

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee the  
Resource Adequacy Program, Consider Program  
Refinements, and Establish Annual Local and  
Flexible Procurement Obligations for the 2016 and  
2017 Compliance Years.

Rulemaking 14-10-010  
(Filed October 16, 2014)

**CALIFORNIA ENERGY STORAGE ALLIANCE'S  
PRELIMINARY PHASE 3 PROPOSALS**

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December 16, 2016

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Pursuant to the *Assigned Commissioner and Administrative Law Judge's Scoping Memo and Ruling*, issued September 13, 2016, the California Energy Storage Alliance ("CESA")<sup>1</sup> hereby submits these Preliminary Resource Adequacy Phase 3 Proposals.

**I. INTRODUCTION**

CESA suggests several proposals for consideration by the Commission. This proposal fits within the scope of Resource Adequacy ("RA") Phase 3 which focuses on the establishment of Effective Load Carrying Capability ("ELCC") counts for solar and wind, as well as on durable

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<sup>1</sup> 8minutenergy Renewables, Adara Power, Advanced Microgrid Solutions, AES Energy Storage, Amber Kinetics, Aquion Energy, Bright Energy Storage Technologies, Brookfield, California Environmental Associates, Consolidated Edison Development, Inc., Cumulus Energy Storage, Customized Energy Solutions, Demand Energy, Doosan GridTech, Eagle Crest Energy Company, East Penn Manufacturing Company, Ecoult, Electric Motor Werks, Inc., ElectrIQ Power, ELSYS Inc., Energy Storage Systems Inc., Enphase Energy, GE Energy Storage, Geli, Gordon & Rees, Green Charge Networks, Greensmith Energy, Gridscape Solutions, Gridtential Energy, Inc., Hitachi Chemical Co., Ice Energy, IE Softworks, Innovation Core SEI, Inc. (A Sumitomo Electric Company), Invenergy LLC, Johnson Controls, K&L Gates, LG Chem Power, Inc., Lockheed Martin Advanced Energy Storage LLC, LS Power Development, LLC, Mercedes-Benz Research & Development North America, National Grid, Nature & PeopleFirst, NEC Energy Solutions, Inc., NextEra Energy Resources, NEXTracker, NGK Insulators, Ltd., NRG Energy LLC, OutBack Power Technologies, Parker Hannifin Corporation, Powertree Services Inc., Qnovo, Recurrent Energy, RES Americas Inc., Saft America Inc., Samsung SDI, Sharp Electronics Corporation, Skylar Capital Management, SolarCity, Southwest Generation, Sovereign Energy, Stem, SunPower Corporation, Sunrun, Swell Energy, Trina Energy Storage, Tri-Technic, UniEnergy Technologies, Wellhead Electric, Yunicos. The views expressed in this Proposal are those of CESA, and do not necessarily reflect the views of all of the individual CESA member companies. (<http://storagealliance.org>).

flexible product proposals. CESA additionally proposes analysis of a two-hour Resource RA system product which, as part of a portfolio of resources, could provide appropriate RA service.

**II. THE COMMISSION SHOULD MODEL AND DEVELOP ELCC COUNTS FOR SOLAR PLUS STORAGE AND WIND PLUS STORAGE IN MULTIPLE CONFIGURATIONS.**

As the state moves to establish and implement ELCCs for solar and wind resources, the owners, contractual right-holders, or developers of such resources may see the RA counting value of these resources change. Such changes can be detrimental to resource economics and the viability of projects. The Commission should model alternative ELCCs for wind and solar resources based on how a resource could perform if coupled with energy storage. With established ELCCs for not only stand-alone wind and solar but also for solar plus storage and wind plus storage, resource owners, rights holders, or developers may choose to augment renewable resources with a predetermined amount of energy storage in order to improve the RA counting of these resources.

The addition of energy storage to solar and wind resources could also improve the value of energy generated from these renewable resources by shifting delivery at times to periods of higher energy prices, likely when energy or ramping needs are higher. The addition of energy storage could thus improve the RA count, economics, and usefulness to the grid of these renewable resources.

For example, based on ELCC stochastic modeling, it appears logical that a small addition of energy storage, both in terms of MWs and of MWhs, could materially improve the ELCC of a solar or renewable resource by helping the resource to carry an incremental amount of load in a variety of circumstances. Thus, a small addition of energy storage capacity coupled with the

resource could yield an outsized value to the developer and the grid. This possibility for high return makes this opportunity intriguing and helpful for the state.

**A. The Commission should develop two or more ELCCs for solar plus storage if modeling indicates there is reasonable value.**

CESA recommends the Commission conduct ELCC modeling in at least two different solar plus storage configurations so that developers can consider the benefits and costs of adding energy storage to their resource. The following two ‘packages’ will be particularly helpful.

**Storage Package A:** The minimal optimum: For every 5 MW of rated solar capacity, an addition of  $X$  MW of energy storage with  $Y$  MWh should increase the ELCC by  $Z$  MW. This minimal optimum would represent an amount of energy storage capacity and energy that could, with minimal cost, boost an ELCC dramatically. Calculations of the minimal optimum could be developed through modeling different configurations (*See* Table 1) or through identifying the mathematical function or ‘curve’ of how added storage changes an ELCC (*See* Figure 1). The variables of both energy storage capacity (MW) and storage energy (MWh) may make the curve challenging to develop.

