

May 20, 2014

The Honorable Carla Peterman, Commissioner  
California Public Utilities Commission  
505 Van Ness Avenue  
San Francisco, California 94102

**Re: Workshop Report on Pumped Hydro Workshop Prepared by the California Public Utilities Commission's Policy and Planning Division, dated March 9, 2014**

Dear Commissioner Peterman:

The California Energy Storage Alliance ("CESA") very much appreciates the Commission following through on its commitment to hold a pumped hydro storage workshop pursuant to the final decision in R. 10-12-007, which required a workshop to "further explore the operational characteristics and uses for pumped storage projects." We believe the workshop was the first targeted discussion of any kind on pumped hydro storage in recent memory at the Commission. We believe this is a result of the emergence of the energy storage market in California due to the Commission's implementation of AB 2514, as well as the well demonstrated viability and promising cost benefits offered by modern pumped hydro storage technology.

As you know, the California Air Resources Board ("ARB") is charged with implementing AB 32 and Executive Orders that set the stage for substantial reduction in greenhouse gas ("GHG") emissions that accelerate rapidly from 2020. The ARB is currently preparing an update to its Scoping Plan, and there are strong indications that electric sector GHG emissions reduction objectives will become far greater than the Commission is currently considering. As noted in the presentations by Argonne National Laboratory, Stanford University, and other presenters at the workshop, there is an opportunity to achieve substantial success with early attention to aggressive GHG reduction planning consistent with the ARB Scoping Plan Update. Increasingly, there are indications that effective early planning by the Commission in the 2014 Long-Term Procurement Plan ("LTPP") proceeding (R.13-12-010) could begin implementing a transition that will result in a negative cost of carbon if effectively begun in the very near future. Effective integration of pumped hydro Storage into both the Commission's process and the resultant utility procurement directives can lower the cost of electricity to ratepayers, and accelerate GHG goal achievement at a negative cost to ratepayers. Effective action now to include Pumped hydro storage and preferred resources combined at proper scale and timing could achieve meaningful rate savings and facilitate electricity as a substitute fuel in transportation and other sectors, in a win-win for the California economy and GHG reduction.

The Workshop Report on Pumped Storage Workshop ("Workshop Report") summarized most of the key points raised at the workshop. We appreciate the effort, but also believe it is important to supplement the Workshop Report with what we believe are important additional takeaways for the Commission. Our perceptions are that currently pumped hydro storage lacks clear procurement direction from the Commission, which does not have recent working experience with pumped storage due to lack of market activity over the last three decades. Evaluation of pumped hydro storage, along with cost-effective renewable resources combined at the proper scale from projects and resources

currently in development can produce a negative cost of carbon, compared to the use of gas-fired generation (“GFG”) that is currently being selected in utility requests for offers because planning processes are not studying the most effective resource combinations as an alternative to GFG.

California’s utilities need guidance from the Commission on how to best value pumped hydro storage for ratepayer benefit, and the 2014 LTPP proceeding is the most logical venue to do so. Participants at the workshop raised this theme most frequently as a market barrier, as mentioned in presentations, as well as in discussions by audience participants. It was noted that at least one utility, PG&E, has informally solicited benefit and cost information for pumped hydro storage, but we believe that such efforts can only be effective in yielding useful information on ratepayer benefit when utilities have a Commission-adopted evaluation framework in hand to work with. The PG&E presentation points out the lack of a robust evaluation process to properly recognize pumped hydro storage’s value to ratepayers, particularly when combined with the lowest cost renewable resources effectively combined at the same scale as GFG is being evaluated.

Unfortunately it appears that, the Commission- directed planning study parameters provided to the California Independent System Operator (“CAISO”) and the utilities this year do not provide adequate guidance for sensitivity analysis. As a result, the studies necessary to evaluate effective use of pumped hydro storage and renewable resources in the most effective combinations are not being performed by the CAISO. This disconnect is more pronounced when considering that a representative of the Sacramento Municipal Utility District (“SMUD”) said at the workshop that its decision to invest in the Iowa Hills pumped hydro storage project was driven by analytics, which informed its Board of Directors to decide to proceed with the investment due to it being a “proven and reliable technology” with “large amounts of dispatchable capacity” and driven at the same time by the imperatives of AB 2514, namely integration of renewable generation and GHG reduction.

