES as early as possible. As shown in the "Charging Forward: Energy Storage in a Net Zero Commonwealth" report, LDES will likely be needed as early as 2030 in order to support the Commonwealth's decarbonization goals and maintain reliability. If the LDES procurement is not carried out until 2030, the Commonwealth would likely not be able to benefit from LDES until two to five years later, depending on technology lead times. Ensuring the early deployment of the 750 MW LDES required by section 83E would also provide a head start for the Commonwealth's entities, especially utilities, to gain experience with these technologies and durations, ahead of the additional LDES that the Commonwealth will require to meet its decarbonization goals into 2050 with a reliable grid in the most cost-effective manner that protects ratepayers.

c. Ensuring that the procurement schedule allows all commercially available technologies to competitively participate in the procurements:

Hydrostor's A-CAES facilities, typically 500 MW on 100 acres, are able to provide significant capacity to the grid from a compact footprint competitively thanks to economies of scale. Additionally, due to the use of spinning turbines and large scale, A-CAES projects can provide ancillary services to support grid reliability similar to traditional thermal generation. Our facilities also have the potential to increase their capacity at a very low marginal cost. In order for Massachusetts to position itself to be able to assess an A-CAES project and its benefits through a competitive bid, the procurement should be designed to take into account large-scale, long lead time assets. As explained above, Hydrostor recommends a two-to-three year notice on the timing of the procurement, and to carry out the procurement as early as 2028 to balance the development requirements of a long lead time asset like A-CAES with the Commonwealth's need for LDES earlier in the 2030s. Additionally, Hydrostor recommends that the RFP Drafting Parties carry out a single LDES procurement for the total 750MW. Given that an A-CAES facility is typically in the order of 500 MW, Hydrostor and its investors need a level of certainty that procuring a project of this size is feasible. Any procurement lower than 750 MW would question whether an A-CAES project could be feasibly selected under the program. A 750 MW procurement would provide that minimum level of certainty, while also preserving margins for several LDES technologies to be considered, ensuring a competitive playing field. A-CAES presents a competitive, low-cost alternative to meet long-duration reliability needs, as proven by our existing contracts for the projects under advanced development in California and Australia. Procurement pathways and programs designed to include all types of LDES projects with varying nameplate capacities and lead times will ensure that the Commonwealth can competitively consider the lowest cost solutions.

2.2. Environmental Attributes and Clean Peak Qualification

Hydrostor looks forward to engaging with the RFP Drafting Parties and other stakeholders on further conversations about environmental attributes and the Clean Peak Qualification in relation to the LDES procurement. Hydrostor's A-CAES facilities, given their high capacity typically in the order of 500 MW, long duration of 8 hours or longer, and the availability of turbines that can provide inertia to the grid similar to traditional thermal generation, can serve as replacements to peaker plants and help the Commonwealth and the region at large achieve their decarbonization goals while ensuring grid reliability in a cost-effective manner to ratepayers.

2.3. Eligible Bids

Hydrostor's A-CAES facilities fall under the "mechanical" or "thermo-mechanical" categories of LDES technology types and fit under the Section 83E criteria for LDES "capable of dispatching energy at its full rated capacity for a period greater than 10 hours and less than or equal to 24 hours." While our projects currently under development in California and Australia are 8-hour systems, our technology can be readily scaled to meet the Massachusetts definition of 10 hours or longer. Hydrostor does not recommend a maximum bid size for the LDES procurement. Large-scale LDES solutions like LDES require economies of scale in order to provide their benefits to the grid at the lowest cost to ratepayers. If establishing a maximum bid is required, it should be greater than 500 MW to competitively allow A-CAES and other large infrastructure projects to participate, especially in the context of the LDES needs into 2050 identified in the "Charging Forward: Energy Storage in a Net Zero Commonwealth" report. Finally, Hydrostor looks forward to further discussions on appropriate maturity requirements for the LDES procurement. Like in other markets, Hydrostor would support including an active application in the ISO-NE interconnection process and an initial degree of progress toward permitting as maturity requirements, as long as the timelines on both fronts are feasible under reasonable investment and permitting practices. Specifically, as explained in section 2.1, ideally the LDES procurement schedule would be signaled two to three years in

advance, and procurement awards would be finalized ahead of large deposit requirements with high "at risk" fees.

