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**SCE's Comments on the California Energy Commission Docket No. 15-MISC-05:
Joint Agency Workshop on Bulk Energy Storage**

Additional submitted attachment is included below.

December 18, 2015

California Energy Commission
Docket Office, MS-4
Re: Docket No. 15-MISC-05
1516 Ninth Street
Sacramento, CA 95814-5512
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Re: Southern California Edison Company's Comments on the California Energy Commission
Docket No. 15-MISC-05: Joint Agency Workshop on Bulk Energy Storage

Dear Commissioner Weisenmiller:

On November 20, 2015, the California Energy Commission (Energy Commission) held a Joint Agency Workshop on Bulk Energy Storage (Workshop). Southern California Edison (SCE) participated in the Workshop and appreciates the opportunity to provide these written comments.

During the Workshop, SCE was requested to provide information about its experience operating its Catalina Battery, a 1 MW, 7.2 MWh Sodium-Sulfur (Na-S) battery located at the Pebbly Beach Generation Station on Catalina Island. These comments provide a brief overview of SCE's operation of the battery and plans for the future.

Catalina is an islanded system, both literally and electrically: All electricity served to customers on the island is generated on the island; there is no connection to the grid on the mainland. The Island's daily load generally ranges from 2 MW to 6 MW, and customers are served on three 12kV circuits. Pebbly Beach is the sole generation station on the island. SCE's generation fleet on Catalina includes six diesel units, with nameplate capacity rating from 1 MW to 2.8 MW each, 23 propane-fueled microturbines, with a capacity of 65 kW each (1.495 MW total), and the 1 MW battery. The battery provides additional flexibility and reliability to the Catalina grid. Most importantly, the Catalina battery is operated in conjunction with the diesel fleet to dramatically increase efficiency and reduce air pollutant emissions. Additionally, SCE is currently exploring the potential to use the battery to mitigate system disturbances.

A. Current Operations of the Battery

The 1 MW Na-S battery is currently being used to increase the flexibility of generation serving Catalina's customers as well as to enable Pebbly Beach Generating Station to start up, shutdown, and run the diesel generators at their best pollution control and operating efficiency ranges. Pebbly Beach's diesel generators are equipped with Selective Catalytic Reduction equipment on the exhaust of each engine, resulting in more than 90% reduction of NOx (Nitrous Oxides). To operate effectively, the catalyst requires the exhaust temperature to be 550 degrees F or higher to begin the catalytic reaction.

This exhaust temperature is generally not achieved when the units are operated below 70% of maximum power. Thus, in order to ensure constant NO_x reduction treatment is maintained, the units must be operated at least at 70% of maximum output. As discussed below, operation of the Na-S battery allows for higher loading of the engines to maintain the emissions reduction.

As load increases, SCE must start additional units to serve the incremental load. Without the battery, it would be a challenge to operate the diesel fleet such that all units operate above the 70% threshold; at certain times, especially during morning and evening ramps, it would be necessary to run a unit below 70% power in order to balance supply and demand. For example, when incremental load requires starting up a new unit, that unit may need to operate at low power until load further increases.

The battery provides a solution to this problem: Pebbly Beach uses the battery as a load source to increase the net power demand of the system. This allows an engine that is coming on-line to go immediately into its upper power range, maintaining the supply and demand balance while allowing the catalytic reduction to begin immediately. As the island load further increases, the battery charging mode is reduced as the net output of Pebbly Beach follows the load ramping up. The process is reversed when Island net load is lessening: an engine can be taken out of service while running at high power by having the battery pick up its output upon shutdown. This avoids the need to ramp down the generator to low power to follow down the load, which would result in increased NO_x emissions. Finally, the battery may also be used as a conventional peaking resource. The battery can either avoid the need to start another diesel unit, or can delay the start of the diesel unit.

B. Potential Future Uses of the Battery

SCE is currently investigating the potential to add new capabilities to the battery to provide stability during grid events to help mitigate some of the unique challenges on Catalina. On the mainland, the electrical system frequency is stable: There are multiple in-basin generating sources, and control components such as synchronous condensers, peaking units, and multiple transmission networks support system frequency when a line outage occurs or a generation source is interrupted. Conversely, Catalina's system frequency control is challenged due to the comparatively small load served, as well as having only a single generation station to support that load.

Frequency will swing continuously during normal operation from 59.7 Hz to 60.2 Hz. The frequency is monitored manually by the control operator and is controlled by putting additional generation on line or reducing generation as needed. During load/circuit drops or interruptions, frequency becomes unstable causing automatic relaying of major island circuits as well as tripping off-line the microturbines and diesel generators. During system disturbances, such as one of the three 12kV transmission circuits being interrupted by a bird incident or other cause, the frequency can quickly deteriorate to 55-56 Hz. This frequency degradation can cause the inverter-based microturbines to trip offline. If the diesel generators cannot pick up the lost generation, then the diesel generators trip offline as well.

To mitigate these challenges, SCE is currently investigating opportunities to utilize the battery as a fast-acting power/frequency conditioner to reduce the occurrence of system disturbances on the generation equipment. With this additional functionality, the battery could respond at extremely high speeds to system disturbances, and prevent generation units from tripping offline and causing further system problems. The battery may be able to provide this new functionality while continuing its role as a net

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load support device to enable efficient operation of the diesel generator units. SCE is currently working with a vendor to determine the feasibility of adding this functionality.

In conclusion, SCE appreciates the Energy Commission's consideration of these comments and looks forward to its continuing collaboration with the Energy Commission. Please do not hesitate to contact me at (916) 441-3979 with any questions or concerns you may have. I am available to discuss these matters further at your convenience.

Very truly yours,

/s/ Catherine Hackney

Catherine Hackney