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Pathfinder CAES I LLC Comments on the November 20, 2015 Joint California Energy Commission and California Public Utilities Commission Bulk Storage Workshop

Additional submitted attachment is included below.

December 18, 2015

California Energy Commission
1516 9th Street
Sacramento, CA 95814-5512

Docket # 15-MISC-05



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RE: Pathfinder CAES I LLC Comments on the November 20, 2015 Joint California Energy Commission and California Public Utilities Commission Bulk Storage Workshop

Dear Commissioners:

Pathfinder CAES I LLC ("Pathfinder") appreciates the opportunity to submit comments in response to the Joint California Energy Commission (CEC) and California Public Utilities Commission (CPUC) Long-Term Procurement Plan (LTPP) Workshop on Bulk Energy Storage. We thank President Picker, Commissioner Peterman, Chair Weisenmiller, and California Independent System Operator (CAISO) President Berberich for directing attention to the topic of bulk storage. We further appreciate that Burbank Water and Power was given the opportunity to present as part of the proposed projects panel at the workshop.

Pathfinder plans to construct, own, and operate a 300 MW compressed air energy storage (CAES) project located in Milford County, Utah. This project is the first of several phases ("Phase I") and is designed to support grid-level integration of California renewable energy generation. The Phase I CAES project will be constructed at the eastern terminus of the Southern Transmission System (STS) in Delta, Utah. Ultimately, the Pathfinder CAES development could serve as a partial replacement for the Intermountain Power Project (IPP), a 1,900 MW coal plant serving Utah and Southern California publically owned utilities (POUs).

As the CEC, CPUC and CAISO commence planning for California's 50% renewable, low-carbon future, we hope that these agencies will continue to work collaboratively to identify future needs for flexible

resources and will create the procurement pathways necessary to realize the benefits of bulk storage for both California and the region. Most importantly, the agencies should provide guidance to the utilities that will encourage development of bulk storage.

With these goals in mind, Pathfinder offers the following comments.

I. Bulk storage must be part of future planning as California approaches 50% renewables.

Although the CPUC did not identify a specific need for bulk storage as part of the 2014 LTPP, there will most certainly be a need for additional flexible resources as California approaches 50% renewables. The level of curtailment that California currently experiences may be workable, but higher levels of curtailment at a higher RPS may threaten the state's renewable and carbon-reduction policies.

However, excess generation does not necessarily require curtailment, and bulk storage can be used to manage over-generation and facilitate greater renewable integration. Specifically, bulk storage can limit the need to curtail renewable generation during low demand periods by storing and time shifting energy to match needs during periods of higher demand.

Several studies have drawn similar conclusions about the role of bulk storage with 50% renewables. E3's Pathways study concluded that energy storage, and especially deep-draw storage, would be a key integration solution in all 50% renewables scenarios. Specifically, the study concluded that roughly 5,000 MW of long-duration energy storage would be needed at 50% renewables in 2030, without flexible hydrogen fuel production.¹ The Low Carbon Grid Study 2030 concluded that additional bulk storage is important to minimizing curtailment and costs in a low carbon electric grid, especially when other methods of providing grid flexibility are limited (e.g., limitations on regional imports and exports).² E3's RESOLVE model analysis also indicates that some storage for long-duration services will be needed for a 55% RPS.³ Finally, CAISO's Bulk Storage Case Study found that bulk storage is beneficial in reducing curtailment, emissions, production costs, and renewable overbuild starting at a 40% RPS.⁴

While the CPUC and CEC have not yet identified a specific bulk storage target, Pathfinder recommends that the agencies work swiftly to further understand the need for bulk storage in California's future. Even before quantifying the precise bulk storage need or determining the exact "right" portfolio of renewable integration solutions, we believe the agencies should first acknowledge and agree that *some* quantity of bulk storage will be needed in the next ten to twenty years. This signal would provide developers and investors the confidence needed to move forward in the project planning process.

¹ https://ethree.com/documents/E3_PATHWAYS_GHG_Scenarios_Updated_April2015.pdf

² <http://lowcarbongrid2030.org/>

³ E3 studied a 55% RPS in its preliminary RESOLVE model runs.
http://docketpublic.energy.ca.gov/PublicDocuments/15-MISC-05/TN206710_20151120T084825_E3_Bulk_Storage_Presentation.pptx

⁴ http://docketpublic.energy.ca.gov/PublicDocuments/15-MISC-05/TN206656_20151117T120924_Bulk_Storage_Workshop_ISO_Presentation.pdf

II. Successful procurement of high-quality, cost-effective energy storage will require an integrated, long-term understanding of the benefits of bulk storage for California and the west.

