

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

Order Instituting Rulemaking to Continue Implementation and Administration of California Renewables Portfolio Standard Program	Rulemaking 08-08-009 (filed August 21, 2008)
Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues	Rulemaking 08-03-008 (filed March 13, 2008)

**RESPONSES OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR  
TO DATA REQUESTS ISSUED BY ENERGY DIVISION**

The California Independent System Operator Corporation (“CAISO”) submits these responses to the Data Request issued by Energy Division dated February 18, 2009, and circulated by email dated February 18, 2009, to the service lists in the above-encaptioned proceedings. The Data Request stated the following:

Energy Division staff is collecting information on Advanced Energy Storage (AES) technologies and the benefits attributable to the increased usage of storage on either the customer side of the meter or the utility side of the meter. Energy Division staff invites interested stakeholders to provide information on AES technologies to inform staff’s ongoing analysis of policy and program options that could further encourage the deployment of AES applications in so far as storage can help further the energy policy priorities of the State of California, in particular increasing the use of renewable energy.

Data Request No. 1(a)

**1. Types of Benefits**

a. Customer Side of the Meter Applications

Staff is interested in the types of benefits that accrue when customer-side AES technologies are used either in stand-alone applications or in conjunction with a renewable energy system.

- Describe different types of benefits of customer-side AES (either stand-alone or not) and to whom the benefits accrue. For example, one type of benefit could be savings from energy arbitrage that accrue to the AES owner, another could be reduced demand charges for the AES owner, and a third could be the value of deferred transmission and distribution upgrades that accrue to utility ratepayers.

Response to Data Request No. 1(a)

Customer energy storage associated with photovoltaic (PV) units would smooth the minute-to-minute fluctuations in energy production from the PV units. This would potentially reduce voltage flicker at both this customer site and for the other customers that are connected to the same distribution facility (low side of the distribution transformer).

Unless there are real-time retail rates for customers, it is difficult to see how the customer could arbitrage the volatility of electric rates. A large amount of energy storage would be required to store several hours of off-peak energy, for delivery during on-peak periods. For instance, if a customer had a plug-in electric hybrid vehicle that could provide some energy storage, the customer could potentially take advantage of special lower rates at night for charging up the vehicle's battery and discharge any surplus (unneeded) energy from the vehicle during peak periods with higher rates.

Large commercial and industrial customers could use short-term storage to eliminate load spikes that would drive up their demand charges. This would require that the customer have a load that experiences spikes, such as large motors or other non-conforming loads.

Data Request No. 1(b)

b. Utility Side of the Meter Applications

Staff is interested in the types of benefits that accrue when utility-side AES technologies are used either in stand-alone applications or in conjunction with a renewable energy system.

- Describe different types of benefits of utility-side AES (either stand-alone or not) and to whom the benefits accrue.

Response to Data Request No. 1(b)

There are 3 potential applications for utility installed energy storage on a distribution system:

1. On the low voltage side of the distribution transformer;
2. In an optimum location on the distribution circuit; or
3. At a distribution substation.

A utility could install lithium-ion (“LI”) batteries on the low side of distribution transformers for areas with customer installed PV systems. The utility’s objective would be to improve voltage control for the customers, reduce voltage flicker, and provide a way of managing peak loads of distribution transformers.

If the storage devices are installed in optimum locations on the distribution circuit, then they could provide voltage support and power quality for a large group of customers in that area.

If the storage facility is located in the substation, then the utility could use the storage system to shave the peak load for the substation transformer and potentially extend the life of the transformer for several years. Again, the storage device can be used for substation voltage support. If the device has the capability for a number of MW-Hrs of energy storage, then it could be used to provide Blackstart capability by helping to re-energize the electrical system and providing cranking power for local generation facilities. In this regard, it would help the system manage large inrush currents for the start up of large loads and would provide dynamic VARS for voltage support.

Data Request No. 2

**2. Identifying and Removing Barriers to AES Deployment**

What are the key technical, economic and policy barriers preventing greater deployment of renewables-related AES in California, and how might California policymaker’s best address these barriers?

Response to Data Request No. 2

The key barrier today is how to finance energy storage facilities. One would expect that an investor in AES would desire to have some guarantee of a revenue stream for a number of years. Generally, an investor in a renewable generation facility cannot find financing for construction of the facility until it has a signed Power Purchase Agreement (PPA) with a local utility. Likewise, an investor in AES is likely to need a PPA or, if the utility is the owner of the AES, a guarantee that the utility can place the capital cost into the utility’s rate base.

The Commission may consider whether having an incentive program for AES is appropriate, perhaps along the lines of programs similar to those enjoyed by wind and solar generators. This could help to drive down the costs for the early investors (i.e., the first 100-200MW of energy storage) and help to build up the volume. The larger the volume of energy storage orders, the more the cost can be driven down on a per-unit basis.

A perceived policy barrier is that, if the energy storage device were owned by the utility, and it were in the utility rate base, then the utility could not bid that resource into the CAISO Ancillary Services (“AS”) market. This issue reflects a limitation in regulatory policy and the way in which regulators view the distinction between rate-based assets and market assets. This limitation may be valid, but, then again, it may not. If the AES can provide both i) transmission (or distribution) services and ii) also provide AS (such as regulation or operating reserves), then it is incumbent on policy-makers to, at least, investigate the viability of new regulatory paradigms for such resources.

AES has the advantage that it can be located anywhere – even in normally constrained urban areas. It emits low or no GHG, it is not noisy, and, typically, it does not have serious environmental constraints. Accordingly, AES could be located in a warehouse in urban areas, such as San Francisco, San Diego or Los Angeles. As noted, AES can be used for load shifting or to provide local voltage support and unload transmission circuits into constrained areas. This said, before authorizing the procurement of AES, such devices must be demonstrated to be cost effective in terms of the services provided or in reducing emissions and meeting other environmental goals. The Commission, therefore, should support the development of pilot projects, in order to evaluate the potential benefits of AES, through the collection of actual performance data.

