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

COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE RESPONDING TO ADMINISTRATIVE LAW JUDGE'S RULING ENTERING INTERIM STAFF REPORT INTO RECORD AND SEEKING COMMENTS

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In accordance with the California Public Utilities Commission's ("Commission's") Rules of Practice and Procedure, the California Energy Storage Alliance ("CESA")[1] hereby submits these comments on the *Administrative Law Judge's Ruling entering Staff Report Into Record and Seeking Comments*, issued by Administrative Law Judge Amy C. Yip-Kikugawa on January 18, 2013 ("ALJ's Ruling").

I. INTRODUCTION.

As directed by the ALJ's Ruling, CESA provides comments on the Interim Staff Report,[2] addresses each of the specific questions included in the Interim Staff Report, and provides comments pertaining to energy storage-specific recommendations raised at the Storage OIR Procurement Policy workshop held on January 14, 2013. A substantial body of ground-breaking new work and detailed analysis of energy storage applications to add to the robust evidentiary

[1]The California Energy Storage Alliance consists of A123 Systems, Alton Energy, AU Optronics, Beacon Power, CALMAC, Chevron Energy Solutions, Christenson Electric, Inc., Clean Energy Systems, Inc., Deeya Energy, DN Tanks, Energy Cache, EnerVault, FAFCO Thermal Storage Systems, Flextronics, Foresight Renewable Systems, Greensmith Energy Management Systems, Growing Energy Labs, Halotechnics, Ice Energy, Innovation Core SEI, LG Chem, LightSail Energy, NextEra Energy Resources, Panasonic, Primus Power, RedFlow Technologies, RES Americas, Saft America, Samsung SDI, Sharp Labs of America, Silent Power, SolarCity, Stem, Sumitomo Corporation of America, SunVerge, TAS Energy, UniEnergy Technologies, and Xtreme Power. The views expressed in these Comments are those of CESA, and do not necessarily reflect the views of all of the individual CESA member companies. http://storagealliance.org

[2] *Energy Storage Phase 2 Interim Staff Report,* issued January 4, 2013.

basis for policy decisions has been accomplished at the Commission and documented by a diverse set of stakeholders in this proceeding over the course of 2012. Consensus among stakeholders has emerged from extensive dialogue facilitated by the Commission's Energy Division Staff around three specific energy storage applications (scenarios) and the benefits they bring to the electric power system for consideration by the Commission:

1. Bulk/transmission-Interconnected Scenario.
2. Distribution-Interconnected Scenario.
3. Behind the Meter Scenario.

There is, of course, ongoing detailed work on a methodology for determining cost-effectiveness that captures all of the unique attributes of energy storage. There is a parallel emerging consensus that certain applications of energy storage are already both viable and cost-effective, and that with clear market signals a rapidly increasing number of additional applications will likely be so in the near future.

This proceeding is producing comprehensive new thinking on how energy storage can be deployed throughout the electric power system to improve system efficiency, and in so doing, enable a more efficient, affordable, cleaner and more reliable electric power system for California. In the coming weeks, initial work on the cost-effectiveness methodology for high priority energy storage applications should be completed. The interim staff report supports commission consideration of the following policies with respect to "fast energy storage" that provides regulation service: (1) establish energy storage procurement goals for resources that are designed specifically to provide frequency regulation and other ancillary services; (2) adopt rules that cause utilities to look to energy storage systems to provide ancillary services before looking to fossil-fired generation for such services; and (3) allow utilities to utilize a portfolio approach that enables them to procure energy storage systems that provide one specific service to the grid, such as frequency regulation, if utilization of those resources in the utility's portfolio provide a benefit to ratepayers. Comparable specific policies for the entire spectrum of energy storage resource types are detailed below at section IV.e.1. There is overwhelming evidence that energy storage is needed to maintain an efficient, reliable and affordable electricity system in California. The rationale behind this policy imperative is summarized in Appendix A to these comments.

II. DEVELOPMENT OF A PORTFOLIO OF 'WIN-WIN" ENERGY STORAGE PROCUREMENT GOALS SHOULD BE A CENTRAL FOCUS IN THIS PROCEEDING.

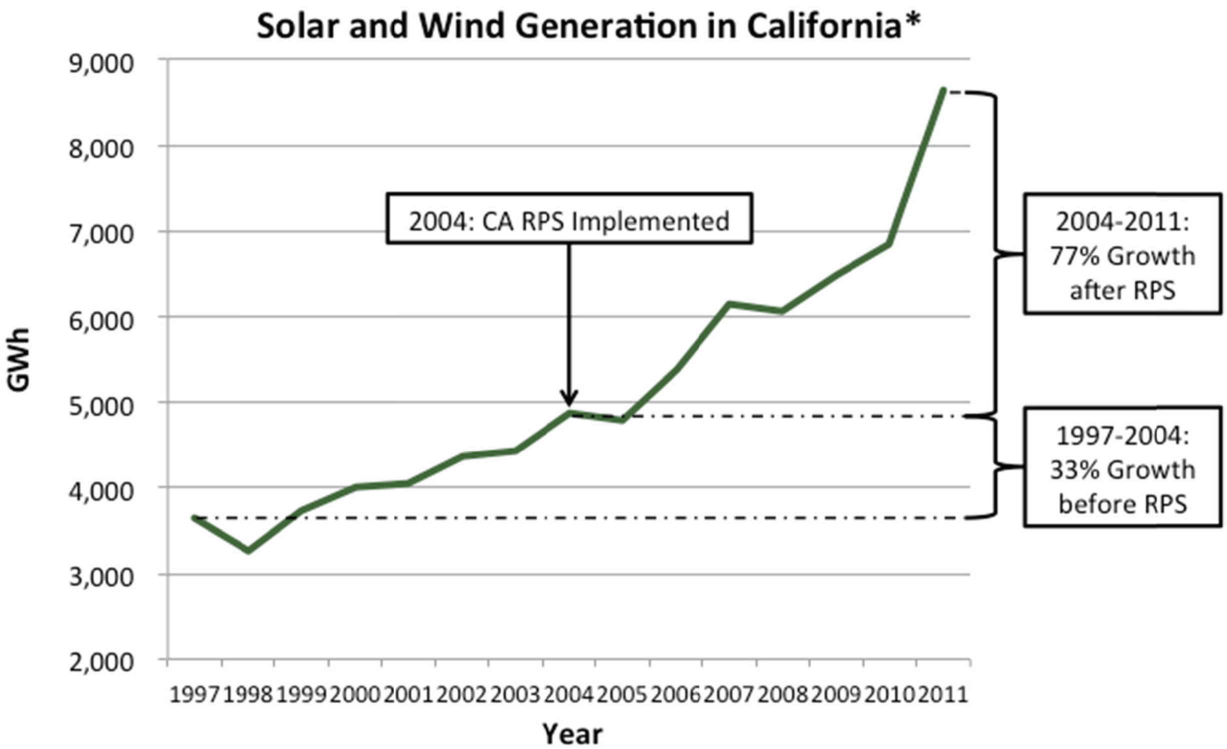
A. Why Are Energy Storage Procurement Goals Important?