While bulk storage is just one of several renewable integration strategies, it provides important short-duration and long-duration services essential to ensuring a robust electric grid. The Pathfinder Phase I project, for example, would provide up to 48 hours of storage (14,400 MWh) and can ramp to full load (300 MW) within 5 minutes to deliver that stored energy back to the grid. Moreover, the facility will be able to operate in both storage and minimal generation modes simultaneously, which delivers to the grid a maximum amount of ancillary capabilities (300 MW Reg Up and 300 MW Reg Down) per MW of power generation capability, especially when compared to conventional gas-fired power generation technologies commercially available today (combustion and combined cycle gas turbines). Lastly, the project supports grid inertia stability (frequency response) by providing transmission operators the benefit of four separate rotating generators (two electrical generators for the two compressors and two electrical generators for the expanders). CAES is a suitable alternative to building new fossil-fuel generation (such as gas peakers) and can minimize the inefficient dispatch of existing thermal resources, thereby helping California manage excess generation and maintain system reliability through increased renewable penetration at reduced production costs and lower GHG emissions. Future modeling should incorporate the multiple benefits of storage, including system-wide benefits and GHG benefits.

In the 2016 LTPP, the CPUC should seek to identify and quantify not only the need for flexible resources in general, but also specific needs for specific services at different locations and points in time.

Regarding location, this needs assessment should consider not only California's system but the needs throughout the Western Electricity Coordinating Council (WECC) region. Increases in RPS standards, compliance with the Clean Power Plan (CPP), and potential federal carbon programs will all increase the need for bulk storage throughout the WECC. As California integrates its electric systems with that of PacifiCorp (and possibly other balancing areas), the challenges and opportunities associated with increasing renewables throughout the West will become California's challenge and opportunity.

To this end, the CEC and the CPUC should provide clarity on how it will treat out-of-state bulk storage resources as part of any bulk storage or all-source procurement process. Both CAES and Pumped Hydro Storage (PHS) are dependent on unique geographies (geology and hydrology); limiting bulk storage procurement to in-state projects would hinder the state's ability to acquire the most high-quality, cost-effective resources.

In terms of timeframe, the CPUC should look out over longer than typical time periods in the 2016 LTPP process—up to a twenty-year look out—in order to more accurately assess the benefits of bulk storage and accommodate the long lead time for bulk storage projects. While it may be impossible for the CPUC to make procurement decisions based on complete information about future market conditions—for example, the price of batteries in 2025 is not known—there are opportunities for utility investments in

low or “no-regrets” projects, which the CPUC can safely authorize in the near-term given current understanding of needs and alternatives.

Finally, beyond the LTPP, bulk storage should also be considered in other important venues. As CESA recommended in its workshop presentation, the CAISO should consider a special study in the Transmission Planning Process to assess the benefits of bulk storage in optimizing transmission build out and renewable integration.

III. Future agency assessments and decisions should include multiple bulk storage technologies.

CAES technology has been in-use and operational in two locations for over twenty years. However, regulators and utilities are less familiar with this technology than they are with PHS. Nevertheless, state agencies should be sure that future assessments and decisions on bulk storage are inclusive of more than one bulk storage technology. Bulk storage is not synonymous with PHS, and PHS may not be the best option in all cases. CAES needs to be a part of all bulk storage discussions.

Overall, there has been insufficient modeling to address bulk energy storage needs. While Pathfinder lauds recent agency efforts to study the benefits of bulk storage, future studies, including the CAISO Bulk Storage analysis for a 50% RPS target and studies associated with the 2016 LTPP, should include CAES.

Burbank Water and Power has been working with Pathfinder, Duke American Transmission Company, and the WECC Transmission Expansion Planning Policy Committee (TEPPC) to advance the understanding of the benefits of CAES for integrating renewables. The TEPPC 2014 study group selected Pathfinder’s proposal to evaluate a 1,200 MW CAES project and a 2,200 MW Wyoming wind project compared to a 1,200 MW combined cycle natural gas plant as a high priority study. However, aside from this analysis, CAES has largely been absent from state and regional studies. Pathfinder looks forward to working with the CPUC, CEC, and CAISO to provide the information needed to properly evaluate CAES and incorporate this technology into future resource assessments.

