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Presented by

Investigating the potential for residential PV systems paired with a home battery system to support California's grid reliability

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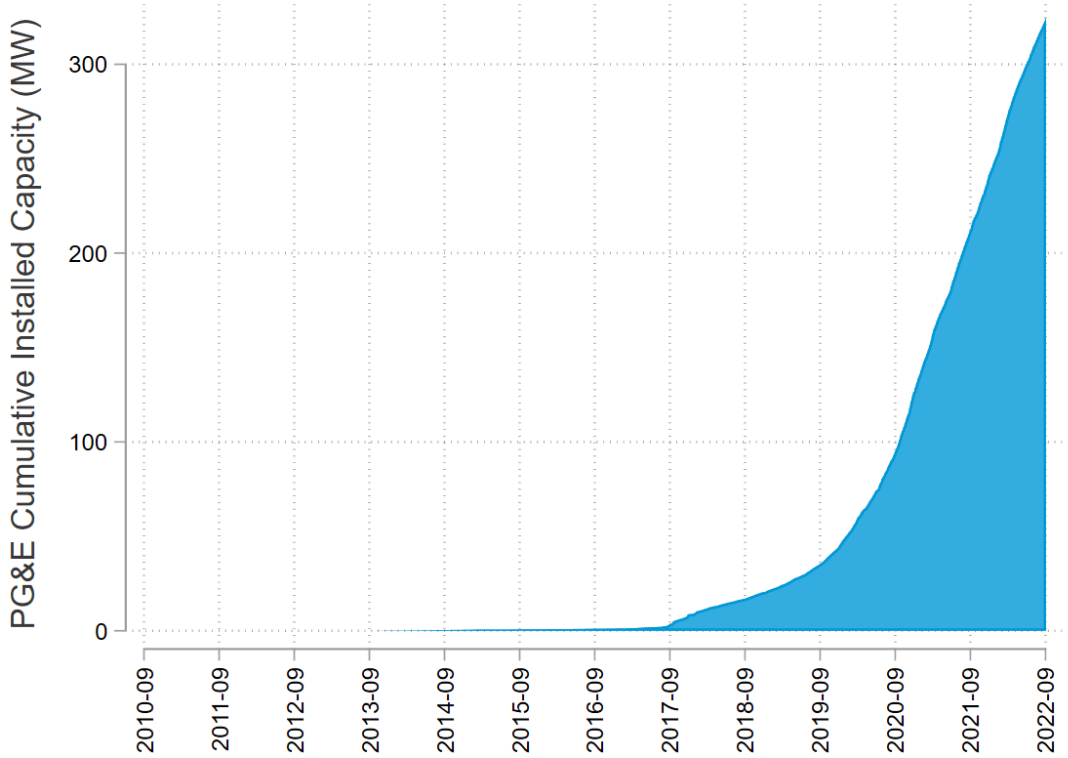
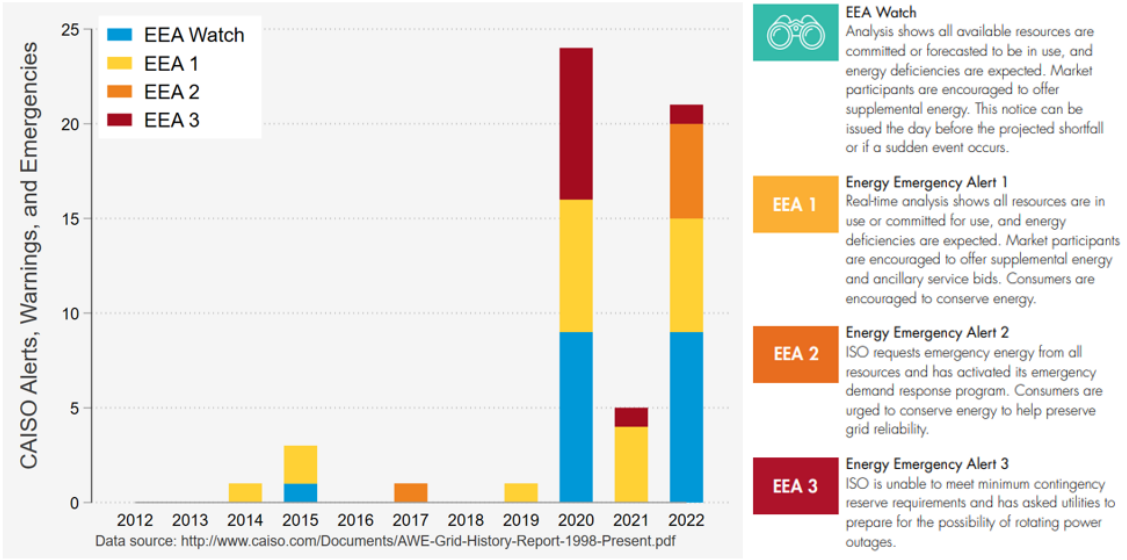
Battery Storage is a growing resource with the potential to help the grid during times of stress