### Data Request No. 3

#### **3. Customer Interest in AES Technologies under Current AES Incentives**

Utility customers who plan to own or host new AES systems, and AES manufacturers or integrators, please answer the following sub questions:

- a. Will the incentives for AES in SGIP per (D.) 08-11-044 be sufficient for your firm to develop integrated storage/fuel cell or storage/wind projects? Why or why not?
- b. Has the AES SGIP incentive changed your firm’s near term priorities? If so, how?
- c. How, if at all, should the AES SGIP incentive for small wind and fuel cells be modified?

The CAISO offers no response to this Data Request

The questions are not applicable to the CAISO and, accordingly, the CAISO provides no response. Instructions in the Data Requests noted that “[r]espondents can provide information on some or all questions.”

Data Request No. 4

**4. Potential Policies to Support AES Technologies**

What (if any) additional support could CPUC approve for renewables-related AES? Describe and defend the type of policy best suited for this purpose and the correct incentive level(s) if applicable. Possible types of support could include revision of customer tariffs, a new ratepayer-funded rebate (based on AES capacity, use levels, or something else), or an increased rate of return for utilities owning AES.

Response to Data Request No. 4

The increase in the amount of wind generation over the next 5 to 10 years will result in some serious mismatch of load and generation in off peak periods (11 PM to 6 AM). Energy storage can provide the additional nighttime load that will be essential for capturing the excess production of green energy and to shift the delivery to critical afternoon peak load periods. There are a variety of AES technologies that are capable of providing this energy shifting:

1. Pump Storage facilities;
2. Compressed Air Storage; and
3. Batteries and Plug-in Hybrid Electric Vehicles (“PHEV”)

Flywheels and AES with limited amount of energy storage may provide Regulation Services, but do not have a deep enough energy storage capability to provide the energy shifting that will be required to accommodate increasing levels of renewable energy on the electrical system.

To the extent that there are retail or customer applications of AES, i.e. PHEVs, the Commission should evaluate existing rate structures and consider whether there are proper incentives for customers to utilize the technologies as intended. Further, to the extent the AES acts as transmission equipment, the primary means of recovering the utilities’ costs will be through federally approved transmission rates. Nevertheless, there may be some means to augment the utilities’ rate of return, through Commission jurisdictional rates, if federal rates of return prove to be insufficient to spur AES development from a transmission standpoint. Smart metering and the development of ‘Smart Grid’ systems are likely to be key infrastructure requirements, and the Commission should encourage these investments. Again, prior to engaging in enduring policy changes, the Commission should support pilot projects that evaluate the value of such resources to ratepayers.

Data Request No. 5

**5. California Market Potential for AES Technologies**

Annually between 2009 and 2020, what are appropriate statewide targets for AES that adds value to solar PV, other renewable customer generation or RPS-eligible systems in California (being specific about what targets are appropriate for what types or applications of AES)? What is the analytical justification for your suggested targets?

Response to Data Request No. 5

At this point, the CAISO does not have good data on the performance characteristics of PV devices, nor have we built models that could help answer this specific question. It is a good question, but it will require some research and development and analytical engineering work to create a discussion paper and insights on the optimum solution.

Data Request No. 6

**6. Policy Justifications for Support for Storage**

Conceptually, please comment on whether and why it makes sense for ratepayers to subsidize AES given the benefits of subsidizing additional renewable energy generation, energy efficiency, demand response or other emissions-reducing or load-shaping strategies with lower costs.

The CAISO offers no response to this Data Request

The questions are not applicable to the CAISO and, accordingly, the CAISO provides no response. Instructions in the Data Requests noted that “[r]espondents can provide information on some or all questions.”

Data Request No. 7

**7. Other Useful Information**

Please submit any market studies, papers or other information that staff may find useful in its analysis of AES benefits.

Response to Data Request No. 7

The CAISO is preparing a more comprehensive paper on energy storage concepts and potential value of storage. The CAISO will share the document with the Commission and other interested parties when the paper is completed and ready for release.

Data Request No. 8

**8. Additional Questions Specifically for Storage  
Manufacturers/Integrators:**

a. Please provide

- a description of your technology,
- the specific target market applications your firm is addressing (i.e., back up/emergency power, peak shaving, integration with renewables on customer or utility side of the meter) and
- relevant product specifications/performance attributes (average range of kW, kWh, max. hours discharging at full capacity, round trip efficiency, average system life in years, environmental siting issues and any other useful performance characteristics).
- cost or price information. Please provide the following for the years 2000, 2005 and 2009, and projections for 2015 and 2020 (listing corresponding installed capacity levels for each year, including projections for future years): total installed cost broken down by 1) energy-related cost (\$/kWh), 2) power-related cost (\$/kW), 3) balance-of-plant cost (\$/kW). Please also list separately the following cost components (all measured in \$/kW): 1) capital cost of equipment, 2) installation cost, 3) operation & maintenance cost, 4) disposal cost, 5) replacement cost, 6) any other relevant cost components.

b. Provide qualitative and quantitative descriptions of your firm's existing AES installations currently in operation and being used in conjunction with solar PV, other renewable customer generation or RPS-eligible renewable energy systems. For example, who is the owner, what is the application, how is the project creating value and what if any policies/programs supported the development of the project? What percent of the total project cost was funded by those programs?

The CAISO offers no response to this Data Request

The questions are directed to specific manufacturers and are not applicable to the CAISO. Accordingly, the CAISO provides no response. Instructions in the Data Requests noted that “[r]espondents can provide information on some or all questions.”