Assessing VPP Performance: Impacts of a Test Event in California

PREPARED BY

Ryan Hledik
Kate Peters
Purvaansh Lohiya

PREPARED FOR

Sunrun
Tesla

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The VPP test event

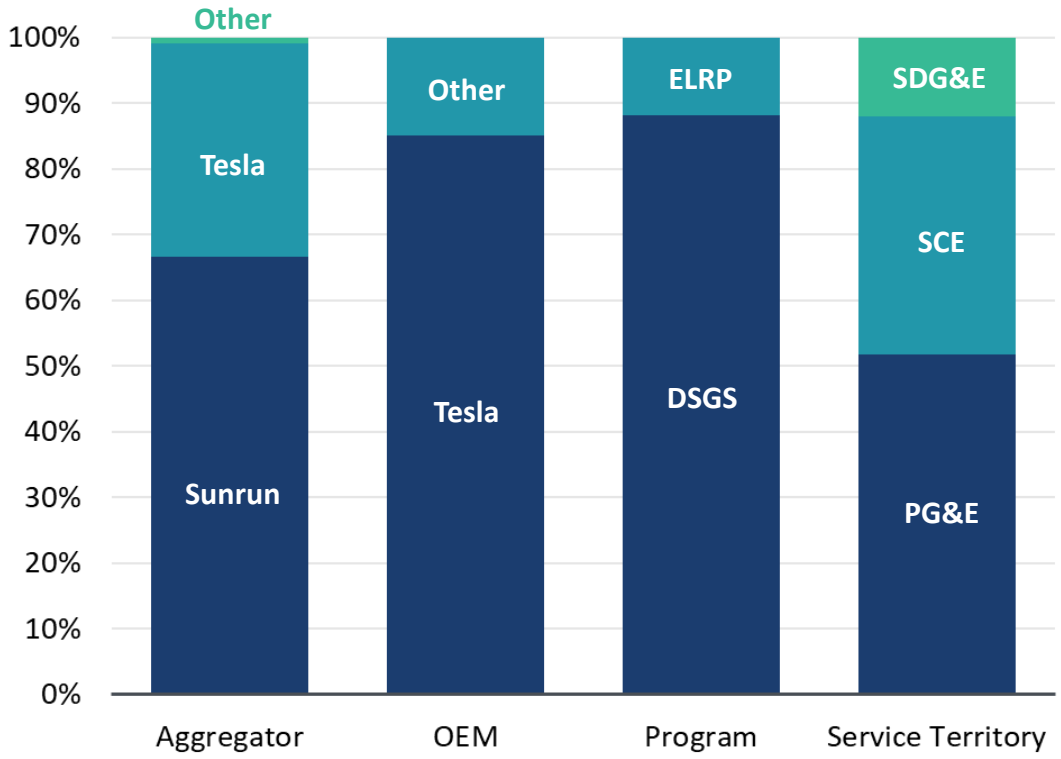
On July 29, 2025, several virtual power plant (VPP) aggregators in California discharged their portfolio of batteries between 7 and 9 pm, producing 535 MW of average output.

The aggregators conducted the event to assess the performance capability of their battery fleet heading into California's summer peak season, when the VPP's grid services will be needed most.

The participants accounted for a diverse mix of battery manufacturers, aggregators, VPP programs, and geographic locations. In general, Sunrun was the largest aggregator, Tesla was the largest OEM, and most of the batteries were enrolled in California's Demand-Side Grid Support (DSGS) program.

The aggregators provided Brattle with data to analyze the impact of the event. This presentation summarizes our initial findings. Further detail will be provided in a forthcoming report by Brattle for Sunrun and Tesla.

Composition of VPP Event Participants



Notes: Based on Brattle analysis of 5-minute telemetry data provided by Sunrun and Tesla. Percentages indicate share of 535 MW impact. DSGS = Demand Side Grid Support, ELRP = Emergency Load Reduction Program.

