

*Knowledge to Shape Your Future*

## 2014 SDG&E PTR/SCTD Evaluation

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## Introduction

- Program Overviews
- Methods
- Ex-post Results
- Ex-Ante Estimates

## Peak Time Rebate (Reduce Your Use) 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.

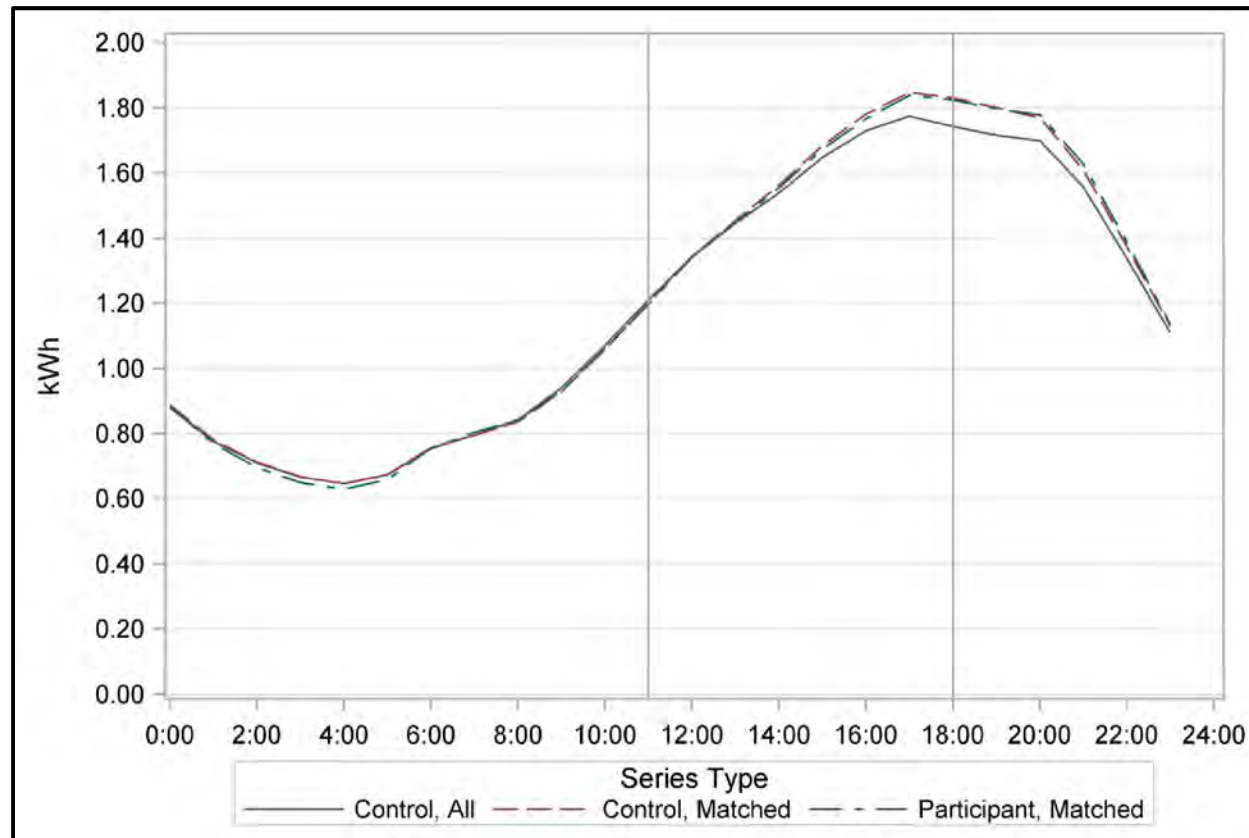


## Methods

- Regression-based models using a difference-in-differences format
- 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 – Billing Data, 5-to-1 matches
  - > Stage II – Interval Data, 1-to-1 matches