We know from past experience that the most effective and expeditious way forward is through focus that can only be achieved by the creation of specific and appropriately sized utility energy resource procurement goals. Clear, effective procurement goals will also send a strong market signal to developers to continue to make the significant capital investment needed to construct longer lead time projects. The most outstanding example of market success with the right kind of focus and policy direction is California's Renewable Portfolio Standard ("RPS"),[3] which has made California a leader in renewable energy.

Renewable generation capacity alone has increased by 77% since the RPS was enacted in 2004, whereas it had only increased by 33% over the previous eight years, as depicted in the chart below. California now generates almost 12% of all energy needs from renewable sources.

[3] California's Renewables Portfolio Standard (RPS) was established in 2002 under Senate Bill (SB) 1078 (Stats. 2002, ch. 516, Sec. 3) and accelerated in 2006 under S.B. 107 (Stats. 2006, ch. 464, Sec. 13). This legislation established, among other things, that the amount of electricity procured per year from eligible renewable energy resources, as defined therein, would be an amount equal to at least 20% of the total electricity sold to retail customers in the state by December 31, 2017. The Legislature accelerated this goal to 20% by 2010 in Senate Bill 107 (Simitian, Stats. 2006, ch. 464). In 2011, Senate Bill 2 1X (Simitian, Stats. 2011, ch. 1) made significant changes to the RPS Program, most notably extending the RPS goals from 20% of retail sales of California's investor-owned utilities (IOUs), electric service providers (ESPs), and community choice aggregators (CCAs) by the end of 2010 to 33% of retail sales of IOUs, ESPs, and CCA and publicly owned utilities by 2020.

Texas has an RPS and generates 7.2% of its energy from renewables to date. In contrast, Vermont, which has a voluntary RPS, only generates less than 1% from renewable resources. Mississippi, which has no RPS, only generates .01% of its energy from renewable sources.[4]



On average, the 30 states with RPS goals have met 91% of their annual targets year over year.[5] Procurement targets send strong market signals with excellent market results. For example, photovoltaic ("PV") solar technology prices have been falling by an average of 5-7% per year.[6]

PV solar price distributions have become lower, and narrower, meaning that the market is more mature (it has greater competition, and better informed customers). Procurement goals

[4] IEA Electricity Data - *Net Generation by State by Type of Producer by Energy Source* (EIA-906, EIA-920, and EIA-923); 2011 data.
[5] *LBN RPS Compliance Summary Data*, August 2012.
[6] *Tracking the Sun V, a Historical Summary of installed Price of Photovoltaic in the United States 1998-2011,* November 2012.

provide the green light to many conservative investors who may have been on the fence and now can be confident that there will be market demand. Energy storage, as a technology class with great promise for grid applications, is in great need of such a market signal. A clear market signal for energy storage procurement by utilities in California will intensify investment and help achieve anticipated system-level cost reduction even more quickly.

While very successful for renewable energy and PV, and highly recommended by CESA for energy storage, procurement goals may not be an appropriate policy mechanism for all situations. As CESA Co-Founder and Executive Director, Janice Lin, described in her January 14, 2013 Workshop presentation, procurement goals for a technology class make sense when:

- All benefits are not monetized through existing rules and policies, but un-captured benefits demonstrate the technology's cost-effectiveness.
- Widespread deployment creates net benefits for society and ratepayers.
- Increasing scale improves cost-effectiveness compared to business-as-usual alternatives.
- The inertia of business-as-usual procurement must be overcome.
- Near-term inaction will risk incurring substantial lost opportunity costs.

All of these criteria exist today in California with respect to energy storage.

B. What Do Energy Storage Procurement Goals Mean For This Proceeding?

Appropriately sized and clear utility procurement goals are vital to realizing the benefits of energy storage in California's electric power system. Requiring utilities to help develop and achieve quantified energy storage portfolio procurement goals for adoption of well documented viable and cost-effective applications of energy storage will provide the necessary market signals to a diverse set of stakeholders that are considering investing in California's energy storage market that such investments will be a worthwhile endeavor. Stakeholders include not only energy storage equipment manufacturers, but also energy project developers, systems integrators, project financiers and investors, and a myriad of other participants at every level of the market value chain.

Stimulating investments in economies of scale in manufacturing and delivery systems which will steadily drive down costs thus enabling deployment of more applications of energy storage and even greater benefits to ratepayers… fulfilling the clear intent of the California legislature in enacting AB 2514. Because all applications of energy storage discussed in this proceeding will be deployed in California, the installation and maintenance of a fleet of flexible, dispatchable energy storage resources throughout our electric power system will bring multiple benefits, including not only air quality and cost savings, but also significant job creation for California's economy. As discussed in the documented use cases, energy storage plays an important role in advancing the use of renewable energy, energy efficiency, demand response, and distributed generation, thereby helping California to meet its 33% RPS goal. Finally, as the leading market for energy storage systems in the U.S., California will likely become a net exporter of energy storage technology and know-how to other regions throughout the U.S. and globally.

