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Antora Energy Comments Re Request for Information for Long Duration Energy Storage Demonstration Solicitation, 23-ERDD-08

See attached document.

Additional submitted attachment is included below.

ANTORA

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February 14, 2024

California Energy Commission
715 P Street
Sacramento, CA 95814

Docket No. 23-ERDD-08: RFI for Long Duration Energy Storage
TN #: 253771

Comments from Antora Energy

Thank you for the opportunity to comment on the Request for Information for Long Duration Energy Storage Demonstration Solicitation. Antora Energy commends the CEC's work on accelerating the deployment of long-duration energy storage to support a zero-carbon grid, in addition to emphasizing the importance of non-lithium battery technologies that provide multiple benefits to ratepayers and the grid.

About Antora Energy

Based in Sunnyvale, CA, Antora Energy manufactures thermal batteries that convert low-cost, intermittent renewable electricity into reliable, on-demand zero-emissions industrial heat and power. The company has received funding from the U.S. Department of Energy's Advanced Research Projects Agency-Energy and Industrial Efficiency and Decarbonization Office; the National Science Foundation; and the California Energy Commission. Antora is also backed by leading investors including Breakthrough Energy Ventures, Lowercarbon Capital, Shell Ventures, and BHP Ventures. At scale, Antora's products can eliminate gigatons of emissions while strengthening the U.S. manufacturing sector.

Background & General Comments

Antora is a California-based company manufacturing long-duration thermal batteries in California. Currently, Antora is operating a demonstration system near Fresno, CA, that has de-risked the design and production of Antora's first product, a thermal battery that outputs heat.

Antora is actively developing a thermal battery product that outputs both heat and electricity, directly replacing combustion-based combined-heat-and-power systems. In addition to outputting DC power in line with the requirements in the funding opportunity, the system provides multiple benefits, including outputting reliable, zero-emissions industrial heat (such as in the form of steam) and serving as a flexible behind-the-meter load. Such systems are essential

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to decarbonizing industry, which represent nearly a quarter of California's GHG emissions, while providing grid benefits and saving ratepayer money. **We urge CEC to explicitly include LDES systems that output both heat and power as eligible for this funding, so long as they meet the other requirements in the funding opportunity.**

Below, we have answered select solicitation questions in detail.

Thank you for your consideration,

Haley Gilbert

Haley Gilbert
Head of Business Operations
Antora Energy

LDES System Demonstration Questions

Question 1 — According to the California legislation that authorized the LDES program, all demonstration projects must have a system capacity of a minimum of 1 MW for at least 8 hours1. Given this requirement and the current state of your non-Li LDES, which of the following system sizes could you deliver in the next 18 months to 2 years? Additionally, which system size would help your technology reach the 200-400 MWh system size in the next 3-6 years?

Antora's thermal energy storage system is based on a modular approach that enables multiple thermal battery modules to be deployed to meet thermal and electrical loads of nearly any size. For this reason, we expect to be able to deliver a 200-400 MWh system size in the next 3-6 years when starting at any of the system size ranges provided. However, while Antora has the flexibility to deliver a variety of system sizes at production scale, earlier-TRL demonstrations will be limited by the restrictions and requirements of the chosen site. For this reason, we encourage CEC to leave recipients the flexibility to size the system according to the needs of the site and to the development needs of the technology at hand.

Question 2 — What would be the range of the estimated project costs in a direct current (DC) configuration for demonstrating each of the three different system sizes listed in question 1 for your non-Li LDES system as a function of the location of deployment? Additionally, what would be the life expectancy of the demonstrated project? Would it be

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considered pre-commercial or commercial, and have an expected life of 10-20 years or longer? Please explain.

The range of estimated project costs would be highly dependent on the system proposed to be developed, depending on factors such as the ratio of heat and electricity delivered and the storage duration. We expect projects to be fully functioning and selling energy behind-the-meter to a customer site, and so would be considered commercial. Antora's products have an expected lifetime in excess of 30 years.

Question 3 — For the system sizes listed in question 1, what is the maximum amount of match funding that a technology provider and selected end customer can contribute towards one of the proposed future grants - 20%, 30%, 40%, or higher?

