

**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

**REPLY COMMENTS OF PACIFIC GAS AND ELECTRIC COMPANY (U 39 E)  
TO COMMENTS SUBMITTED ON AUGUST 29, 2011 FOR THE  
ENERGY STORAGE OIR**

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Pursuant to Administrative Law Judge (“ALJ”) Amy C. Yip-Kikugawa’s ruling of July 21, 2011 (“Ruling”) in the above-captioned proceeding (“Energy Storage OIR”), Pacific Gas and Electric Company (“PG&E”) submits its reply comments on the presentations made by parties at the June 28, 2011, workshop in this proceeding, as well as answers to the questions provided in the Ruling.

**I. INTRODUCTION**

PG&E supports an environment where storage can compete on equal footing with other resource alternatives, demand-side or supply-side. PG&E also supports the Commission’s efforts to identify and remove impediments that limit or hinder the ability for energy storage to fairly compete with other alternatives. In the comments below, PG&E summarizes five challenges that may act as potential barriers to the development of energy storage. These potential barriers were also identified by most parties in their initial comments. For each item, PG&E provides a brief definition of the potential barrier, references to relating stakeholder comments, and recommendations for specific actions for the Commission. PG&E discussion of the potential barriers can be summarized as follows:

- There is no accepted methodology to value the benefits of energy storage. PG&E supports the Commission's Phase 2 in this proceeding to examine the cost-benefit methodologies for energy storage.
- Resource Adequacy (RA) counting rules lack clarity as to how they apply to energy storage. The Commission can aid by providing clarity in the RA proceeding.
- Time differentiated retail rates can provide price signals to incent customer-side energy storage. However, existing rates already provide opportunities for customers to respond to price signals. Further rate design issues should be addressed in the proper rates proceeding.
- There is uncertainty about electric system needs and the future of CAISO ancillary services markets. The Commission can work in coordination with the CAISO to determine the amount and operating characteristics of flexible capacity needed in the future.
- Lack of transparency about costs for integrating intermittent renewables masks the value that storage can provide. Cost causation and cost allocation for renewable integration can provide greater transparency. This issue mostly falls under FERC and CAISO jurisdiction.

Additionally, PG&E also offers comments on several additional items that are summarized as follows:

- The lack of procurement targets for storage is not an impediment for energy storage and there are efforts underway to determine the need for flexible resources, like storage, in the Commission's ongoing long term procurement plans rulemaking.<sup>1</sup>

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<sup>1</sup> R. 10-05-006, Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long-Term Procurement Plans.

- CESA’s proposal to merge AB2514 with SB1 2x circumvents the Legislature’s directive for AB2514.
- California’s pumped storage fleet is flexible and valuable to California’s electric system and disagrees with the Sierra Club’s comments.
- To preserve the option to build long lead-times projects like pumped storage, feasibility studies must proceed concurrently while resource need is being determined.

With respect to the five potential barriers, PG&E does not believe that a procurement mandate or target will resolve the challenges. Regardless of whether targets are adopted or not, these will continue to impede deployment of energy storage and in some cases deployment of non-storage alternatives as well.

PG&E does not support the creation of mandates or artificial procurement targets for energy storage. PG&E believes that such policies will lead to sub-optimal procurement decisions and unnecessarily increase customer costs. PG&E’s concerns are echoed by the Consumer Federation of California (“CFC”), Division of Ratepayer Advocates (“DRA”), Southern California Edison (“SCE”), and San Diego Gas and Electric (“SDG&E”). Furthermore, PG&E agrees with DRA, SCE and SDG&E that the Commission should approach potential barriers on a technology neutral basis to allow energy storage to compete on an equal footing with other supply or demand-side resources. The least cost and best fit resources will emerge from a competitive process resulting in an efficient solution for customers.

Consistent with its opening comments,<sup>2</sup> PG&E encourage the Commission to take other actions to support energy storage in meeting the state’s future need for grid flexibility. PG&E encourages the Commission to fund pilot programs to gain greater operating experience with

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<sup>2</sup> Dated August 29, 2011.

emerging storage technologies and fund feasibility studies for long lead-time projects. These actions create optionality for promising storage projects in the future.