C. What is the difference between a Goal and a Mandate?

CESA supports the development of energy storage procurement goals -- defined as a specific amount of cost-effective energy storage capacity to be procured and be in commercial operation by specific dates. Importantly, such goals should be based on need, must be cost-effective and provide the necessary market signal to encourage project development and investment in California. The key difference between goals and mandates is that goals are arrived at jointly by stakeholders and are cost-effective. This is a departure from prior mandates in California. On this latter point, the specific energy storage goals need to have all of the following characteristics:

1. Take into account existing and planned energy storage development. For example, there is 9,600 MW of pumped hydro in the FERC licensing queue for California. Of that amount, approximately 4,000-5,000 MW will be in advanced licensing stages by 2020. Of that amount, approximately 2,000-3,000 MW can be online and operational by 2020 with the proper market signaling in place.

2. Be clear and easy to communicate. For example, CESA recommends that the 2020 goals specify an amount of energy storage that should be online and operational, not simply procured. Such energy storage goals should be consistent with the use case scenarios developed in Phase 1 of this proceeding.

3. Be of sufficient magnitude to encourage investment in a diverse portfolio of storage assets in California's electric system. Given existing policies and future needs driven for example, by once through cooling ("OTC"), nuclear retirement and renewable integration, California needs not only large bulk (*e.g.* pumped hydro) energy storage solutions but also a range of portfolio solutions including distribution-interconnected and behind the meter energy storage to manage peak demand.

4. Be consistent and of sufficient time scale to attract investment and foster market transformation. For example, Considering the large capacity of bulk energy storage that has the ability to come online by 2020 and beyond, the procurement targets must facilitate the longer lead-times and financing needs of these large development projects, in order for those projects to be realized.

Finally, any energy storage procurement goals must of course be 'likely to be cost effective' based on the cost effectiveness modeling work that currently being executed under this rulemaking. The magnitude of that potential cost effectiveness will of course be directly related to the timing and magnitude of any resulting energy storage procurement goals.

III. ENERGY DIVISION STAFF ANALYSIS TO DATE AND INITIAL PROPOSALS ON HOW ENERGY STORAGE SHOULD BE EVALUATED AND INCORPORTED INTO EXISTING PROCUREMENT PORTFOLIOS FORM AN EXCELLENT BASIS FOR DEVELOPING A COMPREHENSIVE ENERGY STORAGE ROADMAP.

A. Comments on Interim Energy Division Staff Analysis.

The Energy Division's Phase 2 Interim Staff Report fairly summarizes the extensive and thorough collaborative work accomplished with CESA and other stakeholders in developing the framework adopted in Phase 1 of this proceeding.[7] CESA applauds the Energy Division Staff for their leadership and tremendous progress to date on the very complex multi-faceted topic of energy storage. The analysis thus far in Phase 2 likewise adequately captures a general description of work in progress in developing use cases and a cost-effectiveness methodology that flesh out the Phase 1 framework, which CESA supports. These comments provide CESA's views on specific aspects of the Energy Division Staff analysis and the policy implications for the next step of producing a portfolio of cost-effective and viable energy storage goals that can be implemented by the utilities. The initial evaluation methodology proposals put forward by Energy Division Staff substantially captures and advances the dialogue among Energy Division Staff, CESA, the utilities, and other stakeholders to date. CESA's view of the proposals at this stage of the proceeding follows.

B. CESA's Energy Storage Portfolio Roadmap.

CESA proposes a portfolio approach for the Commission to create a roadmap for a suite of energy storage procurement goals that relate directly to identified need for a limited number of the most promising cost-effective energy storage use cases. Table 1, below, depicts the essence of the approach that CESA recommends. For purposes of discussion, Table 1 is populated by *representative* figures that illustrate the magnitude of anticipated need for certain applications of a select number energy storage applications and a methodology to arrive at goals that relate to the qualities of the types of viable and cost-effective energy storage technologies that can reasonably be projected to meet those needs today. As stated above, the final timing and magnitude of the resulting energy storage procurement goals should be informed by the results of

[7] On August 2, 2012, the Commission adopted Decision 12-08-016, which adopted the Energy Storage Framework Staff Proposal (Staff Proposal) of Commission Staff. The Staff Proposal contained a framework to analyze energy storage and identified 20 "end uses." These end uses were then combined into four basic "scenarios" for further analysis. The decision initiated a second phase of this proceeding to analyze the priority scenarios contained in the Staff Proposal.

the cost effectiveness work currently underway, and should be revisited as soon as more guidance is available from the cost effectiveness work.

CESA believes an appropriate energy storage portfolio can be developed by creating procurement goals in three main areas: capacity, ancillary services and behind the meter, consistent with the scenarios identified in the Phase 1 framework. Grid needs vary, as do system capabilities. Defining goals in these three areas of need assures that energy storage procured is best matched to overall electric system need.

> **1. Capacity.** As noted above, 2,000-3,000 GW of cost-effective pumped hydro storage has the potential to come online by 2020, with the right policy support. The California Independent System Operator "CAISO") is expected to release a report soon detailing its projected need in Phase 2 of the Long Term Procurement Planning proceeding ("LTPP") (R.12-03-014). In order to more quickly deploy cost-effective storage on the grid, the Commission should set aside a significant portion of the need identified to serve as a goal for energy storage capacity, building upon likely pumped hydro capacity for 2020.
>
> **2. Ancillary Services.** It is important to specifically identify an ancillary services goal because energy storage systems supplying regulation or flexible ramping may be different - and have different economics - from systems optimized solely to provide capacity.[8] According to the CAISO, California will need to more than double the amount of regulation procured by the CAISO to support the 33% RPS goal. CAISO has also publicly reported that as much as 4,800 MW of flexible ramping will be required.[9]. In addition to the State's other flexible capacity needs to replace the significant amount of OTC, nuclear, and inefficient generation in the system, CESA recommends using an ancillary services and/or regulation requirement as the baseline for an energy storage procurement goal.
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> **3. Behind the Meter.** This goal is designed to better integrate current and planned distributed generation ("DG"), and to provide a way for ratepayers to take advantage of energy storage systems installed behind the customers utility service meter to reduce their electric bills and increase electric reliability, especially in emergency

[8] However, if capacity-purposed or behind the meter systems can also perform regulation, they could also be candidates for meeting the regulation goal, rated according to their level of utilization for regulation meeting specified eligibility requirements

[9] http://www.caiso.com/planning/Pages/ReportsBulletins/Default.aspx. The CAISO conducted a study to forecast the regulation required to meet the 33% RPS in 2020. There he CAISO analyzed four scenarios, showing that the CAISO needs 754 MW of Regulation Up and 767 MW of Regulation Down on average per hour in 2020 as compared to the 333 MW of Regulation Up and 350 MW of Regulation Down procured on average each hour in 2012. This equates to 420 MW of required new regulation service required. *See*, CAISO Briefing on Renewable Integration – Market Vision and Roadmap, October 20, 2011.

