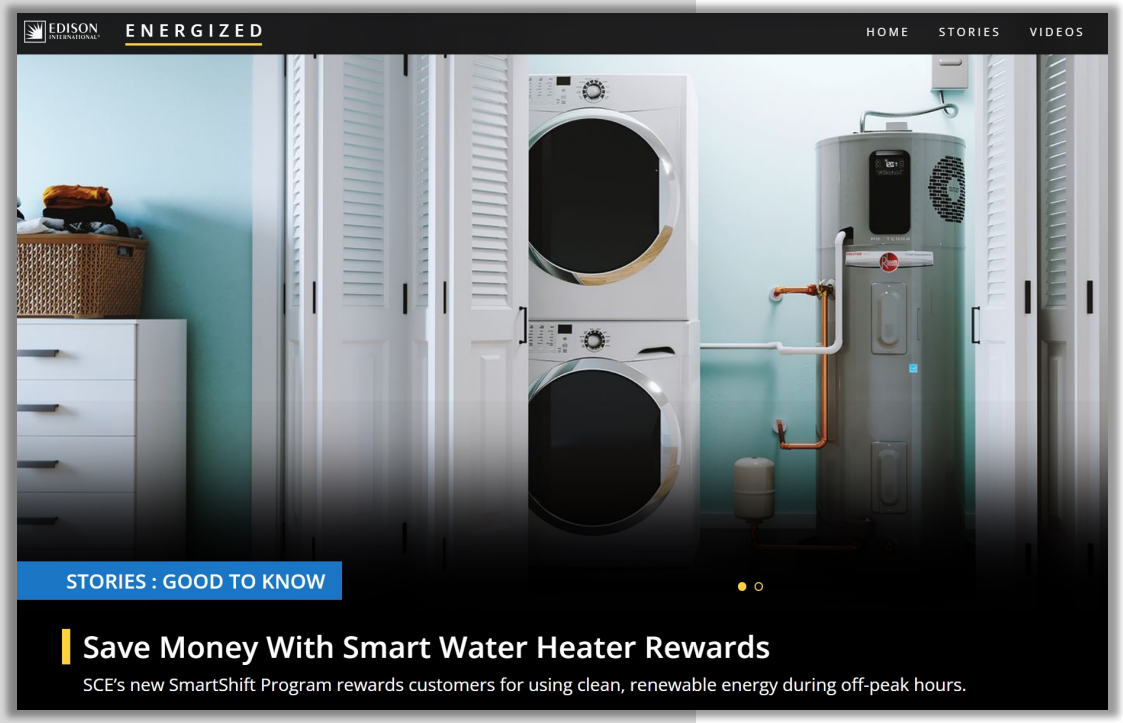
SCE's SmartShift (load shifting) Pilot

Interim Evaluation Findings



March 03, 2026
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CP&S
Evaluation Measurement & Verification
Southern California Edison

Energy for What's Ahead®

SOUTHERN CALIFORNIA EDISON®

Outline

- Background & Policy
- Program Implementation
- Experimental Design
- Preliminary Results
- Observations on Temp. Setpoints
- Key Takeaways

Background & Policy

California Assembly Bill 2868 - 2016

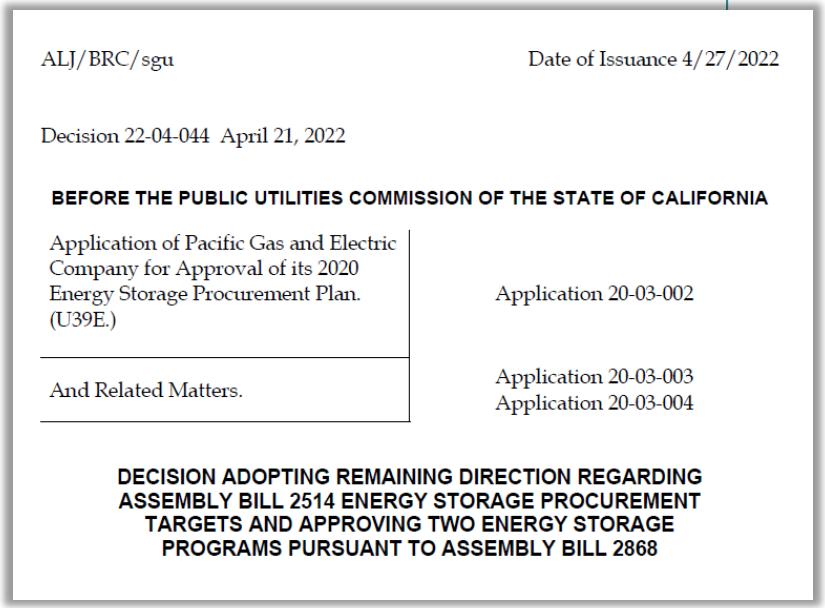
- To accelerate widespread deployment of distributed energy storage systems to achieve ratepayer benefits, reduce dependence on petroleum, meet air quality standards, and reduce emissions of greenhouse gases.