VPP operational profile

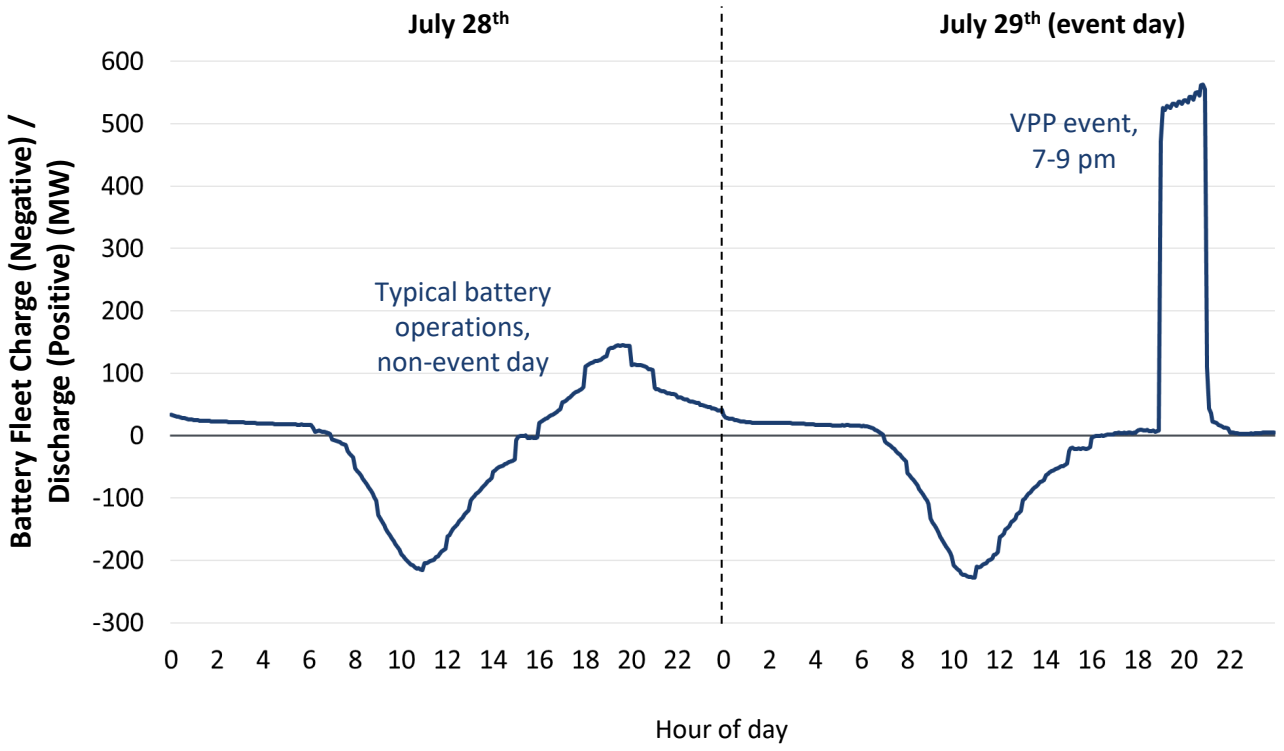
Aggregate VPP performance during the event was consistent and mostly additive to status quo operations.

The figure at right compares the operation of the batteries on the day before the event to their operation on the day of the event.

Battery performance during the event demonstrates a significant departure from status quo operations. In other words, most of the 535 MW of battery output was additive; it would not have occurred in the absence of calling an event.

Additionally, the figure illustrates relatively consistent output from the batteries for the duration of the event, without significant fluctuations or any performance attrition.

Battery Operations Before and During the Event



Notes: Based on Brattle analysis of 5-minute telemetry data provided by Sunrun and Tesla. Battery dispatch is raw power output, without any baseline adjustments.