> situation such as the recent Southern California fires and earthquakes where loss of the electric grid ripples out … affecting the mobility fuel supply and other public health and safety systems. As such, CESA recommends that this goal be based upon a ratio of DG to energy storage that has been predicted to be most beneficial to customers and the grid. In CESA's extensive modeling of the value proposition of behind the meter storage, a 1:3 ratio of energy storage to DG is highly beneficial to achieve optimum project economics based on optimizing for time of use energy cost and reducing demand charges in IOU service territory. Governor Brown currently has a plan to enable deployment of 12,000 MW of DG"). This, for example, can form a good baseline for determining a behind the meter storage goal.

As part of procurement goals, it is important that energy storage systems be well suited to specific identified areas of need, and that their actual operation supports the goal. In order to assure that goals are satisfied appropriately, CESA proposes the following eligibility structure, which includes a minimum duration, utilization, and interconnection requirement for systems in each area. Energy storage resources may be eligible for more than one category, but would accordingly have different utilization ratings in different areas, as discussed below.

1. Minimum duration requirements are proposed to make sure that systems are able to provide the most critical benefit. Specific energy storage systems may require longer minimum durations than proposed, depending on Commission determinations in other proceedings. For instance, it may make sense to propose that capacity systems have four-hour durations in order to also incorporate resource adequacy ("RA") value for all capacity-eligible installations.

2. Utilization requirements validate the operation of a given energy storage system to assure that its operation supports the procurement goal. Utilization represents the usage requirement for the energy storage resource to be counted toward the procurement goal. If the energy storage system operates under the specified threshold, the MW rating of the energy storage system as it pertains to the procurement goal would be de-rated in a linear manner relative to its actual operation. Utilization over the specified threshold would not increase the MW rating relative to the procurement goal, as it would merely indicate successful and cost-effective operation of the energy storage system on the grid.

3. Interconnection requirement simply specifies where and how the energy storage system is connected to the grid. This validates that the energy storage system is capable of fulfilling the need in the performance goal.

The *representative* examples provided in the table below titled "Procurement Goal Framework" indicate how various categories of energy storage systems might be eligible to fulfill the three goal areas. Of course energy storage systems may satisfy multiple procurement goals simultaneously and procurement goal levels may differ, depending on the amount of energy storage system utilization in each goal category.

Procurement Goal Framework

		Procurement Goal Area		
		Capacity	**Ancillary Services**	**Behind the Meter**
Eligibility	**Minimum Duration**	2 Hours	15 Minutes	2 Hours
	Utilization	Availability equivalent to a CT - available XX% of local peak hours	Bids within XX% of market price XX% of the hours of the year	Operates 2 hrs. each summer weekday, as defined by the tariff
	Interconnection	Connected to transmission or distribution system	Eligible to participate in ancillary services markets	Connected behind the meter
Examples**	Modern pumped storage	X	X	
	Bill management with market participation		X	X
	Bill management.			X
	Molten salt storage	X		
	Flywheel-based regulation system		X	
	Battery-based regulation system		X	
	Battery flexible peaker system	X	X	

**Examples are purely hypothetical. In each example, MW ratings for each goal area would be based on actual utilization as described above.

Finally, it is important to point out that the time horizons provided by AB 2514 (2015 and 2020), may not be sufficient but are a crucial first step. Specific 2015 goals can be determined as part of the cost-effectiveness analysis and review of which energy storage systems can be installed and on-line for cost effective priority applications within the 2015 time horizon. Tremendous benefits of certain energy storage systems can be brought to California very quickly with a market signal that addresses a longer time horizon. For example, new pumped hydro facilities require many decades for development. On the other end of the technology spectrum, many new, innovative energy storage technologies will also require a longer time horizon than 2020 to reach full commercialization. Of course, any such longer term goal must be based on need, likelihood to achieve cost effectiveness and should be periodically revisited as further planning at the CAISO and the Commission progresses.

IV. SPECIFIC QUESTIONS POSED IN THE INTERIM STAFF REPORT.

A. Use Cases.

1. Do the Use Cases provide an adequate representation of the range of valuable applications that energy storage currently provides to the electric grid?

RESPONSE: Yes, because of the multi-stakeholder process used to develop these use cases, they represent ground-breaking new work on how energy storage can be utilized on the grid. It is important to note that these use cases should be treated as living documents which can be amended as we learn more, both about potential uses of energy storage and as new innovative storage solutions are developed over time. For example, ratepayers benefit from lower fuel consumption and GHG emissions from the operation of energy storage systems, but there is no way that they can be fully rewarded for providing these benefits. The grid benefits both from energy storage systems enabling lower procurement and from reduced fossil fuel consumption from more efficient fleet operation, but the value is not monetized for energy storage system to date.

During discussions about the models/methodologies, stakeholders have recognized that there are limitations to the models, and, in particular, several benefits identified in the use case discussions seem not to be represented at all in the models. For example, none of the methods proposed seem to take into consideration the unique benefits of energy storage in reducing emissions and increasing grid fleet efficiency. If the unique benefits of energy storage cannot be adequately represented in the models, the cost-effectiveness analysis would undervalue the benefits of energy storage. It is important to recognize that to determine cost-effectiveness for energy storage use cases all the benefits should be considered and included.

