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**Electronic Delivery**

California Energy Commission  
Dockets Office, MS-4  
1516 Ninth Street  
Sacramento, CA 95814

**Re: Docket No. 11-IEP-1**

Docket Office:

Please find attached PG&E's comments in response to the Energy Storage for Renewable Integration workshop, held April 28. Please contact me should you have any questions.

Sincerely,

Attachment

**DOCKET**

**11-IEP-1**

DATE May 17 2011

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**PACIFIC GAS AND ELECTRIC COMPANY COMMENTS IN RESPONSE TO THE IEPR  
COMMITTEE WORKSHOP ON ENERGY STORAGE FOR RENEWABLE INTEGRATION**

**APRIL 28TH, 2011**

**DOCKET NO. 11-IEP-1**

Pacific Gas and Electric Company ('PG&E') appreciates the opportunity to provide comments in response to the California Energy Commission's ('CEC') IEPR workshop regarding how energy storage can support renewable integration in California. We look forward to continued coordination with California's regulatory bodies responsible for promoting renewables while ensuring grid reliability.

PG&E's comments are divided in three parts. First, PG&E summarizes its presentation at the workshop on the questions asked from the utilities panel. Second, PG&E provides the information requested by Chairman Weisenmiller. Finally, PG&E addresses certain claims made during the workshop about the relationship of storage capacity to the capacity of other resources available to supply the integration requirements for renewable resources.

**Part 1 - PG&E's position on questions asked from the utilities panel**

1. How does the role of energy storage differ from the utility or market perspective?

A: From the utility's perspective, electric storage is an alternative that should be considered in meeting the system's need for operational flexibility created by the planned increases in intermittent renewable generation, distributed, and customer-owned photovoltaic generation. PG&E recommends the following path to determine electric storage's role in meeting this need.

- The first step is to determine integration needs, that is, the amount of integration requirements and their desired operating features. Regulation, following and ramping needs are examples. Need determination is technology neutral. Any resource can be considered to meet the need provided it has the desired operating features.
- The second step is to determine if the existing system has the necessary capability to supply those integration requirements and, if not, determine the residual resource need and the associated operating characteristics.
- The final step is to select competitively the best alternative or combination of alternatives that can best meet the residual need. This is accomplished thru a technology-neutral competitive solicitation.

2. Who should own grid connected energy storage?

A: As indicated by utility representatives at the April 28, 2011 workshop, PG&E believes that utility ownership is desired for reliability applications of storage as well as for situations where the storage facility is integrated with the utility system. For

example, a pumped storage facility that is part of the same river system as other hydro facilities the utility operates.

3. How will the utilities implement the Energy Storage development, demonstration and deployment plan for meeting the AB 2514 requirements?

A: PG&E opposes the use of set asides or mandates for electric storage. A mandate or set aside is not necessary if storage is cost-effective, compared to other alternatives and best fits an identified need. Instead, PG&E recommends the three step process proposed in response to the prior question to determine electric storage's future additions.

PG&E supports electric storage when cost-effective to meet an identified need. PG&E owns and operates Helms Pumped Storage Project, and currently has a compressed air storage demonstration project, two active battery demonstration projects, and a pending application before the California Public Utilities Commission for funding of a feasibility study for a new pumped storage facility in anticipation of increased integration needs for intermittent renewable resources needed to meet the State's renewable goals.

## **Part 2 - Information requested by Chairman Weisenmiller from PG&E**

1. Chairman Weisenmiller asked PG&E to put into the record slides 9-12 from PG&E's presentation at the Independent Energy Producers 2010 Annual meeting. In response, PG&E provides the link to the presentation below. PG&E also wishes to update the ramp rate of pumped storage from the 40 MW per minute shown in Slide 9 to 80 MW per minute.

Link to presentation:

<http://www.iepa.com/2010AnnualMeeting/RoyKugaIEP092410.ppt>

2. Chairman Weisenmiller asked PG&E to explain PG&E's opposition to the CAISO's Regulation Energy Management (REM) program. In response, PG&E provides a link to comments PG&E offered to CAISO on its initial REM proposal.

