Demand Response Load Impacts from SCE's Third Party Programmable Communicating Thermostat (PCT) Study

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April, 2015

Presentation overview

- Program overview
- Evaluation methodology
- Ex post results

Summary of results

Number of Customers[1]	Avg. Reference Load (kW)	Avg. Load w/ DR (kW)	Avg. Load Impact (kW)	% Load Impact	Aggregate Load Impact (MW)	Heat Buildup (Avg. °F, 12 AM to 5 PM)
2,650	2.25	1.64	0.60	26.9%	1.6	77.8

[1] Average number of customers across event season

Program overview

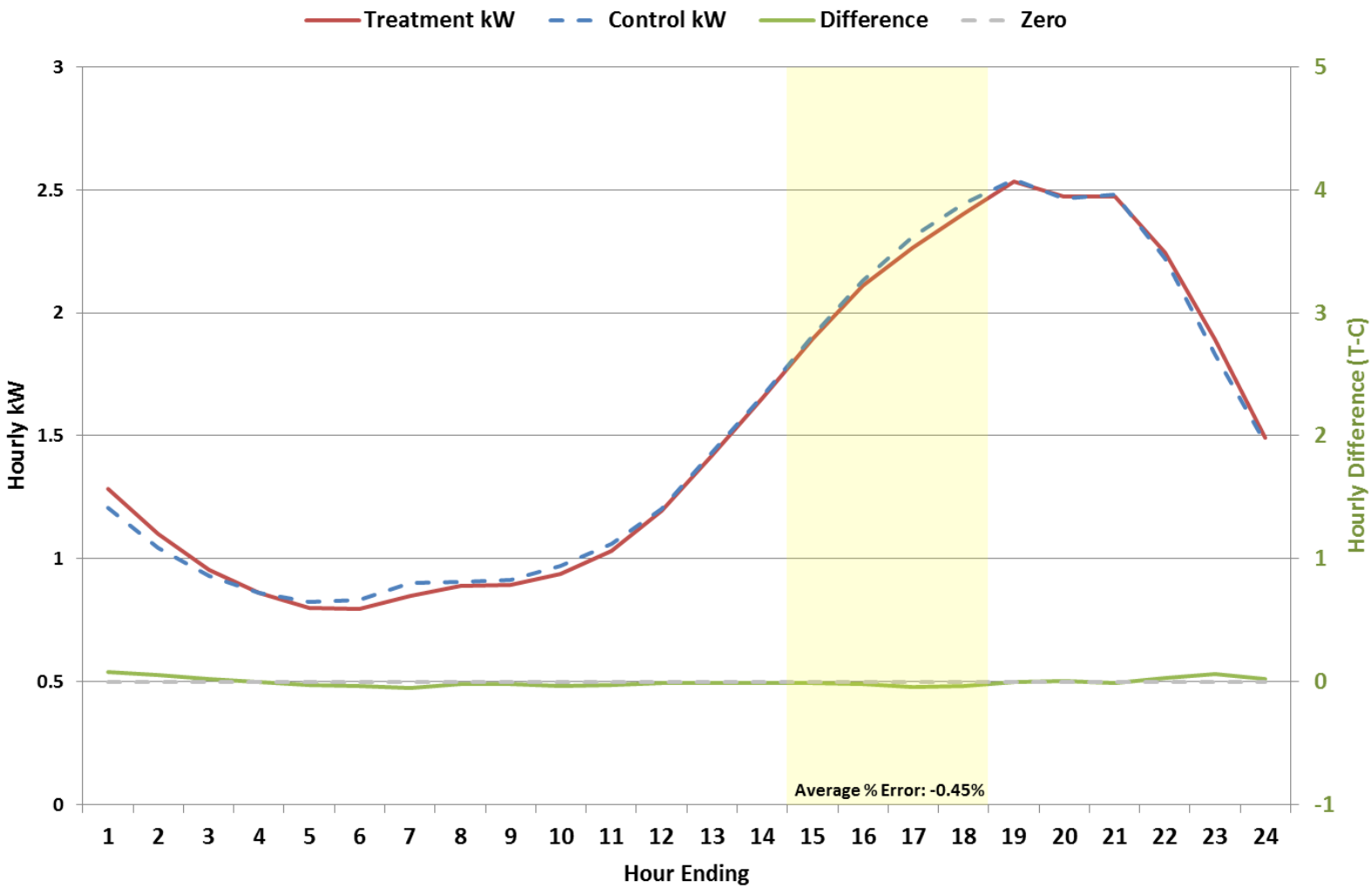
- Third-party PCT customers: Customers who have a programmable communicating thermostat (PCT) and participated in the third-party PCT study, which enabled demand response during 2014 “Save Power Days” events
  - Customers were recruited and communicated with exclusively via third-party program implementers
  - Curtailment signals were sent to the PCT via the third-party
  - 2-4 degree set back was typical, and varied by service provider approach and strategy
  - Bill credits for load reductions were incorporated via SCE’s regular monthly bills

