What? Another DR Evaluation Presentation?

Interesting and out of the ordinary findings from SDG&E's PTR evaluation

Dave Hanna

Chicago, IL - August xx, 2015

INTRODUCTION

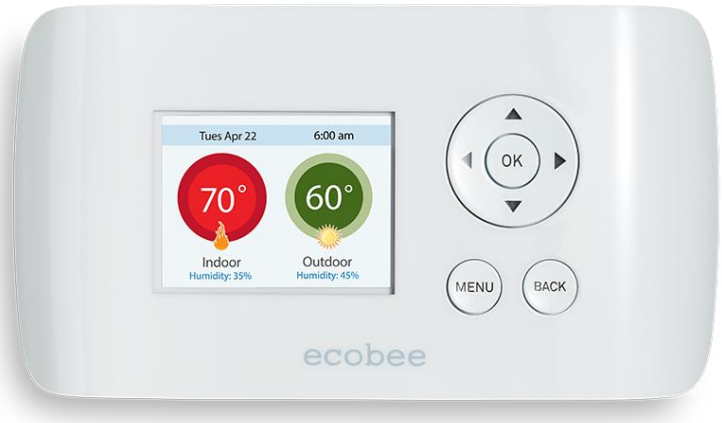
- Program Overview
- Analysis Methods
- Results:
  - Net Energy Metering (PV) Impact on PTR
  - Smart Thermostats in PTR – AC cycling vs temperature setback
  - Wild Fires – Potential Bias in impact estimation

PEAK TIME REBATE PROGRAM

- Notification on a day-ahead basis for events
  - 11 a.m. – 6 p.m.
- Two-level incentive program
  - Basic ($0.75/kWh)
  - Premium ($1.25/kWh)
- Bill credit based on reduction in electric usage below customer reference level (CRL)
- Opt-in to receive credit, beginning in 2013
  - Was default, with opt-in for notification

SMALL CUSTOMER TECHNOLOGY DEPLOYMENT (SCTD) PROGRAM

- Free programmable communicating thermostats (PCTs) with DR-enabling technology
- Two DR methods – randomly assigned
  - 50% air conditioning cycling
  - 4 degree thermostat setback
- 2 p.m. – 6 p.m.

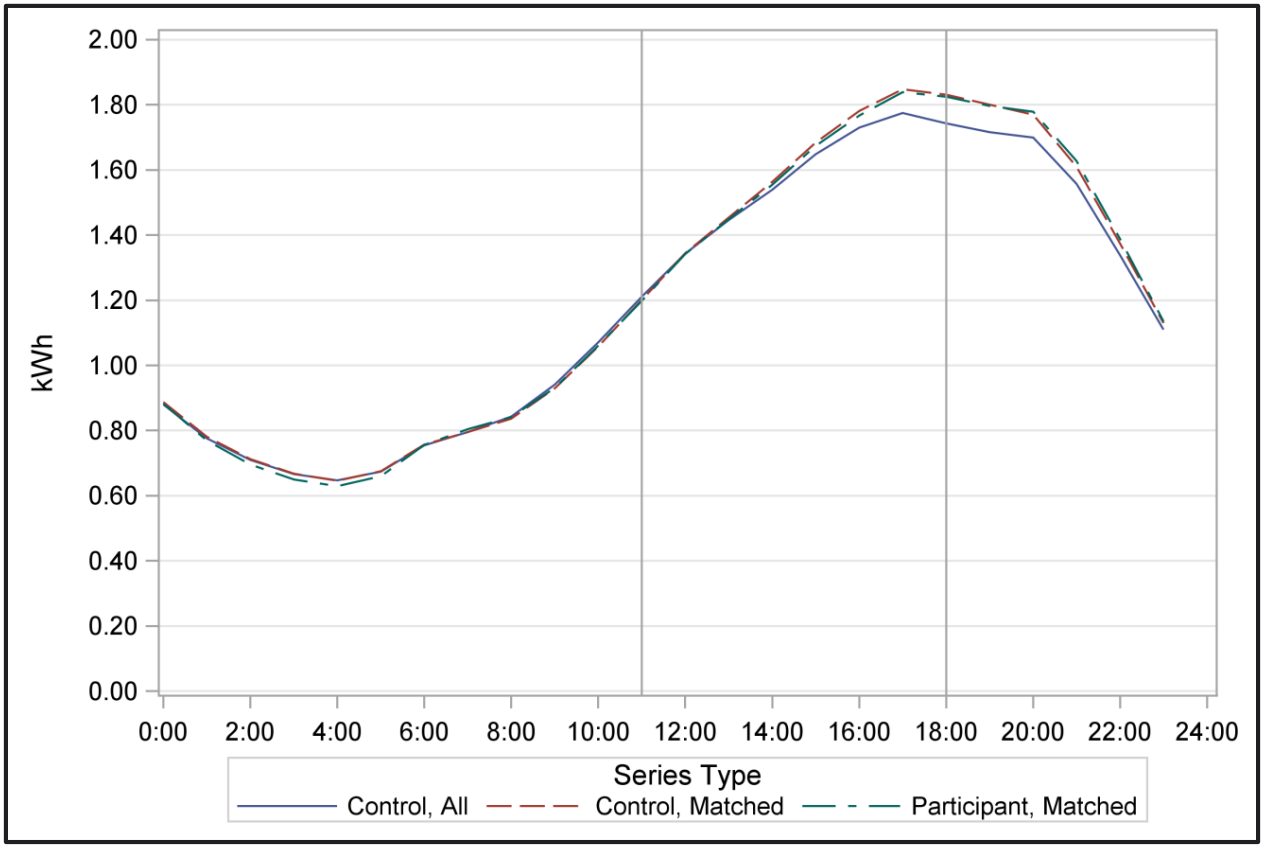


METHODS

- Multiple Segment Aggregated Regression models
  - PTR only –
  - Load Control –
- Compared participant and reference hourly residential loads
  - Reference loads calculated from matched control groups of non-program participants
- Control groups selected via Stratified Propensity Score Matching
  - Logistic regression model to estimate probability of participation

METHODS - PSM

» Two stages of Propensity Score Matching
- Stage I – Monthly Billing Data, 5-to-1 matches
- Stage II – Interval Data, 1-to-1 matches



