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California Energy Commission
Dockets Office, MS-4
Re: Docket No. **09-IEP-1G**
1516 Ninth Street
Sacramento, CA 95814-5512

Re: 2009 Integrated Energy Policy Report (IEPR)- Docket No. 09-IEP-G: 2009 IEPR – Energy Storage Technologies

To Whom It May Concern:

Pursuant to instructions given at the April 2, 2009 Workshop on energy storage technologies at the California Energy Commission (CEC), Southern California Edison Company (SCE) hereby submits the attached written comments on the questions identified for the April 2 Workshop. If you have any questions or need additional information about this request, please contact me at (916) 441-2369.

Very truly yours,

/s/ Manuel Alvarez

Manuel Alvarez

MA:md

Enclosures

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Questions for April 2nd Workshop on Energy Storage Technologies

1. What barriers and/or obstacles have prevented large, utility scale electricity energy storage systems from being installed in California and the nation?

Even with the greatly increased penetration rate of wind and solar renewable resources, to date the combined generating capacity of the Western Electricity Coordinating Council (WECC) existing resources has been sufficient to accommodate the variations in output from these resources without significant operational or economic impacts. This situation is expected to change, however, as the percentage of variable renewable resources increases in response to the state's goals and mandates, and especially as such resources are concentrated in locations which may be electrically remote from utility load centers.

Further, sources of funding have been limited for new state-of-the-art Energy Storage Systems (ESS). Technology research and assessment activities need funding in the effort to implement the study of the various energy storage technologies. More study is needed to understand the capabilities of existing and future ESS technologies, assess their respective grid and market costs and benefits, and determine the need for future improvements. Funding to perform these necessary studies has been limited.

Additional policies needed to effectively support ESS implementation include the following:

- Costs should be allocated equally to all load serving entities. The benefits of energy storage impact all users of the transmission and distribution systems. As such, all benefitting customers should be equally responsible for the associated costs.
- Societal benefits from meeting the State's energy goals and requirements should be considered when assessing the costs and benefits associated with any smart grid technology.
- Load-serving entities should be encouraged to develop voluntary programs to meet specific business needs, as opposed to command and control regulations.
- ESS that are not connected "behind the meter" or behind a generation interconnect should be designated as utility grid assets.

2. How does energy storage affect the ramping and regulation of renewable energy sources?

With increased penetration of renewable intermittent resources, the grid will require more fast-starting and/or fast-ramping resources to make up for generation shortfalls when such resources are not operating at their expected output levels. Energy storage can help serve this function.

Additionally, as a point of semantics, energy storage facilities can be used to compensate for, or mitigate, the effects of variations in output from wind and solar generation resources. However, the storage technologies themselves will not directly affect the ramping and regulation characteristics of the resources. Storage technologies can be used to complement, or levelize to a degree, the output from intermittent resources.

The capacity available from wind and solar generation tends to be variable or intermittent because the primary energy resource powering these facilities cannot easily be stored -- in contrast to traditional coal, oil, and gas fired generation, and renewable biomass or geothermal resources. The situation for wind and solar is analogous to "run-of the river" hydro resources, where the energy to be produced must be captured when and where it is available. When energy production does not match the load, then this generation must be regulated and "ramped" up or down to match the load. In order to produce an output energy shape that matches the load, some type of energy storage would need to be used.

Wind, solar, biomass and geothermal renewable resources have very different operating characteristics, and the extent to which expanded reliance on resources requires additional ramping/regulation will vary depending on the going-forward mix of renewable resources. Currently, utilities procure renewable resources primarily through an auction process (Renewables Portfolio Standard solicitations), which makes selections based on least-cost and best-fit criteria. As a result, it is important that the development of ESS resources be coordinated with, and responsive to, trends in development of cost-effective renewable resources.