- SCE Save Power Days (SPD) program overview
  - SPD is a Peak Time Rebate (PTR) program
  - SCE may call SPD events on a **day-ahead basis, year-round** on **non-holiday weekdays**
    - Event hours: 2:00 p.m. through 6:00 p.m.
    - Most customers earn a rebate of **$0.75** per kWh reduced
    - Customers with approved enabling technology, such as a PCT, are eligible to earn an additional $0.50 per kWh reduced, for a total incentive of **$1.25** per kWh
  - Bill credit is calculated based on 2 to 6 PM load reduction below customer-specific reference level (CSRL)
    - The CSRL is defined as the average 2:00 p.m. through 6:00 p.m. usage for the highest three (3) of five (5) previous weekdays, excluding SPD event days and holidays. Customers with event period usage below their CSRL receive SPD credits.
  - 8 Events in 2014
    - 7/14, 8/4, 9/2, 9/8, 9/11, 9/15, 9/17, 10/3

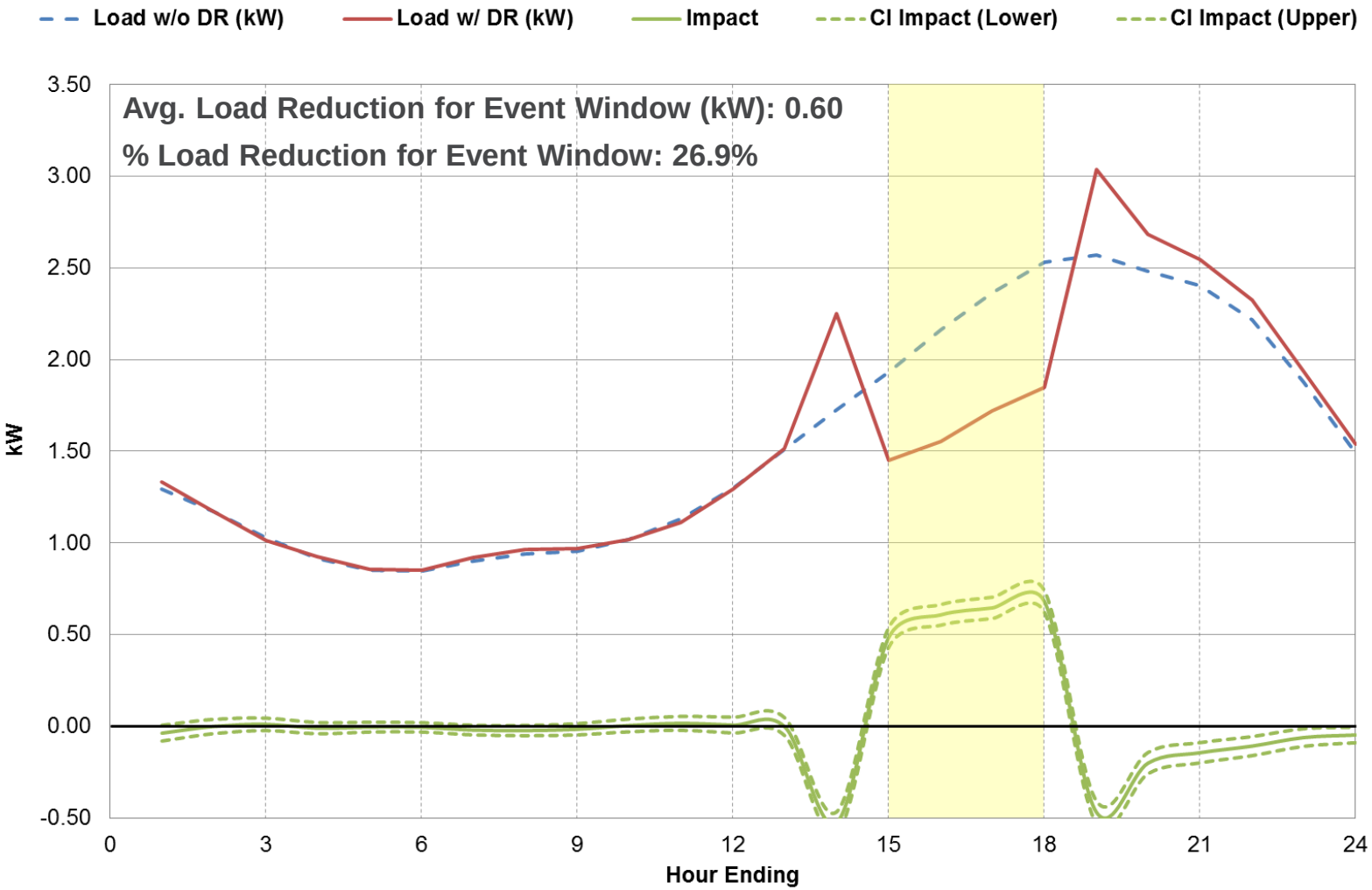
Overview of ex post analysis methodology

- Reference loads for the PCT impact estimates were calculated using a matched control group drawn from the non-participant population
  - Non-participant customers have not provided load impacts in the past (and are no longer eligible for rebates), so they serve as good candidates for the control group
- Control group was selected using a propensity score match to find non-participant customers who had similar load shapes to the PCT customers on proxy event days (within the same weather station area and average daily energy use quartile)
  - Matching variables: Average Daily kWh, Hourly kWh: 11 AM to 9 PM,
- Each customer in the participant population was matched with a customer in the non-participant population with the closest propensity score
  - The analysis included the entire population of PCT customers, and was not based on a sample
  - The entire SCE residential non-participant population was used as a pool for matching (approximately 3.8M customers)
- Load impact estimates were based on the difference in loads for the participant and control group customers on the event day minus the difference in load between the two groups on similar, nonevent days (what is referred to as a difference-in-differences analysis)