PG&E currently has several pilot projects and programs to build experience and incent development of storage. In terms of pilots, PG&E is in the process of deploying two NaS (sodium sulfur) battery projects in its service territory. In addition, PG&E is performing initial studies and analysis on compressed air energy storage. In terms of programs, in September 2011 the Commission adopted modifications to the Self Generation Incentive Program<sup>3</sup> (SGIP) that pays incentives to customers installing new, qualifying stand alone storage projects and storage projects coupled with other eligible technologies to meet all or a portion of their electric needs. The Permanent Load Shifting program<sup>4</sup>, a program proposed by PG&E in its pending Demand Response application, would pay incentives beginning January 1, 2012, for the deployment of storage technologies that can shift peak demand.

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<sup>3</sup> Decision 11-09-015, [http://docs.cpuc.ca.gov/cyberdocs/WebQuickstart.asp?DOC\\_ID=E44432](http://docs.cpuc.ca.gov/cyberdocs/WebQuickstart.asp?DOC_ID=E44432)

<sup>4</sup> Application 11-03-001, Application of Pacific Gas and Electric Company for Approval of Demand Response Programs, Pilots and Budgets for 2012-2014.

## II. DISCUSSION

### REPLY COMMENTS TO BARRIERS IDENTIFIED BY STAKEHOLDERS

#### 1. Cost-Effectiveness Methodology

Energy storage has the potential to provide a wide range of benefits to the electric system. The challenge is that given the wide range of potential benefits and deployment scenarios, it is unclear which benefits can be provided, how much of a benefit can be provided at a given time, and the operating decisions that forces trade-offs between one benefit relative to another. Given this challenge and that the electric industry is still gaining experience with some of the energy storage systems (“ESS”), the methodology and models to value the benefits of energy storage are lacking. The industry needs valuation methodologies that can be used in planning processes that reflect the true operational benefits to the electric system.

This is a potential barrier identified by many parties in their comments, including the CFC,<sup>5</sup> DRA,<sup>6</sup> PG&E,<sup>7</sup> SCE,<sup>8</sup> and Sierra Club.<sup>9</sup>

The Commission has already indicated its intent to address this potential barrier in Phase 2, Cost-Benefit Analysis and Allocation of the Storage OIR.<sup>10</sup> Therefore, consistent with the CPUC’s stated intent, PG&E recommends that this potential barrier be addressed in Phase 2 of

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<sup>5</sup> “Quantifying the value of energy storage services continues to be a barrier.” (Consumer Federation of California, P. 9)

<sup>6</sup> “...lack of a methodology to value cost-effectiveness, including a lack of understanding of how to quantify costs and monetize different value streams for different applications.” (DRA, p. 6)

<sup>7</sup> “...the industry lacks a proper methodology to value the potential benefits in a fair and accurate manner...” (PG&E, p. 4)

<sup>8</sup> “SCE agrees that issues related to valuing and monetizing the benefits of energy storage represent obstacles...” (SCE, Appendix B) *Note: SCE states that it was an obstacle and not a ‘barrier’*

<sup>9</sup> “Major impediments are... the lack of a methodology for valuing the costs and benefits of energy storage...” (Sierra Club, p. 1)

<sup>10</sup> May 31, 2011 Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge, p. 6.

the Storage OIR and provide parties the opportunity to give input on how energy storage benefits should be valued.

## **2. Resource Adequacy Value**

Currently, each Load Serving Entity (LSE) is required to procure sufficient capacity to meet its peak load capacity plus a required planning reserve margin (“PRM”). The Commission has adopted rules to determine the amount of capacity each supply and demand-side resource contributes to meeting this requirement. Under the current RA counting rules, the amount of contribution from energy storage devices with less than 4 hours of energy towards each LSE’s requirement is not clear.