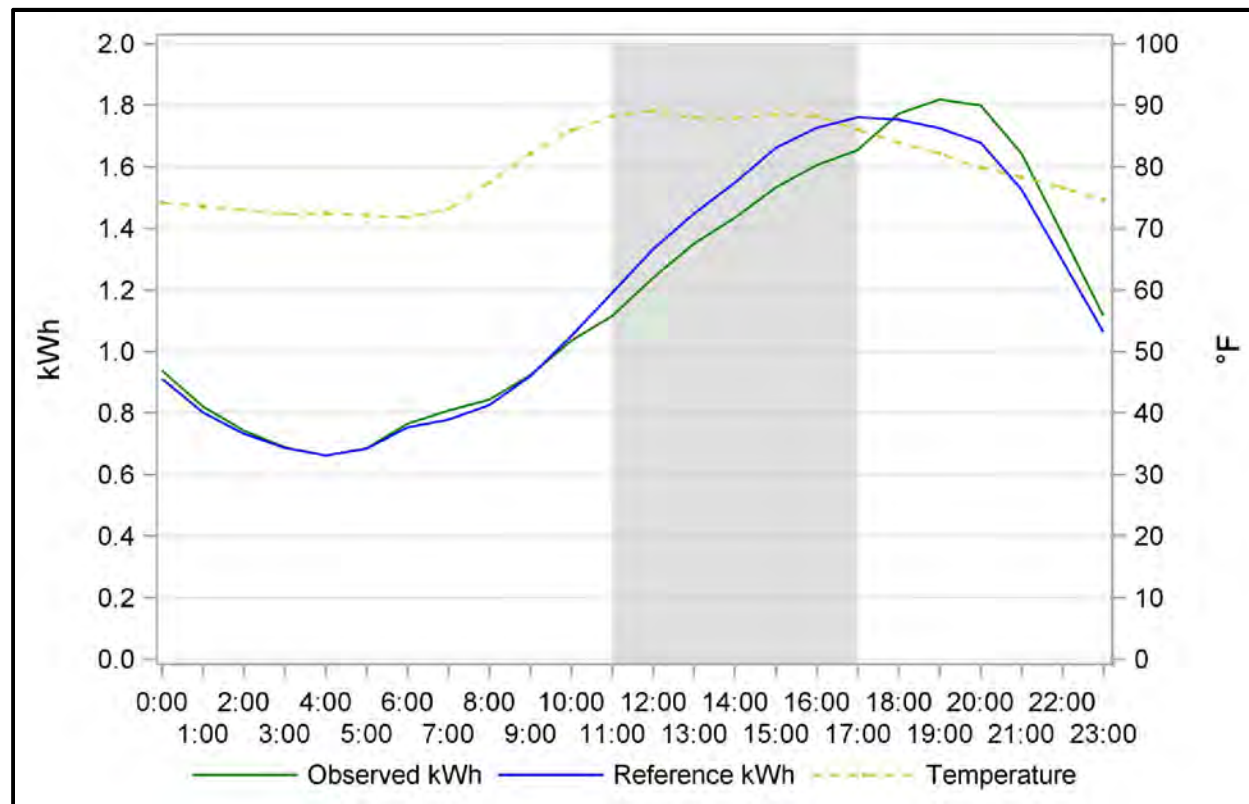
## Methods – Ex-Post Impacts

- 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

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

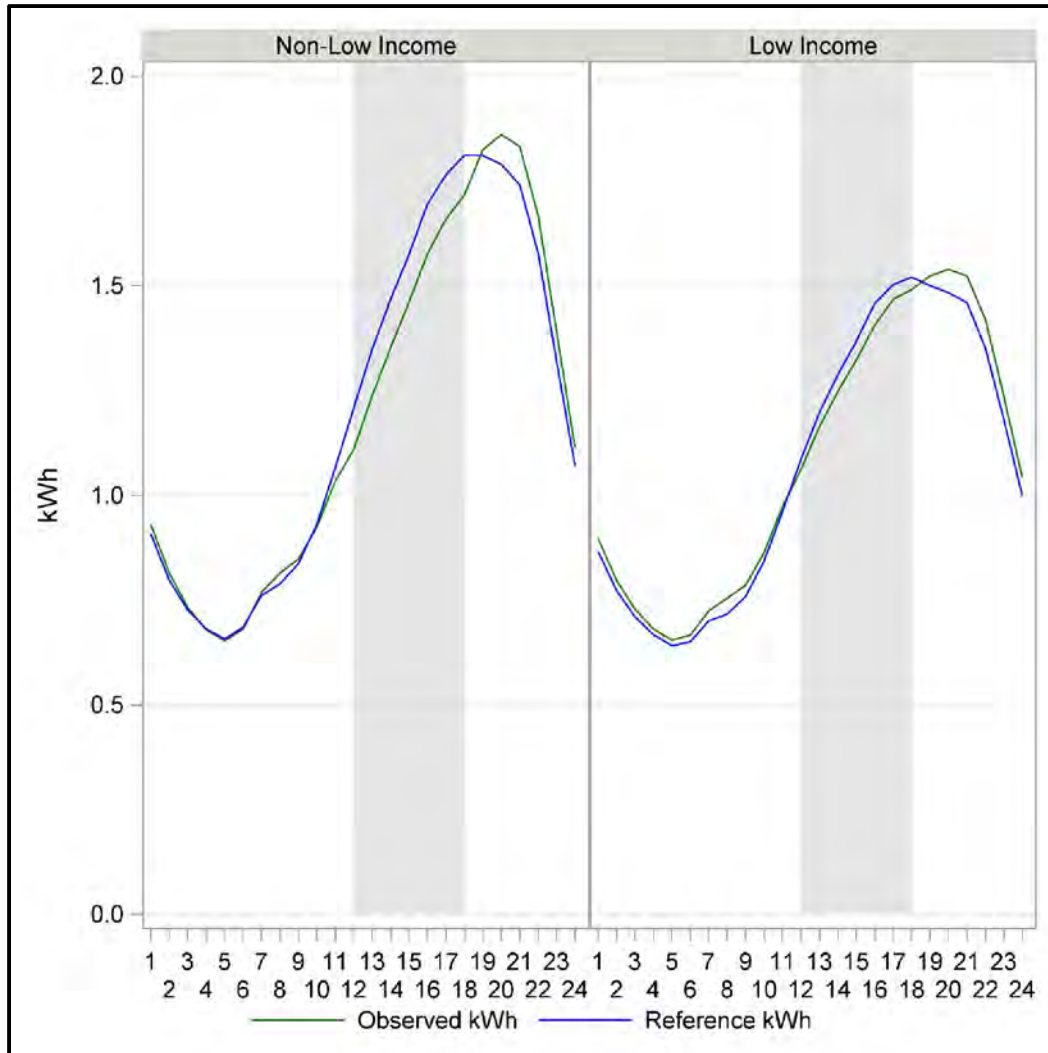
# Results - PTR

- 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



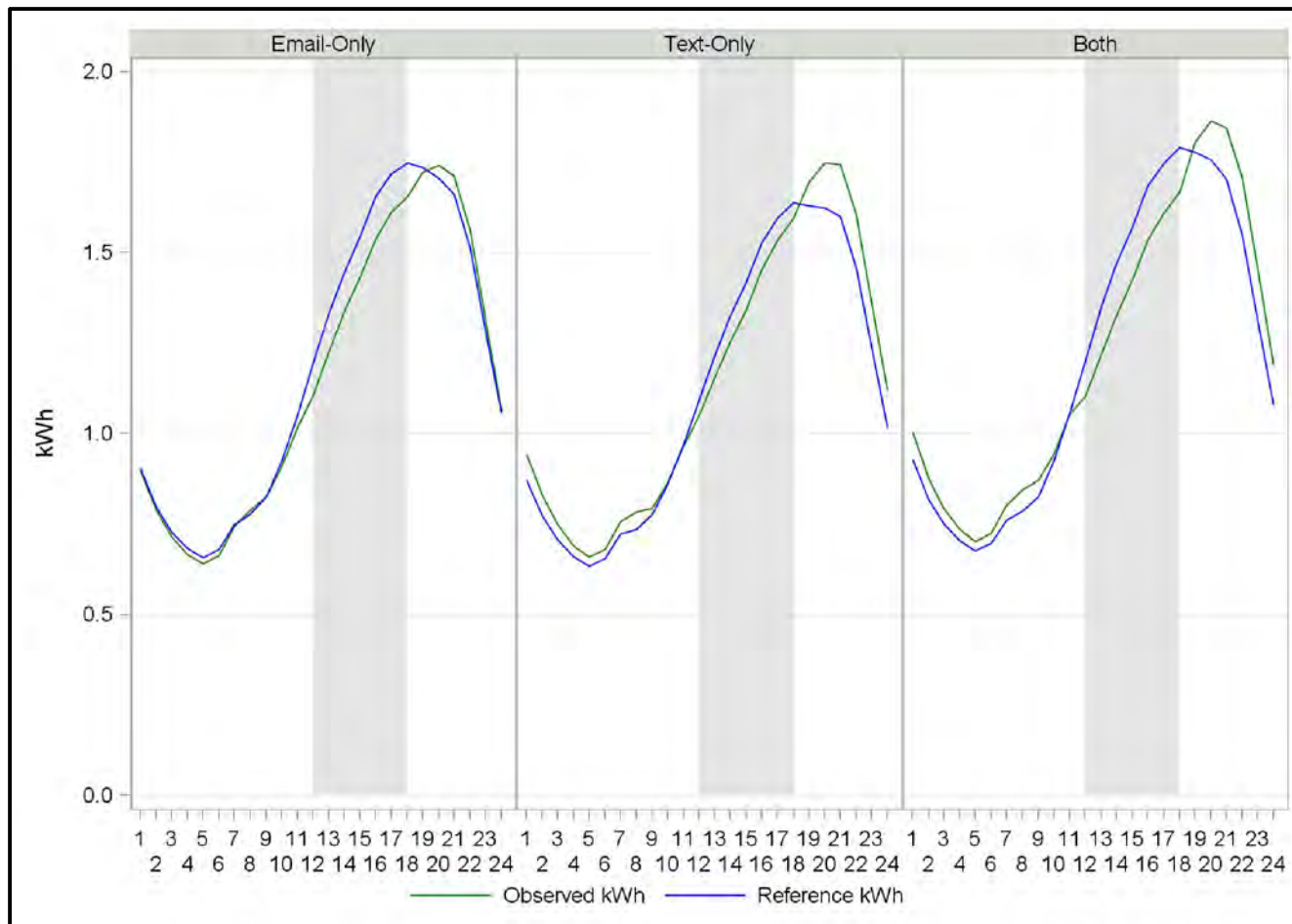


## Results – PTR – Low Income



- Average Participant Event Hour Usage
  - > Non-L.I. : 1.44 kW
  - > L.I. : 1.31 kW
- Average Participant Event Hour Load Reduction
  - > Non-L.I. : 0.11 kW (7.1%)
  - > L.I. : 0.04 kW (2.8%)
- Average Active Participants
  - > Non-L.I. : 35,656
  - > L.I. : 16,199

