BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Pursuant to Assembly Bill 2514 to Consider the Adoption of Procurement Targets for Viable and Cost-Effective Energy Storage Systems.	R.10-12-007 (Filed December 16, 2010)

OPENING COMMENTS OF EDF RENEWABLE ENERGY ON THE PROPOSED DECISION OF COMMISSIONER PETERMAN

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In accordance with the Article 14 of the Commission's Rules of Practice and Procedure, EDF Renewable Energy ("EDF RE") hereby submits these opening comments on the Proposed Decision of Commissioner Peterman ("PD") issued on September 3, 2013.

I. INTRODUCTION

Our comments focus on the PD's exclusion of pumped (hydro) storage projects that are larger than 50 megawatts ("MW") from the proposed Energy Storage Procurement Framework and Design Program ("Storage Framework"). (We note that while the PD implicitly would include pumped storage projects less than 50 MW, as the PD itself notes, pumped storage projects are typically much larger than 50 MW, so such a limitation represents a de facto exclusion of the technology from the Storage Framework and we treat that limitation as such in the remainder of our comments.)

We are of course pleased that the PD is "sympathetic to parties' arguments that pumped storage complies with storage definitions under [Assembly Bill 2514]," recognizes that "these type or projects offer the same or better potential benefits as all of the emerging storage

technologies targeted by this program," and would "strongly encourage the utilities to explore opportunities to partner with developers to install such large pumped storage projects where they make sense within the other general procurement efforts underway in the context of the [Long-Term Procurement Plan] proceeding or elsewhere."[1] We are very concerned, however, that the PD lacks explicit provision for outputs to support and advance the consideration of large-scale pumped storage in the California market, thereby running the risk of the technology becoming stranded in a "no man's land" in spite of the PD's aforementioned recognition of its potential benefits to California ratepayers.

Our comments first recount the numerous characteristics and benefits of pumped storage that firmly establish the technology as deserving of more consideration, both in the context of the Commission's implementation of AB 2514 and in other contexts such as the LTPP and Resource Adequacy ("RA") proceedings. Perhaps more importantly, **we provide a concrete proposal that squarely addresses the PD's reasoning for excluding pumped storage from the proposed Storage Framework**—that is, the concern that "[t]he sheer size of pumped storage projects would dwarf other smaller, emerging technologies and could inhibit the fulfillment of market transformation goals."[2]

We propose that the PD be modified to direct the Energy Division to: (1) commission and oversee a third-party study of pumped storage's portfolio benefits, costs, market barriers and methods for overcoming such barriers; (2) conduct a workshop with the utilities and interested parties that uses the aforesaid study to assess large pumped storage's potential role within the "big picture" of California's varied resource needs; and (3) prepare a workshop report that, in

[1] Proposed Decision, pp. 33 and 34.

[2] Proposed Decision, p. 34.

combination with the third-party study, will serve as the basis for the consideration of large pumped storage in other procurement-related contexts and Commission proceedings.[3]

Importantly, our proposal does not increase the size nor in any way modify the proposed structure of the Storage Framework. (Indeed, the design parameters of a Storage Framework that has a distribution- and customer-side focus will probably not be appropriate for viable procurement of large-scale pumped storage, as we address in proposed Finding of Fact 17 set forth in Appendix A.) Rather, the study and workshop process we have outlined would be an "add on" that will ensure that the Commission's implementation of AB 2514 appropriately covers the full range of viable and commercial storage technologies and does not exclude a major resource option that, as the PD already acknowledges, has the potential to address many of the state's resource needs in the near and far future.