SmartShift Rewards (SCE)

- Thermal energy storage program design to shift load outside of peak hours
- SmartShift leverages HPWH installation programs, such as TECH Clean California

CPUC Decision 22-02-044 (2022)

- The CPUC approved Smart Heat Pump Water Heater Program.



ALJ/BRC/sgu Date of Issuance 4/27/2022

Decision 22-04-044 April 21, 2022

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company for Approval of its 2020 Energy Storage Procurement Plan. (U39E.)	Application 20-03-002
And Related Matters.	Application 20-03-003 Application 20-03-004

DECISION ADOPTING REMAINING DIRECTION REGARDING ASSEMBLY BILL 2514 ENERGY STORAGE PROCUREMENT TARGETS AND APPROVING TWO ENERGY STORAGE PROGRAMS PURSUANT TO ASSEMBLY BILL 2868

Program Implementation

Eligibility

Customers

- SFM, MFM, or small commercially-metered (<50 kW peak demand) customers
- Must be enrolled in a TOU rate plan
- TECH program or similar

Eligible Water Heater Types

- Electric resistance water heaters (ERWHs)
  - *As March 2026, about 6 devices are enrolled*
- Heat pump water heaters (HPWHs)
  - *As March 2026, about 900 devices are enrolled*
  - *Requires thermostatic mixing valve*