In addition, some of the benefits that are claimed to be captured in the models may not be adequately represented. For example, FERC Order No. 755[10] requires ISOs to compensate for the performance of resources providing frequency regulation, and is expected to significantly increase the market-based revenue of fast-responding regulation resources. The models, however, have been described as not taking into consideration the potential revenue of fast-responding regulation resources, including energy storage, since the CAISO has not yet implemented the changes required to achieve the benefits of Order No. 755 (which are expected in May 2013). Furthermore, the fast response characteristic of certain types of energy storage enables it to respond quicker to ISOs dispatch signals on a second-to-second basis than conventional resources, which determines performance and regulation compensation. The models have been described as not taking into account second-to-second dispatch signals from the CAISO, but instead use hourly data to calculate the revenues of the CAISO's markets. Using hourly data may overlook energy storage's unique characteristic of fast response, unless the values reflect the fast and accurate performance and related compensation.

The issue of costs of energy storage resources is best addressed on a project-by-project basis when utilities bring contracts to the Commission for approval. For the current cost-effectiveness analysis in this proceeding, a generic, approximated cost range for energy storage, based on publicly available sources should be sufficient. This range should be based on various

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[10] *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Order No. 755, 137 FERC ¶ 61,064 (2011) ("Order" or "Order No. 755").

installation volumes, as procurement volume directly drives unit cost. Even more granular cost data can be collected by the Energy Division from specific potential bidders in confidence in advance of a final decision on procurement targets in this rulemaking.

2. Besides the section on cost-benefit analysis, which is still a work-in-progress, is there some critical element missing from the Use Cases?

RESPONSE: Yes. As noted above. further analysis should be done regarding the potential for cost improvements as investments increase and associated benefits (*i.e.* economies of scale and research and development-related advances) are realized. This can potentially be modeled using existing industry models, and should be considered as the energy storage market is evolving and has significant potential. As also noted above, a certain use case flexibility should be included as we learn more about potential uses of energy storage.

B. Preferred Resources.

1. Why should Energy Storage be considered a “preferred resource”?

RESPONSE: Cost-effective and viable energy storage resources should be considered the most favored resource available to meet system needs for energy, capacity and ancillary services because they are best suited to meet the need for greater amounts of flexible capacity.

2. Does the Commission need to work with Joint Agencies to modify the Loading Order or will a Commission policy statement suffice?

RESPONSE: The task should not be a high priority that can be allowed to divert critical staff efforts in this proceeding for the foreseeable future. For near-term purposes, energy storage can be treated as preferred as suggested in the LTPP Phase 1 Proposed Decision currently pending at the Commission.

3. What are the implications of designating Energy Storage as a “preferred resource” in this proceeding for other procurement proceedings?

RESPONSE: See responses above.

C. Cost-Effectiveness Methodologies.

1. What models should be pursued for running the cost-effectiveness test?

RESPONSE: An informal working group of the Energy Division Staff and stakeholders focused on cost-effectiveness methodology has had significant interaction with EPRI and its Energy Storage Valuation Tool ("ESVT") model to date. While some presentations have been made by KEMA about the models KEMA has available for storage, more detailed interaction with the KEMA team and the working group will start the week of February 4, 2013. Therefore, the following comments on modeling limitations are focused on EPRI's ESVT model.

As a dispatch model, ESVT is one of the best models available today to compare a single conventional generator to an energy storage system for certain applications. It can model the participation and dispatch of a generator and storage system in the CAISO's markets as they are structured today. The primary limitations of ESVT for CAISO market participation modeling are the following:

1. The model cannot conduct intra-hour dispatch or ramp rates of technologies. This limits frequency regulation and pay for performance calculations such as Order FERC No. 755implementation. The working group, with EPRI, is exploring pricing scenarios for the modeling inputs that can help to mitigate this modeling deficiency.

2. The model only evaluates the day-ahead market and does not allow for real-time market participation. This can impact the capture of negative pricing due to over generation. The working group, with EPRI, is also exploring pricing scenarios for the modeling inputs that can help to mitigate this modeling deficiency.

3. The cost-effectiveness methodology does not include long term pricing forecasts for energy or ancillary services, nor does the model allow for divergence between ancillary service and energy pricing during the operational lives of the systems. Considering the likely changes in pricing over the next 30 years and the impact of increased fuel cost and/or ancillary service value upon the grid needs and energy storage value proposition, these restrictions are problematic.

Also, as a dispatch model, the portfolio impacts are not accounted for in the results. To account for portfolio impacts, one would need a production cost model. Because portfolio effects are not accounted for, the following limitations have been identified:

1. Impacts to overall portfolio fuel requirements are unaccounted for in the ESVT model
2. Emission impacts are unaccounted for in the ESVT model
3. Unit commitment impacts are also unaccounted for in the ESVT model No workarounds within the ESVT model for these portfolio effect issues have been identified by the working group to date. CESA believes that emissions are a critical factor to consider in overall cost-effectiveness analysis. Any ESVT modeling results should be clearly qualified by noting these significant deficiencies.

Other significant limitations of the ESVT model include:

1. The absence of temperature dependent heat rates and capacity de-rates. The informal working group has identified ways to adjust the model inputs to account for some of the impacts to these limitations.
2. Impacts to ramping on heat rate are not accounted for.
3. Planned and unplanned downtime is not accounted for.
4. The value of optionality in resource procurement is not accounted for.

Several other important details on modeling limitations have been noted by the working group and will be documented in a working group paper to support the modeling for this proceeding. The first draft of this working group paper is expected to be released in March 2013.

2. Is there a simplified approach to cost-effectiveness that would meet the Commission needs?

RESPONSE: The approach that is being developed by the Energy Division Staff and stakeholders at this time is simple and easy to understand and explain, and should prove ready to implement immediately without further elaboration. Because specific installed costs will be less meaningful without knowing a specific procurement quantity, CESA recommends that in the near term, cost-effectiveness should be approached by solving for the break-even cost that energy storage must achieve for its benefits to be on a par with any *status quo* solution. Once that break-even point is known, then the Energy Division Staff have the ability to engage in confidential meetings with potential energy storage system suppliers to determine realistic installations costs under various procurement volume scenarios. In this way, the Energy Division Staff can have a very accurate view of what amount of energy storage capacity can realistically be online by 2015 (for the purpose of setting the 2015 procurement goal), and at the same time further define the priorities and specifications needed for the kind of near-term market tests that CESA strongly supports.