Amid the parties that submitted opening comments and reply comments on the Assigned Commissioners Ruling ("ACR"), a wide range of parties call for the inclusion of pumped storage in the Commission's AB 2514 implementation, including Southern California Edison Company ("SCE"), Pacific Gas and Electric Company ("PG&E"), the Independent Power Producers Association ("IEP"), the Center for Energy Efficiency and Renewable Technologies ("CEERT"), the California Wind Energy Association ("CalWEA") and the California Energy Storage Alliance ("CESA"), as well as pumped storage developers such as EDF RE, Shell Energy, Brookfield Energy, Alton Energy, Nevada Hydro and Eagle Crest Energy. Opposition to pumped storage's inclusion was limited to parties such as the Interstate Renewable Energy Council ("IREC"), the Sierra Club and the California Environmental Justice Alliance ("CEJA"), and stemmed primarily from the aforementioned concern that pumped storage's inclusion could

[3] Proposed Findings of Fact and Conclusions of Law in support of our proposal are set forth in Appendix A hereto.

squeeze out emerging storage technologies, an issue that as we have just mentioned is squarely addressed by our proposal. (In fact, IREC also noted the usefulness of new pumped storage to address California's emerging electricity needs.[4])

II. PUMPED STORAGE CLEARLY MEETS THE DEFINITIONS AND GOALS OF THE ENABLING STATUTE AND MOST LIKELY PROVIDES BENEFITS THAT EXCEEDS THOSE OF OTHER STORAGE TECHNOLOGIES, BUT IT IS THE ONLY STORAGE TECHNOLOGY EXCLUDED FROM THE PROPOSED STORAGE FRAMEWORK.

We reiterate here our firm understanding that **pumped storage meets the legislative intent of AB 2514 as well as its definition of eligible technologies set forth in the statute**. In our comments on the Assigned Commissioners Ruling (ACR), we provided a detailed analysis of the legislative record of AB 2514, concluding based thereon that the Legislature's intent was to include pumped (hydro) storage among the storage technologies that are targeted for procurement under the statute.[5] In that regard, we pointed out that pumped storage meets the definition. set forth in newly enacted Public Utilities Code § 2835(a), of energy storage technologies that are eligible to be included in procurement targets adopted under the statutes, in that it uses a mechanical process (pumping water from a lower elevation to a higher elevation) to store energy (in the form of the elevated water's potential energy) that was generated at one time (typically during off-peak hours) for use at a later time (typically during on-peak hours).[6] We further note that, as PG&E pointed out in its opening comments on the ACR, "AB 2514 requires utilities to procure viable and cost-effective energy storage systems, which would include pumped hydro. Thus, this exclusion is not in compliance with the statutes of AB 2514."[7]

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[4] See IREC Opening Comments on ACR, p.

[5] EDF RE Opening Comments on ACR, pp. 3-4.

[6] EDF RE Opening Comments on ACR, pp. 2-3.

[7] PG&E Opening Comments on ACR, p. 14.

We also reiterate that **pumped storage not only provides many of the benefits sought in AB 2514, but is also most likely able to do so more cost-effectively than the emerging storage technologies included in the proposed Storage Framework**. As we noted in our comments on the ACR, pumped storage could fulfill many of the statute's express goals for the electricity system, including:

- Integrating intermittent generation from eligible renewable energy into the reliable operation of the transmission and distribution grid.
- Allowing intermittent generation from eligible renewable energy resources to operate at or near full capacity.
- Reducing the need for new fossil-fuel powered peaking generation facilities by using stored electricity to meet peak demand.
- Reducing purchases of electricity generation sources with higher emissions of greenhouse gases.
- Eliminating or reduce transmission and distribution losses, including increased losses during periods of congestion on the grid.
- Reducing the demand for electricity during peak periods and achieve permanent load-shifting by using thermal storage to meet air-conditioning needs.
- Avoiding or delaying investments in transmission and distribution system upgrades.
- Providing the ancillary services otherwise provided by fossil-fueled generating facilities.[8]

Not only can pumped storage provide the abovementioned benefits, as stated in the PD itself it can also "offer the same or better potential benefits as all of the emerging storage technologies targeted by this program."[9] Indeed, as SCE noted in its comments on the ACR, "pumped hydro is one of only a few technologies that can offer power and energy at a truly

[8] EDF RE Opening Comments on ACR, pp. 4-5 (citing and quoting AB 2514, ch. 469, sec. 1).

[9] Proposed Decision, p. 34.