CAISO system impact

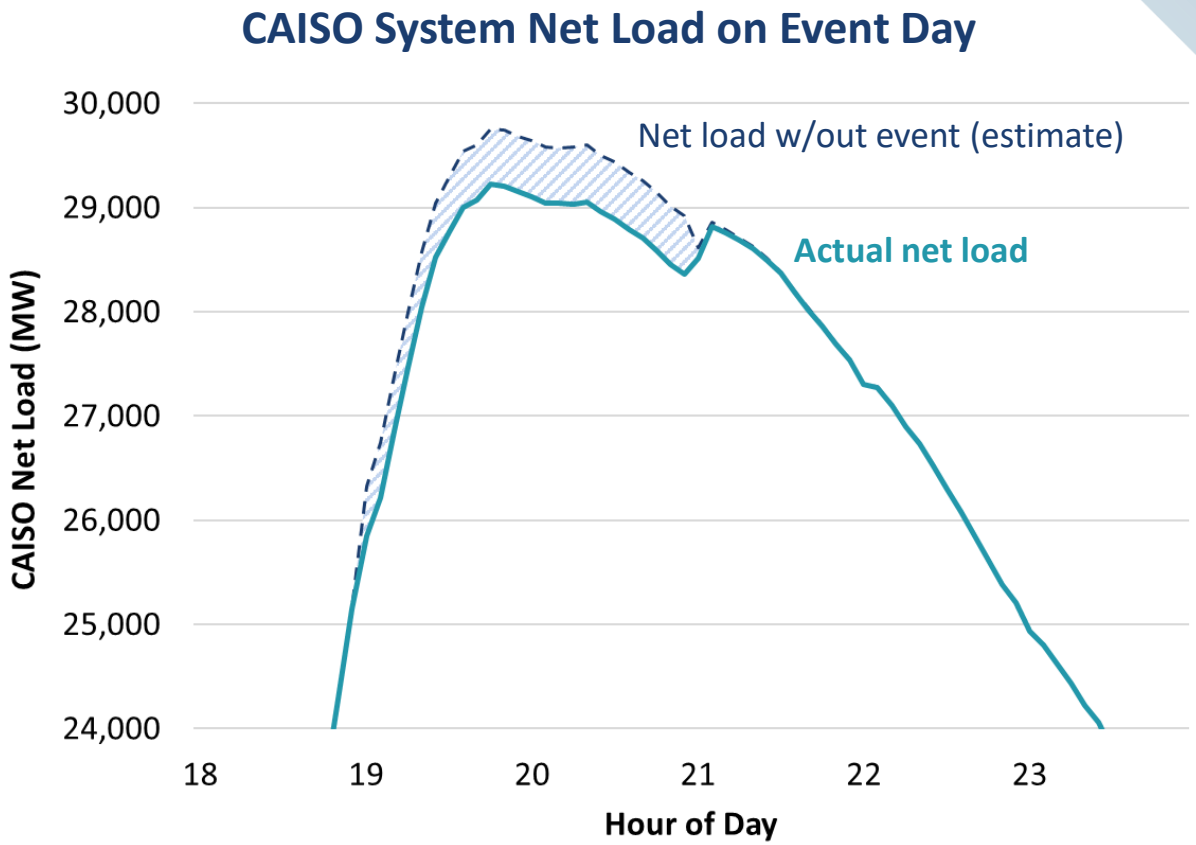
The VPP operated during CAISO's net system peak, the time when output typically is most valuable to the system.

The timing of the event coincided with CAISO's net peak demand on the event day (i.e., load minus wind and solar generation). There was a visible reduction in net load.

On peak days, using VPPs to serve CAISO's net peak could reduce the need to invest in new generation capacity and/or relieve strain on the system associated with the evening load ramp.

In other words, the batteries could help to mitigate some of the challenges associated with California's "duck curve".

Optimized VPP program design and coordination with the system operator could further maximize the value of the battery output to the system.



Notes: Net load sourced from CAISO and reflects actual demand less solar and wind output. Baseline net load in the absence of the event was constructed using 5-minute telemetry data provided by Sunrun and Tesla. All battery output is shown as a reduction in net load.