March 11, 2011

E-mail to docket@energy.state.ca.us

Presiding Member: Robert B. Weisenmiller
Associate Member: Karen Douglas

Original copy to
California Energy Commission
Docket Office, MS-4
Re: Docket 11-IEP-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: Comments of the California Energy Storage Alliance on Draft Committee Revised Scoping Order
Docket 11-IEP-1

Dear Commissioner Weisenmiller and Associate Member Douglas:

The California Energy Storage Alliance (CESA) appreciates this opportunity to comment on the Draft Committee Revised Scoping Order revising the scope of the 2011 Integrated Energy Policy Report (IEPR) (Revised Scoping Order). Of course, CESA is pleased to see that one of the primary reasons for the revision relates to Governor Brown's Clean Energy Jobs Plan:

> "Addressing the energy policy priorities for energy efficiency, renewable resources (distributed and utility scale), energy storage, and combined heat and power facilities that are articulated in Governor Brown's Clean Energy Jobs Plan, along with specific approaches from the California Clean Energy Future roadmap and implementation plan." (p. 1).

CESA also appreciates the Revised Scoping Order's several explicit references to energy storage as one of the most effective approaches to the implementation plan, development of a strategic plan for renewable energy development, and infrastructure additions that include energy storage. In these comments, CESA recommends additional efforts that the Energy Commission can, and should, undertake immediately in the exercise of its statutory authority under existing law. To the extent that the Energy Commission considers acting on CESA's recommendations, the IEPR should also discuss their policy implications.

I. THE ENERGY COMMISSION SHOULD EMPHASIZE ITS SUPPORT OF ENERGY STORAGE BY HIGHLIGHTING IT AS A STANDALONE SUBSIDIARY VOLUME OF THE 2011 IEPR.

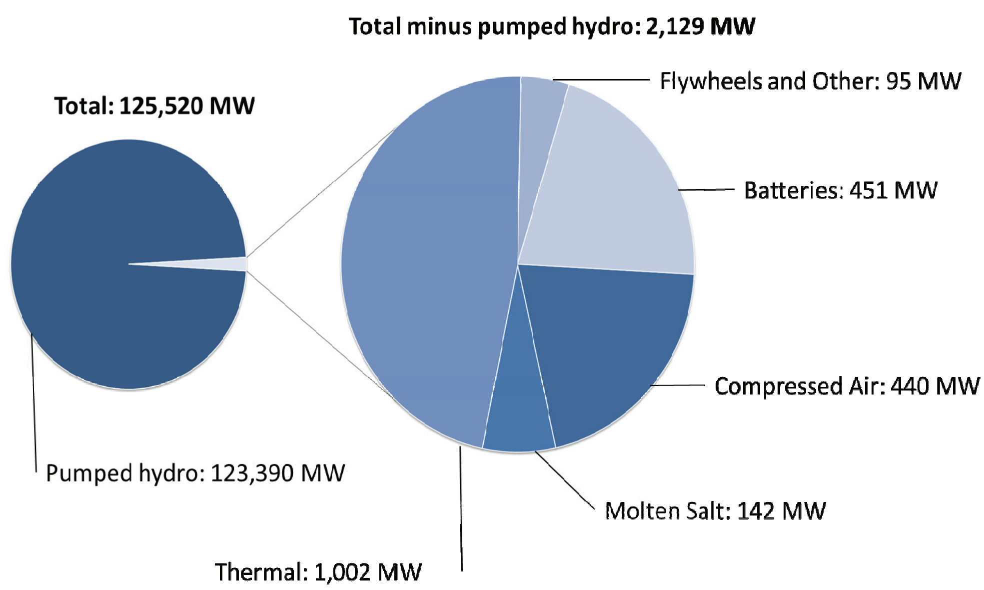
CESA has actively engaged in the Energy Commissions IEPR process and respectfully submits that the time is ripe for the Energy Commission to substantially ramp up its efforts to educate stakeholders, including other regulators and the general public, as to the increasingly critical role energy storage must play in California's energy policy. Because of the unprecedented growth rate of the storage industry and the myriad of benefits and applications that energy storage can provide at every point on the electric grid, it is critical that the Energy Commission devote a standalone Subsidiary Volume to the 2011 IEPR. This will ensure that the Energy Commission and all other stakeholders can capture, organize, and plan for the multitude of benefits that energy storage can provide the electric grid now and in the future.