There were over 300 MW* of Residential Battery Storage Installed at the end of 2022



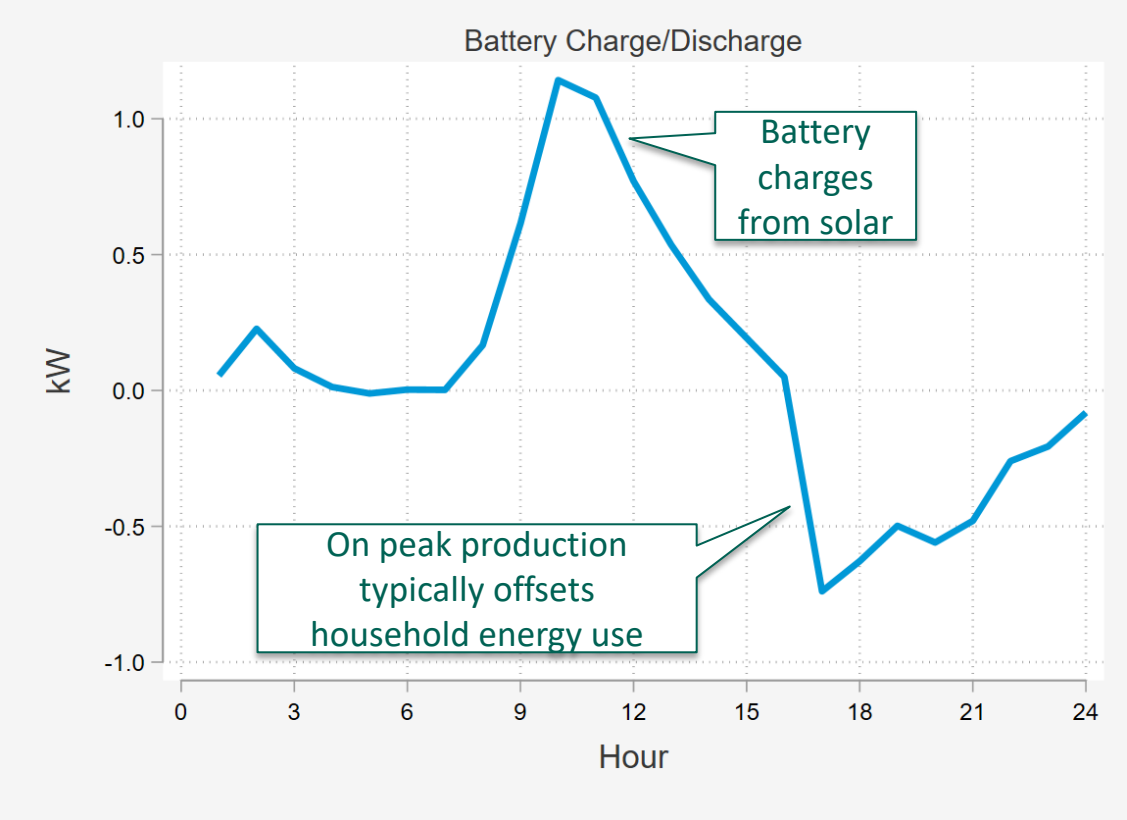
An increase in CAISO Emergency Events has led to a greater need for additional grid resources