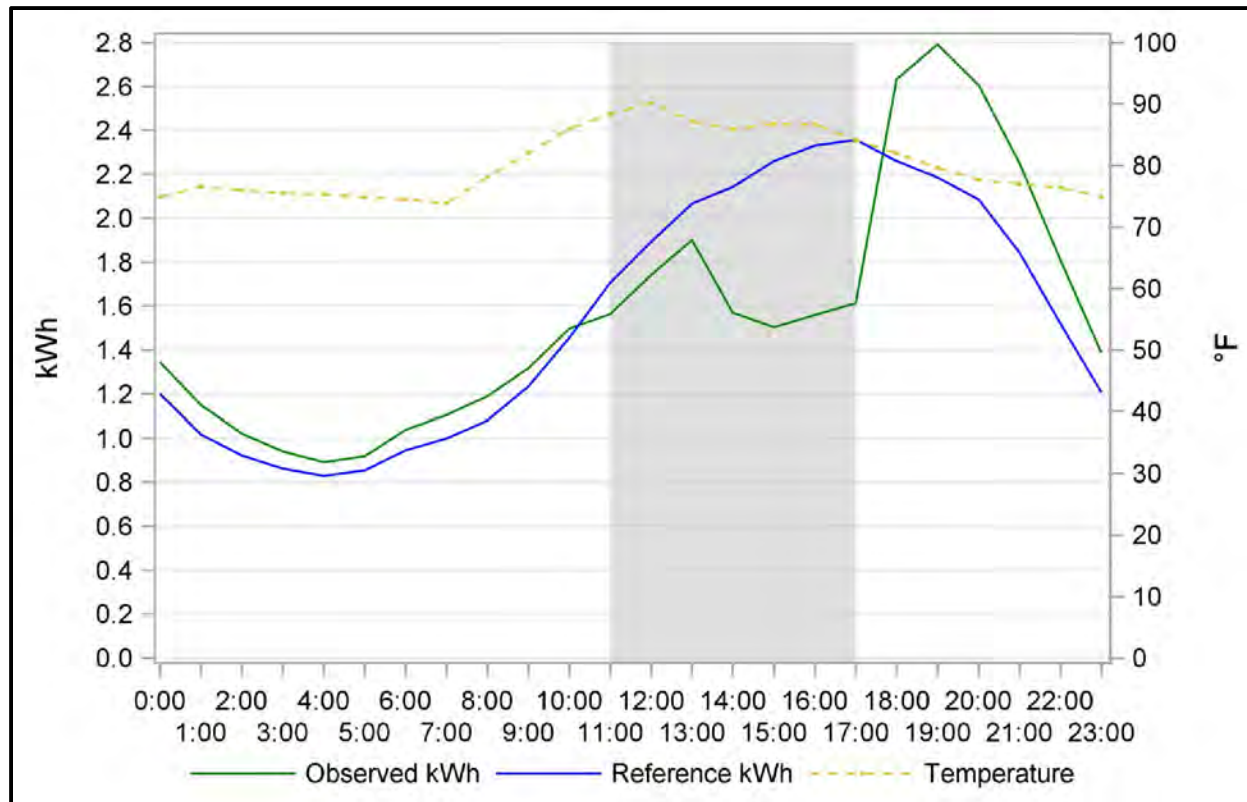
# Results – PTR – Notification Type



- Average Participant Event Hour Load Reduction
  - > Email-Only: 0.10 kW (7.0%)
  - > Text-Only: 0.06 kW (4.4%)
  - > Both: 0.13 kW (8.7%)
- Average Aggregate Event Hour Load Reduction
  - > Email-Only: 3.74 MW
  - > Text-Only: 0.49 MW
  - > Both: 0.96 MW
- Average Active Participants
  - > Email-Only: 35,765
  - > Text-Only: 8,049
  - > Both: 7,251