A. A. Current State of the Industry

Energy storage is a very flexible grid-connected resource and spans all areas of the electric grid. From generation to load, energy storage can play an important role and offer the benefits of a cheaper, cleaner, more reliable grid:

Storage Is a Flexible Grid-Connected Asset

Modern energy storage technologies, some of which have been in existence for decades, cover a wide range of sizes, power (measured in MW), and discharge durations (measured in hours). An energy storage system can be either centralized or distributed and can be utility-owned, customer-owned or third-party owned. Today, there are more than 125 GW of installed grid connected energy storage technologies (including more than 2,000 MW of non-pumped hydro) of deployed worldwide with a comparable amount under development.[1]



The energy storage industry is growing rapidly[2]:

- Top clean tech investment area in 2009: **$320M invested**

[1] Strategen and CESA research; figures current as of April 2010
[2] Strategen Consulting, LLC research

- Key focus of ARRA stimulus funding: **$185M** awarded in 2009 – California received **$74M**
- Advanced energy storage (AES) capacity will increase by **>100%** (2,128 MW current, announced new capacity of 2,250 MW)
- New proposals AES projects in California total over **550 MW**
- GTM Research forecasts AES market to grow by **40%** per annum

In addition to the more than 125 MW of installed capacity, many new energy storage projects are being constructed or planned currently. Every class of energy storage technology from thermal to batteries to pumped hydro is being deployed all over the world today. California should be a leader in promoting the growth of this industry to create more clean energy jobs and secure the future of its electric grid.

B. Multiple Applications for Energy Storage

Energy storage is a grid-connected asset class with seemingly unlimited applications. CESA defines applications as the "practical bundling of potential operational uses of energy storage across the value chain as a function of both physical location and operating profile."[3] A partial list of operational uses include the following for residential, commercial, and industrial customers:

- Time-of-use energy cost management
- Demand charge management
- Demand response
- Permanent load shifting
- Onsite renewable integration
- Onsite renewable generation shifting
- Retail participation in ancillary services
- UPS replacement
- Power Quality (10 Seconds)
- Emergency backup (islanding)

There are also a large number of utility operational uses:

- Electric Supply
  - Electric Energy Time Shift
  - Electric Supply Capacity
- Ancillary Services
  - Load Following
  - Frequency Regulation
  - Electric Supply Reserve Capacity
  - Voltage Support
- Grid Operations
  - Transmission Support
  - Transmission Congestion Relief

[3] *Moving Energy Storage from Concept to Reality: Southern California Edison's Approach to Evaluating Energy Storage*, March, 2011.

  - Reliability (15 min. - 1 hour)
  - Power Quality (10 Seconds)
- T&D Upgrade Deferral
  - Stationary
  - Transportable
- Renewable Integration (Solar and Wind)
  - Ramping
  - Firming
  - Over-generation
  - Generation shifting
  - Frequency Regulation
  - Distribution upgrade deferral due to renewables or EVs