Matching results



Average ex post event results for PCT customers

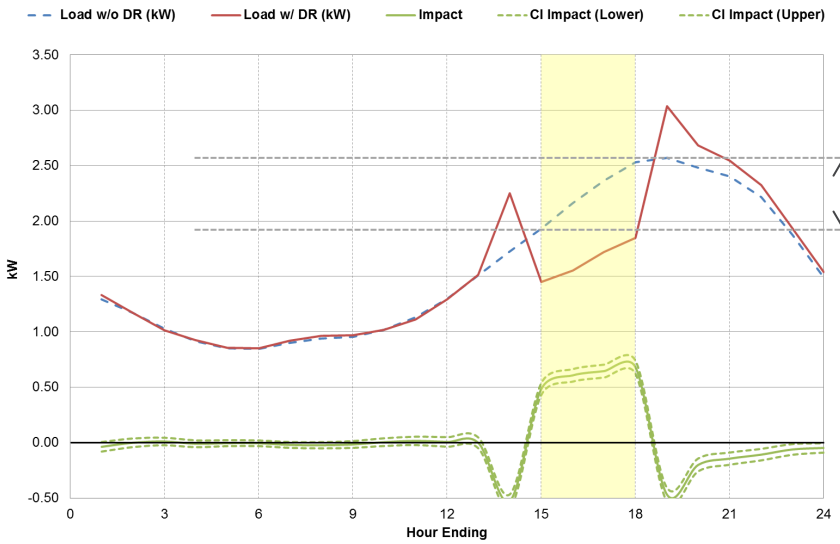


Comparing PCT vs Opt-in SPD load impacts