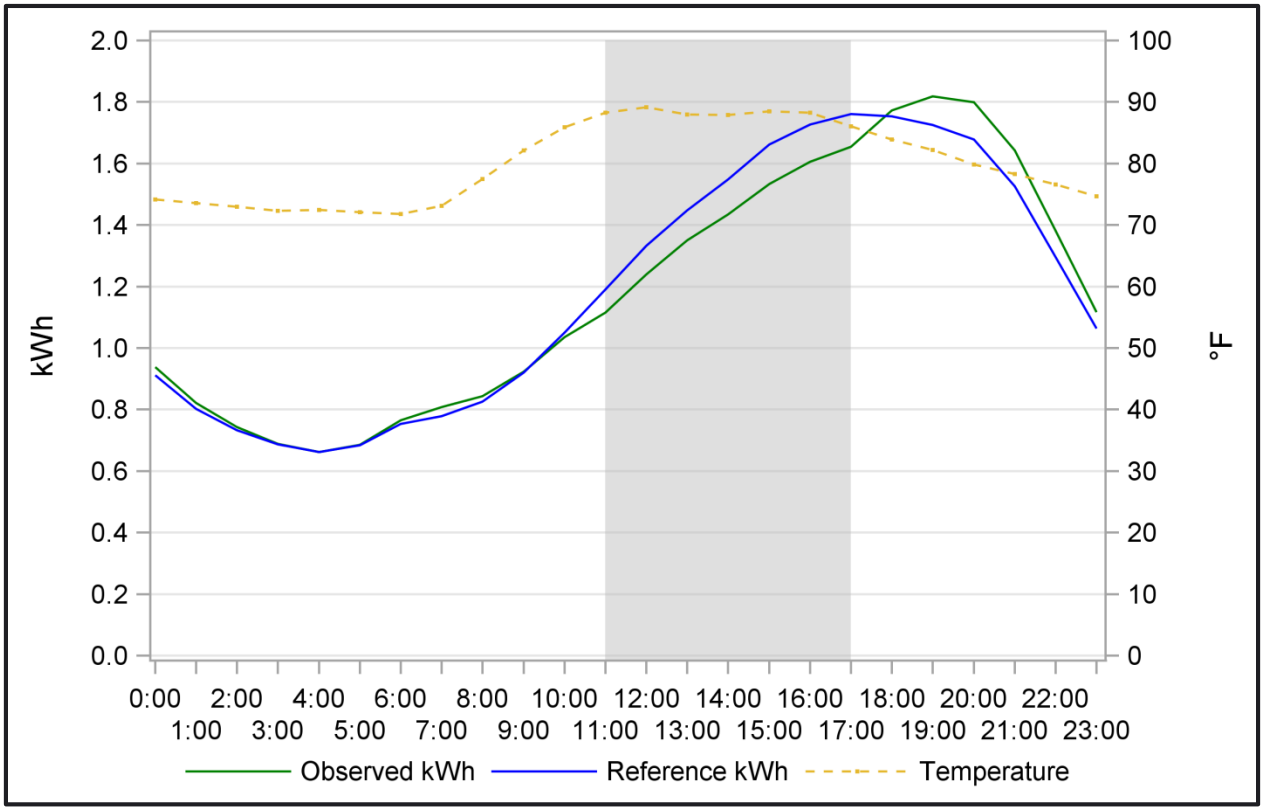
METHODS – EX-POST IMPACTS

- Impact models based on aggregate hourly residential loads for opt-in alert groups and matched controls
- Final model specifications included variables for hour, day of the week, month, cooling degree hours (CDH65), event indicators, and opt-in status

$$
\begin{aligned}
kWh_t = \beta_0 &+ \sum_d \beta_1^d \times DOW_d + \sum_m \beta_2^m \times Month_m + \sum_h \beta_3^h \times Hour_h \\
&+ \sum_d \sum_h \beta_4^{h,d} \times Hour_h \times DOW_d + \sum_m \sum_h \beta_5^{h,m} \times Hour_h \times Month_m + \beta_6 \\
&\times CDH65 + \sum_h \beta_7^h \times Hour_h \times CDH65_h \\
&+ \sum_h \beta_8^h \times Hour_h \times CDH65_h \times Event \\
&+ \sum_h \beta_9^h \times Hour_h \times CDH65_h \times Event \times InactivePart \\
&+ \sum_h \beta_{10}^h \times Hour_h \times CDH65_h \times Event \times ActivePart + \varepsilon_t
\end{aligned}
$$

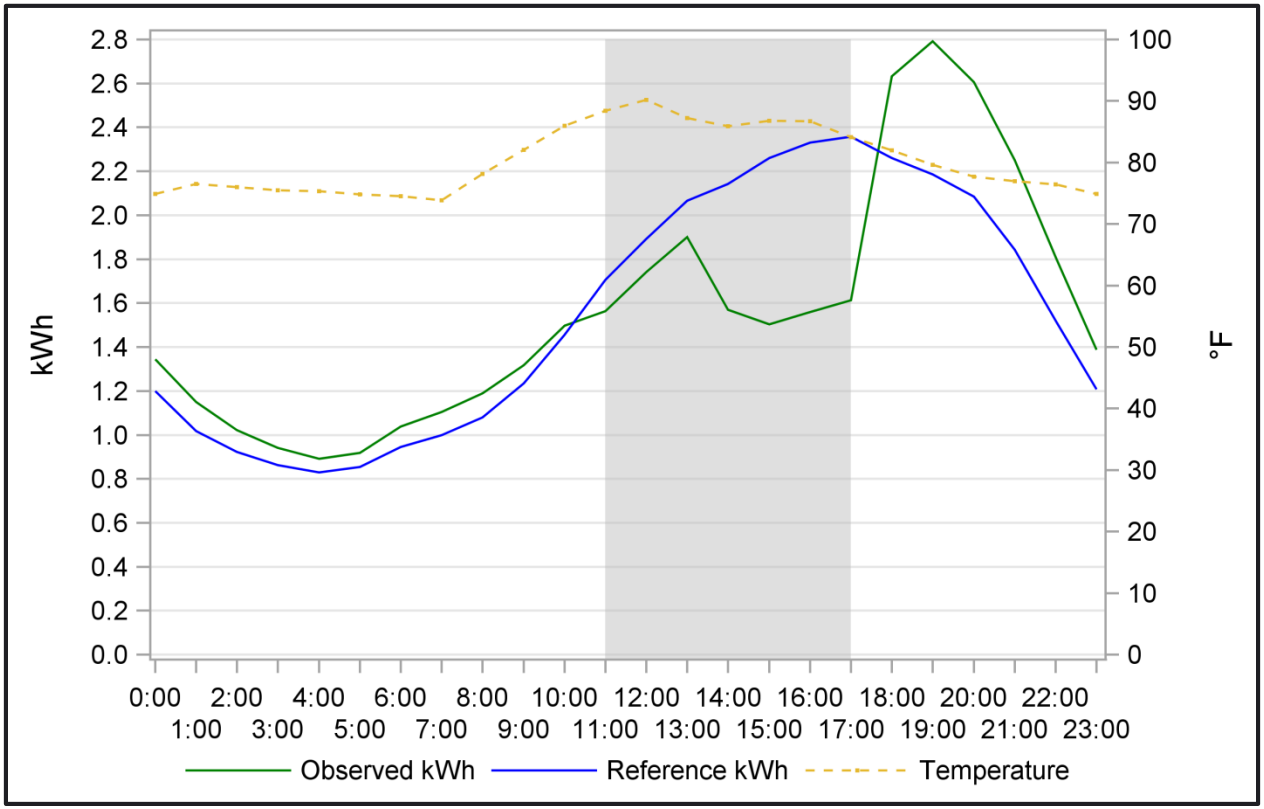
RESULTS - PTR

- Average Participant Event Hour Load Reduction : 0.11 kW
- Average Aggregate Event Hour Load Reduction : 5.92 MW (6.9%)
- Average Temperature : 88.0°F; Average Active Participants : 56,270