'bulk' scale."[10] CalWEA similarly observed that "pumped hydro storage is likely the least-cost, and potentially the most-competitive, form of storage available today assuming the availability of power purchase agreement of at least 20 years."[11]

An analysis of energy storage technologies performed by the Electric Power Research Institute ("EPRI") as a part of this proceeding included a very brief look at pumped storage alongside 30 other technologies and market scenarios. The EPRI analysis showed that pumped storage's net benefit-cost ratio of 1.32 was exceeded by only four other scenarios and technologies out of 31 scenarios and technologies.[12] (That the details of the assumptions underlying EPRI's analysis were unavailable to us is just one of the reasons we believe, per our recommendation, more analysis of pumped storage is warranted.)

We further reiterate the fact that **new pumped storage projects still face market barriers, in spite of the existence of "legacy projects" in California**. AB 2514 seeks to address market barriers for energy storage technologies, and specifically "inadequate evaluation of the use of energy storage to integrate renewable energy resources into the transmission and distribution grid through long-term electricity resource planning, lack of recognition of technological and marketplace advancements, and inadequate statutory and regulatory support."[13] Pumped storage does in fact face all of these barriers in some form and degree. As SCE has observed, while pumped storage may not face the same level of barriers related to technological maturity as do other technologies included in the ACR, that is only one of many barriers faced by emerging storage technologies; the remaining barriers apply equally to legacy technologies such

[10] SCE Opening Comments on ACR, pp. 6-7.

[11] CalWEA Opening Comments on ACR, pp. 10-11.

[12] See EPRI, *Cost-Effectiveness of Energy Storage in California*, p. A-2.

[13] AB 2514, sec. 1(f).

as pumped storage hydro.[14] SCE further points out that pumped storage hydro faces its own set of barriers, including siting requirements and exceptionally challenging permitting requirements.[15] Eagle Crest Energy similarly identified numerous market barriers to pumped storage, including long development lead times, incompatibility with the short-term focus on resource adequacy planning, and the lack of a defined interconnection process at CAISO.[16]

We note that the most elaborated opposition to pumped storage's inclusion, beyond worry that it would eat into demand for other storage technologies, came from the Sierra Club and CEJA, who attempt to justify the exclusion of pumped storage because "those technologies are already into the California grid and face a different set of market barriers."[17] However, both those assertions are unrelated to AB 2514, which focuses on "commercially available technology" and deals with the market barriers mentioned in the preceding paragraph. Moreover, their assertions also incorrectly imply that the existence "legacy projects," to use SCE's terminology and including the Helms and Castaic projects among others, shows that the modern California marketplace is ready for the procurement of new pumped storage projects. The barriers discussed above contradict that belief. Their assertion also neglects to take into account the historical context of legacy projects, which as we elaborated in our reply comments "were essentially a byproduct of the unique period of intensive dam and hydropower construction in the state in the 1960s and 1970s. The characteristics of the state's electricity marketplace at that time have no resemblance to today's marketplace, including permitting of

[14] SCE Opening Comments on ACR, p. 6.

[15] SCE Opening Comments on ACR, p. 6.

[16] See Eagle Crest Opening Comments on ACR, p. 5.

[17] Sierra Club-CEJA Opening Comments on ACR, p. 26.

hydropower and the need for associated environmental safeguards, the lack of independent power producers, the relative lack of variable resources in the state's electricity mix, the role of regulatory oversight of investor- owned utilities, and many other market factors. We also note that we are well past a generation of utility employees well versed in how to invest in and construct pumped storage hydro, which poses an institutional challenge for developers and utilities alike."[18] The reality is that **new pumped storage technology offers even more benefits and represents innovation from which California has yet to benefit.**

Regarding this last point, it is essential for the Commission to understand today's pumped storage technology is not the same as yesterday's technology that was employed in California's existing pumped storage projects. Today's variable speed turbine technology enables generation ramp rates of 60 MW per *second*, which is significantly better than ramp rates from comparably sized thermal resources, and also provides very quick and accurate automatic generation control ("AGC") response, which are two attributes of great importance in meeting future intra-hour system needs in California. As we noted in our reply comments, SCE elaborated that new variable speed turbine technology provides such a substantial advancement in pumped storage's capabilities that it justifies California's re-engaging with pumped storage for future investment so that ratepayers can benefit.[19] Projects such as the new *Nant de Drance* project in Switzerland herald new abilities to provide grid regulation service (network frequency and voltage) while in pumping mode, increase in global plant efficiency, operate over a wider hydraulic head range thereby increasing the availability and the generation flexibility of the plant, create instantaneous power output adjustment help to rectify sudden voltage disruptions/variations caused by network problems, and provide smoother operation (for example at partial load) and elimination of

[18] EDF RE Reply Comments on ACR, pp. 6-7.