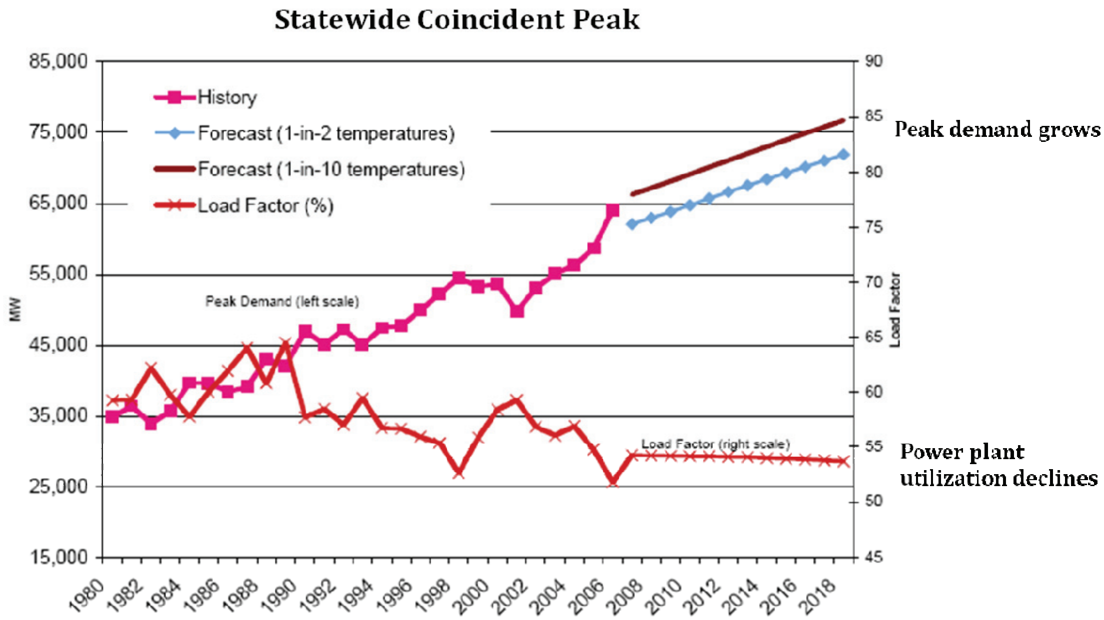
C. Ratepayer Benefits

All ratepayer classes will benefit from energy storage. Some of the key benefits include the following:

- System-wide savings and decreased emissions from lower LCOG and better performance
  - Peaker plant substitution
  - Frequency regulation
- Customer savings
  - Lower electric bills
  - Increased ROI on renewables
- Increased customer control over future dynamic and pricy tariff structures
- Increased homeowner reliability and stability
- Green job creation

D. C. Energy Storage Makes Grid Operations Cleaner and More Cost-Effective

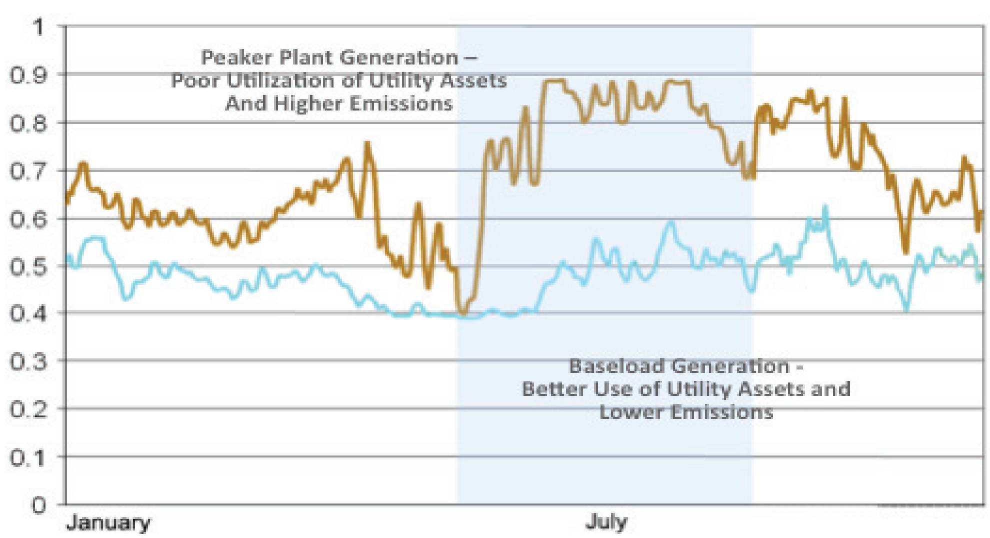
When energy storage provides these operational uses, it can do it more effectively than conventional resources. For example, California's peak load is growing and asset utilization is decreasing. The following charts illustrate this point:



Source: California Energy Commission California Energy Demand 2008–2018, CEC-200-2007-015-SF

Grid energy storage displaces less efficient, dirtier peaker generation by time-shifting more efficient, cleaner base-load generation to peak periods. This results in substantial system-wide air quality benefits. As an example, the chart below compares actual carbon dioxide (CO2) emissions of peak vs. off-peak generation in Southern California Edison's service territory. Peaker plant generation produces far more CO2 emissions per MWh than base load generation, especially during the summer months. This is true of California's other utilities as well.

Peak vs. Off-Peak CO_2 Emission Rate (Tons/MWh)[4]



[4] *2006 CPUC Update for Energy Efficiency Proceeding* (Brian Horii, E3).