RESULTS - SCTD

- Average Participant Event Hour Load Reduction : 0.61 kW
- Average Aggregate Event Hour Load Reduction : 1.16 MW (22.9%)
- Average Active Participants : 1,887

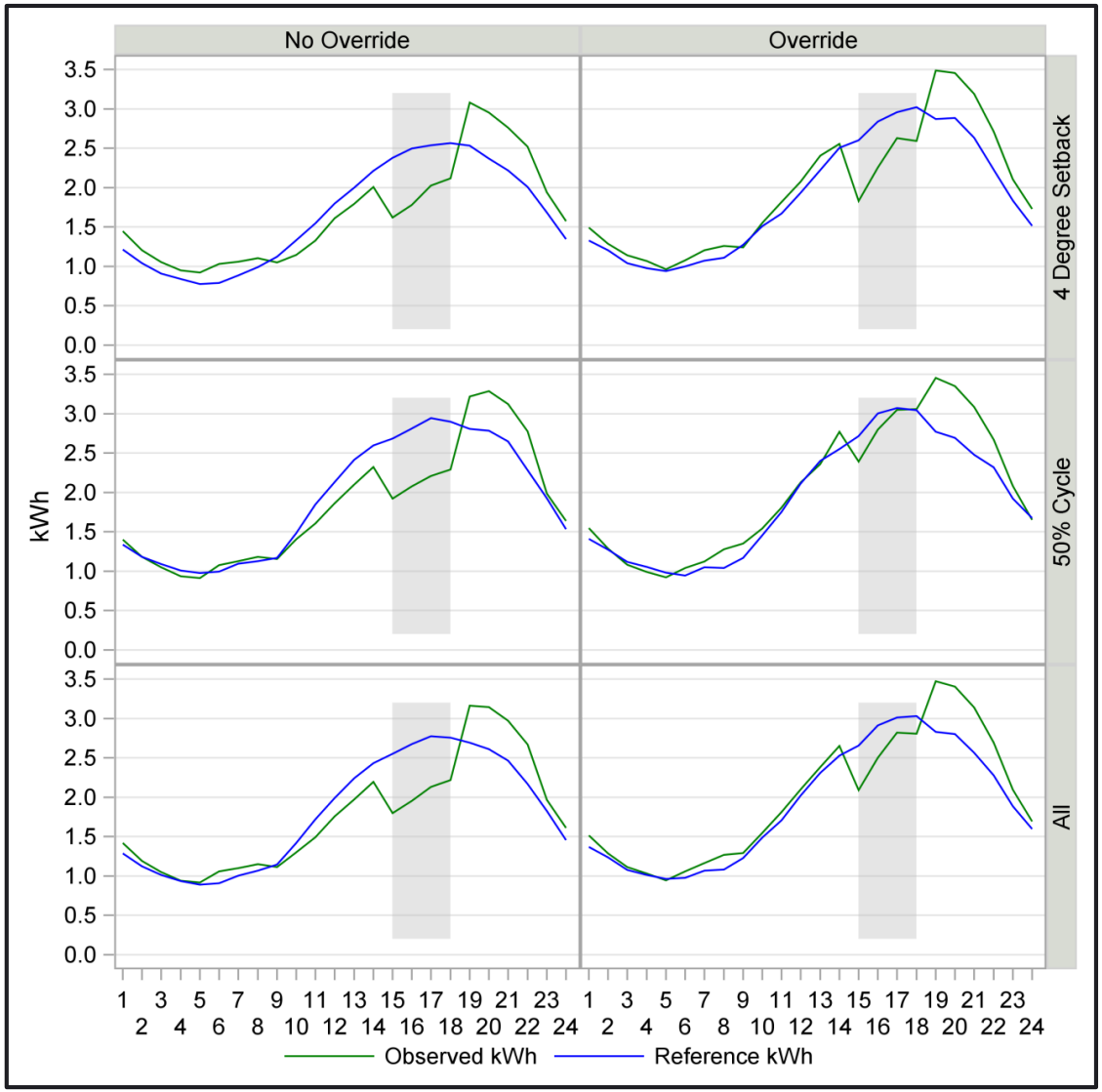


SO…, WHERE’S THE INTERESTING STUFF?