[19] See SCE Opening Comments on ACR, pp. 6-7.

operation modes prone to hydraulic instability or cavitation, which in turn results in reduced civil engineering costs, improved reliability, reduced maintenance, and increased lifetime.[20]

Which leaves us with at the point we started, namely that **the exclusion of pumped storage projects 50 MW and over from the Design Program is due solely on its typically larger size**. The PD is helpfully blunt in its reasoning for excluding pumped storage projects above 50 MW from the proposed Storage Framework when it states, "it is simply their scale that is inappropriate for inclusion here."[21] We appreciate that the PD represents an advancement from the ACR in that the PD is comfortable with pumped storage's appropriateness under AB 2514's definitions and goals, its ability to "offer the same or better potential benefits as all of the emerging storage technologies targeted by this program," and its intent to "strongly encourage the utilities to explore opportunities to partner with developers to install such large pumped storage projects."[22] Our proposal and recommended modifications to the PD squarely address this sole reason identified in the PD for pumped storage's exclusion, and do so in a way that can provide meaningful advancement of pumped storage in the California electricity market.

III. THE COMMISSION SHOULD ORDER A THIRD-PARTY STUDY AND HOLD A SUBSEQUENT WORKSHOP TO IDENTIFY METHODS TO ADVANCE PUMPED STORAGE IN THE STATE'S ELECTRICITY MARKETPLACE

As we discuss above, pumped storage projects do exist in California today, but only due to the legacy of a bygone era that is scarcely recognizable now. In discussions with utilities, regulators, and other stakeholders, we have perceived renewed interest in pumped storage as one of the potential tools to help address the state's emerging electricity needs related to integration

[20] See EDF RE Reply Comments on ACR, pp. 3-4.

[21] Proposed Decision, p. 34.

[22] Proposed Decision, p. 34.

of variable resources and greenhouse gas abatement, as well as reliability needs related to the closure of the San Onofre Nuclear Generating Station and a sizeable amount of once-through-cooling, natural-gas-fired generation capacity. Indeed, these issues have prompted deep and portentous discussions within the LTPP proceeding, as well as interagency discussions among the California Independent System Operator ("CAISO"), the California Energy Commission ("CEC"), and this Commission.

In our view, the most pressing output needed to advance pumped storage, given its typically larger size,[23] is an assessment of how it can fit in the state's least-cost, most reliable, and least-emitting electricity resource portfolio. Exclusion of pumped storage not only from the proposed Storage Framework but also from any meaningful, actionable item in this proceeding is most dangerous in the context of the broader electricity need discussion in the state. We reasonably anticipate that without clear output pursuant to this proceeding, pumped storage may continue to elicit widespread interest but will not see any real follow-through such as I needed to give the technology a "fair shot" in broader state planning discussions compared to technologies that are in common parlance in resource procurement discussions today.

What is needed the most is credible, public analysis of modern pumped storage technology, and a public discussion amongst key parties on whether and how to overcome existing market barriers to the deployment of the technology. Such a process and the associated output will be immensely helpful in informing broader electricity planning discussions, which

[23] We note that the PD finds that most pumped storage projects are 500 MW or larger. While that may be true of most *existing* projects, many of the newer projects and those in development across the globe can be smaller than that. Accordingly, we recommend that the PD be modified to state that the most such projects are larger than *50* MW, thereby conforming the PD's finding on this point with the 50 MW cap on the size of pumped storage projects that are eligible to count toward the procurement targets established under the proposed Storage Framework.

are the most important venues in which to elevate pumped storage's role given the technology's inherently long development lead time and large-scale configuration.