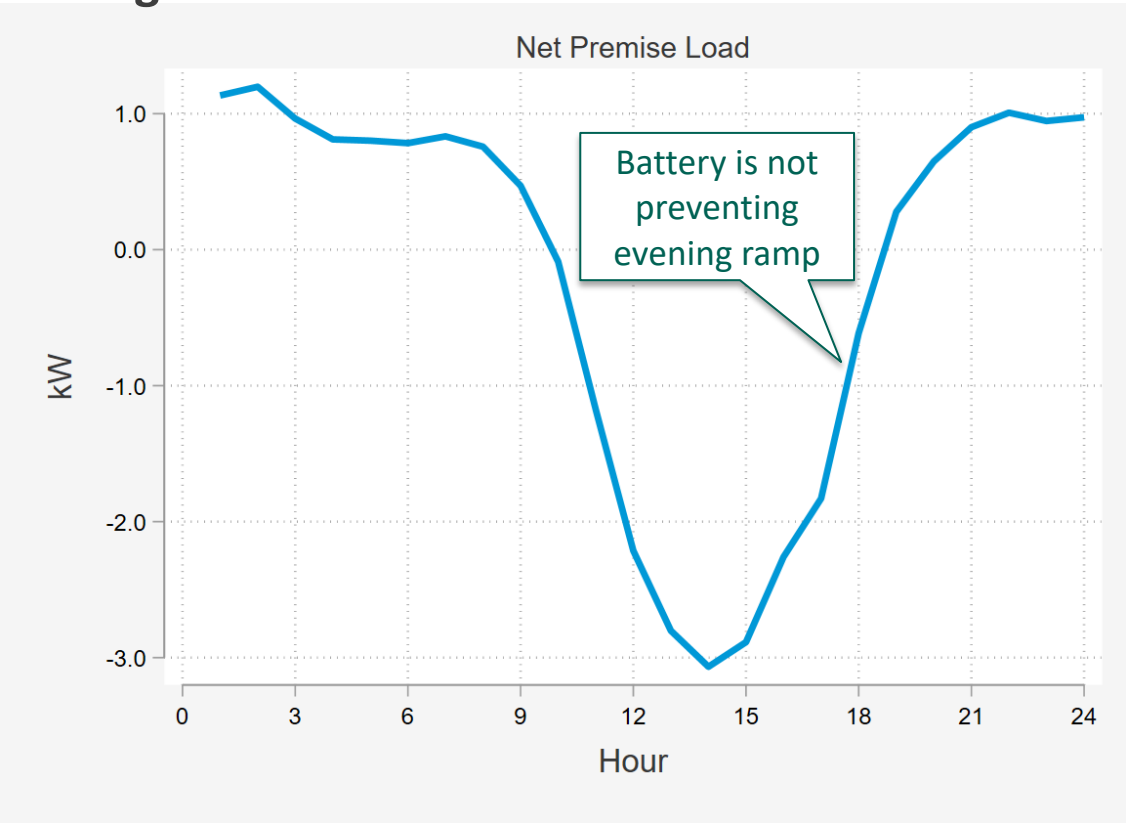
*Source: https://www.californiadgstats.ca.gov/download/interconnection_rule21_projects/. Downloaded October 31, 2022. Last updated September 30,2022. Note that this value includes all storage projects, not just storage projects tied to PV.