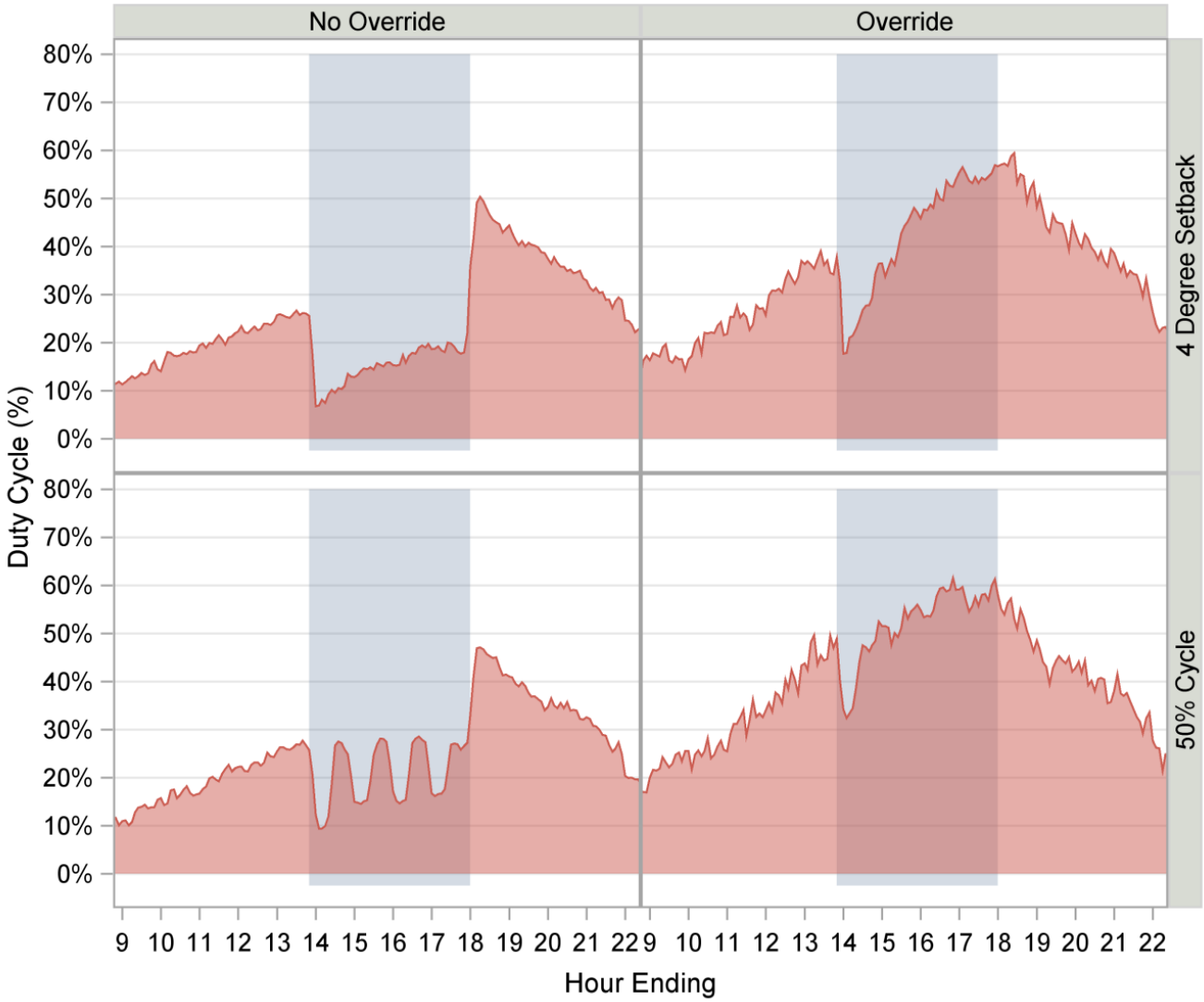
SCTD – OVERRIDES

- Participants can override DR signal during events
  - Thermostat runtime reports show manual AC usage
- About 20% of participants overrode at all during events, averaging 55-65% of event duration
- About 15% of participants overrode for the majority of event, averaging 80-85% of event duration