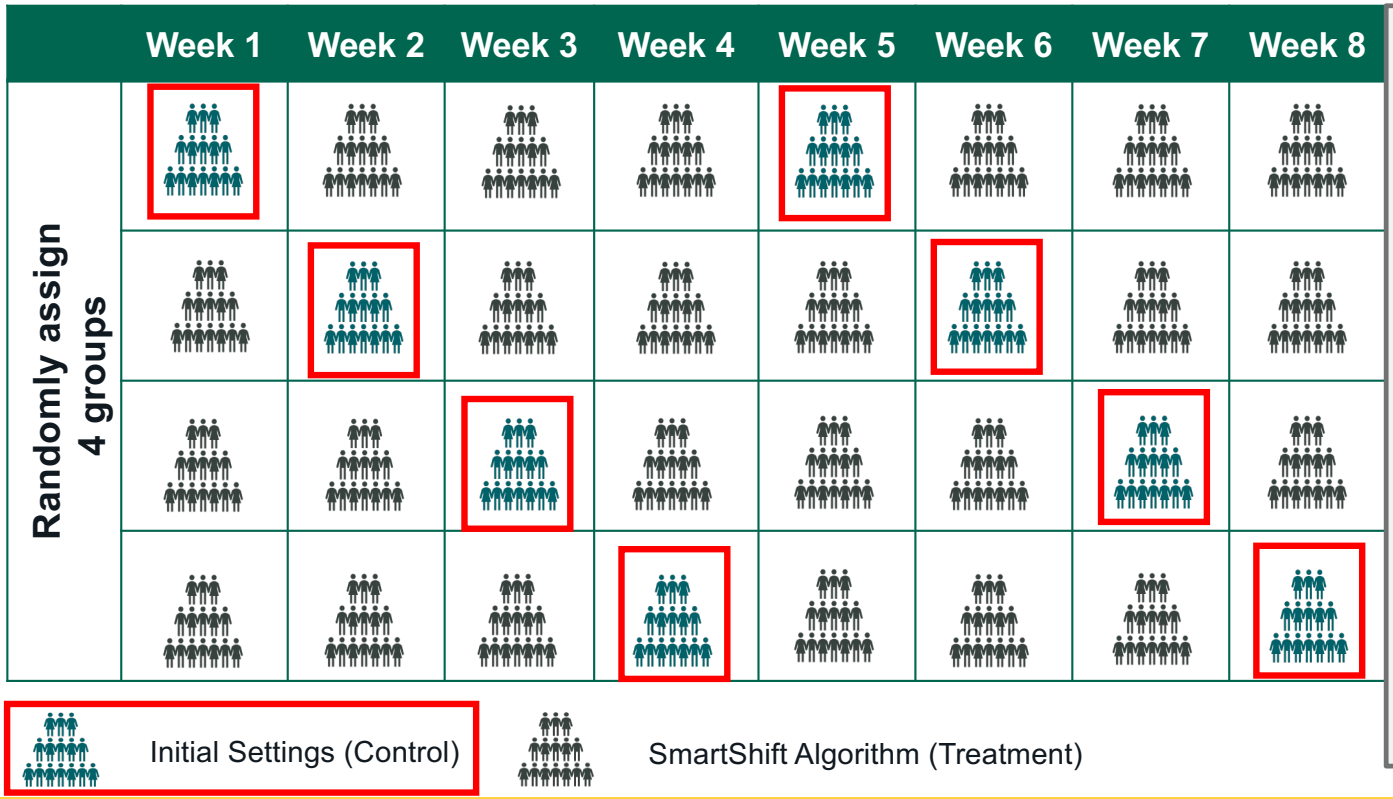
Available Connection Technologies

- **WiFi (using water heater manufacturer's API)**:
  - Some HPWHs and ERWHs
- **Plug-in CTA-2045 module*:**
  - Most HPWHs, some ERWHs
- Wire-in direct load controller*:
  - Most ERWHs