PG&E was not the only market participant to raise concerns with the CAISO's REM proposals. SCE and the CAISO's Department of Market Monitoring (DMM) shared many of the same concerns.

Regulation Energy Management (REM) was first introduced in late 2009 as part of the Non-Generator Resources in Ancillary Services Markets<sup>1</sup> stakeholder process. In that original proposal, the energy coming in and out of the battery would be netted rather than settled at real-time prices. This was inconsistent from how traditional regulating units settle their energy and was considered unacceptable by PG&E<sup>2</sup>, SCE<sup>3</sup>, and the CAISO DMM<sup>4</sup>. As a result of stakeholder feedback, CAISO

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<sup>1</sup> Revised Draft Final Proposal for Participation of Non-Generator Resources in California ISO Ancillary Services Markets. February 10, 2010. <http://www.aiso.com/2738/2738f17617750.pdf>

<sup>2</sup> Comments of PG&E on Revised Draft Final Proposal. February 24, 2010. <http://www.aiso.com/2749/27498ea359070.pdf>

<sup>3</sup> Comments of SCE on Revised Draft Final Proposal. February 24, 2010. <http://www.aiso.com/2748/2748e1ca9bc0.pdf>

eliminated REM from the Non-Generator Resources initiative and reintroduced it in a standalone initiative in November of 2010<sup>5</sup>. That updated proposal was approved by the CAISO board in February 2011<sup>6</sup>.

PG&E is not directly opposed to that final proposal. Rather PG&E recommended structuring REM as a pilot program with a sunset date. We believe that the CAISO can use REM as a first step to assess the viability of using limited energy storage resources to provide regulation. In our final round of comments, we expressed two main concerns over the widespread adoption of REM<sup>7</sup>:

- (1) REM is different from traditional regulation because it cannot meet the operating characteristics of regulation as specified in the CAISO's tariff or meet the cascading requirements of a superior Ancillary Service product.
- (2) Because REM regulation does not possess the capability robustness of traditional regulation, the CAISO may feel a need to increase the total regulation requirement to provide a traditional regulation backstop for a portion of the REM regulation, thereby increasing regulation cost.

SCE<sup>8</sup> and the CAISO DMM<sup>9</sup> have also echoed PG&E's concerns with the proposal. Despite these concerns, PG&E continues to support investigating this issue on a pilot basis. We are currently coordinating with the CAISO to implement two separate sodium sulfur battery pilot projects and are open to allowing the CAISO to test REM functionality with those units.

PG&E supports integrating storage resources where financially viable and where those resources can receive sufficient compensation through existing and appropriate market products. In the event that other resources can offer similar services to satisfy the market needs, PG&E supports the least-cost solution.

3. Chairman Weisenmiller asked PG&E for suggestions for R&D to existing facilities.

PG&E believes that to accommodate the planned increases in intermittent generation, California will need a system with sufficient flexible and dispatchable resources. Future system flexibility can come from a variety of sources, where storage is one component. Another source of flexibility is from modifications to the existing fleet. Within the hydro fleet, potential projects include recovering storage capacity of the existing reservoirs, and installing or upgrading systems for automation to allow AGC.

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<sup>4</sup> Comments of CAISO DMM on Revised Draft Final Proposal. March 4, 2010.

<http://www.aiso.com/2750/2750bb072b320.pdf>

<sup>5</sup> Straw Proposal on Regulation Energy Management. November 15, 2010. <http://www.aiso.com/284f/284f83af4db50.pdf>

<sup>6</sup> Revised Draft Final Proposal on Regulation Energy Management. January 13, 2011.

<http://www.aiso.com/2b05/2b05e7075f6d0.pdf>

<sup>7</sup> Comments of PG&E on REM Draft Final Proposal <http://www.aiso.com/2b05/2b057fdc3e0c0.pdf>

<sup>8</sup> Comments of SCE on REM Draft Final Proposal. January 7, 2011. <http://www.aiso.com/2b02/2b0283ec5f080.pdf>

<sup>9</sup> Comments of CAISO DMM on REM Draft Final Proposal. January 6, 2011.

