

TOU optimization study with smart technologies

1. Overview

The objective of this study is to evaluate if residential smart technologies, such as smart thermostat, can optimize TOU customers HVAC energy use in order to shift customers energy usage from peak to non-peak and potentially result in customers' bill saving. In the study, the technology should provide a "set it and forget it" experience for the customers. The study should analyze performance of smart thermostats, including:

- Enrollment rates for all three smart thermostat manufacturers, regardless of recruitment method, by recruitment mechanism
- TOU sign-up rates with email and push notification by vendor
- Estimate load impacts for each event overall and by smart thermostat manufacturers, TOU status, and TOU auto-programming
- Estimating the load impacts for each event called
- Estimate the TOU impacts on non-event days overall and by smart thermostat manufacturers, TOU status, and TOU auto-programming
- Estimate the enhanced energy savings for different smart thermostat manufacturers
- Compare DR load impacts for all three smart thermostat manufacturers
- Compare effectiveness between vendor's TOU optimization versus smart thermostat manufacturer's TOU optimization
- Comparison of automation capabilities for smart thermostat manufacturers to understand potential for load flexibility, shed, shape, and shimmy

2. Collaboration

The DRET team contracted with a third-party vendor who is familiar with residential smart technologies, manufacturers, and the market to implement this DRET study.

3. Results/Status

During the first and second quarters of 2021, the study recruited 13,350 customers to enroll in the pilot. The study also called six DR test events to measure the load impact from pilot participants. Below are high level results of this study:

- Sites that signed up for automated TOU response reduced 4-9 pm loads by ~0.20 on a daily basis, with some variation by temperature
- For sites with automated TOU response, the full event impact is the

daily TOU response plus the event day impact

- Cooling loads peak around 4 pm and start declining (though household load peaks in the evening)
- Air conditioner loads are less coincident with CAISO net loads than with PG&E and CAISO gross loads
- The reductions for hotter temperature days exceeded 1.0 kW but decayed for later event hours.
- The biggest drivers of event response are weather, the event hour, and daily automated response to TOU later event hours

4. Next Steps

This assessment ended on December 31st, 2021. PG&E is finalizing the report and it will be posted at the ETCC website in the 2nd quarter of 2022.