We therefore urge the Commission to initiate the following outputs:

1. A third-party analysis, to be commissioned and overseen by the Energy Division's staff that is tasked on energy storage, that makes findings on:
    a. The state of pumped storage technology, and in comparison to technology currently used in existing pumped storage projects in California;
    b. Pumped storage's operational benefits in the state's electricity portfolio, and particularly in the context of intrahour management of the grid;
    c. The costs of deployment and operation of projects using modern, variable pump technology;
    d. Key barriers to deployment in the market; and
    e. Potential solutions to overcoming market barriers.
2. A workshop, including the three investor-owned utilities, that covers the results of the aforementioned analysis, identifies the importance (or, if decided, lack of) of deploying pumped storage technology for ratepayer benefit, and measures to overcome existing barriers in the market.
3. A report that summarizes the workshop discussion and conclusions.

The above process could be a part of this proceeding. Or, it can be ordered to run outside of the proceeding. In either case, there should be deadlines established such that the results are useful as an input into broader electricity planning proceedings and discussions in California

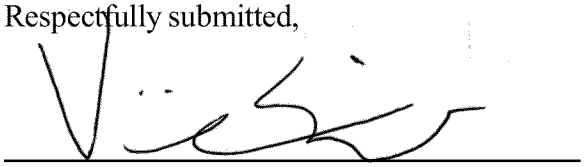
Our proposed study and workshop process would not increase or otherwise impact the size or the structure of the proposed Storage Framework, thereby alleviating the PD's only concern with pumped storage. However, it would be a very meaningful result for those, such as EDF RE, who are willing to put in the extensive time, financing, and know-how to make new pumped storage generation a reality for ratepayer benefit. Conversely, the lack of any actionable output on pumped storage from this proceeding would be contrary to the intent and language of AB 2514, and could very well consign pumped storage to being no more than a perpetually

"interesting notion" in California, even as other states and countries nations move forward with investments that will bring new pumped storage technology to life for widespread benefit. We have confidence in the Commission's willingness and ability to take the next useful and actionable step for pumped storage.

IV. CONCLUSION

For the foregoing reasons, EDF Renewable Energy urges the Commission to modify the Proposed Decision as recommended herein. In accordance with Rule 14.3(b), proposed findings of fact and conclusions of law corresponding to EDF Renewable Energy's recommended modifications to the Proposed Decision are set forth in Appendix A attached hereto.

Respectfully submitted,



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September 23, 3013

Appendix A

Findings of Fact

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10. Pumped storage offers the same or better potential benefits as emerging storage technologies.

11. Pumped storage faces many of the same barriers as emerging storage technologies.

12. Pumped storage projects may face additional barriers due to, among other things, the long development lead time for such projects.

~~10~~**13**. The majority of **newer** pumped storage projects are ~~500~~**50** MW or over, **with some exceeding 500 MW**.

~~11~~**14**. A single pumped storage project could account for the entire procurement target within a utility territory.

~~12~~**15**. The sheer size of a large-scale pumped storage project would dwarf other smaller, emerging technologies and could inhibit the fulfillment of market transformation goals.

16. There should be opportunities for the procurement of energy storage projects, including large-scale pumped storage, outside of the Energy Storage Procurement Framework and Design Program.

17. Subjecting large-scale pumped storage projects to the requirements and limitations of the Energy Storage Procurement Framework and Design Program could act as a barrier to the procurement of such projects.

~~13~~18. AB 2514 requires that energy storage systems procured be cost effective.

19. The Commission on should leverage the analysis already conducted in this proceeding with a dedicated study of the benefits and cost-effectiveness of pumped storage.

20. A study of the potential benefits of pumped storage would inform the Commission's decisionmaking and the evaluation of storage projects that may be procured under the Commission's other procurement programs such as the LTPP and RA programs.

Conclusions of Law

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10. The exclusion of large-scale pumped storage projects from the Energy Storage Procurement Framework and Design Program does not preclude their participation in other procurement programs.

11. It is reasonable for the Commission to commission a third-party study, conduct a workshop on the study, and prepare a report on pumped storage's potential benefits, costs, the current state of the technology, market barriers and methods to remove such barriers.