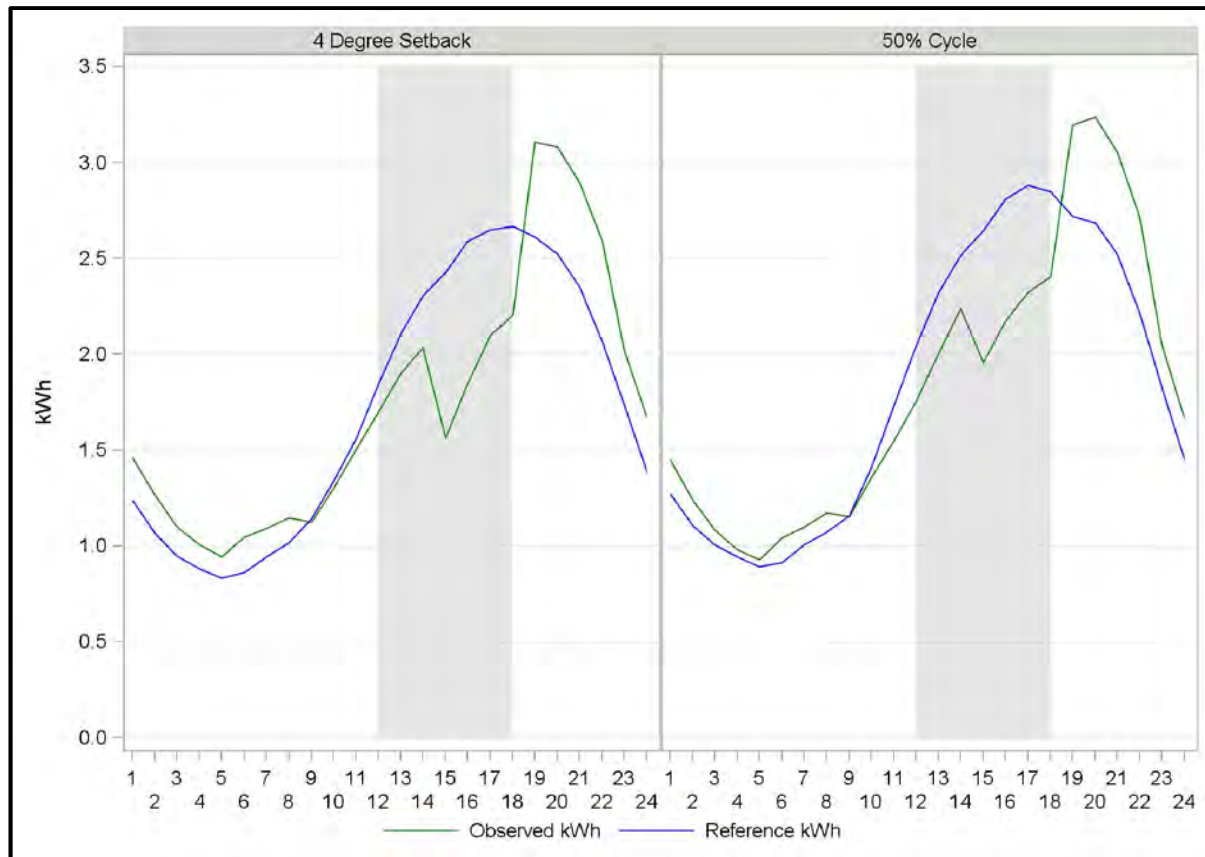
# Results - SCTD

- 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