3. To address Staff's concern that it may not be the best use of resources to run all of the Use Cases through cost-effectiveness models, is there a priority criteria or prioritized list of Use Cases that can be utilized?

RESPONSE: Yes. CESA is proposing just such an approach. The informal cost-effectiveness working group has already developed a plan for how to move forward with the analysis. CESA is fully committed to ensuring that all applications are reviewed in time for their results to be included as part of the record in this proceeding.

4. If not, how can we ensure that the analysis gets done for all the Use Cases in a timely manner?

RESPONSE: All reasonable known use cases need to be or should be evaluated before the Commission issues a final decision. This can be accomplished by continuing take full advantage of the combined efforts of many stakeholders in this proceeding in the same way that the use cases have been developed thus far.

D. Policy Options

1. Does Staff's priority listing of Policy Options accurately represent the most important issues facing storage in the identified proceedings?

RESPONSE: CESA applauds Energy Division staff for identifying an appropriate list of Policy Options, including:

- Interpreting energy storage as a preferred resources
- Establishing energy storage procurement targets
- Developing energy storage cost effectiveness framework
- Coordinating policy actions in related proceedings

CESA respectfully adds that ordering immediate and substantial market tests of priority applications that are determined to be "likely to be cost-effective" occur as soon as possible, ideally for implementation no later than Q1 2014. In addition, CESA support policies that would allow utilities to execute contracts with energy storage resources with terms greater than ten years, as renewable energy resources currently are eligible for. CESA supports actively pursuing all of these policy options in parallel.

2. Are suggested actions for resolution of barriers the best approach to advancing energy storage deployment?

RESPONSE: The suggestions are adequate for present purposes. This is no one best resolution, but they are all moving in the right direction. What is critical is that market tests proceed with all deliberate speed, as this will be a critical near term market signal that will accelerate learning and provide valuable insight and more strategic options to California when considering other policy actions. For example, the proposed 50MW procurement requirement for local capacity requirement ("LCR") in Phase 1 of the LTPP should be implemented as soon as possible. Energy storage can be deployed far more quickly than a CT. If the 50 MW energy storage procurement requirement for LCR is found to be more cost-effective than a *status quo* solution, then the remaining procurement required under LCR can be adjusted accordingly.

E. Related Proceedings.

1. Does the list of issues in related proceedings capture the work being done in the other proceedings described?

RESPONSE: Between now and the end of 2013, there are a few very specific actions the Commission should take in a few active proceedings that will have immediate positive impact and momentum in achieving California's goal of accelerating wide spread deployment of energy storage systems in 2013. CESA is, of course, working toward a number of strategic objectives with all of California's regulatory policy decision makers, and utilities, in addition to those that are listed here, but this list has been selected because it can all be realistically be accomplished by the Commission before the end of 2013.

a. Long Term Procurement Planning, Phase 2

1. Direct the utilities to use CESA's Model All-Source RFO, along with other flexible approaches, to procure energy storage on a basis comparable to other resources to meet the Local Capacity Requirement ("LCR") determined in Track 1 and the statewide system need to be determined in Track 2, and clearly require that they must be fairly evaluated by the utilities.

2. Support the distinction between "preferred resources" that are currently included in the Loading Order in the Energy Action Plan, and a "most favored resource" procurement policy preference for the flexible operating characteristics of resources available to meet grid operating flexibility requirements, specifically including energy storage.

b. Resource Adequacy

1. Adopt multi-year contracting mechanism for procurement of capacity that includes energy storage resources.

2. Adopt a category of flexible capacity that takes into consideration the flexible resource abilities of energy storage while allowing these resources to also provide other products and services from the same system.

3. Adopt a Net Qualifying Capacity value for energy storage with less than one hour capacity using the capacity formula that the CAISO applies in its Regulation Energy Management market for frequency regulation, in which energy storage resources with less than one hour of capacity are allocated MWs of capacity corresponding to their sustained output over 15 minutes.

c. Behind-the-Meter Incentive Programs

1. Amend the existing SGIP program so that small thermal storage technologies combined with packaged air conditioners (3-20 ton refrigerant based air conditioning) can qualify under the SGIP.

2. Consolidate statewide Self Generation Incentive Program and Permanent Load Shifting program management under a third party such as the California Center for Sustainable Energy. This will improve efficiency, reduce transaction cost and ensure that the interests of ratepayers are met consistently state wide.

3. Encourage innovative collaboration between utilities and distributed energy storage stakeholders, in particular, to allow partial or full utility control of storage assets behind the meter in exchange for payment under a long term contract for the beneficial use of those assets.

d. Interconnection

1. Form a small standalone energy storage-working group within the proceeding that is focused exclusively on interconnection-related subjects specific to energy storage with emphasis on real-time utility implementation of Rule 21.

2. Require the utilities to adopt standardized performance specifications to facilitate administrative approval of energy storage systems to meet Rule 21 fast tract screen and protective equipment requirements.

3. Direct utilities not to violate Section 2827(g) of the Public Utilities Code by requiring energy storage systems integrated with net energy metered distributed generation to pay for interconnection under Rule 21.

2. Is there more that should be done in the identified proceedings to advance energy storage deployment, aside from establishing procurement targets?

RESPONSE: Yes. See response to question E.1, above.

V. RECOMMENDATIONS RAISED IN THE JOINT ENERGY STORAGE/LONG TERM PROCUREMENT PLANNING WORKSHOP.

There were three specific recommendations involving energy storage made as part of the Joint Energy Storage/Long Term Procurement workshop that should be addressed in this proceeding. CESA recommends several specific actions in this proceeding that also support previous recommendations for action in the LTPP proceeding.