Participants at the workshop frequently referred to the LTPP process as the primary venue to remove this barrier. The workshop occurred prior to the decision in Track 4 of the 2012 LTPP (R.12-03-014) which linked pumped hydro storage to “preferred resources” for procurement in southern California. The combination of the workshop findings and the results of the 2012 LTPP Track 4 point to the importance of addressing pumped hydro storage valuation in the 2014 LTPP that has begun. However, the 2014 LTPP study parameters provided to the CAISO do not include planning for pumped hydro storage and preferred resources at the scale and mix necessary to produce a meaningful study result.

Pumped hydro storage offers strong energy return-on-investment value. The presentation by Charles Barnhart of Stanford University highlighted the fact that pumped hydro storage offers the strongest “energy ROI” among energy storage options. Energy return on investment (“ROI”) serves as a proxy for GHG reduction value. Mr. Barnhart noted that most energy storage technologies offer better energy ROI than gas-fired peaking generation, and his reported ROI for pumped hydro storage was far above the ROI for other GHG-free alternatives. By his analysis, pumped hydro storage is also the single most cost-effective technology to eliminate curtailment of renewable generation, and is not being studied for that important benefit.

There is substantial, active development of pumped hydro storage projects in California today. According to Argonne National Laboratory, there are almost 50 pumped hydro storage permits in process at the Federal Energy Regulatory Commission, most of which will utilize advanced adjustable

speed technology. EDF Renewable Energy's presentation showed a worldwide footprint of pumped hydro storage development, including projects in development and construction today. Alton Energy, and Eagle Crest and Brookfield also outlined their projects in detail, and SMUD discussed its project that is moving ahead to completion. The attached Exhibit 1 provides a listing and details of the most active pumped hydro storage projects being developed in California. These projects, along with effective combination with renewable resources can provide GHG-free energy and capacity, firmed and shaped, at a negative cost of carbon compared to GFG, in the 2020 to 2030 time frame, if they are allowed to do so. CESA advocates that studies be supplemented in the 2014 LTPP so that 2015 can start successful procurement to this end.

The current volume of development is important to consider in light of the Workshop Report's brief discussion of pumped hydro storage's permitting and locational "challenges," and its focus on factors not consistent with most California projects in development. While we do not assert that developing a new pumped hydro storage project today is easy, presentations showed that pumped storage development challenges are not out of the realm of those faced by other large-scale energy resources development projects. The primary challenge facing pumped hydro storage today is a lack of market visibility and "pull" due to a failure to evaluate pumped hydro storage in combination with renewable resources as the most appropriate procurement alternative.

Today's pumped hydro storage technology is even better for the grid than yesterdays. SMUD's presentation showed that new variable-speed technology provides 65% savings compared to fixed-speed turbines under "high wind" scenarios analyzed by SMUD. The Argonne National Laboratory presentation lists further benefits such as more flexible voltage support, reduced frequency drops associated with generator outages, quicker response to variable generation fluctuations, and increased turbine efficiency and lifetime.

Most markets do not optimize pumped hydro storage for storage and generation. Both capabilities tend to be bid differently in markets other than PJM, with generation bid on a day-ahead basis, and storage on an hour-ahead basis with attendant price uncertainty. The Argonne National Laboratory presentation clearly showed that pumped hydro storage offers cost savings to the grid across a range of operational segments. However, the very piecemeal nature of selling those attributes in the market makes sustained financing of projects very difficult, particularly considering stand-alone project evaluations as opposed to overall results with effective combination with renewable resources. The Workshop Report does reiterate the finding that attributes such as inertia, voltage control and frequency control are not properly valued in the market, as demonstrated by SMUD.

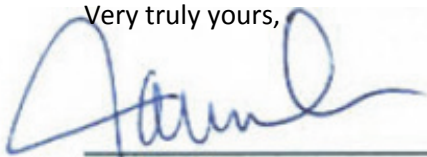
The 2014 LTPP proceeding is moving forward on a well-defined schedule to evaluate need in 2014 and ultimately procurement in 2015, but has left out meaningful studies and sensitivity analysis including pumped hydro storage and the most cost effective renewable resources. The 2014 LTPP Scoping Ruling suggests that procurement processes may be evaluated for modification in the 2016 LTPP process to ensure accomplishment of the state's 2050 GHG goals but no actions are proposed to be taken in the 2014 cycle. We believe the time to take action is now to ensure that low/zero emissions resource are available when and where they will be needed. The 2014 LTPP Scoping Ruling and Planning Scenarios have included a discussion of ARB's GHG reduction goals, but they do not include study of any GHG reduction in the electric supply, or sensitivity analysis consistent with - or even close to - the ARB goals. As a result, pumped hydro storage and the most cost-effective GHG-free renewable resources are missing from the study scenarios. Retirement scenarios for GFG resources use 40-year operating life as