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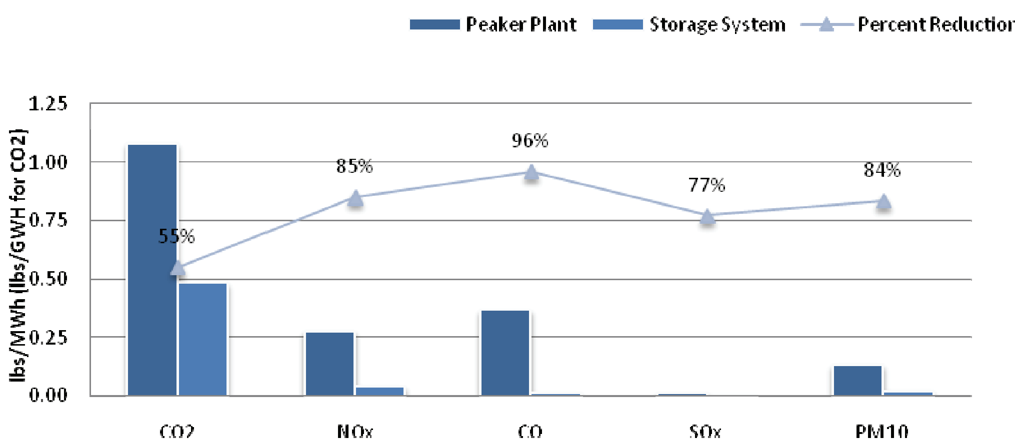
To help illustrate the air quality benefits and cost effectiveness of energy storage as an alternative to natural gas-fired peaker plants, CESA compared the emissions generated on-peak by a gas-fired peaker with the emissions of a kWh of electricity provided on-peak by an energy storage system—as well as the levelized cost of generation (LCOG). For simplicity, this comparison selected a commercially available energy storage technology – lead-acid batteries – with specifications similar to the large lead-acid energy storage peaking facility located in Chino, California. The Chino facility was a 10 megawatt (MW), 4-hour-duration system that successfully demonstrated energy storage's ability to manage peak load from 1988 through 1996.[5][6] Full details of this comparison can be found in CESA's white paper: ***Energy Storage—a Cheaper and Cleaner Alternative to Natural Gas-Fired Peaker Plants***.

Energy storage usage resulted in significant air quality benefits as compared to the natural gas peaker. Assuming Pacific Gas and Electric's base load electric mix as the off-peak source of electricity, energy storage would provide 55% CO2 savings, 85% NOx savings, and up to 96% savings of CO per MWh of on-peak electricity delivered, as depicted in the graph below:



Similarly, for cost-effectiveness, energy storage outperforms the conventional peaker in LCOG. To calculate the cost per kWh of electricity discharged by an energy storage system, the same 20-year project time horizon and 5% capacity factor were used. **This analysis found that the levelized cost of generation for energy storage is less than that of a simple cycle gas-fired peaker:**

CESA also conducted a side-by-side comparison of a flywheel and a conventional combined cycle gas-fired turbine (CCGT) performing frequency regulation. In the study, CESA found that energy storage is more capable of following a faster, frequently changing regulation signal. The following two graphs illustrate the flywheel and CCGT's differences:

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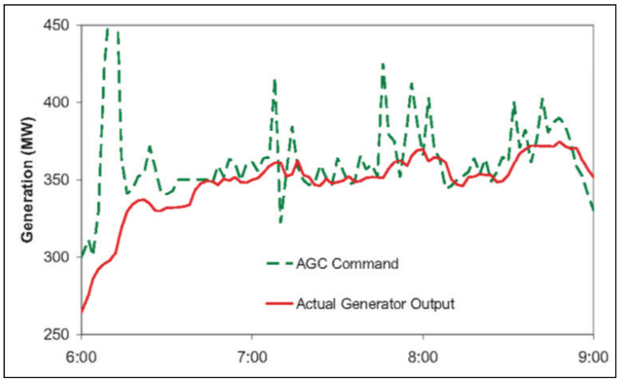
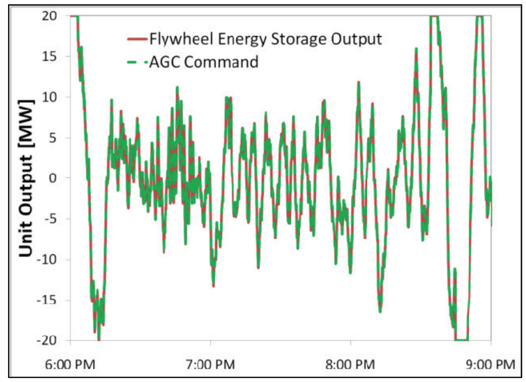
[5] Energy storage performance specifications based on commercially deployed lead-acid grid storage projects, including the EPRI–funded grid level energy storage demonstration project in Chino, California.