**SmartShift Rewards provides hardware and may provide installation at no cost*

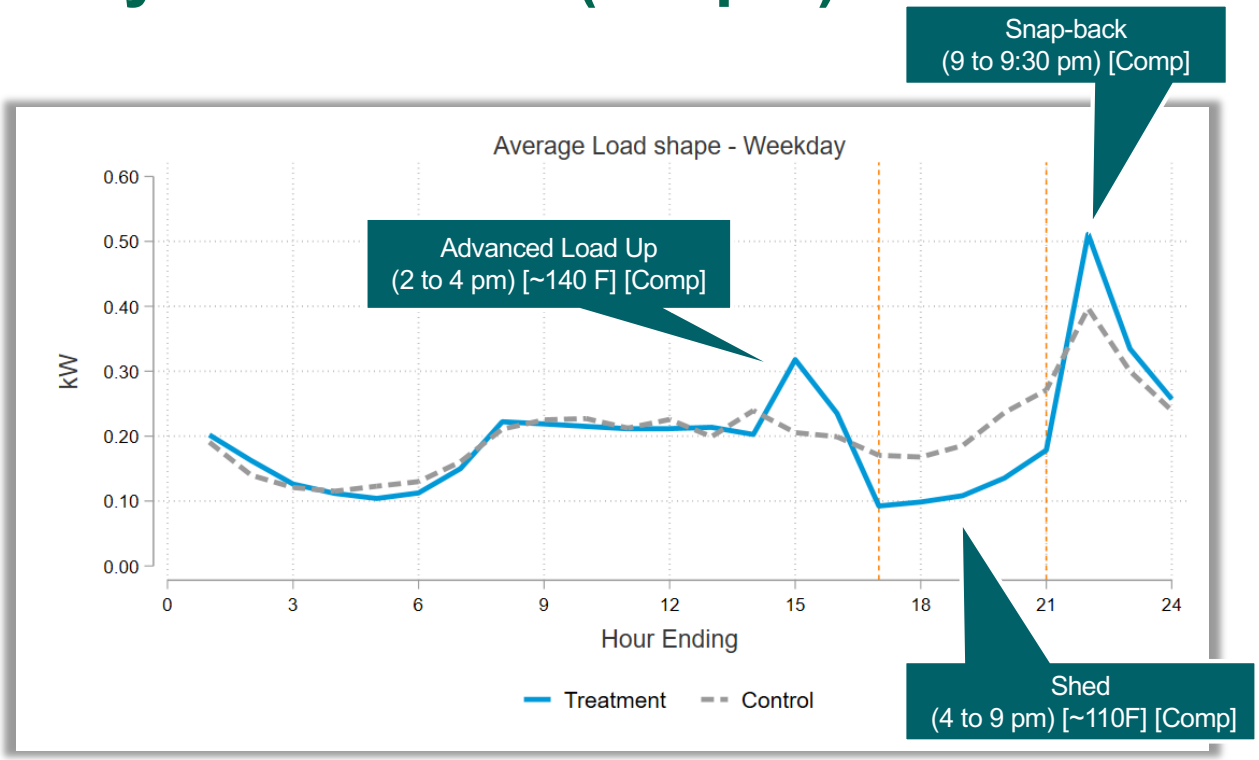
Experimental Design

(RCT) Randomized Controlled Trials w/ Alternating Treatment



- Each device experiences Treatment and Control weeks over time
  - ***75% of time in treatment mode***: Preserve bill impacts for participants
- Customers don't know when the automated shifting is in effect
- On average:
  - Groups are similar since drawn randomly
  - Treatment & control days are similar

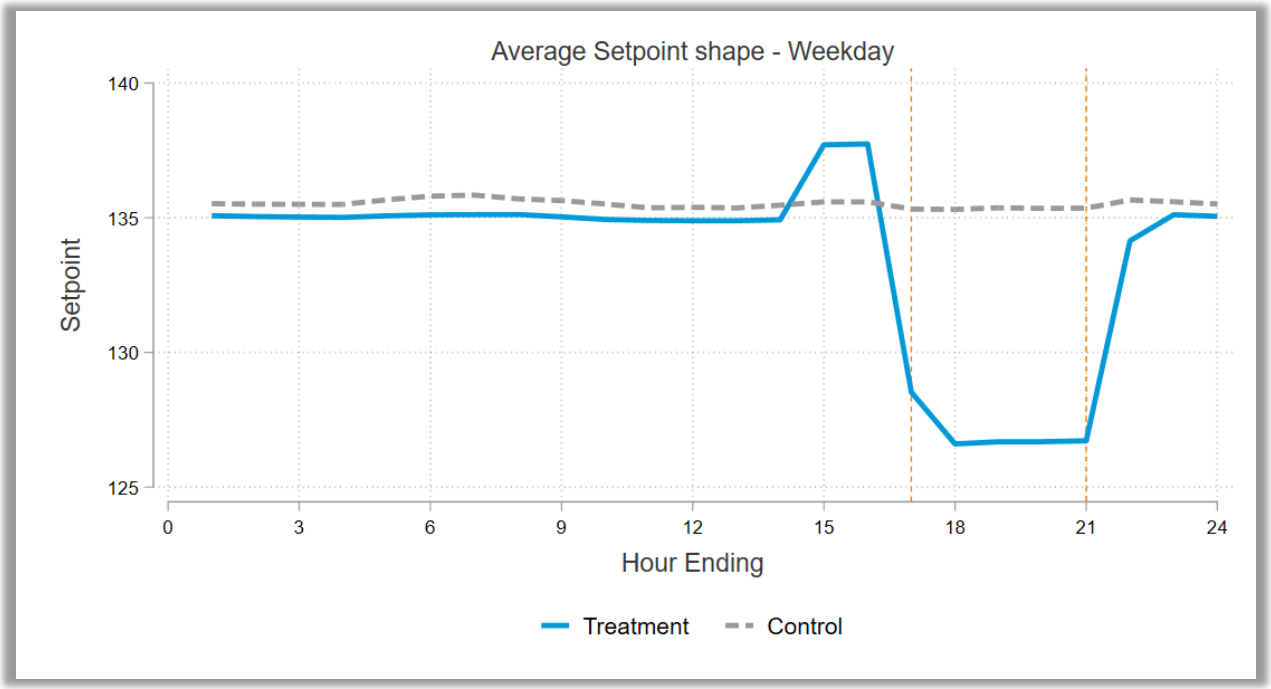
Preliminary Experimental Results: Peak loads reduced by almost 30% (4-9 pm)



* Future analysis with correlating tank water temp vs water drawn

- **Peak load reduction:** 0.06 kW per device (statistically significant)
  - Baseline usage level from 4-9 pm: 0.197 kW (so 28.5% reduction)
- **Total daily kWh:** Increase of 0.07 kWh (not significant)
  - Essentially zero – no overall EE impacts
- **Customer bill** savings of about $20 per year from load shifting in conjunction with TOU rate window
- JA13 – not strong evidence

Observations: Temp. set points raised less than anticipated during pre-peak load-up



During advanced load up (2-4 pm), set point raised 3° on avg.