This barrier was included in the comments by PG&E<sup>11</sup> and SCE.<sup>12</sup> Related comments were offered by DRA<sup>13</sup> and MW Storage Farms,<sup>14</sup> who commented that the current system lacks a long-term procurement mechanism for frequency regulation, a service that can be provided by energy storage. To provide context for this comment, under current rules, LSEs procure generic RA, without a differentiation for the specific characteristics of RA resource procured to meet the requirements. Furthermore, there is currently no forward market to procure flexible services, such as frequency regulation. The CAISO also identified this issue and has included it in their Roadmap Initiative.<sup>15</sup>

PG&E believes that the Commission can help to clarify the counting rules to determine the RA value of storage technologies and applications. These topics, however, should not be addressed in this Storage OIR, but rather they should be the subject of the Commission’s on-going RA proceeding.

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<sup>11</sup> “Resource Adequacy counting rules for energy storage devices are not clear.” (PG&E, p. 6)

<sup>12</sup> “No rules exist for determining the RA value of a storage device.” (SCE, p. 9)

<sup>13</sup> “...frequency regulation benefits would require the CPUC to allow for storage to enter into long-term contracts. DRA supports this position.” (DRA, p. 2)

<sup>14</sup> “No long term market for frequency regulation.” (MW Storage Farms, p. 13)

<sup>15</sup> Renewables Integration Market Vision & Roadmap. CAISO. 8/29/2011, p. 44

### 3. Time-Differentiated Retail Rates

Several parties identified the lack of dynamic price signals as a potential barrier to storage. However, work is already underway in utility-specific General Rate Case (GRC) proceedings and other forums which will expand the availability of existing TOU rate schedules and promote wider adoption of more dynamic pricing options such as critical peak pricing (available now) and real-time pricing (under development). For example, SCE indicated that with the deployment of smart meters, new and existing time-of-use (TOU) and dynamic pricing rates will be available to its customers by 2013, and that these rates could incentivize customers to invest in energy storage to arbitrage basic TOU price differentials.<sup>16</sup> Similar choices have been adopted for PG&E's customers in Decision 10-02-032 and these new rate programs are in the process of being made available for all rate classes. SDG&E notes a different barrier. It notes that net metering programs provide customers with access to free storage services from their host utility for output from specific kinds of qualifying distributed generation equipment and this free service diminishes the likelihood of investing in energy storage.<sup>17</sup>

Many TOU and dynamic pricing signals are already available for customers and more will be developed over time, providing increasing opportunities for customers with energy storage equipment to respond to economically appropriate TOU and dynamic pricing signals. However, marginal cost-based revenue allocation and rate design are complex subjects which involve many utility-specific considerations that are best addressed in utility-specific GRC Phase 2 applications and similar proceedings. PG&E agrees with SCE that rate design should not be addressed in this Storage OIR, but should be addressed within the proper Commission

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<sup>16</sup> "Retail rates do not reflect time-based variations in the market price of Electricity." (SCE, p.11)

<sup>17</sup> "...Net Energy Metering program provides customers access to free storage services from their host utility. This free service diminishes the likelihood of investing in energy storage systems beyond the meter in order to capture the full value of PV systems and mitigate the intermittent nature of this generation source. This creates a complete barrier to entry for retail markets that otherwise might be available" (SDG&E, p. 5)



ratemaking forum where the various impacts of different rate proposals, including energy storage, can be considered.

#### **4. Evolving Market Products**

The types of markets and products that will be available in the future to accommodate the planned additions of renewable generation are evolving. The increases in intermittent generation needed to achieve a 33% renewable goal require the electric system to be more flexible than it is today. The Commission in its 2010 Long-Term Procurement Plan (“LTPP”)<sup>18</sup> Proceeding is in the process of considering the need for flexible capacity to integrate new wind and solar additions. As part of this proceeding, the California Independent System Operator (“CAISO”) is leading studies to estimate the need for regulation, load following, and other similar flexibility requirements and products. The CAISO and the three investor utility utilities filed their initial assessment of these flexibility requirements and the need for flexible resources for renewable integration in the LTPP proceeding on July 1, 2011. Additionally, most parties to that proceeding joined a settlement agreement (“Track 1 Settlement Agreement”), that identifies the need for continued review and adjustment of the methodology and assumptions used in the renewable integration analysis with a recommendation that a final Commission assessment of need or a decision should be issued no later than December 31, 2012.<sup>19</sup>

While there is considerable uncertainty on the future need for flexible capacity, characteristics of that capacity, and future markets and products, the CAISO and FERC have made progress in making changes to markets and tariffs to enable energy storage to participate and monetize benefits. The CAISO also has an on-going stakeholder process, called Renewables

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<sup>18</sup> R. 10-05-006, Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long-Term Procurement Plans.