PCT

Avg. Load Reduction for Event Window (kW): 0.60

% Load Reduction for Event Window: 26.9%

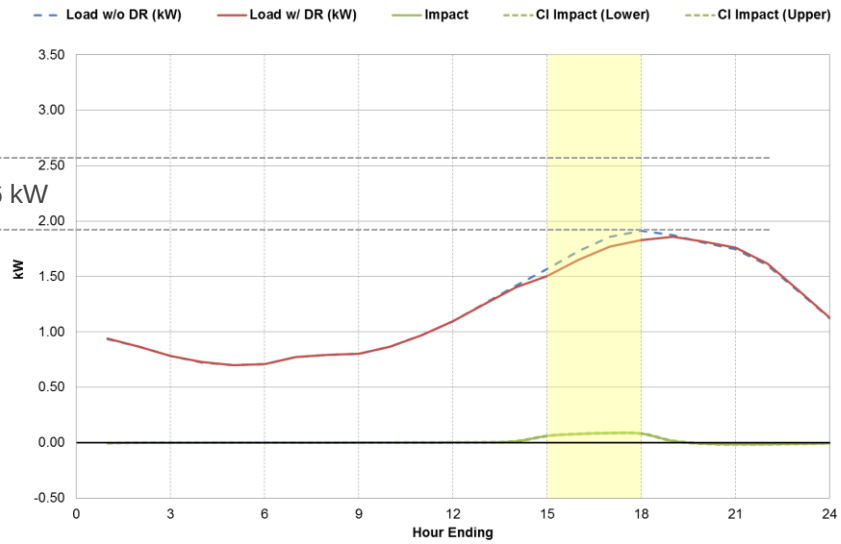