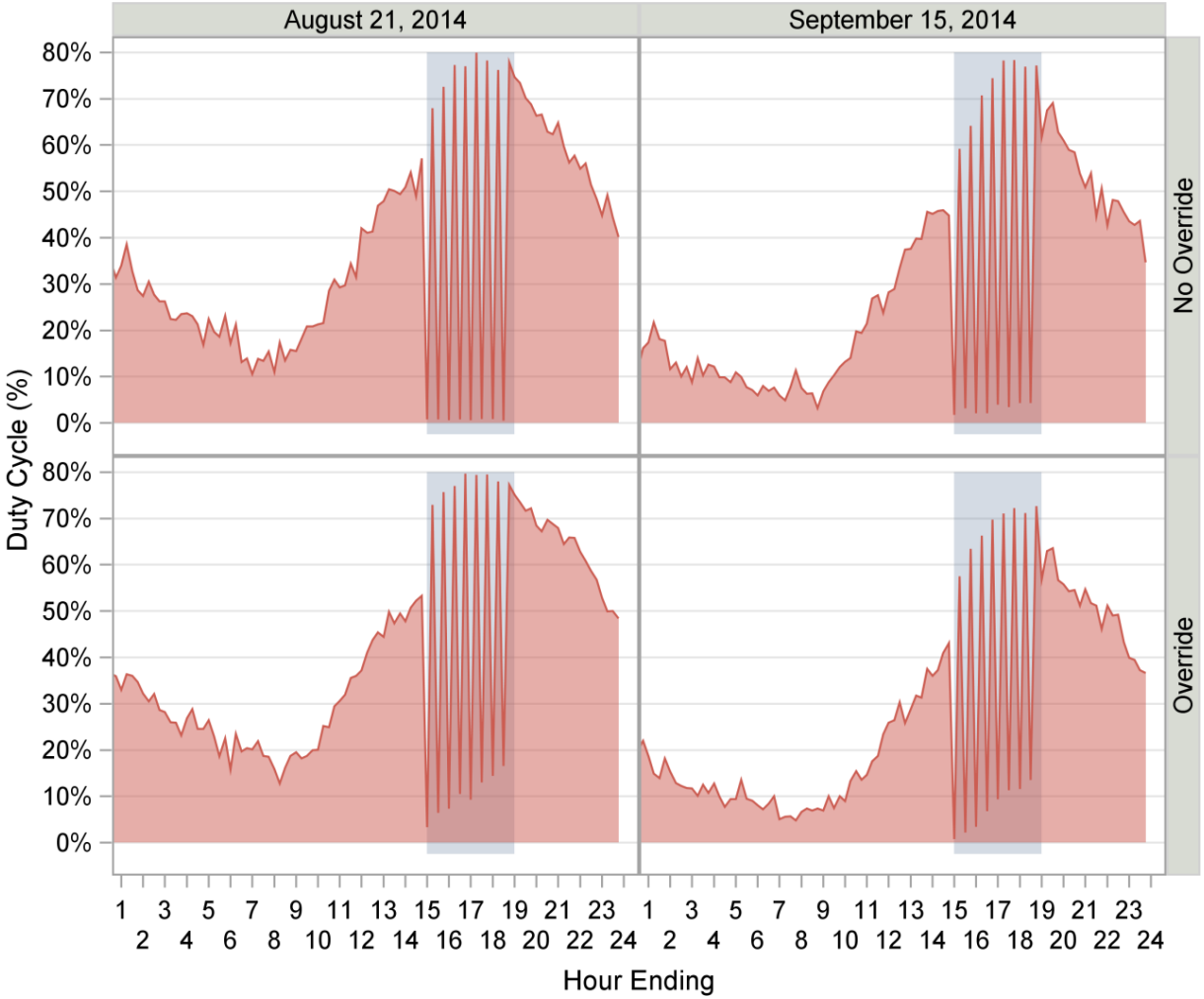
SCTD – OVERRIDES



SCTD OVERRIDES IN THERMOSTAT DATA

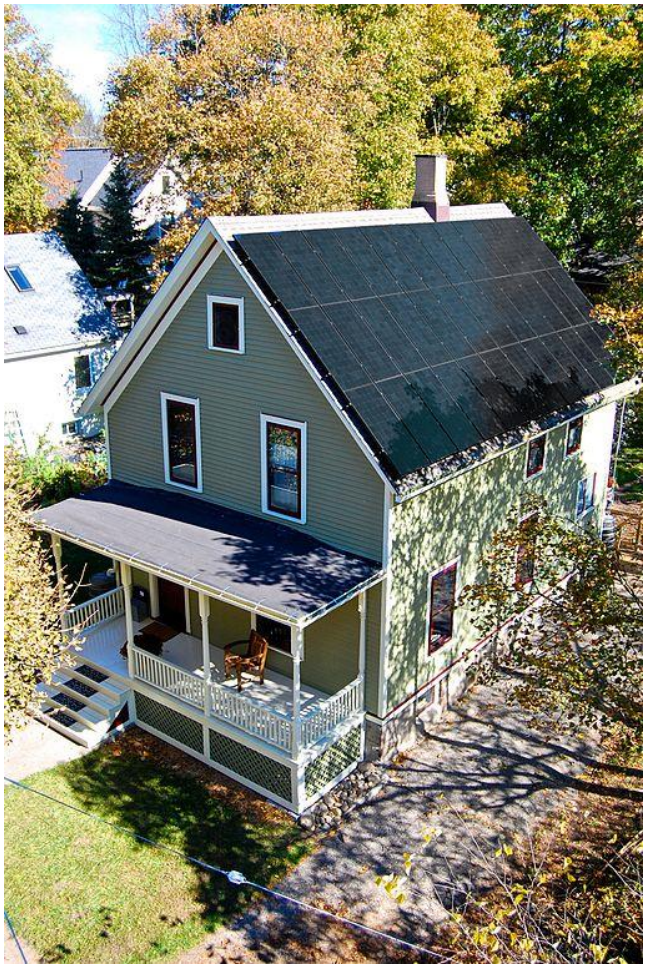


OTHER SMART THERMOSTAT PILOT

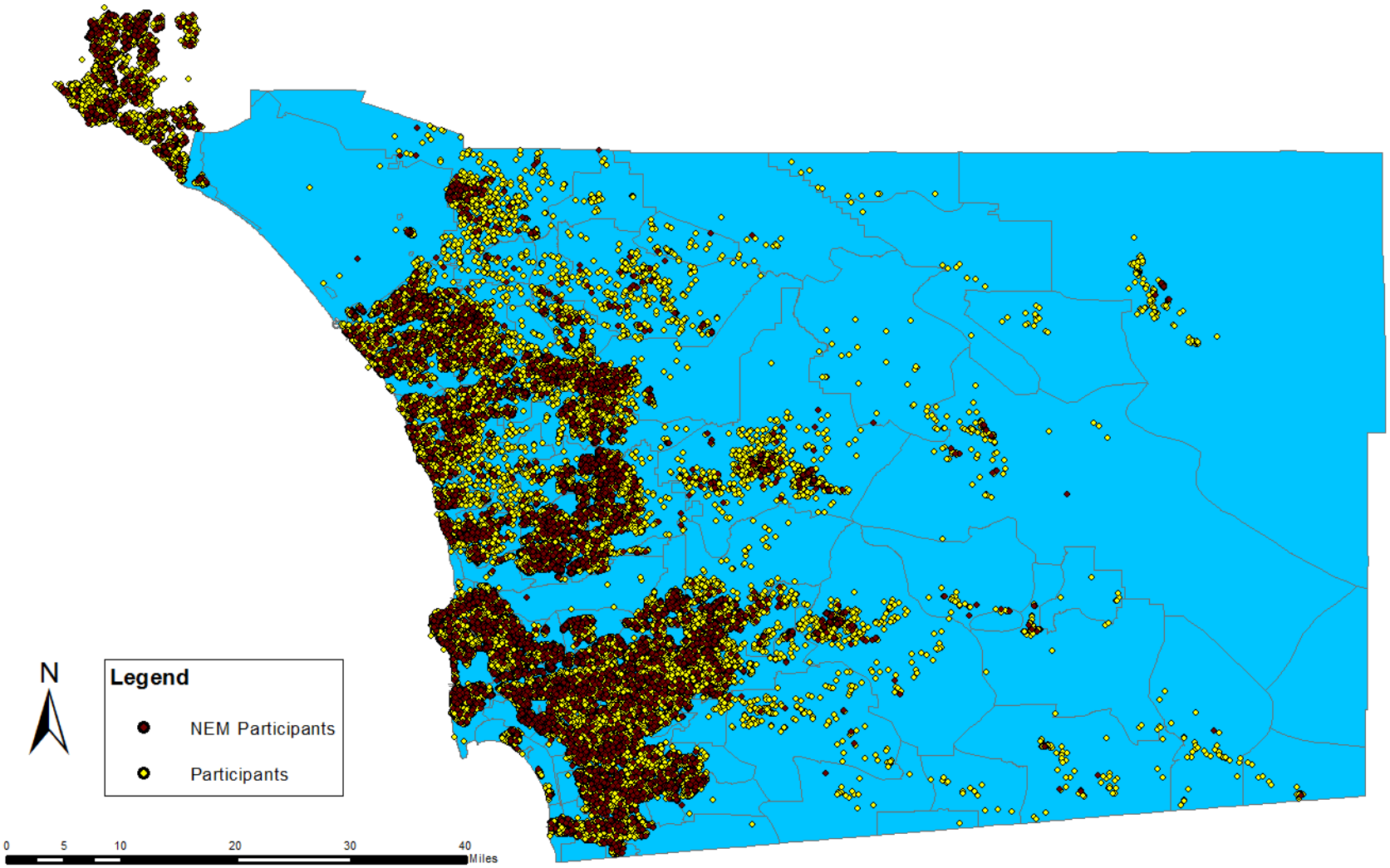


NET ENERGY METERING

- PTR participants with photovoltaic (PV) generation
- Able to export excess PV energy back to grid
- PSM matching done on both import and export channels of interval data
- Ex-post results based on net impact of NEM customers' consumption minus exported PV delivered to the grid