2.4. Facilitating the Financing of Projects:
The procurements for LDES should be designed to provide the "missing money" to make these categories of projects investable and to provide a reasonable level of financial hedge. There are different contracting mechanisms and frameworks that could be used to achieve these goals, some of which may include contracting for energy services. Hydrostor looks forward to ongoing engagement with stakeholders on this topic. These contracting mechanisms may end up being similar to and draw from those used for the mid-duration storage procurements; however, there will inevitably be specific elements that may only apply to LDES and thus require an LDES-specific discussion. Hydrostor recommends that the RFP Drafting Parties provide a process with sufficient time ahead of the LDES procurement to address these details. Hydrostor looks forward to contributing to these discussions, including on tolling agreements, index storage credits, and other mechanisms, drawing from our active experience on these topics in other jurisdictions, including California, New York, and other international jurisdictions.

2.5. Contract Length and Degradation
A contract length of 30 years is appropriate for the LDES procurement and aligns with what is being considered in other jurisdictions, although longer terms are being considered in some jurisdictions and may be appropriate for some LDES technologies. Hydrostor's A-CAES for example has a 50+ year lifetime with no efficiency degradation and thus no augmentation requirements to maintain performance.

2.6. Project Viability and Other Qualitative Factors
Hydrostor would recommend a procurement design for LDES that considers both price and non-price evaluation factors. Non-price evaluation factors could include active status in the ISO-NE interconnection process, progress on permitting and site control, job creation and economic development benefits, stability of supply chains, and additional benefits to the grid. Hydrostor looks forward to ongoing collaboration on this front in relation to the LDES procurement.

2.7. Economic Development and Workforce
As noted above in section 2.6, these considerations could be captured as non-price evaluation factors. Hydrostor's A-CAES facilities are estimated to provide thousands of jobs during its construction phase, as well as approximately 40 full-time jobs for its 50+ year operational lifetime and ongoing demand for local services and supplies, ensuring lasting economic benefits.

3. About Hydrostor's Advanced Compress Air Energy Storage (A-CAES) Facilities

A-CAES is an emission free, commercially proven, cost-competitive LDES solutions. As seen in Figure 1 below, during times of abundant solar or wind generation, Hydrostor's A-CAES uses extra energy to charge the system by compressing ambient air. The heat generated as the air is compressed is captured and stored aboveground, as it will be needed in later stages of the process.

Once the heat has been removed, the cooled, compressed air is pushed into a cavern underground that is filled with water and connected to a surface reservoir. As air is injected into the cavern, an equivalent volume of water is pushed out of the cavern and up into the surface reservoir, maintaining constant pressure within the cavern while operating. The system is now charged, and the potential energy can be stored until it's needed.

When it's time to discharge energy back to the grid, the process reverses. Water is released to flow from the surface reservoir back into the underground cavern, pushing compressed air back to the surface. The air is reheated using the stored heat from the compression process and is used to drive air turbines, generating electricity that can be fed back onto the grid.

In this way, you can think of Hydrostor's underground caverns as an underground battery. When it is full of compressed air, it is charged; when it is full of water, it is empty.