<sup>19</sup> Dated August 3, 2011, p. 6. Parties to the Track 1 Settlement Agreement included, among others, DRA, Green Power Institute, the IOUs, Sierra Club, and Vote Solar Initiative.

Integration Market Vision and Roadmap Initiative, to identify and implement incremental market improvements for renewable integration. The FERC has issued a Notice of Proposed Rulemaking (“NOPR”) to include “pay for performance” compensation for providing frequency regulation.<sup>20</sup>

The uncertainty around renewable integration market products and prices were identified by DRA,<sup>21</sup> PG&E, SCE,<sup>22 23</sup> and SDG&E.<sup>24 25</sup> This uncertainty is not unique to energy storage; it affects all market participants. Future market solutions should be technology neutral and allow energy storage to participate on equal footing with other resources.

To reduce the uncertainty around renewable integration market products and prices, PG&E recommends that the Commission work in coordination with the CAISO to determine the amount and operating characteristics or types of flexible capacity to integrate incremental renewable additions. Once resource need is determined, a competitive procurement process will determine what combination of resources (supply or demand-side), including energy storage, is best able to meet the identified resource need.

## **5. Renewable Integration and Cost Allocation**

Today, the costs of integrating California’s planned additions of intermittent renewable resources are not known. Current market costs of integration are generally allocated to LSEs and sometimes supply,<sup>26</sup> rather than to the load or the generator causing the integration costs through

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<sup>20</sup> FERC AD10-11-000, RM11-7-000.

<sup>21</sup> “...there is currently a great deal of uncertainty regarding how CAISO rules and markets will change as a result of the need to support integration of additional renewable generation.” (DRA, p. 8)

<sup>22</sup> “Technical and tariff changes are needed to allow energy storage to participate in the CAISO markets.” (SCE, p. 9)

<sup>23</sup> “Storage systems are not currently rewarded for speed or accuracy under current CAISO ancillary services product definitions.” (SCE, p. 12)

<sup>24</sup> “Lack of accurate price signals” (SDG&E, p. 4)

<sup>25</sup> “Inadequate markets under existing regulatory jurisdictions” (SDG&E, p. 4)

<sup>26</sup> The costs of PIRP are currently allocated in the first tier by net negative deviation by both load and supply.

uncertainty in their load or generator forecasts. This practice results in price signals that do not reflect the value of firming and shaping resources, also referred to as renewable integration.

Renewable integration is a benefit that flexible resources, such as energy storage, provide to the electric system. Therefore, a clear definition and allocation of integration costs can help energy storage monetize this benefit.

This issue was identified in several different forms by parties. DRA,<sup>27</sup> PG&E,<sup>28</sup> and SCE<sup>29</sup> <sup>30</sup> noted the lack of cost allocation rules for renewable integration as well as a CAISO product for balancing intermittent renewables. The California Energy Storage Alliance<sup>31</sup> (CESA) and Vote Solar<sup>32</sup> stated that current Renewable Portfolio Standard (RPS) procurement processes do not value intermittent renewables coupled with energy storage.

Green Power Institute (“GPI”)<sup>33</sup> also commented on the reduction in value of the potential Renewable Energy Credits (“REC”) due to charge/discharge losses of a storage unit and that those reductions should be eligible for creating RECs. While GPI’s proposal appears to be a one-off proposal, GPI’s comments highlight a need for transparent and clear policies that allocate integration costs based on cost causation. With this information, a generator can choose

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<sup>27</sup> “Rules establishing renewable integration cost allocation would clarify the value of storage coupled with renewable integration cost allocation would clarify the value of storage coupled with renewable generation, for example, based on the ability of storage to reduce expected integration costs borne by each project.” (DRA, p. 8)

<sup>28</sup> “Lack of integration costs masks the value that energy storage technologies can provide.” (PG&E, p. 7)

<sup>29</sup> “Renewable integration cost allocation and markets are not yet developed or understood.” (SCE, p. 10)