[6] EPRI Chino Study TR-101787, *Chino Battery Energy Storage Power Plant: Engineer-of-Record Report* (December 1992).

Fast-Response Energy Storage Provides Near Instantaneous Response to a Control Signal



Slow Ramping of Conventional Generator



Flywheel Energy Storage Example

For the flywheel vs. CCGT frequency regulation use case, the flywheel outperformed the CCGT in all aspects—including financial and emissions metrics:

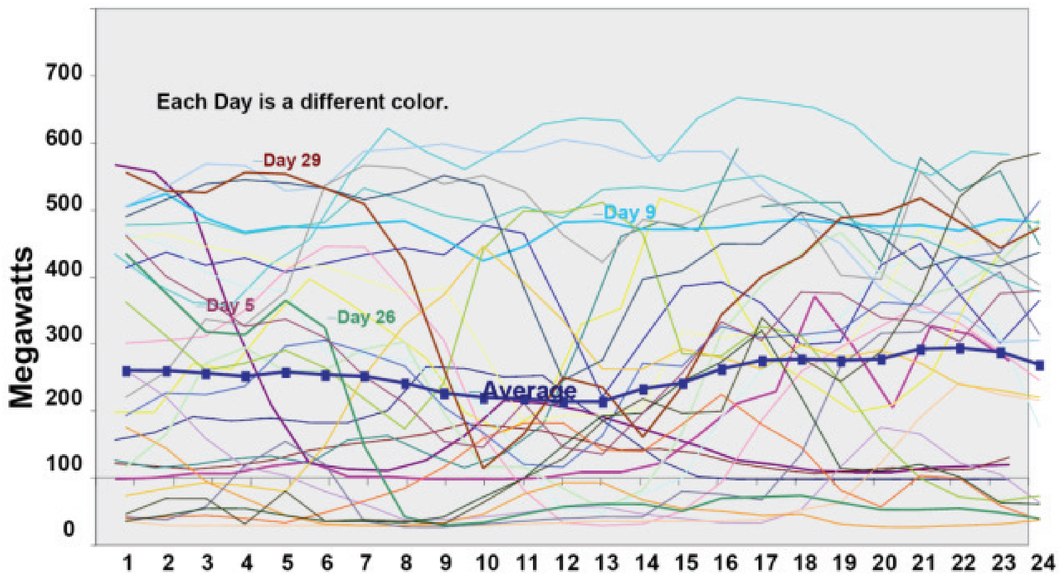
The full CESA white papers and the associated models can be downloaded from CESA's website:

http://www.storagealliance.org/work-whitepapers.html

E. Renewables Integration

It is widely recognized in the energy industry that energy storage can assist with renewables integration. Storage can be an excellent solution to help manage the intermittent/variable nature of wind and solar generation, and thus storage is a valuable enabler for more renewable generation to integrate into California's electric power system. The following wind generation curves illustrate this variability:

One Month's Power from a Wind Farm[7]



The above renewables generation curve data illustrates the variable nature of PV and wind generation. Energy storage can be utilized to smooth and ramp this variability to create a more stable electric system. In the future, as more renewable generation comes online in California, energy storage assets can be placed on the grid from centralized renewable plants at the transmission level to customer-sited renewable systems at the distribution level.