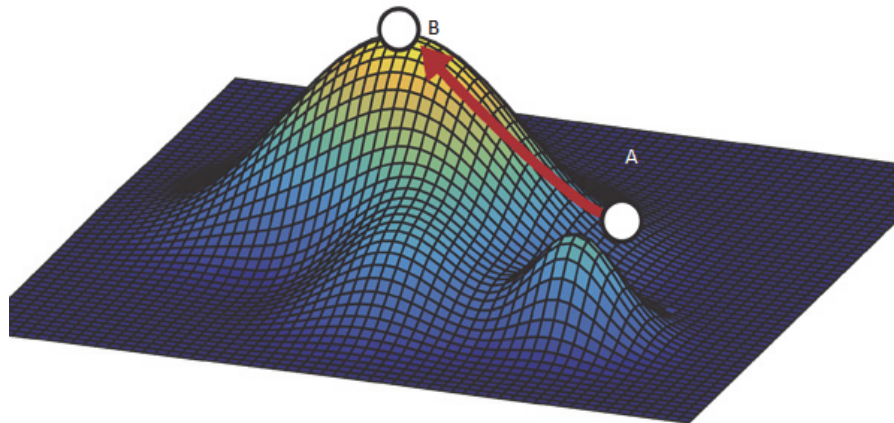
**Storage Package B:** A Secondary Optimum based on a larger energy storage system: For every 5 MW of rated solar, an addition of  $U$  MW of energy storage with  $V$  MWhs shall increase the ELCC by  $W$  MW. This secondary optimum would represent a somewhat larger amount of energy storage (MWs and/or MWhs) than Package A, and would yield a larger boost in ELCC than in package A. Depending on project costs and criteria, it may make sense for some projects to seek to maximize their RA count through Package B, instead of marginally boosting their RA through package A. As with Package A, the appropriate levels of energy storage (MWs and MWhs) for

Package B could be determined through iterative modeling runs or through the development of a solar plus storage mathematical function. Package B represents a point of problematically decreasing diminishing returns based on the ability to boost ELCC by adding energy storage.

*Table 1: Hypothetical ELCC Chart of Solar Plus Storage in Various Storage Configurations*

	<b>.25 MWh</b>	<b>.5 MWh</b>	<b>.75 MWh</b>	<b>1 MWh</b>	<b>1.5 MWh</b>	<b>2 MWh</b>
<b>.25 MW</b>	?	?	?	?	?	?
<b>.5 MW</b>	?	?	?	?	?	?
<b>.75 MW</b>	?	?	?	?	?	?
<b>1 MW</b>	?	?	?	?	?	?
<b>1.5 MW</b>	?	?	?	?	?	?
<b>2.0 MW</b>	?	?	?	?	?	?
<b>2.5 MW</b>	?	?	?	?	?	?

Figure 1: Hypothetical Curve of ELCC for Solar with Different Storage MWs and MWh configurations<sup>2</sup>



**B. The Commission should develop two or more ELCCs for wind plus storage if modeling indicates there is reasonable value.**

Wind resources too may benefit from the option to boost their capacity count and shift output through the addition of energy storage. Similar to the above proposal for solar plus storage, the Commission should undertake consideration of wind plus storage modeling. The nature of wind generation profiles may direct very different ‘packages’ of storage. Analysis will reveal what packages are optimal, if any. Again, CESA recommends the development of at least two packages, assuming they are significantly different in the amount of the additional energy storage as well as in the resulting ELCC boost.

Energy storage developers are generally equipped with capabilities to contemplate the economics of adding energy storage to renewable generation projects. A deep understanding is needed of the ELCC modeling and of counter-factual cases of dispatches of resources with

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<sup>2</sup> Hypothetical curve included to provide a visual example of what a curve for ELCC with various solar plus storage configurations could resemble, although a different overall shape to the curve could be expected. Points A and B were added as representations of the ELCCs under Packages A and B. This graph was provided through an unrelated article: “Environmental Changes Bridge Evolutionary Valleys,” Steinberg and Ostermeier, *Science Advances*, January 22, 2016, <http://advances.sciencemag.org/content/2/1/e1500921.figures-only>.

energy storage versus without will help in the determination of appropriate cases for modeling or in the formulation of a curve for ELCC for solar plus storage and ELCC for wind plus storage.

**III. THE COMMISSION SHOULD DEFINE EFFECTIVE FLEXIBLE CAPACITY BASED ON TWO-HOUR RAMPING CAPABILITIES AND SHORTER START-UP TIME.**

Based on analysis, both the California Independent System Operator (“CAISO”) and the CAISO’s Department of Market Monitoring have stated that the current “Flex RA” counting approach of a ‘3 hour ramp’ yields does not guarantee a correctly committed fleet for the CAISO’s markets. The RA program can address this reliability concern by changing the RA counting convention from a 3-hour ramp capability to a 2-hour ramp capability. Such a rule change would limit the ability of slow-start resources to qualify as Flex RA, and would instead yield a Flex RA fleet that more readily meets the real-world flexibility needs of the CAISO system.

Rules to change the Flex RA count of resources based on start-up times should also inform this change. Future grid conditions are expected to be more variable and uncertain, and short-start resources provide more optionality in their commitment, better serving the CAISO’s needs. For example, it could be that resources unable to be committed by RTUC for flexibility needs could be made ineligible.

**IV. THE COMMISSION SHOULD CONSIDER AND AUTHORIZE A 2-HOUR SYSTEM RA PRODUCT.**

CESA views RA as a planning exercise that yields a fleet that is capable of meeting all the needs of the grid over a defined planning period. Logically, diversity in the fleet offers benefits, and the Commission has historically used ‘buckets’ to shape the levels of participation from different resources. Currently, 2-hour energy storage resources are ineligible to serve as

RA resources. The Commission should establish eligibility criteria and related rules for a two-hour product.

**V. CONCLUSION**

CESA appreciates the opportunity to submit these preliminary proposals for rule changes and modeling in the RA proceeding, and looks forward to working with the Commission and parties on the further development of a durable and robust RA program.

Respectfully submitted,



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