<sup>30</sup> “A new ‘balancing’ product is not yet fully developed.” (SCE, p. 13)

<sup>31</sup> “Because a ‘renewable product’ that is firming, shaped, or dispatched with energy storage would have greater value than a ‘pure renewables’ product, procurement mechanisms and the pricing of any such firming, shaped, or dispatched renewable product should reflect that benefit. Currently, the RPS procurement processes do not make this possible, thus creating major barriers for energy storage deployment to assist with renewable project development.” (CESA, p. 6)

<sup>32</sup> “Tops on this list is expanding Renewable Portfolio Standard (RPS) contract evaluation metrics to include the value of storage in renewable generation proposals.” (Vote Solar, p. 3)

<sup>33</sup> “Storage can be used to produce a more valuable electricity product for a renewable energy producer to provide to the grid, but in doing so the total amount of energy supplied through the utility interconnection meter is reduced... this energy should not be considered to be part of station service at the power generator, and should be eligible for the creation of RECs.” (GPI, p. 3)

the more profitable solution of either accruing full RECs and incurring an integration cost without storage or accruing fewer RECs and avoiding an integration cost by installing storage.

A clear definition and allocation of integration costs creates a service with price signals that flexible resources, such as energy storage, can provide. The issue of integration cost allocation issue falls under the jurisdiction of FERC and for the CAISO to implement in its markets. As with the Evolving Market Products barrier discussed in section 4., PG&E recommends the Commission actively engage the CAISO in its Roadmap Initiative to ensure integration cost are allocated based on cost causation.

## 6. Summary of Potential Barriers and Proposed Commission Actions

The table below summarizes the challenges or potential barriers affecting energy storage, and PG&E’s recommendation of possible actions available to the Commission to facilitate removal of those barriers.

### Summary of Potential Barriers Identified by Parties and PG&E’s Proposed CPUC Actions

Potential Barrier	Definition	Proposed Commission Action
Cost-Effectiveness Methodology	It is difficult to value the benefits of energy storage	As part of the Commission’s already planned Phase 2 of the Storage OIR, seek parties’ input to inform how energy storage benefits should be valued
Resource Adequacy (“RA”) Value	RA counting rules for energy storage devices are not clear	Clarify the RA value of energy storage technologies and applications in the RA proceeding
Time-Differentiated Retail Rates	Lack of dynamic price signals, including the existence of free storage service thru net metering programs	Existing TOU and dynamic pricing choices already provide many opportunities for energy storage customers to respond to existing pricing signals, and continue to address retail rate design in rate design proceedings

Evolving Market Products	There is uncertainty on the future need for flexible capacity, characteristics of that flexible capacity, and markets and products.	Determine the need for renewable integration resources in the LTPP by December 31, 2012. Once the resource need is determined, allow a competitive procurement process to determine the combination of flexible resources (supply or demand-side resources) to meet the identified resource need.
Renewable Integration Benefits	Lack of transparency for cost of integration, lack of method for monetizing this benefit, and procurement processes do not value combined storage with renewables.	This issue is under the jurisdiction of FERC and the CAISO.

As explained earlier, there are clear actions the Commission can take to remove or diminish the challenges or potential barriers identified above. Most of the identified challenges are the subject of other on-going proceedings at the Commission such as the RA or the LTPP proceeding. However, none of these challenges can be adequately managed with the use of a procurement mandate for energy storage.

**REPLY TO SPECIFIC ISSUES RAISED BY PARTIES IN INITIAL COMMENTS**

**1. Create a technology neutral environment allowing competition among all resource alternatives.**

PG&E does not agree with the Sierra Club’s statement<sup>34</sup> that a lack of procurement targets is an impediment for energy storage. The lack of a procurement target or mandate should not be viewed as an impediment. PG&E believes in creating an environment where energy storage can compete on an equal footing with other alternatives available to meet the identified resource need without the need for a procurement target.

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<sup>34</sup> Sierra Club, p. 1

PG&E also disagrees with MW Storage Farm's statements<sup>35</sup> that California has a need for 4GW of storage by 2020 and overall theme of its comments to have widespread storage deployment. PG&E recognizes that the future system will need to be more flexible to accommodate the 33% RPS requirement, but that flexibility can be provided in many different ways.