Absent intervention, batteries are discharged to their full capacity

Batteries discharge less than 1 kW from 4-9 PM

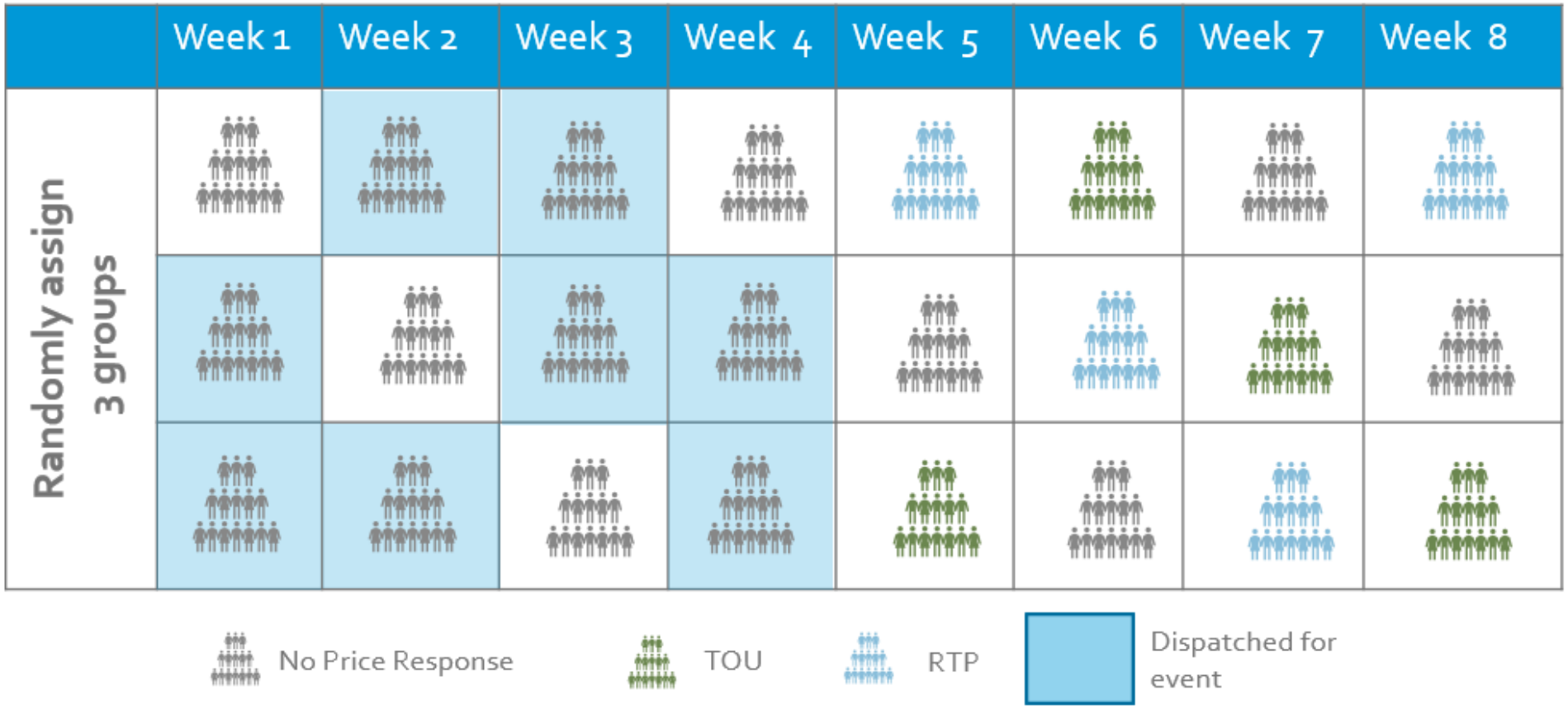


Participant households draw power from the grid during the 4-9 PM window