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In addition to assisting the grid with variability, energy storage can utilize anticipated wind overgeneration in California. In the recent *Statewide Joint IOU Study of Permanent Load Shifting*, E3 estimated that with approximately 8,800 MW of wind in 2020, about 1,700 hours of overgeneration will occur (predominately in the spring off-peak hours). Storage can charge during hours with overgeneration and receive the avoided cost benefit of the marginal renewable resource. The following charts from the Permanent Load Shifting workshop presentation held on November 10, 2010 depict this predicted overgeneration:

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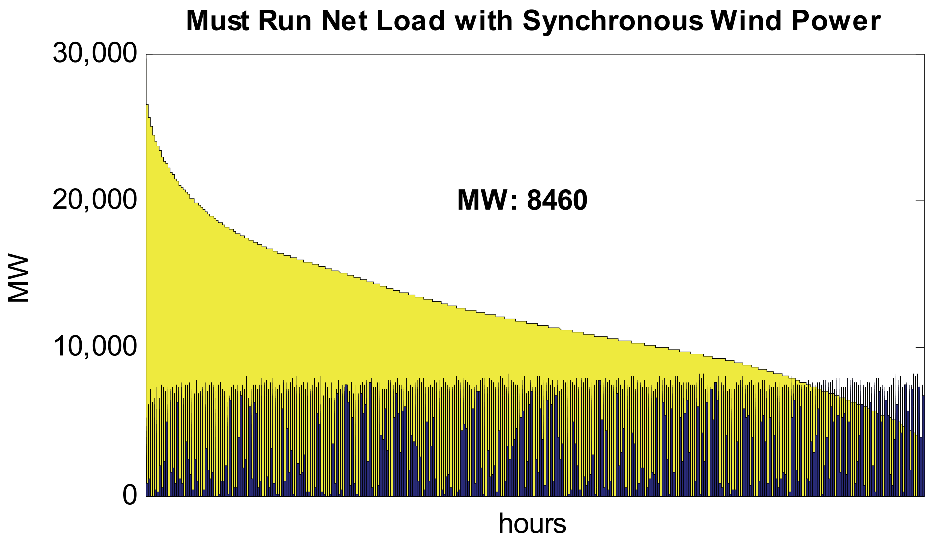
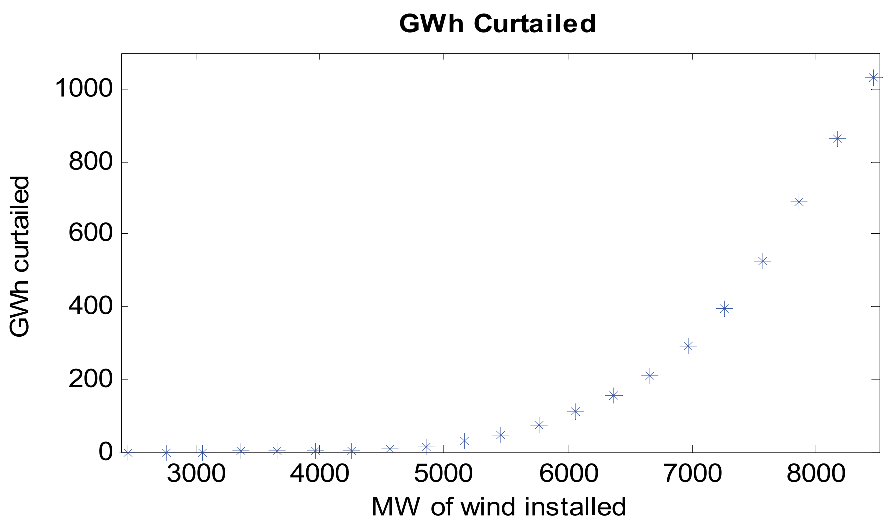
[7] Source: Jay Apt and Aimee Curtright, Carnegie Mellon Electricity Industry Center working Paper CEIC-08-04


Must Run Net Load with Synchronous Wind Power
30,000
20,000
10,000
0
MW
MW: 8460
hours


GWh Curtailed
1000
800
600
400
200
0
GWh curtailed
3000
4000
5000
6000
7000
8000
MW of wind installed

II. THE ENERGY COMMISSION SHOULD PROACTIVELY PROMOTE ADVANCEMENT OF ENERGY STORAGE REQUIRED BY AB 2514.[8]

On December 16, 2010 (before AB 2514 became effective on January 1, 2011) the California Public Utilities Commission (CPUC) opened the rulemaking proceeding it was required to open by March 1, 2012.[9] In opening the rulemaking over a year before it had to the CPUC said:

> "We also open this proceeding on our own motion to initiate policy for California utilities to consider the procurement of viable and cost-effective energy storage systems. Although the Legislature has given the Commission until March 1, 2012 to open this proceeding, we see the enactment of AB 2514 as an important opportunity for this Commission to continue its rational implementation of advanced sustainable energy technologies and the integration of intermittent resources in our electricity grid." (p. 1).