0.66 kW

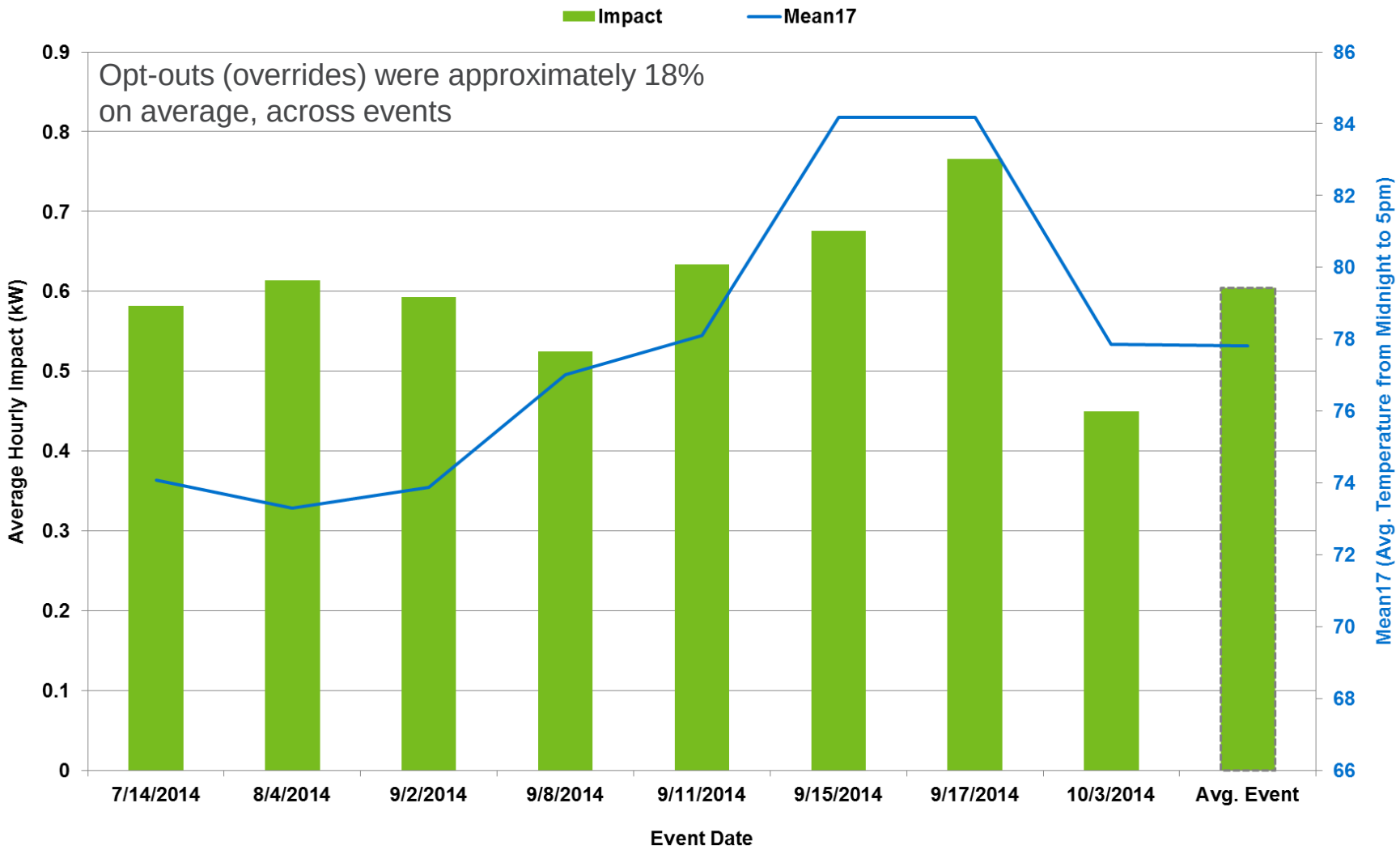
Opt-in SPD

Avg. Load Reduction for Event Window (kW): 0.08

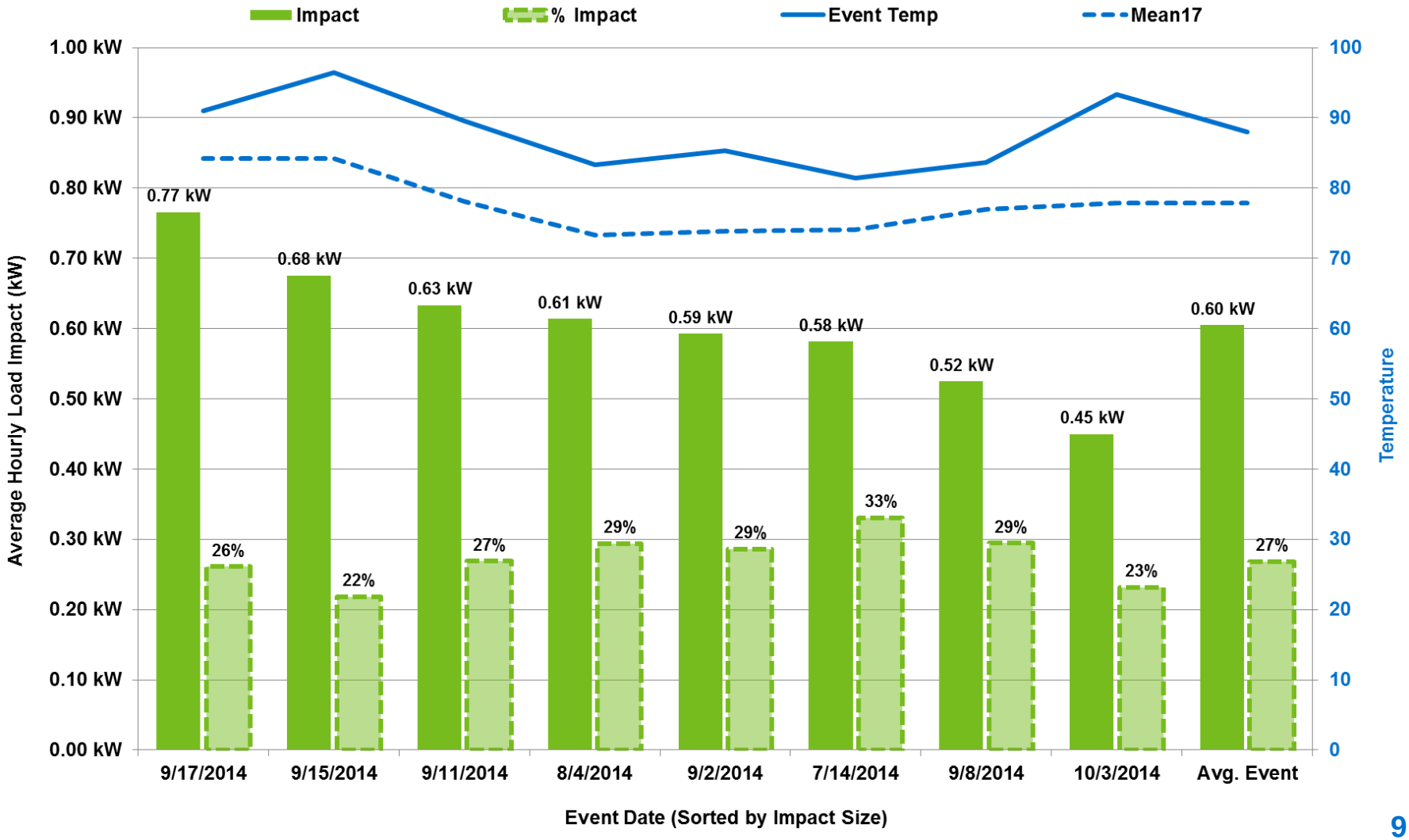