a minimum, so all of the new base load GFG being procured will be operating until at least 2060, far beyond the time GHG Goals will allow such operation. Not having GHG emissions properly studied will unfortunately badly miss the most cost-effective opportunities to gain this same capacity from a highly flexible mix of cost-effective renewable resources, coupled with pumped hydro storage at costs lower than the new GFG being procured. Because of this, lower cost and achievable solutions will not be studied in LTPP 2014 and will simply not occur. The wrong resources will be procured by default, unless a correction is made now. The record in the 2014 LTPP must include sufficient information and analysis of pumped hydro storage and lowest cost renewable resources that can be credibly considered in decisions this year.

The 2014 LTPP proceeding correctly identifies the need for GHG-free electricity, the critical role for pumped hydro storage, and of course for procured resources to be lowest cost, best-fit and flexible. The 2014 LTPP proceeding establishes standards for credible comparison of alternatives, but fails to include pumped hydro storage and the lowest cost renewable resources into the studies that establish the data for credible comparison. Because the known pumped hydro storage projects being developed in California as shown in Exhibit 1 is so flexible, and the projects are of sufficient size, successful integration of pumped hydro storage can be assumed for 2014 LTPP comparison purposes, provided the Commission so determines. Thus pumped hydro storage and the most cost-effective GHG free renewable resources can be considered without modifying and delaying the studies that are already underway.

CESA urges the Commission to allow full consideration of pumped hydro energy storage in the 2014 LTPP, as there was sufficient information provided in the March 9, 2014 workshop that we believe will support the ultimate finding that pumped hydro energy storage is one of the most cost-effective resources that can provide GHG-free energy and flexibility. The 2014 LTPP proceeding should include full evaluation and consideration of the level of GHG emissions produced in each of the alternative scenarios studied in the 2014 LTPP proceeding, along with overall total system costs, as compared to a scenario that appropriately factors in the capabilities of pumped hydro storage projects under development in combination with low cost renewable resources. In this way the Commission can make properly informed decisions in the need determination in 2014, and for its subsequent procurement decisions in 2015.

Very truly yours,



Janice Lin, Executive Director

cc: Service List for R.10-12-007  
Service List for R.13-12-010  
President Michael Peevey  
Commissioner Michel Peter Florio  
Commissioner Catherine Sandoval  
Commissioner Michael Picker

## Exhibit 1 Pumped Hydro Projects for the California Market – May 20, 2014

FERC P#	Development Projects	Generate		Gross	CloseLoop	On	Each	County	CAISO	Preliminary	Est	Adjustable
		MW	MWH	Head	Off Exist	Any	Turbine					
14201	Bison 1	2,000	12,000	2,350	Yes	No	(8) 250	Kern	SP15	Yes	2021	Yes
14201	Bison 2	2,000	12,000	2,700	Yes	No	(8) 250	Kern	SP15	Yes	2023	Yes
13123	Eagle Mountain	1,300	22,000	1,400	Yes	Yes	(4) 325	Riverside	SP15	Yes	2021	Yes
2101	Iowa Hill	400	6,500	1,200	No	Yes	(3) 133	El Dorado	SMUD	Yes		Yes
14227	LEAPS	500	10,000	1,500	No	Yes	(2) 250	Riverside	SP15	Yes		Yes
13318	Swan Lake	600	8,880	1,150	Yes	Yes	(4) 150	Oregon COB	NP15	Yes	2021	Yes
12807	Mulqueeney Ranch	280	2,240	720	Yes	No	(2) 140	Alameda	NP15	Pending		
12747	San Vicente	500	1,750	1,340	No	Yes	(2) 250	San Diego	SP15	Pending		
13221	Mokelumne	1,200	12,000	1,850	No	Yes	(4) 300	Amador	NP15	Yes		
<b>Operating Projets</b>												
2426	Castaic	1,247	12,470	1,060	No	Yes	(6) 250	Los Angeles	LADWP	N/A		No
67	Eastwood	200	510,850	1,338	No	Yes		Fresno	SP15	N/A		No
2735	Helms	1,212		1,744	No	Yes	(3) 400	Fresno	NP15	N/A		No
2299	San Luis	424	126,350	305	No	Yes	(8) 53	Merced	NP15	N/A		No
	Lake Hodges	40		770	No	Yes	(2) 20	San Diego	SP15	N/A		No

Source: FERC, Public Data, Developer Provided Information