A. SCE proposed a novel method for assigning a "net qualifying capacity" value to storage.

Comment: SCE proposes the use of an interim Net Qualifying Capacity ("NQC") counting mechanism that would include a determination of "highest and best use" to establish NQC values for LCR procurement analysis of energy storage devices. Certain storage technologies may also be effective in meeting the operating attributes required to satisfy the LCR need, and SCE will fully consider any proposals from storage providers to do so.

CESA disagrees with SCE's proposal that energy storage devices with less than one hour of capacity should not have an NQC, since their primary value is in ancillary service markets and/or as frequency response resources. There is a clear need for flexible capacity which the ISO has defined as the ability of the fleet to provide regulation, load following, and maximum continuous ramping. A more appropriate NQC value for energy storage with less than one hour capacity would be to use the capacity formula that the CAISO applies under its Regulation Energy Management ("REM") market for frequency regulation, in which energy storage resources with less than one hour of capacity are allocated MWs of capacity corresponding to their sustained output over 15 minutes.[11]

Existing fossil fuel-powered plants displaced by energy storage providing frequency regulation can be shifted to provide a corresponding amount of added peak generation capacity and energy. A MW of regulation and other ancillary service capacity can free a traditional capacity to respond to load requirements, so a MW from ancillary service-only should be allocated a NQC. NERC requires each balancing authority to maintain frequency within defined limits (BAL-001). Absent an ancillary service-only resource, generation capacity must be allocated to provide frequency regulation in order to maintain frequency.

[11] *See*, CAISO Tariff (Fifth Replacement), Section 8.

Generation resource capacity allocated to frequency regulation cannot also be counted to provide operating reserves. For each MW that an "ancillary service-only" energy storage resource replaces a generation resource, the generation resource gains two MWs that can now be counted to provide operating reserves or energy. Since an ancillary-service-only energy storage resource frees up generation capacity for operating reserves, the ancillary service capacity should receive credit as a capacity resource.

Due to its benefits, any energy storage capacity that counts as NQC should also count towards LCR. The same "displacement" argument applies to LCR where the operational flexibility of energy storage means that it frees up less flexible, traditional plant that can dedicate their longer duration capability to meeting LCR. In the absence of energy storage as a local resource, the amount of capacity available from the traditional resource to meet LCR can be compromised. Failure to recognize the locational benefit of energy storage greater than one hour also fails to recognize the greater modularity and ease of siting associated with energy storage resources, as alternatives to conventional resources. The proposed three-hour cut-off for LCR appears unnecessarily arbitrary – if energy storage were to be treated as a direct equivalent of a peaking generation resource, then this would make sense. However, an energy storage resource is not a direct equivalent of a peaking generation resource, so applying a peaking generation resource LCR value methodology seems inappropriate.

While a an energy storage resource may be limited to providing one set of products and services at a certain point in time, the same energy storage resource may provide additional products and services at other times, depending on market signals and grid needs. Limiting the valuation of an energy storage resource to a single use based on a single expected mode of operating can significantly undervalue the flexibility and optionality of energy storage.

B. CESA proposed a "Model All-Source" procurement structure focused on evaluation of benefits attributable to energy storage.

Comment: CESA's "Model All-Source" Procurement Structure highlights the following items to enable more competitive RFOs[12]:

a. When eligible technologies are listed, energy storage should be included as a category of resource from which a utility will consider offers.

b. Minimum offer size should be 1 MW.

c. The delivery term and expected commercial operating date ("COD") should take into account the benefit that energy storage resources can be developed and constructed in less time than conventional generation.

d. RFOs should recognize and fairly value responses that include a phased approach to commercial online dates ("CODs"), which can provide tremendous value to utilities by enabling capacity to be installed only when the system requires it.

e. The fact that energy storage resources can meet or greatly exceed the operational flexibility requested by the All-Source RFOs should be recognized and valued.

f. RFOs need to appropriately value the products that energy storage resources offer. Simply calculating an offer's benefits as the market value of the energy, capacity and ancillary services offered, including risks and uncertainties of the costs and benefits, does not appropriately capture the benefits, some of which are not yet monetized (*e.g.* speed and accuracy).

g. The GHG and other emissions benefits of energy storage resources should be valued appropriately.

h. The benefits of the storage resource to the utility's portfolio should be valued appropriately. Energy storage resources can improve the operational efficiency of a fleet, reduce fuel consumption, reduce emissions, and reduce system costs.

C. CESA raised the issue of whether there are barriers that inhibit RFO respondents, from offering retrofit/incremental offers.

CESA's view is that there are no barriers that are unique to RFP respondent's offering retrofit/incremental offers.

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[12] *See*, CESA Comments, October 5, 2012, in the LTPP proceeding.

VI. CONCLUSION.

CESA appreciates this opportunity to provide these comments in response to the ALJ'S Ruling, and looks forward to continuing to work with the Commission and parties to achieve the goals of this proceeding.

Respectfully submitted,

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APPENDIX A

Overview Of The Need For Energy Storage In California

1. **The Public Policy Case for Energy Storage**

Energy storage is a very broad asset class that includes many technology subclasses, including; gravitational, electro chemical, thermal and mechanical means for storage energy. Energy storage is also a dynamically evolving asset class – dramatic cost reductions are underway -- fueled by large investments in the electrification of transportation as is the case of lithium ion -- many new types of advanced energy storage solutions spanning many energy storage technology subclasses are emerging due to active venture capital and private equity investments While there are many types of advanced new energy storage technologies being commercialized today, bulk energy storage, such as advanced pumped storage hydropower ("PHS"), has very long, proven, and reliable service life in the order of 75-100 years or more.[1] PHS also has the potential to provide 2,000-3,000 MW of new bulk energy storage to California's electric power system as early as 2020.

