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<u>**VIA FEDERAL EXPRESS AND EMAIL**</u>

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RE: <u>Questions on Energy Storage Policy Data for 2009 IEPR</u>

Dear Mike:

Thank you for giving CESA the opportunity to answer questions on Energy Storage Policy Data for 2009 IEPR. Below is our formal response to your request. Please contact me if you have any questions.

1. **How do you define utility scale energy storage?**

A perhaps more meaningful term than "utility-scale" that is increasingly used is "grid-scale," which means "of value to or deriving value from connection to the grid." In California today, operating under a FERC-approved tariff, the CAISO is the *de facto* arbiter of what energy storage it will pay for. As a practical matter, what currently has value in current CAISO management of the grid is any kind of energy storage technology that is able to shift, in aggregate, 1MW or more. Of course, this explicitly includes smaller distributed energy storage systems that in aggregate can total up to 1MW. One MW is meaningful from a policy perspective because it is the size threshold that is technically and administratively cost-effective for the CAISO's purposes. Energy storage systems may or may not be centrally controlled—in other words, they are still "grid scale" even if an electric distribution utility doesn't have a direct role in controlling the energy storage (e.g. end-use customers could be responding to a retail or wholesale program or price signal).

"Utility-scale" itself isn't defined to our knowledge. Key in fact is that energy storage is "utility-friendly" and "utility-grade." That means, among many other positive attributes, it (i) performs reliably and cost-effectively, (ii) advances other utility and grid goals like reliability, peak reduction, CO2 reduction, voltage regulation, and (iii) is “smart” and controllable (although not necessarily directly) by utilities. We note that at one time small distributed renewables (such as PV, wind, and biomass) and demand-side management were considered too small and distributed to be appropriate utility-scale/utility-grade resources, but now, quite appropriately, they are at the top of California’s loading order. Similarly, today there are some who might believe that certain energy storage seems too small and distributed to be “utility-scale.” But as long as a given energy storage technology can make a meaningful and cost-effective contribution to the above utility-grade attributes, it is an appropriate resource for the power grid – even if individual units are measured in kW not MW – and deserves support by utilities, the CAISO, and the State government.

2. Are you aware of any published definitions of energy storage (utility or distributed scale) that would describe the differences between different levels of storage?

Somewhat surprisingly, there is no published definition of “energy storage” *per se* that can be gleaned from the most likely energy industry or governmental sources such as NERC, or EIA glossaries of terms. This fact is most relevant as it relates to the answer to question number 3, below and is addressed there. In terms of “different levels,” there are two parameters to consider. If the “level” were considered in terms of size (measured in MW) the differences would relate to qualification thresholds for various tariff or incentive programs. Another important level to consider is length of storage time and discharge rate. There is a very wide spectrum of energy storage subcategories that can be stratified from permanent load shifting, such as thermal energy storage on one end (many hours) to flywheels used for regulation or power smoothing (seconds or less) on the other end.

3. Can you provide any justification/useful information as to why California should consider energy storage as a fourth category?

Energy storage is very different than generation, consumption, transmission and distribution and therefore it is appropriate and crucial is that it has its own category for purposes of *inter alia* qualification for incentive programs (such as the SGIP), tariffs, and utility rate base treatment. In an order approving wholesale rates for electricity sold by the Norton compressed air energy storage facility in 2001 the FERC clearly articulated the basic reason that energy storage is a “thing” unto itself: “While common industry practice is to use ‘energy’ and ‘electric energy’ interchangeably, for the purposes of this order, the Commission distinguishes between the terms as follows. The term ‘energy’ is used in the technical sense to mean the ‘capacity for doing work’, while ‘electric energy’ is used to mean electricity, one of the several forms energy may take. (Other forms of energy include nuclear, mechanical, radiant (or light), thermal (or heat), and chemical.) We make this distinction to ensure that the phrase 'energy storage facility' is understood as not implying that electric energy is being stored, since, by definition, electricity cannot be stored." California is moving in the right direction by creation of a regulatory storage category at the retail level, as a specific subset of demand response, referred to as "permanent load shifting." However, California should much more explicitly align itself with the direction that the FERC is taking to afford equal treatment to generation and load in terms of pricing and direct access to the wholesale market for ancillary services with its Orders 890 and 719, and its Smart Grid Policy.

In a recent proposed decision approving utility demand response programs, the CPUC stated that: "The phrase 'permanent load shifting' refers to the shifting of energy usage by one or more customers from one-time period to another on a recurring basis. Permanent load shifting often involves storing electricity produced during off peak hours and then using the stored energy to support load during periods when peak energy use is typically high. Examples of permanent load shifting technologies include battery storage and thermal energy storage. Thermal energy storage draws electricity during off-peak hours, which it stores in the form of thermal energy in ice, chilled water or a eutectic salt solution. That stored energy can be used during peak hours, generally to cool buildings without drawing additional electricity from the power grid during the day."

The CPUC's proposed decision, of course, dovetails with the recent FERC Smart Grid Policy, which states that: "For the purposes of this Policy Statement, electric storage refers to the storage of different forms of energy that may be beneficial to the bulk-power system. For example, while pumped hydroelectric storage refers to the potential energy stored in a reservoir of water, it is the conversion of that energy to electricity by a water turbine generator that makes it useful. Similarly, a flywheel stores kinetic energy to spin a generator, and batteries convert chemical energy directly into electricity. Moreover, there are useful applications for stored energy (for example, thermal energy) that is not converted into electricity, but can substitute for electrical power by providing an end use."