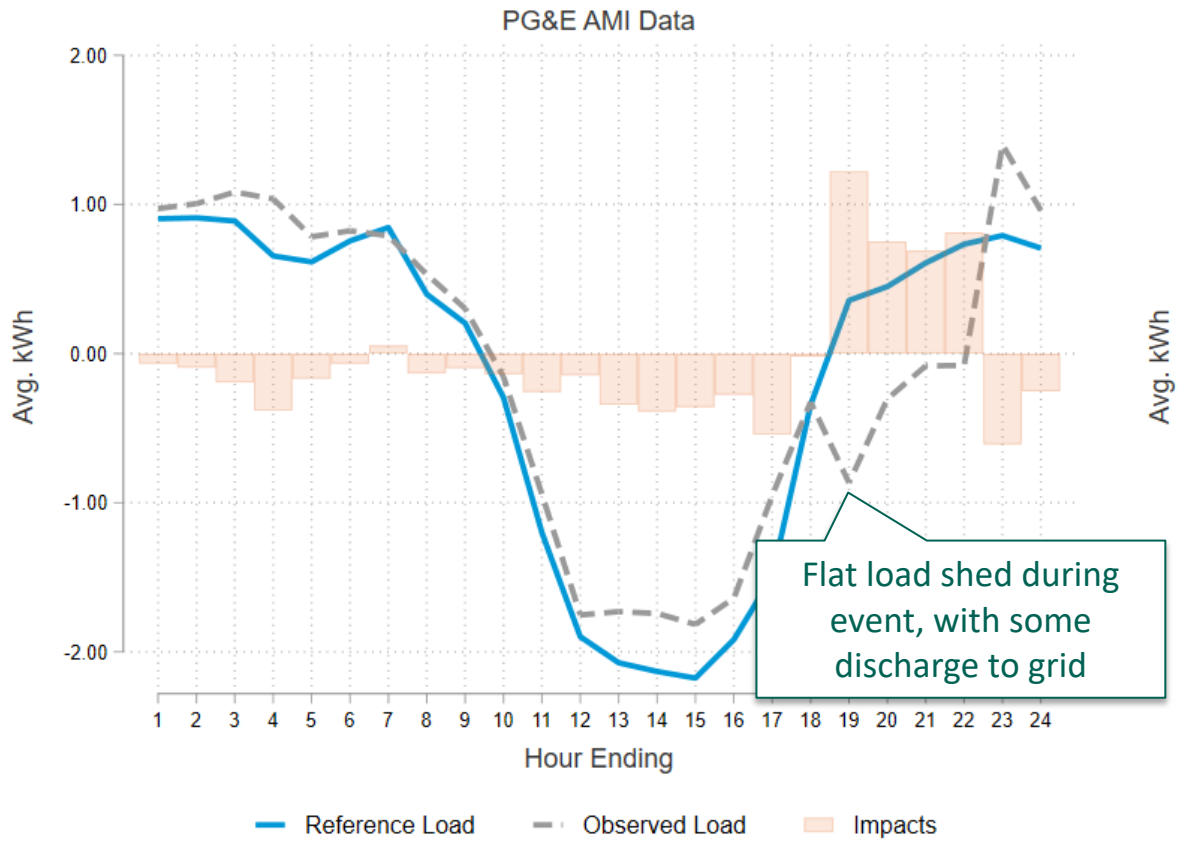
Loads represent average summer loads for all participants absent intervention.

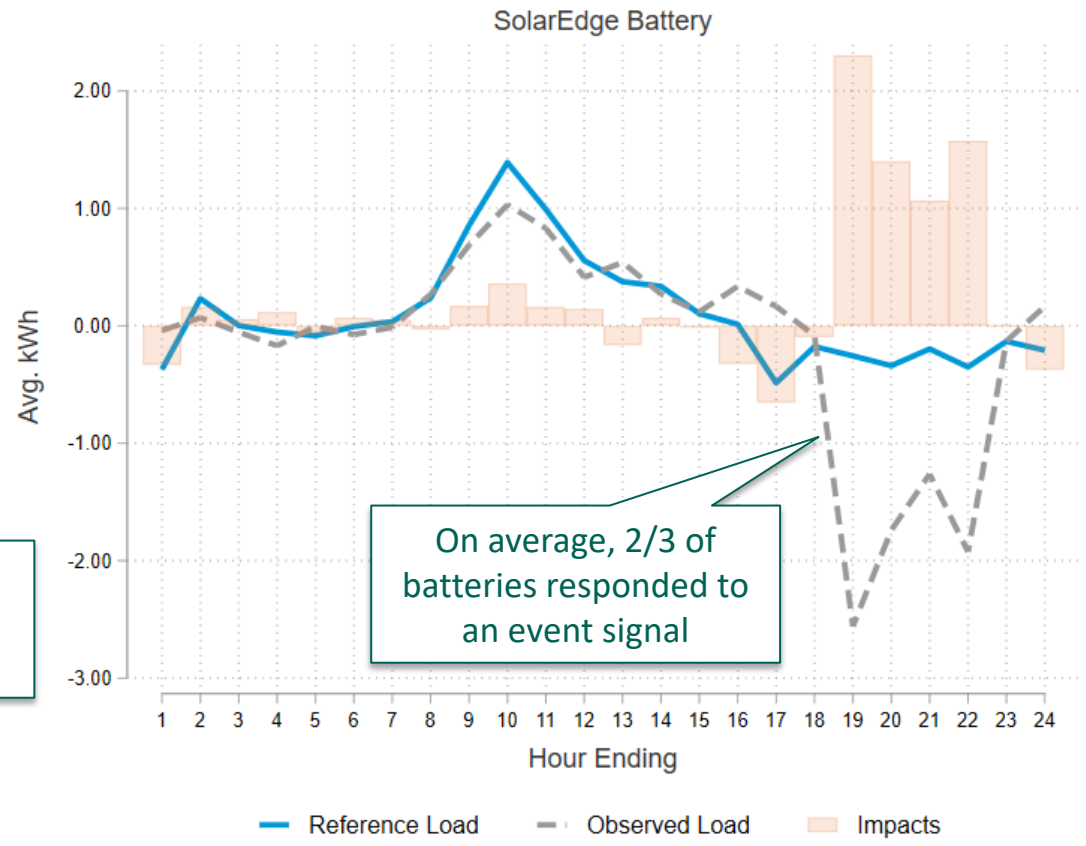
Pilot investigated how customers responded to TOU, DR, and RTP signals