<http://www.aiso.com/2afe/2afee17a2b670.pdf>

Within the thermal fleet, additional flexibility can be attained by decreasing service times and minimum generation requirements with installation of software and auxiliary components.

Additional research and analysis is required to determine additional projects to provide flexibility and to calculate the cost-benefits of all potential projects.

### **Part 3 – PG&E’s comments on claims made about the relationship of storage capacity to the capacity of other resources available for the integration of renewable resources**

PG&E commends the efforts of KEMA and PNNL to understand storage value, however some of their conclusions are not well supported. We caution against using these conclusions to inform decisions on the relative cost-effectiveness of storage. The following two sections provide the rationale for PG&E’s concerns.

1. KEMA indicated that there is a 2 for 1 relationship between storage capacity and combustion turbine (CT) capacity. (1 MW of storage is equivalent to 2 MW of CT).

A study completed by KEMA claims that “A 100 MW CT is theoretically capable of at most 50 MW of up and 50 MW of down regulation.... A 100 MW storage system is theoretically capable of 100 MW up and down regulation, twice the regulation capability of the CT unit.”<sup>10</sup>

PG&E does not agree with the empirical analysis and conclusion that storage capacity provides twice the amount of regulation of a CT. For example, a 100 MW storage unit with a full state-of-charge can only offer 100 MW of regulation down, just as a CT operating at full capacity. As KEMA notes, a CT’s minimum operating level limits its ability to provide 100% of its capacity for regulation. Similarly, a storage device’s state-of-charge and available energy also limit its ability to provide its full capacity for regulation. The duration of the provision of the service also distinguishes CTs and batteries since the nature of the fuel sources are very different. Furthermore, a simple 2 for 1 sound-bite ignores differences in reliability and energy benefits among storage alternatives and other alternatives available to provide integration services. In summary, the simple 2 for 1 sound-bite is misleading, and should not be used in influencing policy about electric storage or in determining the relative cost-effectiveness of storage technologies without proper qualifications.

2. PNNL also claims that a) ideal resources (unlimited ramping capability) are 2.7 times more efficient than combustion turbines, and b) that fast responsive resources reduce regulation procurement by 40%<sup>11</sup>.

With respect to the first claim, PG&E generally agrees that faster ramping resources will respond to AGC signals faster. PG&E cautions against using the percentage ramping per minute metric to compare resource efficiencies. The California fleet has resources with a wide range of operating characteristics to serve different functions

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<sup>10</sup> . Research Evaluation of Wind Generation, Solar Generation, and Storage Impact on the California Grid, KEMA, June 2010.

<sup>11</sup> Makarov YV, S Lu, J Ma, and TB Nguyen. 2008. Assessing the Value of Regulation Resources Based on Their Time Response Characteristics. PNNL-17632, Pacific Northwest National Laboratory, Richland, WA.

within the electric system. A single ramping metric provides limited information about a resource's efficiency or cost-effectiveness given that it does not account for its fixed or operating cost, or the value of other services it provides to the system. Also, the energy limitations of new storage technologies need to be considered in determining their effectiveness to provide integration services.

With respect to the second claim, the CAISO determines the amount of hourly up and down regulation required on the system based on the worst 10-minute ramp rate within each hour considering demand, interties schedules, and generation self-schedules<sup>12</sup>. The existing requirements for regulation procurement and market structure do not take into account the ramping characteristics of generation resources. As a result, PG&E finds PNNL's conclusion of a 40% reduction in the procurement of regulation to be unsupported.

Again, PG&E appreciates the opportunity to participate in this IEPR proceeding and to contribute to the analysis and dialog with respect to how best to integrate renewable resources and ensure the operational feasibility of the electric infrastructure in 2020 and beyond.

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<sup>12</sup> CAISO Technical Bulletin. "AS Procurement – Regulation" Dec. 30, 2009. <http://www.caiso.com/2494/2494c16876b0.pdf>