4. What existing or new State and Federal legislative (or other) actions should be highlighted/noted in the 2009 IEPR?

Including advanced energy storage technology that is integrated with qualifying renewable generation technology in California's SGIP is a significant step already taken by the CPUC. Pending state legislation, such as SB 412 (Kehoe) would further expand the role of energy storage incentives. Another bill, AB 44 (Blakeslee), would allow utilities an incentive

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rate of return and require a prominent place for storage in utility long term procurement planning.

Federal legislative actions regarding energy storage of note are the significant financial support for energy storage in the American Recovery and Reinvestment Act of 2009 (the "Stimulus" legislation, P.L. 111-5); the introduction of the "Storage Technology of Renewable and Green Energy (STORAGE) Act" by Senator Ron Wyden and others (S.1091) and other legislation to provide tax incentives for qualifying energy storage devices; and the passage by the U.S. House of Representatives of the American Clean Energy and Security Act of 2009 (H.R. 2454), with provisions that explicitly and implicitly promote the deployment of energy storage. (This is likely to increase over the coming months due to the many actions currently underway at both the state and federal level on energy policy.)

5. **Are you aware of any document referencing how much energy storage should be applied to the electric grid to assist in integrating renewables? If so, what is it/where can it be found?**

For reasons that are not readily apparent, the preliminary results of a 33% RPS Implementation Analysis being conducted by the CPUC's Energy Division staff, makes no attempt to quantify a role for energy storage. There are many guesses based on various degrees of rigor in analysis of available data that arguably net to nothing particularly helpful. For example, a recent Pew Center for Global Climate change states: "Global electric energy storage capacity is 90 GW, which is only 3 percent of electric power production capacity due to the high capital cost of electric energy storage compared to natural gas power plants which can provide similar services, and regulatory barriers to entry in the electricity market. Of that global capacity, 22 GW of electric energy storage is in the United States (2.5 percent of U.S. power capacity)." Unfortunately there is no way to assess the method used to reach this conclusion.

It is worth noting that the amount of energy storage that is necessary and cost-effective typically rises faster than does the level of renewables in a system for at least two reasons. One, small amounts of intermittency can be responded to by various operational means, but large amounts of intermittency need capital plant such as cost-effective energy storage. Two, ambitious renewables mandates such as the 33% RPS will be largely met by wind (and perhaps PV) rather than other renewables such as biomass or geothermal, and thus will highlight the significant intermittency and off-peak nature of wind and to a lesser degree PV.

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6. Is there a way to easily define the barriers that prevent energy storage from utilizing all of its possible revenue streams? Are there recommendations for how to resolve the identified barriers?

Not at this time. This is in fact a very important question that deserves the considerable attention and resources of the CEC and other utility-sector decision-makers and stakeholders, as they have devoted to demand response, energy efficiency, distributed renewables and other non-traditional energy resources.

Accordingly, CESA intends to do this as the core of a proposed comprehensive vision setting, policy analysis, and road mapping undertaking (including developing potential recommendations) for energy storage in California. To undertake this important work in a timely and thorough manner, CESA will be recommending that the CEC provide at least $100,000 in funding to conduct the underlying benefits analysis and other work by the CEC, CESA and other parties regarding barriers to the deployment of cost-effective energy storage. Recommendations will be supported by data and analysis and are anticipated to be along the following lines:

(a) Increase PIER funding for wide-scale demonstrations of advanced energy storage in different cross-cutting applications in the marketplace -- to demonstrate capture of multiple value streams in various applications and business models

- Energy storage with renewables (distributed and wholesale)
- Energy storage integrated with onsite renewables and demand response
- Energy storage integrated with all of above plus emergency backup applications -- to help achieve highly reliable islanded loads with no onsite emissions

(b) Expand commercial incentives for distributed energy storage -- via the California Self Generation Incentive Program

- Stand-alone energy storage
- Energy storage coupled with solar

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(c) Develop and implement energy policy that encourages peak load reduction. Examples:

- Tariff design that appropriately values the cost of generating and delivering energy on peak
- A multiplier benefit for renewables delivered on peak
- Peak reduction standard for California state agencies
- Increased rate of return for utility investment in energy storage

(d) Help create industry standards to assist with market deployment of energy storage – including, for example:

- Standard quoting/sizing/costing/performance parameters, similar to what the CEC has done for photovoltaics
- Standards for interconnection
- Standards and protocols for dispatch
- Standards for environmental siting/permitting that different local city and county governments can use as a framework for grid connected energy storage applications

(e) Explicitly add energy storage as a key enabling technology to California's loading order, and thus help achieve the goals of the loading order while improving cost-effectiveness, grid reliability, overall system energy efficiency, GHG mitigation and other electricity, efficiency, demand response and renewable energy goals.

7. Is there a computer model representation for utility scale energy storage systems (>50MW) suitable for overall grid analysis? If so, where can it be found?

Yes, E3 has a model that can do this. We understand that it has been under development for over four years. E3 is a key consulting firm CESA would like to use to do the comprehensive analysis proposed in CESA's answer to question number 6, above. (We note, however, that consistent with our response to question number 1, above, we do not agree that >50MW is an appropriate definition of "utility scale" energy storage.)

8. Do you have any specific recommendations for future PIER research in the area of energy storage that should be identified in the 2009 IEPR?

Yes. As stated in CESA's answer to question number 7, above, the CEC should provide funding for CESA to do the comprehensive analysis with a team that includes E3. CESA also advocates for PIER funding to include wide-scale demonstrations of distributed, aggregated systems storage systems—both stand-alone ones integrated with any form of generation technology, and those coupled with demand response and distributed renewable generation resources.

Sincerely

Janice Lin