% Load Reduction for Event Window: 4.4%



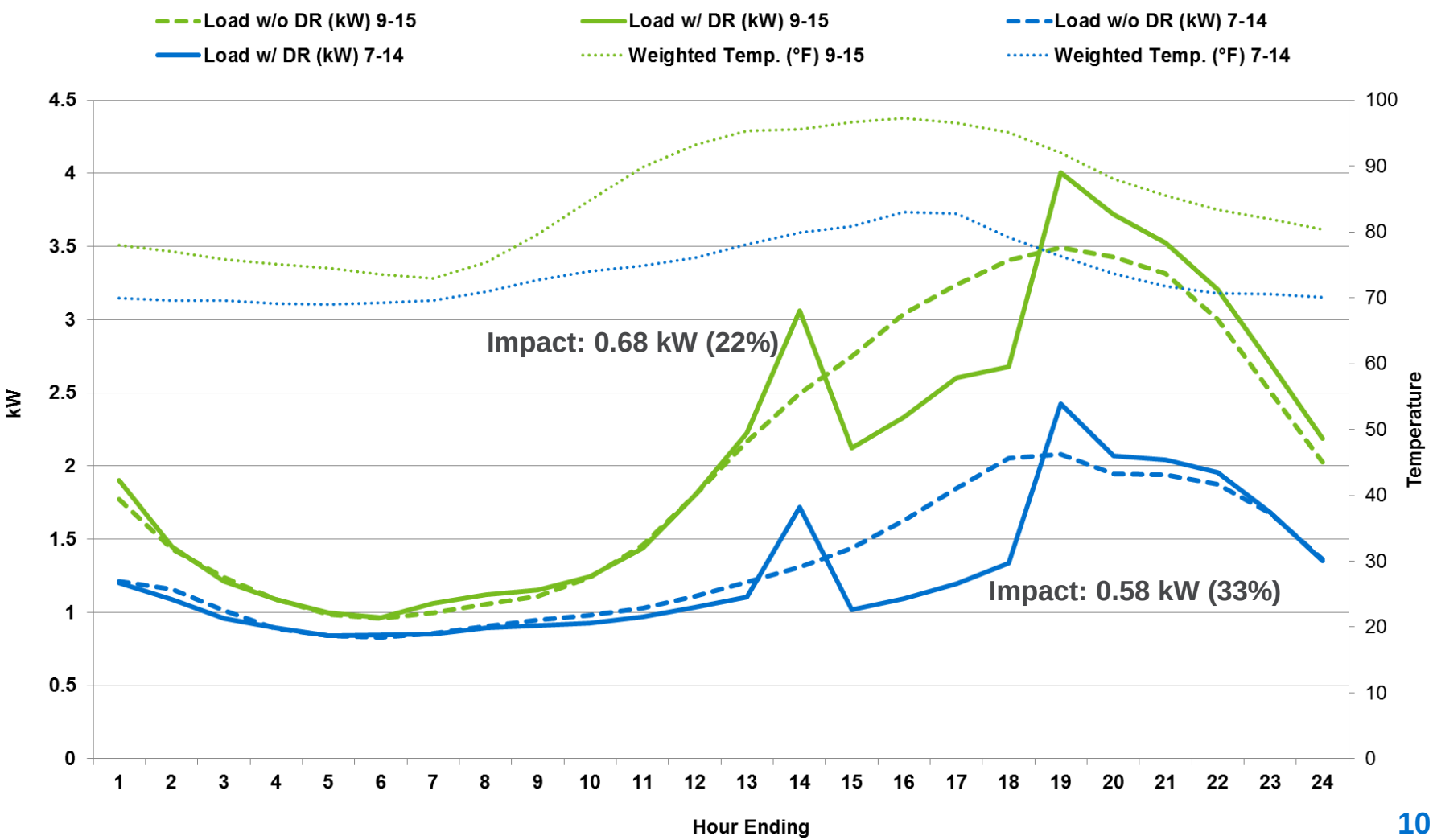
Ex post results by event for PCT customers