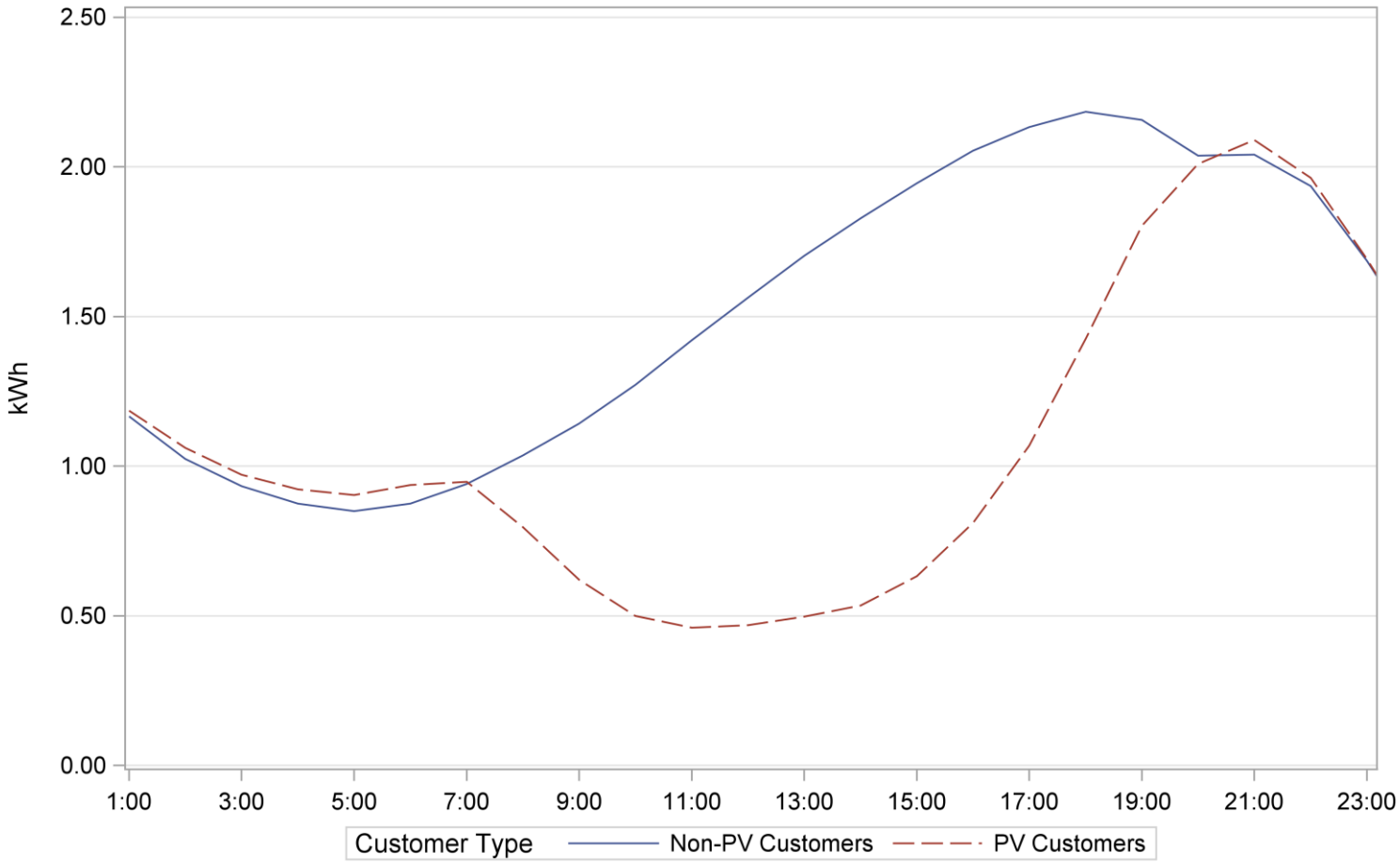


NEM PTR PARTICIPANTS IN SDG&E



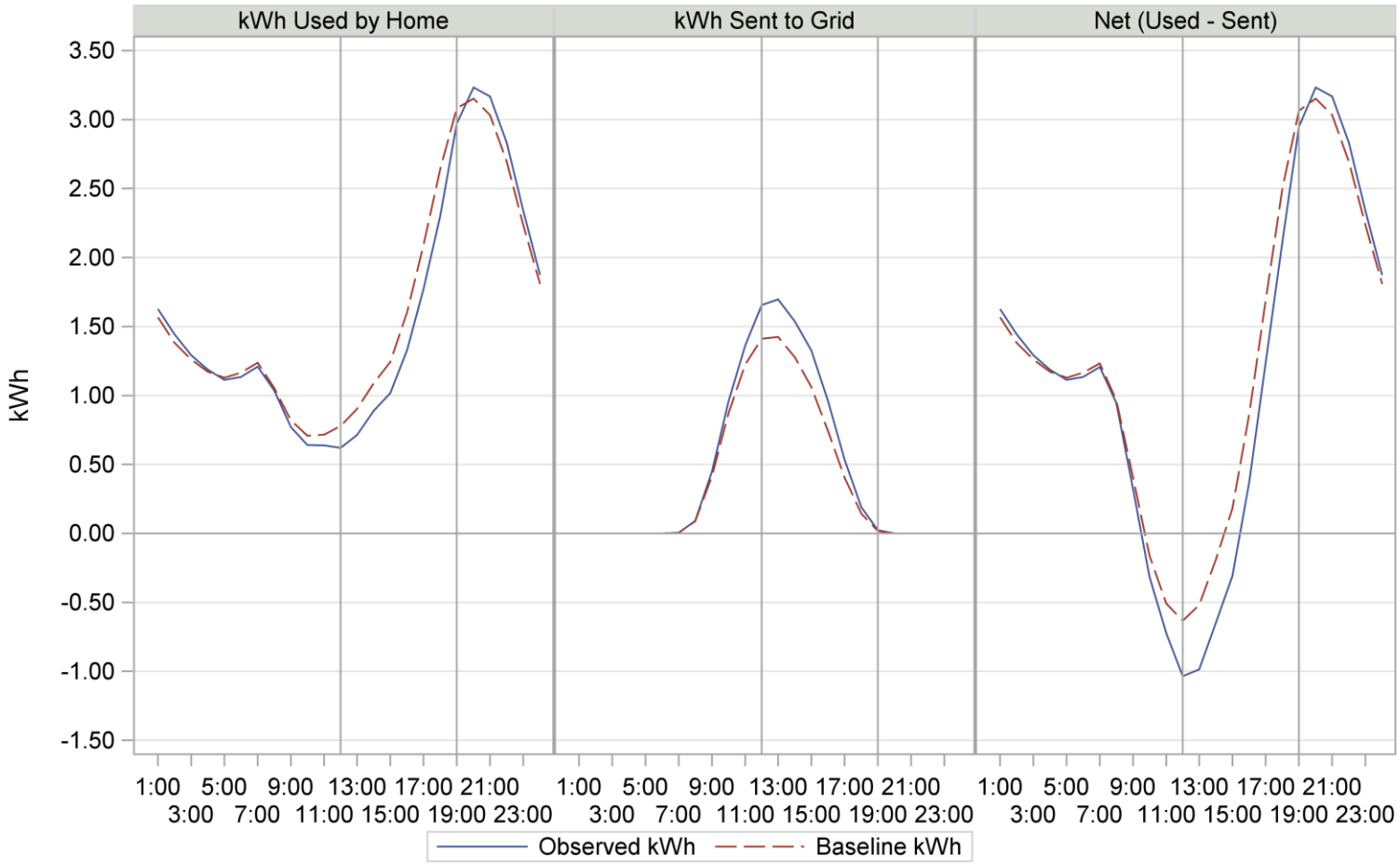
NET ENERGY METERING

» Solar Generation has a Significant Impact on Customer Demand



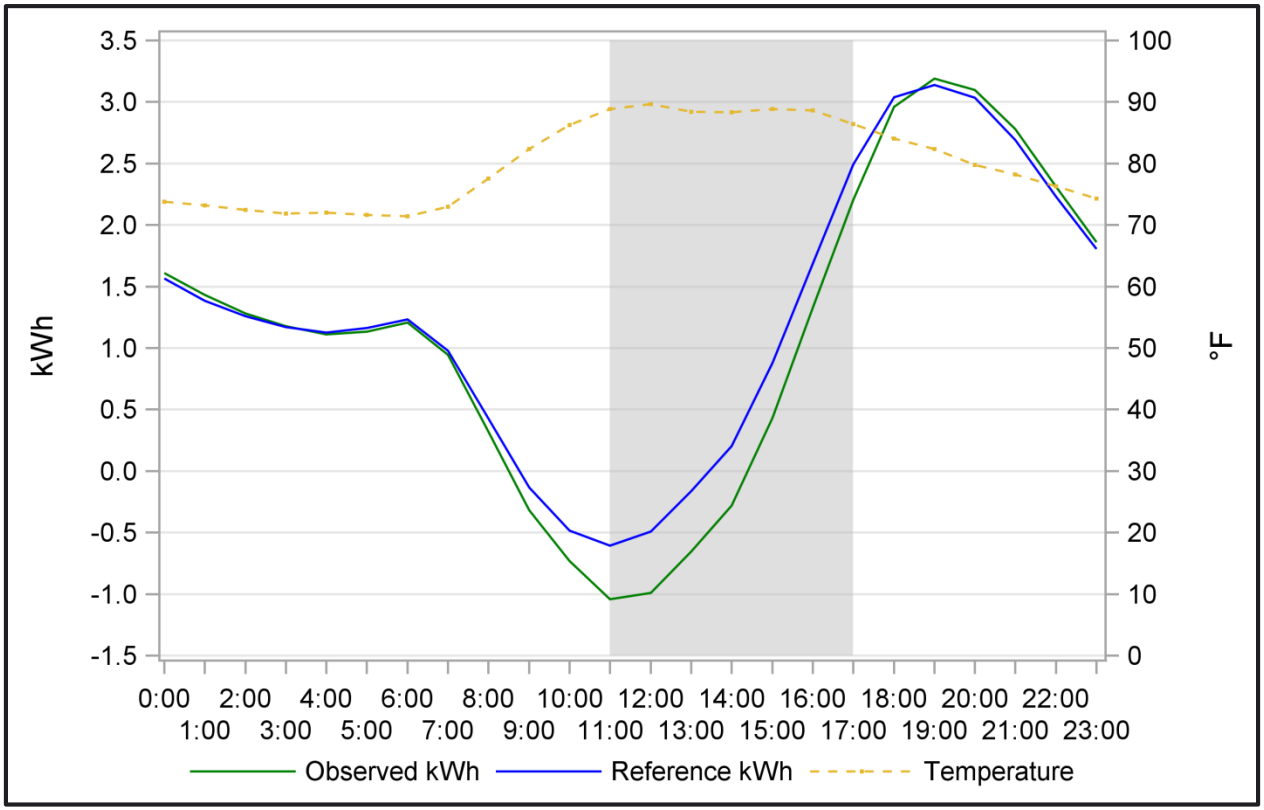
NET ENERGY METERING