The Energy Commission is well aware of the critical role it is required to fulfill in implementation of AB 2514, and it must act now if it is to exercise needed leadership in marshaling the efforts of California's publicly owned utilities. [10] Pursuant to AB 2514, the Energy Commission has a number of specific rights and responsibilities with respect to Publicly Owned Utilities. Publicly owned electric utilities serving end use customers must, on or before March 1, 2012, initiate a process to determine appropriate targets, if any, to procure viable and cost-effective energy storage systems to be achieved by December 31, 2016, and December 31, 2021. The Energy Commission must, in reviewing the plans and reports submitted by public electric utilities consider the integration of technologically viable and cost effective energy storage technologies with other programs, including demand side management or other means that will result in the most efficient use of generation resources and cost effective energy efficient grid integration and management.

III. THE ENERGY COMMISSION SHOULD EXERCISE AUTHORITY UNDER THE WARREN-ALQUIST ACT TO PROMOTE THE ADVANCEMENT OF ENERGY STORAGE.

The Energy Commission has yet to scratch the surface of the statutory authority it is granted under the Warren-Alquist Act to promote deployment of energy storage. The Legislature recognized the critical role of energy storage when it passed the Warren-Alquist Act in 1976, creating the Energy Commission. In Warren-Alquist the Legislature mandated that the Energy Commission should "adopt a program of electrical load management [that] shall consider…*End use storage systems* which store energy during off-peak periods for use during peak periods." (Public Resources Code Section 25403.5) The Legislature has in fact built the role for storage into the statute's various definitions of eligible renewables (including Public Resources Code Sections 26500, 25619, 25620, 25647, as well as various sections of the Government Code and the Public Utilities Code) and also instructed the Energy Commission to pursue "projects that have the potential to enhance the reliability, peaking power, and *storage capabilities* of renewable energy." (Public Resources Code Section 25620.1).

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8 (Assembly Bill (AB) 2514 – Skinner, Stats. 2010 – ch. 469).
9 *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.
10 *See, CESA 's Comments on the IEPR Committee's Scoping Memo*, December 17, 2010.

In the context of its 2007 IEPR proceeding, the Energy Commission spoke directly to energy storage and other forms of load management:

> "Public Resources Code § 25403.5 gives the Energy Commission the authority to adopt electricity load management standards for each utility service area. The statute identifies several techniques that the Energy Commission must consider, but it does not limit the Commission's authority to the techniques identified. These techniques include: 1. Adjustments in rate structure to encourage use of electrical energy at off-peak hours or to encourage control of daily electrical load. Compliance with those adjustments in rate structure shall be subject to the approval of the Public Utilities Commission in a proceeding to change rates or service. 2. End use storage systems that store energy during off-peak periods for use during peak periods." (pp. 2-3).[11]

Stating that The Energy Commission's load management standards authority can serve as a valuable tool to bridge the gap between the current level of demand response in California and its full cost-effective potential, he 2007 IEPR recognized the importance of load management standards and recommended that the Energy Commission institute a formal process to pursue the adoption of load management standards in 2008." (p. 1). In fact, the Energy Commission *did* open a formal rulemaking proceeding to exercise the broad authority to set load management standards.[12] Unfortunately, Rulemaking 2008-DR-01 has been inactive since 2008. CESA submits that the Energy Commission should return to where it left off with that proceeding.

IV. CONCLUSION

CESA appreciates the opportunity to comment on the Draft Revised Scoping Order. CESA looks forward to continuing to work with the Energy Commission and stakeholders in this IEPR proceeding.

Respectfully,

Janice Lin
Cofounder and Director, California Energy Storage Alliance

cc: Suzanne Korosec, CEC, Assistant Director for Policy Development, via e-mail: skorosec@energy.state.ca.us

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[11] *Notice of Joint Committee Workshop on California's Demand Response and the Load Management,* April 5, 2007, and see *Notice of Committee Workshop on Demand Response and the Energy Commission's Load Management Authority,* May 25, 2007.

[12] *Informational and Rulemaking Proceeding on Demand Response Rates, Equipment, and Protocols*, Docket Number 2008-DR-01, Order Number 08-010210, January 2, 2008.