As noted previously, the 2010 LTPP Settlement Agreement anticipates that the need for flexible resources will be determined by the end of 2012. PG&E believes that a competitive procurement process that considers all resource alternatives would determine the combination of resources to meet that identified need. Energy storage is one of the alternatives that can provide this flexibility.

**2. The proposal to merge AB2514 with SB1 2x circumvents the Legislature's directives.**

CESA proposes that the California Energy Commission ("CEC") begin implementation of AB2514 now by merging it with the process of developing regulations to implement SB 2 (1x) that is underway, so that the 33% RPS and this proceeding are directly interconnected.<sup>36</sup> PG&E disagrees with CESA's proposal. The legislature has already determined the process for energy storage and instructed the Commission to determine appropriate targets, if any, to procure viable and cost-effective energy storage systems. CESA's proposal appears to simply circumvent the instructions of AB2514 and should therefore be rejected.

**3. California's pumped storage fleet is flexible and valuable to California's electric system.**

The Sierra Club incorrectly states that California's existing pumped storage fleet is inflexible, that using capacity factors shows underutilization, and that it is a barrier to integration of renewables.

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<sup>35</sup> MW Storage Farms, p. 2

<sup>36</sup> CESA, p.4-5

PG&E's existing pumped storage project, the Helms Pumped Storage Project, is one of the most flexible resource on the CAISO's system. Helms has fast startup times for both generation (stop to full generation in 8 minutes) and pumping (stop to full pump in 20 minutes). It also has very fast upward ramp and downward ramp rates (80 MW per minute per unit) and ability to absorb excess energy from the grid.

Capacity factors, while a useful measure of resource utilization for conventional generation assets, are not useful for assessing resource utilization for storage. Storage facilities provide services that are not captured by a capacity factor metric. For example, storage:

- Absorbs energy during periods of excess energy or lower prices;
- Provides contingency services such as spinning and non-spinning; and,
- Provides flexibility services such as regulation up, regulation down, load following up, and load following down.

These services enable renewable integration, however, not all of the services are captured by the capacity factor. Therefore, the simple use of a capacity factor does not provide useful insight into whether a storage technology is flexible, well utilized, and a contributor to renewable integration.

The Sierra Club is incorrect in its claims that California's pumped storage fleet lacks flexibility, is underutilized, and is a barrier to renewable integration.

**4. To preserve the option to build long lead-times projects like pumped storage, feasibility studies must proceed while resource need is determined.**

PG&E agrees with Brookfield that large-scale projects such as pumped storage require a fair degree of system planning and that the Commission should pay particular attention to

pumped storage because it is a mature and proven technology that can provide a broad range of products useful to support renewable integration.<sup>37</sup>

Pumped storage resource development requires extraordinarily long lead times for environmental studies and licensing, a minimum of 5 years under established FERC regulations. There is a clear need to help manage this long lead-time issue, particularly given the current uncertainty about the need for resources to integrate planned renewable additions. To reduce the time needed to construct, and allow long-lead-time resources to compete to meet an identified need, PG&E recommends feasibility studies be done ahead of time. For example, PG&E attempted to address the long lead times associated with the FERC licensing process by filing on August 20, 2010, an application with the CPUC for recovery of costs for feasibility and related studies for the Mokelumne Pumped Storage Project.<sup>38</sup> The assigned Administrative Law Judge (ALJ) issued a Proposed Decision (“PD”) dismissing the application without prejudice on the grounds that it was premature without a demonstration of need.<sup>39</sup> The reasoning of the ALJ in the PD precisely captures one of the problems developers of pumped storage face in seeking to develop projects: by the time the need for a project is definitively demonstrated, it may be too late to bring it on-line when needed given the extremely long lead times for such projects.

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<sup>37</sup> Brookfield Renewable Power Inc., p. 5

<sup>38</sup> <http://www.cpuc.ca.gov/EFILE/A/122326.pdf>

<sup>39</sup> CPUC, A.10-08-011



### III. CONCLUSION

PG&E appreciates the opportunity to provide these reply comments to the Commission.

Respectfully submitted,

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