» SDG&E AMI Meters Collect Both “Buy” and “Sell”



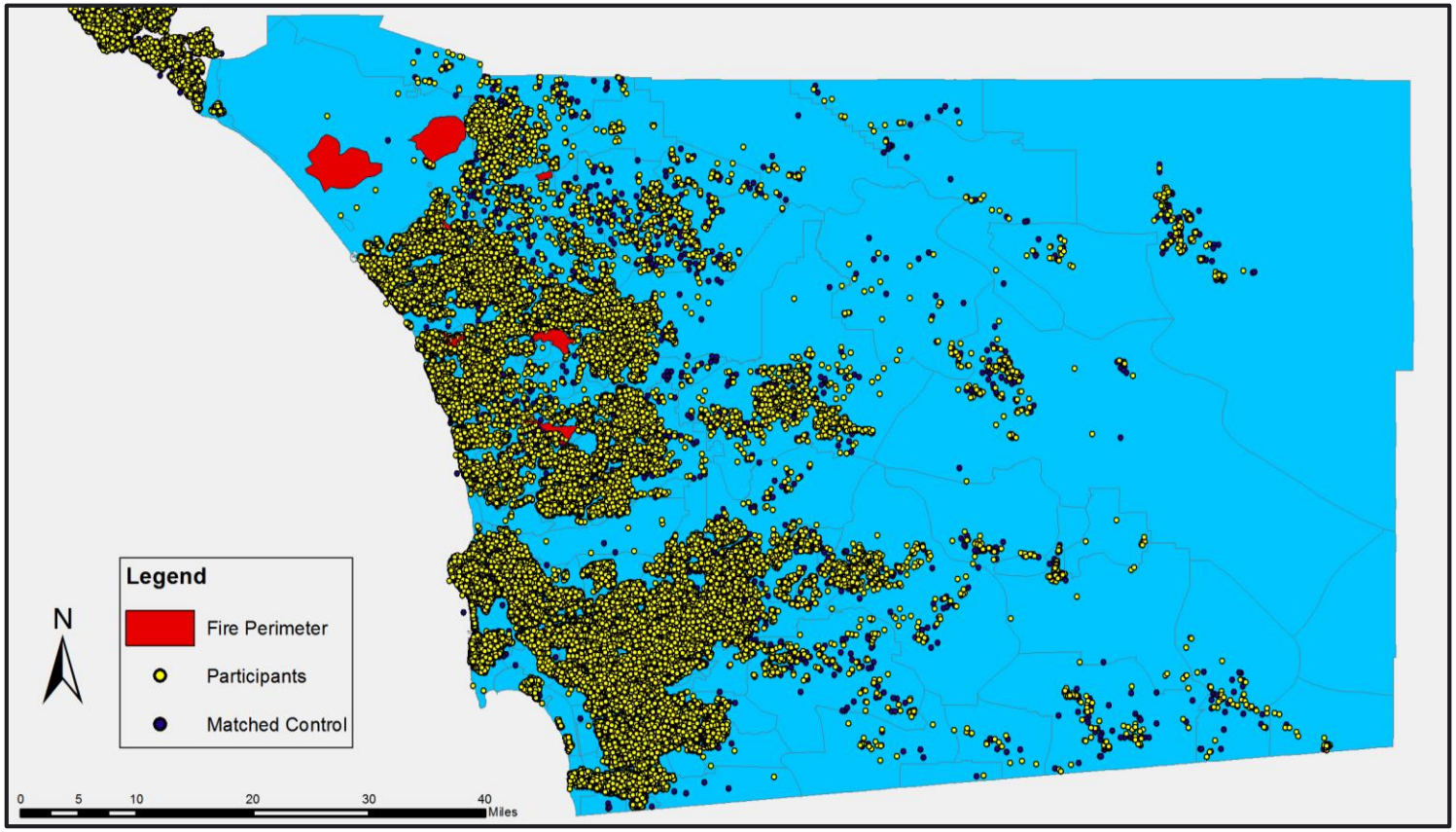
RESULTS – NET ENERGY METERING

- Average Participant Event Hour Load Reduction : 0.43 kW
- Average Aggregate Event Hour Load Reduction : 1.23 MW (-21.3%)
- Average Active Participants : 2,864