During load shed (4-9 pm): Set point dropped by 8° on avg.

Set point already at 140° for most devices → limited increase during advanced load up

Greater potential for demand savings if water heaters are set to 120° or 130°

* Graph shows average set point for all treatment & control devices during the experiment

Key Takeaways

1. **~30% reduction in energy use** during 4-9 pm peak hours, against a baseline of ~200 Watts. The loads are very controllable, but the devices are also very efficient.

2. **Alternating treatment experiment** generated precise, statistically significant impacts.

3. **Set points:** Some “advanced load up” before 4 pm, but limited since most HPWHs in the program are set to 140° (the program will not pre-heat water above 140°)

4. **Resistance heating:** Large “snap back” usage includes more use of resistance heating (all the devices are hybrid HPWHs)

5. **Greenhouse gas impacts** were reduced by high energy use after 9 pm (the snap back). **Bill Savings:** Participants save a modest amount on Time-of-Use rates, about $20/year

6. **Partnership with implementation team:** willingness to collaborate on experimentation has led to evaluation framework that can more rapidly inform program design.

Appendix

Connection Cost and Reliability

Challenge:

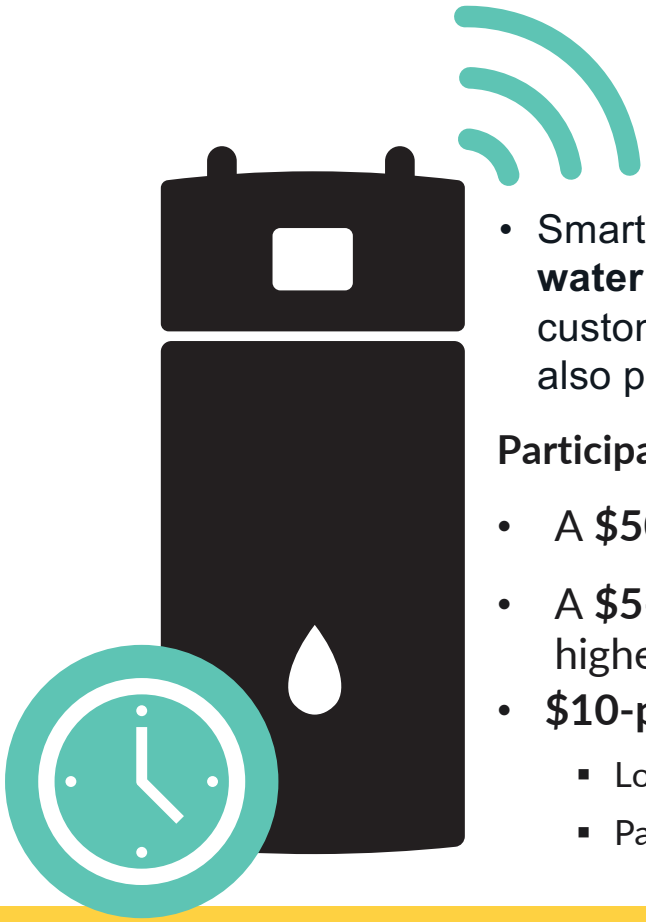
- Tradeoffs between connection cost and reliability

Identified Solutions:

- Program, as well as market, coalescing around CTA-2045 option for HPWHs

	Manufacturer API	CTA-2045 Module	Direct Load Controller
Signal Options	WiFi	WiFi, cellular	WiFi, cellular
Connection Success Rate	**34%**	**87% (cellular)**	**TBD**
Available for	Some HPWHs	Most HPWHs, some ERWHs	Only ERWHs
Installation	Tech-savvy customer with smart phone and WiFi	Plug-in install	Requires contractor
Upfront Cost	None (excl. setup fee)	$$$	$$$
Ongoing Cost	$$-$$$	$$	$$

Customer & SmartShift Rewards



- SmartShift Rewards **sends signals to the customer's water heater to heat water during times when electricity rates are lower**, without sacrificing the customer's comfort. Customers have hot water whenever they need it and could also pay less for their energy.

Participation Incentives:

- A **$50 Enrollment Incentive**
- A **$5-per month Participation Incentive** for general market customers, and a higher
- **$10-per-month Participation Incentive** by meeting **Equity criteria:**
  - Located in a Disadvantaged Community or public housing; or
  - Participation in an income-based utility rate or improvement program