Additionally, it should be noted that different storage technologies have different ramping and regulation capabilities. Compressed Air Energy Storage (CAES) tends to be slower than electro-chemical batteries, flywheels, or pumped hydro facilities, but CAES may be a more economic application to compensate for daily production cycles and certain regulation/ramping requirements. The bottom line is that different forms of storage, like generation technologies, are not homogeneous or fully interchangeable. The needs and characteristics of the system need to first be identified, and then the correct remedial technologies need to be applied. More analysis and meaningful demonstration testing will be required.

3. **What value does a large scale electric energy storage system provide for the integration of large amounts of renewable resources as compared to other backup or intermittency support alternatives?**

   Energy storage technologies have the ability to both absorb and return energy to a utility system, whereas fast-acting combustion turbines or internal combustion engines only have the ability to increase output to fill the "valleys' or make up for the shortages which may occur when variable resources (wind, solar, wave, etc) are not available. The "storage" or "energy accumulation" abilities of many of the current energy storage systems allow such technologies to be more valuable than fast-acting generation alone, albeit at a higher cost.

   The issues associated with integrating a large amount of intermittent renewable resources can be solved by the application of several alternatives. Energy storage is but one of these potential solutions. Further studies, including meaningful demonstrations projects, are needed to determine the amount of storage required, the lifecycle costs and benefits of these systems, and the value of such systems in different applications. It is not yet known if energy storage will prove to be the most cost-effective solution for many of the issues associated with renewable integration. SCE is planning a CAES project and an Automotive Derivative Large Scale Battery project to provide more information on these applications.

4. **Where should large, utility scale electric energy storage systems be deployed to have the greatest beneficial impact on meeting the RPS goals of 2020?**

   Studies have not yet been completed which will determine the optimal amounts, locations, or combination of storage technologies that will best accommodate the RPS goals stated for 2020. Depending on the types of needs that might be identified in such studies, storage capabilities may be needed both at the resource locations and at the load centers to regulate and buffer the flow of energy to meet customer needs. SCE has an application pending at the California Public Utilities Commission (CPUC) to obtain funding (Renewable Integration & Advancement project) to perform some of the necessary studies. As mentioned earlier, the various storage technologies available have varying capabilities and characteristics and should not be simplistically aggregated as a universal solution that will solve all problems.

5. **What is the cost of ownership of electrical storage systems, what benefits will be accrued, and how will they be distributed?**

   More study is needed to accurately assess the costs of ownership and the benefits to be accrued, because many types of energy storage are essentially in their infancy stages and the costs are significantly changing. The costs of any required energy storage should be distributed equally to all benefiting customers.

6. **What are the challenges and solutions to having the costs associated with energy storage systems be recouped from those who benefit from the technology when the benefits are expected to be provided to multiple beneficiaries?**

   Any energy storage systems that are not integrated behind the customer's meter or behind a generation interconnect should be considered a grid asset, and cost recovery should be handled in a manner similar to other grid devices like capacitor banks and static VAR compensators.

7. **What actions are being taken by the electric energy storage industry to bring down the overall costs of large, utility scale electric energy storage systems?**

   Not Applicable.

8. **What incentive programs or other economic stimulus alternatives can be proposed that will encourage the deployment and fielding of more large, utility scale electric energy storage systems in California?**

   Currently, both SCE and PG&E own and operate pumped storage facilities which have been in place since the 1980's. There has not been a need for additional ESS developments (as described in response to question 1), so lack of financial incentives has not been a barrier to ESS development. However, an increased rate of return above the standard would be helpful to mitigate the risks that utilities may face in developing new ESS technologies, as the need for such facilities develops. PUC Code 454.3 allows for up to an additional 1% above the rate of return for renewable resource projects. Pending legislation (AB 44) would authorize the Commission to provide a similar increased rate of return on investment for eligible energy storage facilities.

9. **What research is needed on energy storage in order for the California Grid to be capable of supporting the RPS goal of 33 percent renewables by 2020?**

   Please see response to question 1.

   Modeling different scenarios of resource, load, and system configurations should be completed and evaluated in order to determine what problems may arise under various possible future conditions. Given the problems identified, utility planners could then apply available least-cost, best-fit solutions in developing the types of, and needs for, energy storage systems.