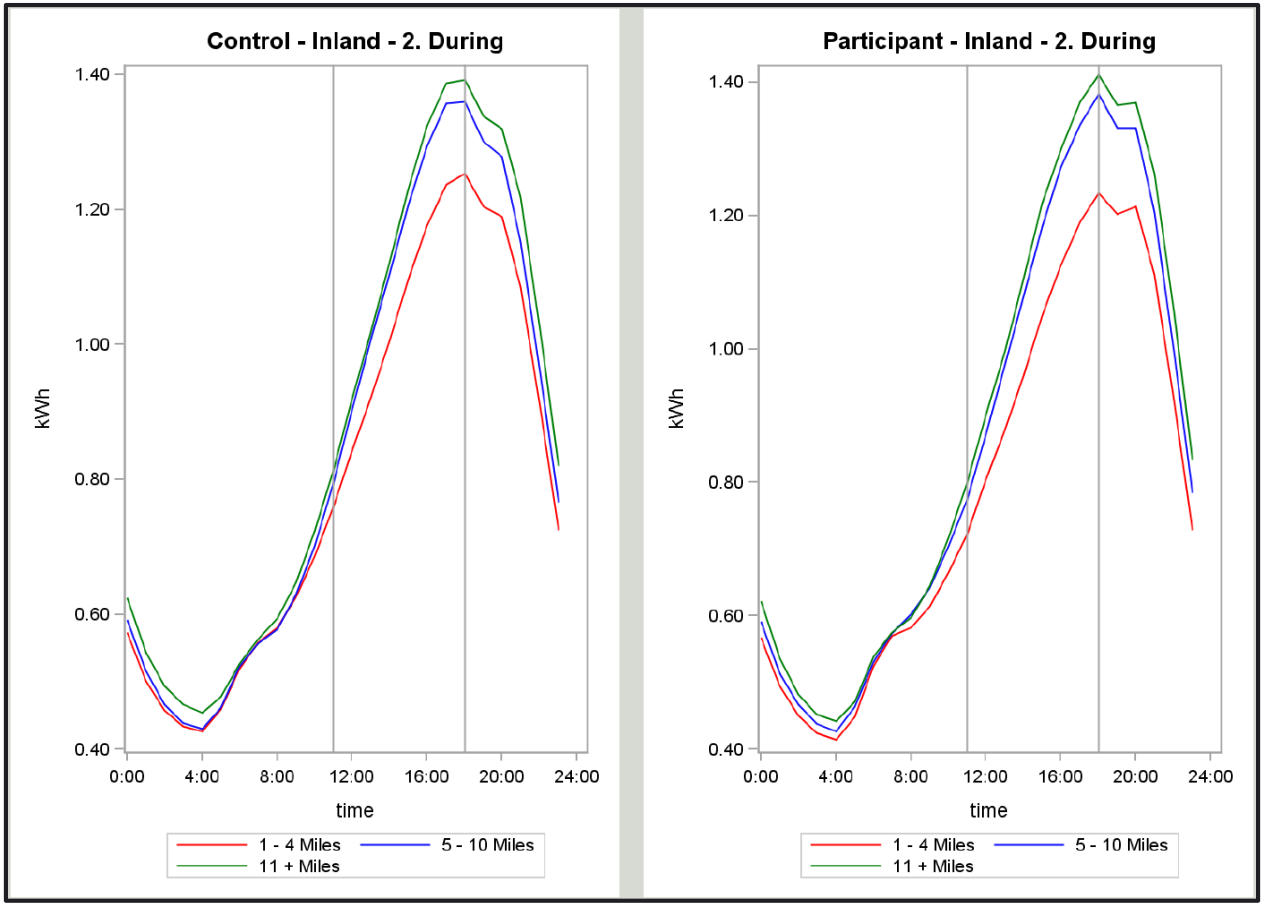
EX-ANTE ESTIMATES - WILDFIRES

» Weather in 2014 was particularly hot
- Swarm of wildfires in May 2014
- Overlapped with several PTR, SCTD, and SS events



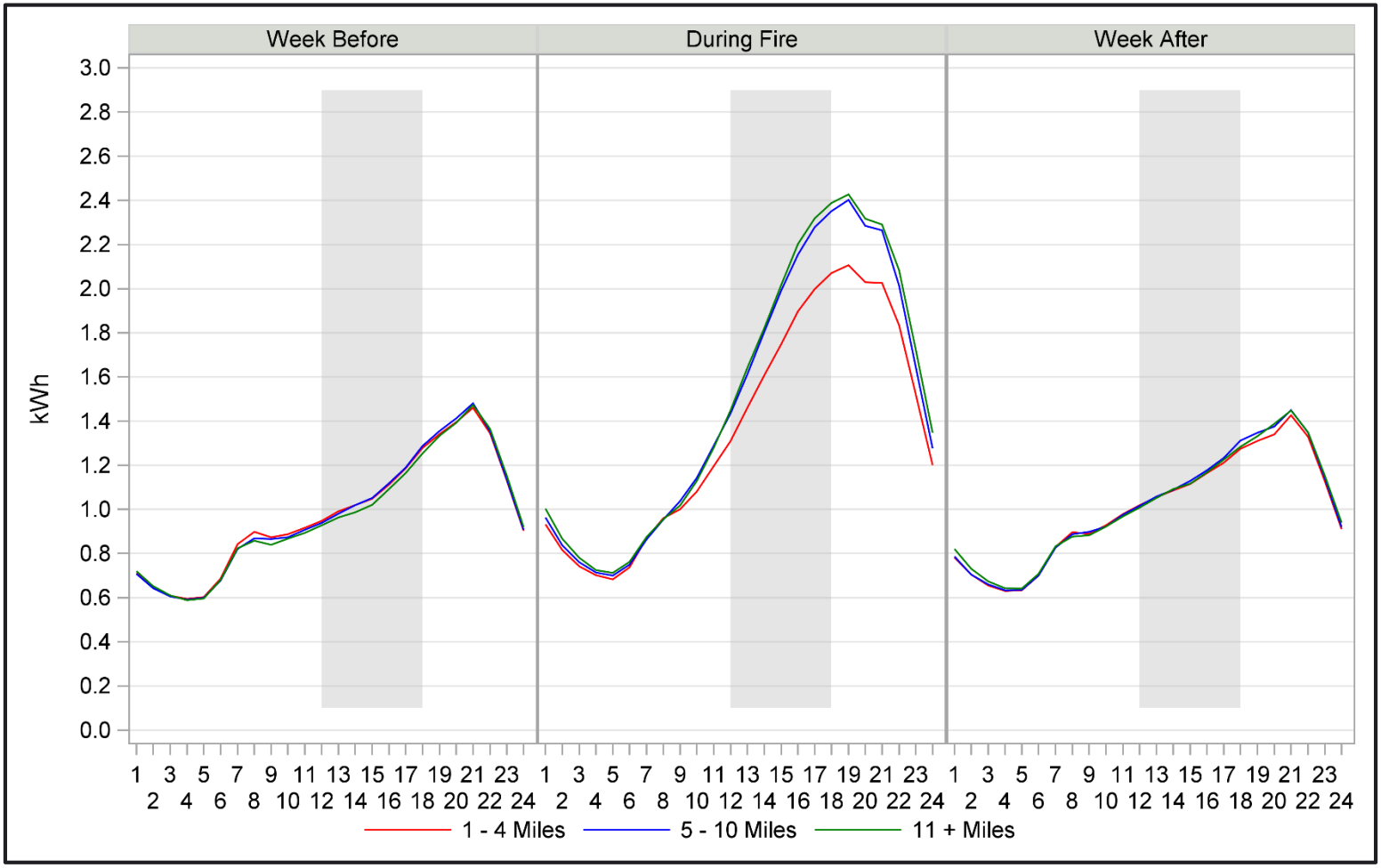
EX-ANTE ESTIMATES - WILDFIRES

» Comparison of Control and Participants by Distance to Fire



EX-ANTE ESTIMATES - WILDFIRES

» Participant Usage Before, During, and After, by Distance to Fire



QUESTIONS?

THANK YOU

Itron

www.itron.com