Whether a centralized, bulk solution such as pumped hydro or other form of distributed energy storage, a portfolio of energy storage solutions deployed in California has the potential to help optimize California's electric power system, facilitate renewable integration and help mitigate the impacts of once-through-cooling ("OTC") retirements and reduced nuclear

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[1] There is substantial potential in California to bring online significant amounts of PHS that is both cost-effective, and able to provide a very large amount of capacity and ancillary service to the grid. In the US Installed Operating Capacity: 20,630 MW (As of 2012). California Installed Operating Capacity: 3,905 MW (as of 2012). U.S. Planned Capacity: Over 44,000 MW of FERC Issued Preliminary Permits for PHS. California's planned capacity includes approximately 9,600 MW of FERC-Issued Preliminary Permits for PHS. Not all of these planned projects will ultimately come to fruition. However, there are still a number of very strategically located large-scale project sites available in California or just adjacent to the California border that will be developed if the correct market signals are provides to project developers.

generation impacts. After securing the initial capital costs for development, the very low operation and maintenance costs and no-cost fuel combine to create a significantly low long-term levelized cost of energy. As a result, for cycling dispatchable generation in peaking-type service, energy storage (particularly bulk pumped hydro) is unmatched in providing a low cost and low carbon emission generating technology. Energy storage can also provide superior value – it is capable of converting the most cost-effective and often, the lowest carbon energy at its lowest marginal cost into very fast responding dispatchable flexible energy and capacity. It expands the flexible capacity available to the California Independent System Operator ("CAISO") by utilizing the most efficient energy qualities of the existing generation fleet, and converting it into future capacity and ancillary services.

The lowest cost and cleanest energy portfolio is achieved by limiting the total installed capacity of base load generation, and utilizing it as close to 100% capacity factor as possible. When such supply exceeds demand, any such surplus should be stored, shifted, and dispatched to help integrate variable intermittent generation, and address intermediate load, and peak load during times of highest need. Energy storage with a low levelized capital cost is necessary to create this transformation to the most efficient and cost-effective energy portfolio.

Utilization of the most efficient intermediate load on the margin during the hours of energy storage charging, allows for significant avoidance of carbon emissions that would otherwise have been emitted from the inefficient natural gas peaking plants with high heat rates. In addition, the ability of energy storage systems to return emission-free energy to the grid during peak demand periods reduces greenhouse gas ("GHG") emissions during the most critical air quality times of the day. This is achieved by increasing the efficiency of the power supply curve – a more strategic utilization of the existing energy generation mix.[2]

2. Greenhouse Gas Emissions Avoidance.

Energy storage's ability to take on the attributes of its charging energy is the reason why energy storage has very significant emissions reductions. The most obvious and best case would be to use energy storage to move renewable energy to offset emissions-bearing generation. But even in the case when energy storage is shifting combined cycle turbine generation ("CCTG") to peak, it would still deliver benefits to offsetting combustion turbine ("CT") generation in energy prices, emissions and reduced commodity risk. This is due to the inefficient operating characteristics of CT power plants.[3] By serving as a load-following resource, energy storage can also facilitate "must-run" inflexible highest efficiency intermediate and base load fossil and nuclear generation.

California has an energy generation mix with a very significant portion covered by near-carbon free sources. Our Renewable Portfolio Standard ("RPS")-eligible renewable content is quickly approaching 33%. There is significant once through cooling ("OTC") capacity scheduled to be retired in the near future. There is also a massive amount of carbon-free nuclear energy that will no longer be contributing to the mix. In total, these changes are contributing to greater demand for fast and flexible capacity resources – one of the key strengths of energy storage.

3. Intermittent Renewable Integration

[2] There are over 16,000 MW of OTC plants in California. Energy storage can strategically and cost-effectively compete to replace this to-be-retired OTC capacity. Another aspect to consider is the significant loss of system inertia when these large numbers of OTC plants are retired. This inertia will not be replaced by intermittent renewable energy projects, and large energy storage projects can provide the necessary stability the grid requires. SONGS' 2,254 MW of capacity is now out of service and off-line Diablo Canyon (2,323 MW) is listed as an OTC plant, and its potential existing life is also in question If California is to meet its aggressive GHG emissions reductions goals, then this nuclear capacity must be replaced with near-zero carbon energy and capacity.

[3] For example – assume an 85% round trip efficient energy storage system shifts 6,800 heat rate output to replace output from a 10,000 heat rate peaker. The effective heat rate of the energy storage resource is 8,000 so it can be delivered cheaper and cleaner and will dampen volatility in natural gas prices.

Although energy storage is not a prerequisite to integrate of intermittent renewable resources, it can help facilitate their integration. For example, unlike generators that experience higher rates of fuel consumption and air pollutant emissions when they provide regulation service, energy storage resources recycle existing power without burning fossil fuel or producing any direct air emissions, thereby lowering total system operating costs and air pollutant emissions.[4] KEMA notes that continued reliance on thermal generating units to meet increased regulation requirements could actually increase emissions of CO2, NOX and other pollutants, thereby defeating one of the main benefits of wind energy generation. Similarly, a study by Carnegie Mellon in October 2008 estimated that 20% of the CO2 emission reduction and up 100% of the NOx emission reduction expected from introducing wind and solar power will be lost because of the extra ramping requirements they impose on traditional generation.[5] Accordingly, there are significant economic, reliability enhancement, and environmental benefits of using fast-ramping storage technologies to provide frequency regulation, including reductions in regulation service procurement requirements[6], reduced costs to ratepayers, improved ability to maintain reliability and reductions in overall emissions on the grid.

Increased use of intermittent renewable energy resource be enabled by introducing additional system load during the periods of lowest energy consumption, and during periods of intermediate system load when intermittent renewable resources are operating at their highest generation levels. In addition, by enabling more efficient circuit utilization, energy storage can facilitate the interconnection of intermittent renewables resources into the grid.

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[4] KEMA, *Emissions Comparison for a 20MW Flywheel-based Frequency Regulation Power Plant*, May 18, 2007.

[5] Katzenstein, W., and Jay Apt. Air Emissions Due To Wind And Solar Power. *Environmental Science & Technology*. 2009, 43, 253-258. http://pubs.acs.org/doi/pdf/10.1021/es801437t

[6] FERC Order No, 755 found that the use of faster-ramping storage resources had the potential to reduce the total amount of total regulation that must be procured by the independent system operators ("ISOs") thus reducing costs to ratepayers.