Antora's systems store electricity as heat and deliver heat and power to industrial customers. As such, each Antora project is not just providing energy, it's directly displacing onsite fossil fuel combustion for industrial customers, such as that in a natural gas boiler or combined-heat-and-power (CHP) system. Such projects are not heavily incentivized by existing utility rates, which do not adequately incentivize the use of off-peak, renewable power—meaning that, in California, electrifying industrial energy loads with long-duration storage requires switching from low-cost natural gas to high-cost California electricity rates. Given the combination of current high electricity costs and first-of-a-kind project costs, we suggest that technology providers contribute no more than 30%.

Question 5 — Considering that California is aggressively planning to procure energy storage and has already approved over 8 GWs of Li-ion systems, when do you anticipate your non-Li system will be able to compete with Li-ion systems in terms of price and performance for a future commercial solicitation if the price range is $350-$450 per kilowatt-hour (kWh) delivered in a DC configuration? Please explain.

Antora's thermal battery stores energy in solid carbon blocks, a low-cost and earth-abundant material with extensive existing supply chains. This enables our system to undercut fossil fuels and lithium-ion batteries on cost, and we expect to be able to deliver projects below this price point by 2027.

Demonstration Sites Questions

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Question 8 — Should demonstration projects be required to be located in Tier 2 or 3 High Fire-Threat District areas (as defined by the CPUC2)? Or should these siting locations be incentivized through solicitation scoring criteria bonus points? Please explain.

Siting demonstration projects in Tier 2 or 3 High Fire-Threat District areas should not be a requirement or result in extra points for applicants. LDES technologies provide significant value beyond resiliency, and optimizing for these varied benefits may include siting projects outside of these areas. In particular, for industrial-focused LDES technologies, greater emissions reductions can be achieved by aligning deployment with large industrial loads in non-high-fire-threat areas, particularly in behind-the-meter configurations.

Question 10 — Is there any preference for behind-the-meter or front-of-the-meter demonstrations for the system size ranges listed in question 1? If so, why?

We encourage CEC to fully consider applications from both behind-the-meter and front-of-the-meter demonstrations for all system size ranges. The size and configuration of an LDES demonstration will vary depending on the customer's requirements and the technology deployed, which may indicate behind-the-meter or front-of-the-meter configurations.

California Environmental Quality Act (CEQA) Questions

Question 13 — When a GFO is posted, proposals are generally due to the CEC within 8 to 12 weeks, and the CEQA process is generally required for the CEC to award grant funding to a project. The CEC has learned from the initial LDES projects that the LDES systems have a greater footprint than systems exempted from CEQA. Therefore, an environmental impact report or negative declaration is normally required for the potential projects, as are other actions required by CEQA. For the system size ranges listed in question 1, how long would it take to complete the CEQA process (and the National Environmental Policy Act (NEPA) if applicable) for your LDES system, and approximately how much would these processes cost?

Antora's energy-dense system has roughly the same footprint and configuration as a utility-scale lithium-ion battery installation. Nonetheless, a CEQA and/or NEPA process may be required. These processes will likely take 18 months or longer, especially in locations near sensitive zones.

Question 14 — Is it reasonable to require that all GFO applicants complete discretionary permitting and CEQA through their local public agency before submitting a proposal for a project in the sizes defined in question 1? Please explain.

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No, such a requirement would unduly restrict the development of the demonstration projects. As such projects need significant buy-in from the customer and site, which may be contingent on external funding, requiring this lengthy process before proposals are submitted would impose an unrealistic burden for many projects.

Greenhouse Gas (GHG) Reductions Questions

Question 17(b) — As stated in the "Background" section of this RFI, the funds are provided by GGRF, and therefore, CEC is required to track GHG reductions provided by the installed systems. Is there a difference in what your technology can provide in GHG reductions if installed in a behind-the-meter or front-of-the-meter configuration?

Antora's thermal battery modules directly displace natural gas combustion in industrial facilities, driving industrial processes with renewable electricity and providing significant emissions reductions. Antora's technology provides significantly more GHG reductions when in a behind-the-meter configuration, which enables the heat and power from Antora's thermal battery to directly integrate into industrial processes (much like an existing CHP combustion system).