Alternating treatments where each week a different group was held back as a control. Reference loads were developed using Difference-in-Differences regression.

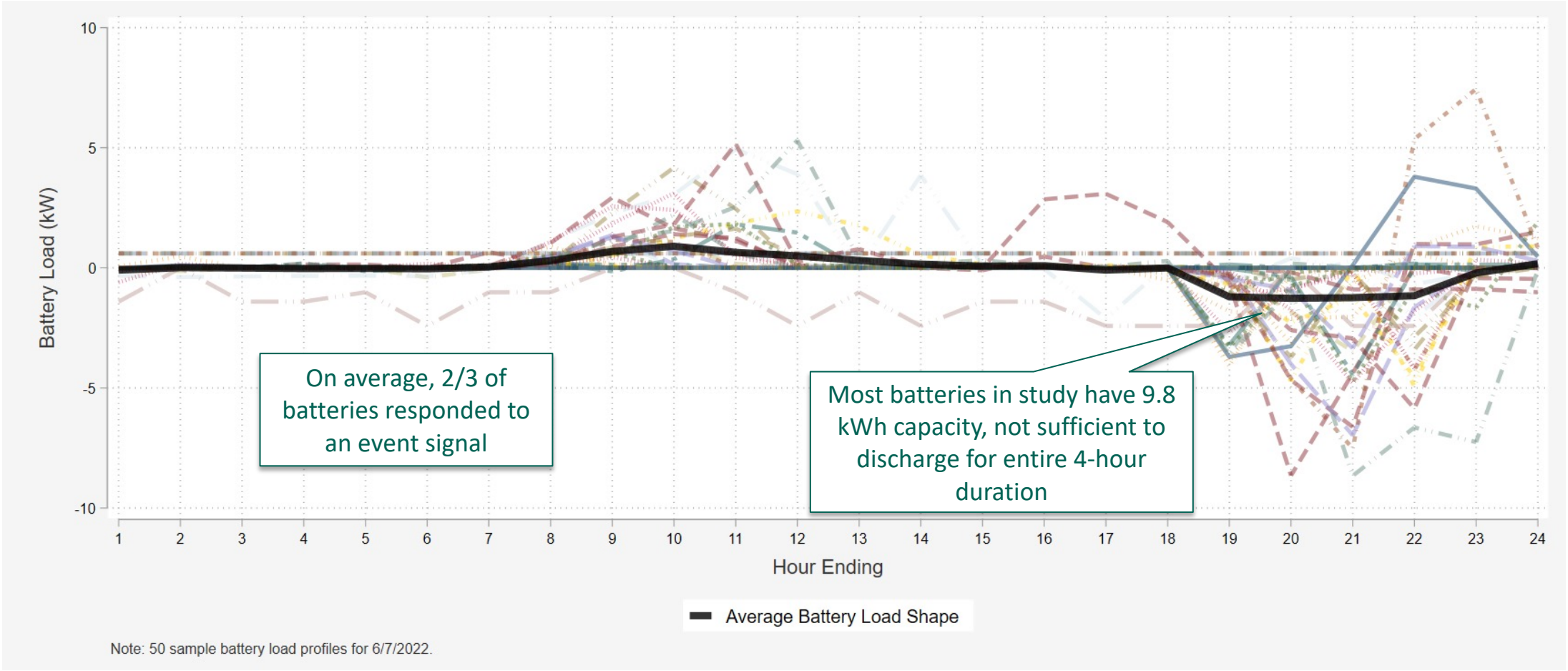
Customer responses to DR signals



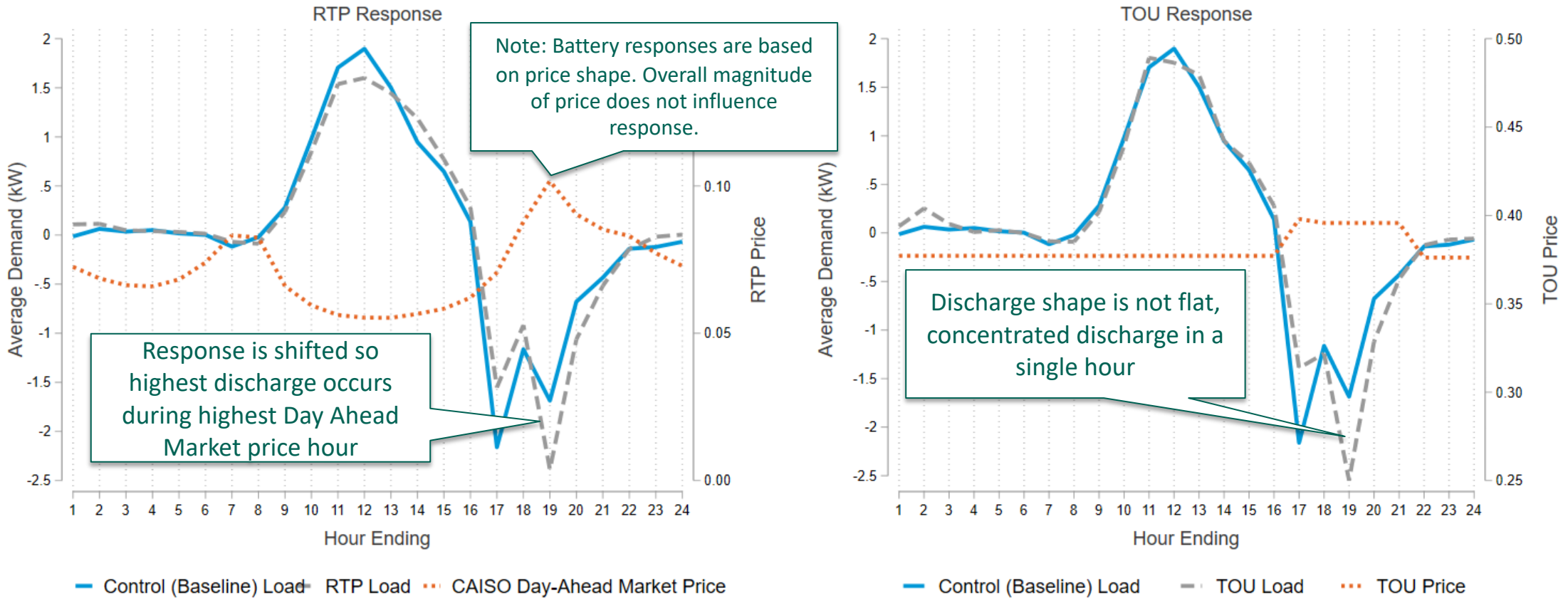


Responses were tested using a randomized control trial with 120 battery storage participants. Each event 40 batteries were held back as a control. Reference load developed using a DID regression.

Flat impacts are created by discharging different batteries at different times



Customer responses to TOU and RTP signals



Responses were tested using a randomized control trial with 120 battery storage participants. Reference load represents batteries that did not receive a price signal.

Key Findings and Future Advancements

1. Batteries are currently underused by customers absent intervention, small dispatch to the grid on average but large potential for additional dispatch on hot days
2. While a single battery discharge shape only provides meaningful impacts for up to 2 hours, we can optimize discharge strategies to provide a flat load shape
3. Batteries can follow prices from the day-ahead market, which provides a permanent load shifting option that helps to meet grid needs. However, the discharge shape from the battery is not flat for this method.
4. Vendors should be encouraged to develop dispatch strategies that best meet grid needs (i.e. a flat dispatch shape)
5. Vendors should be encouraged to charge the batteries using solar when solar production is highest
6. When determining a fleet's capability, vendors should account for non-responsive batteries

This project was funded by PG&E.

For more information, contact Albert Chiu at AKC6@pge.com.

The project report can be found at https://www.etcc-ca.com/reports/dret-btm-residential-battery-load-management-study.

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