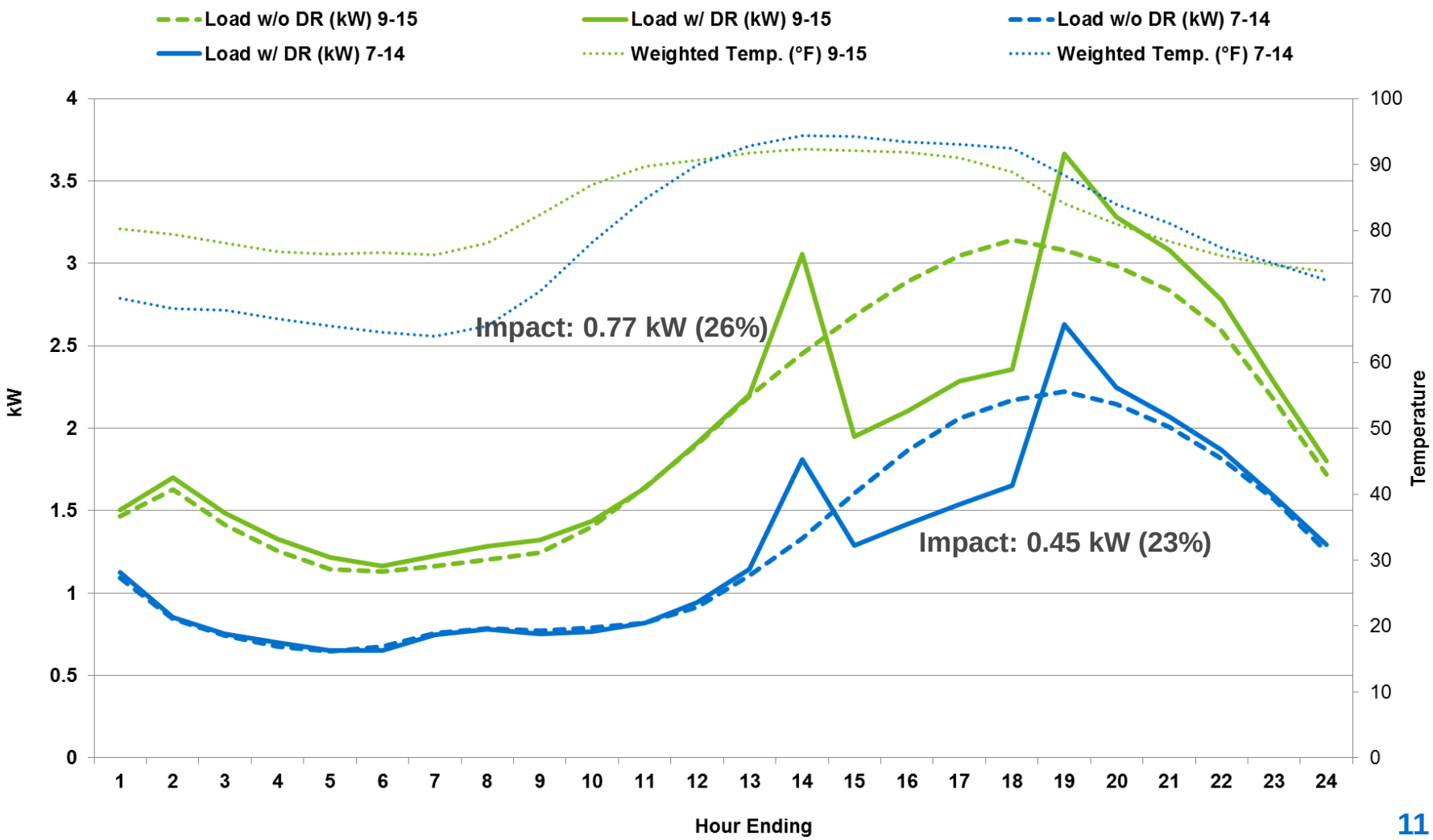
Load impact temperature sensitivity



Load impact temperature sensitivity (Min & Max % Impact)



Load impact temperature sensitivity (Min & Max kW Impact)



Results discussion

- Precooling & snapback
  - Precooling for the average event was statistically significant at approximately -0.5 kW (-30%) in the hour preceding the event
    - The event start time of 2 PM results in the precooling occurring during the hour starting at 1 PM, which is inside the Resource Adequacy (RA) window of 1 PM to 6 PM
  - Snapback is significant during the first hour after the event at approximately -0.47 kW (-18%), and falls off thereafter
- Year over year comparison

Participant Group	Number of Customers[1]	Avg. Reference Load (kW)	Avg. Load w/ DR (kW)	Avg. Load Impact (kW)	% Load Impact	Aggregate Load Impact (MW)	Heat Buildup (Avg. °F, 12 AM to 5 PM)
PCT 2013 (All)	1,344	2.50	1.76	0.75	29.8%	1.0	78.7
PCT 2014 (All)	2,650	2.25	1.64	0.60	26.9%	1.6	77.8
Existing Cust.	1,000	2.28	1.62	0.66	29.1%	0.7	77.8
New Cust.	1,650	2.23	1.66	0.57	25.7%	0.9	77.8

  - Overall, average load impacts per customer decreased by 20%
    - Reference loads decreased by 10% in 2014 compared to 2013
    - Existing customers provided a similar percentage load impact between 2013 and 2014
    - Newly recruited customers exhibited a smaller load impact in both kW and percentage terms

[1] Average number of customers across event season

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