IV. Bulk storage projects should be evaluated in the context of regional needs and opportunities; direct comparisons between technologies outside of this context may be misleading.

In evaluating the need for bulk storage to serve the California grid, state agencies should consider the potential for specific projects to address specific regional needs. Not all projects are possible in all locations and not all projects will provide the same services needed.

Pathfinder is proposing to construct a 300 MW CAES project at the site of the retiring IPP coal plant. A geologically rare salt dome located at the same site as this coal plant offers a unique opportunity to create a replacement plan for IPP that incorporates both renewables and energy storage. Until recently, the only replacement plan under consideration by the Utah and Southern California purchasers in IPP

has been to construct a new 600-1,200 MW CCGT plant. The Los Angeles Department of Water and Power (LADWP), who is the largest purchaser of power from IPP and the plant's operating agent, had previously concluded that a sizable natural gas plant would be necessary at IPP in order to provide sufficient rotating mass to energize the STS transmission line. Today, LADWP is evaluating whether CAES might be able to provide the same service. This would enable the STS to ship higher quantities of renewable energy to serve California.

A recent ABB GridView analysis commissioned by Burbank Water and Power assessed the costs, benefits and operational attributes of the addition of (a) 1,200 MW of CAES plus 3,000 MW of Wyoming wind compared to (b) 1,200 MW of CCGT plus 2,200 MW of Wyoming wind into the WECC in 2024 at a 33% California RPS. The results showed that the CAES scenario (option "a") allowed for more wind power (4,000 GWh per year), at lower system production costs (savings of \$168 million per year), with lower carbon emissions (enough to displace the GHG emissions from a new-build 1,000 MW CCGT). These benefits extend to utilities and ratepayers alike.

At IPP, the alternatives are CCGT or CAES. There are no hydro resources available to build a pumped hydro facility in Delta, UT. Further, electing to simply retire the IPP plant without replacement would mean stranding a very valuable asset: the 2,400 MW HVDC STS line. A CAES plant at IPP creates an opportunity to utilize the STS to provide California and other western states access to high-quality renewables in the west. It is also the best and cleanest option for replacing IPP. While the carbon benefits of a CAES and wind solution are abundantly clear when understood in this context, if decision makers were to compare generic PHS facility to a generic CAES facility it would be severely misleading.

V. The CEC should provide specific direction on how it expects the POUs to evaluate and potentially procure bulk storage resources.

Bulk storage resources provide services that benefit the whole grid, not just the utilities invested in or paying for those services. Therefore, as a number of developers acknowledged at the November 20 workshop, bulk storage projects will likely require new forms of multi-party sales contracts that limit free-ridership.

The utility partnership, which will be necessary for bulk storage resource procurement, will also extend beyond the boundaries of the CAISO. Specifically, bulk storage projects may require partnerships between IOUs and POUs. While the participants in Pathfinder's Phase I CAES project will be comprised primarily of Southern California POUs, Pathfinder ultimately plans to build out a much larger, up to 1,200 MW CAES facility that will be available to IOUs in California and the West. To facilitate multi-party agreements involving both POUs and IOUs, the state agencies should first strive to align POU and IOU requirements for energy storage. The first energy storage mandate enacted by AB 2514 created no firm procurement targets for POUs. While it may not be appropriate to set POU and IOU storage requirements that are exactly equal, it will be challenging for bulk storage developers to foster

collaborative agreements between the two types of utilities without some consistency in state requirements and authorized procurement methods.

Pathfinder recommends that the CEC work closely with the CAISO and the CPUC to develop bulk storage procurement pathways which are conducive to public and private utility collaboration.

VI. Conclusion

Pathfinder sincerely appreciates that the CEC, CPUC and CAISO are directing new attention toward evaluating bulk storage. We hope that the agencies will 1) confirm that bulk storage needs to be a part of California's low carbon future, 2) work swiftly to identify specific bulk storage needs within the western region, 3) evaluate bulk storage projects based on specific regional needs and opportunities to integrate renewables and reduce emissions, and 4) help foster collaboration on bulk storage procurement across public and private utilities.

Pathfinder looks forward to continuing to work with agencies and staff as part of future storage resource planning efforts.

Sincerely,

Pathfinder CAES I LLC