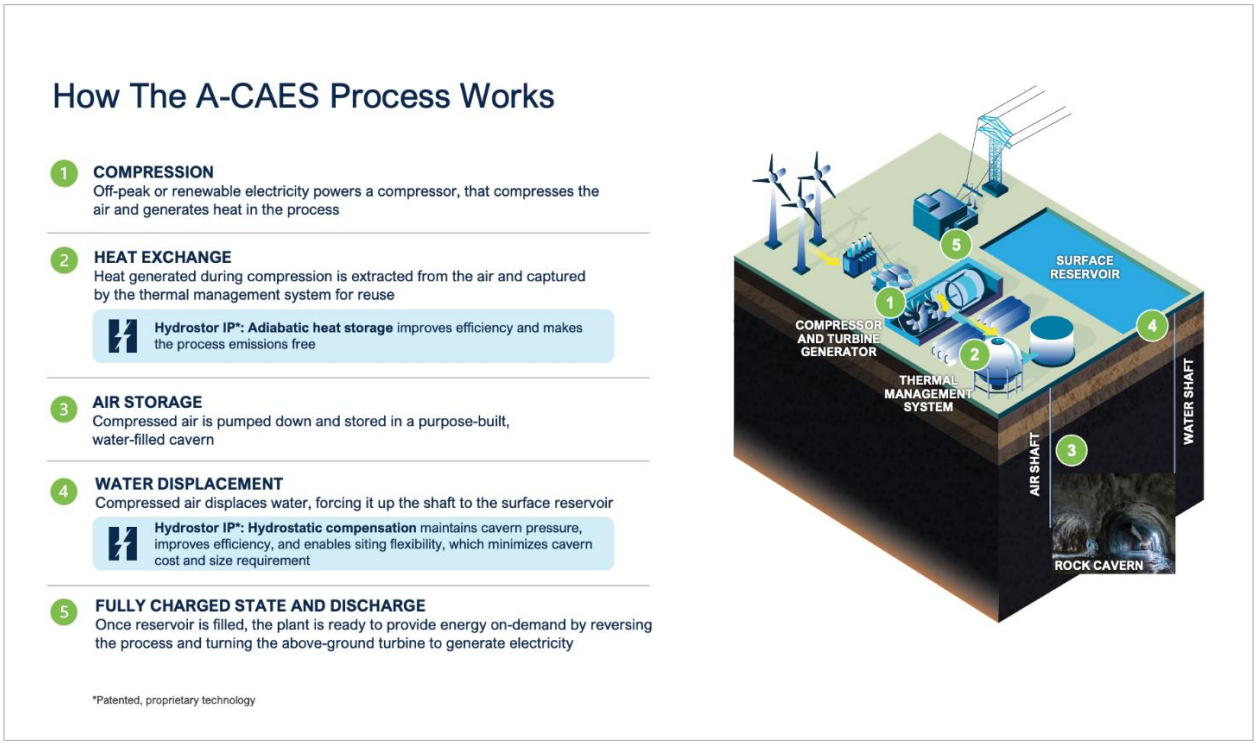

Figure 1. Description of A-CAES technology and operations

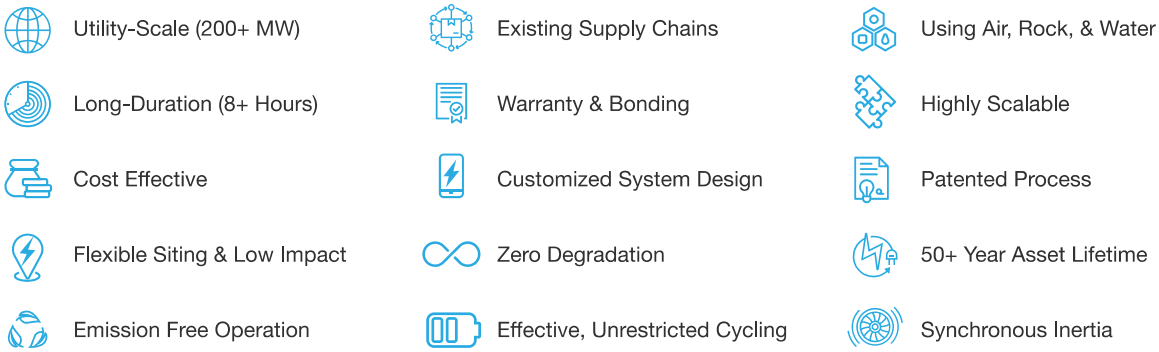

Figure 2. Benefits of A-CAES

Benefits of A-CAES

The benefits of A-CAES as a storage solution, also shown in Figure 2 above, include:

Emissions Free

- Adiabatic thermal storage system uses no fossil fuels and is non-emitting.
- Uses only air, rock, and water; no toxic materials, contaminants, or thermal impacts on environment.

Low Cost, Long Life

- One of the lowest installed cost per kWh for large-scale, long-duration energy storage (500+ MW). Even lower cost on a levelized basis.
- 50+ year system life, low sustaining capex, and unlimited cycling.
- Low operating costs and significantly increased efficiency over traditional CAES systems and alternate forms of thermo-mechanical energy storage.

Proven, Reliable Equipment

- Well-proven mechanical equipment from Tier 1 OEM suppliers is matched with seasoned EPC engineering expertise, system warranty, and delivery guarantees.

Ability to Site Where Needed

- Purpose-built underground storage caverns allow for flexible project siting.

Ancillary Services

- Synchronous motors and generators provide rotational inertia in support of electrical grid stability.
- Full suite of ancillary services available, including voltage support, spinning reserve, black start, and islanded grid generation.

Customized System Design

- System design is optimized to match client requirements, with independent settings for charge, discharge, and storage capacity.
- Long duration of storage enables wide-scale provision of grid capacity.

4. Conclusion

Hydrostor appreciates this opportunity to comment and looks forward to ongoing engagement with the RFP Drafting Parties and other stakeholders on the design of the LDES procurement to support Massachusetts' decarbonization, grid reliability, and affordability goals.