## Results – SCTD – Cycling Strategy

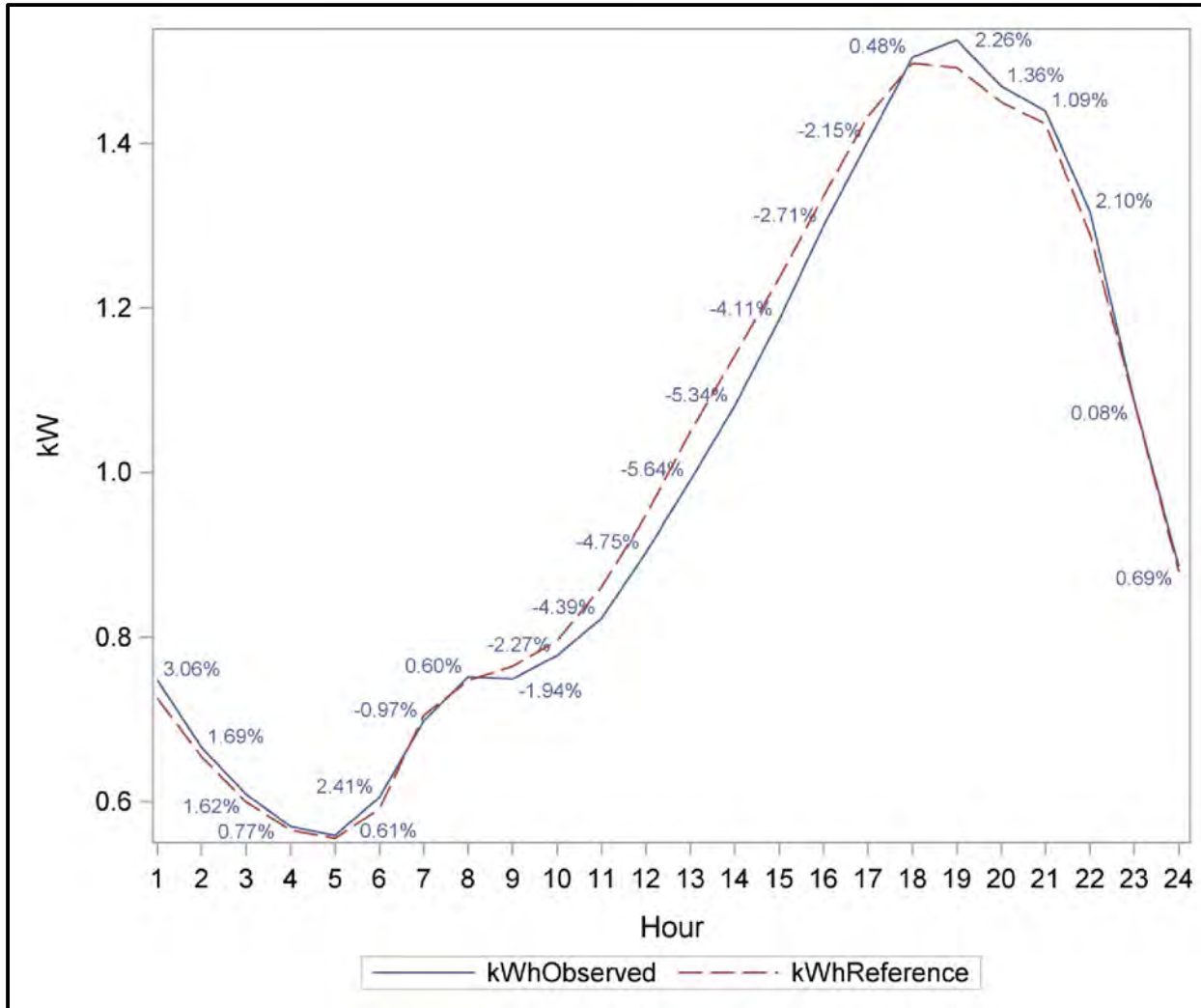
- Average Participant Event Hour Load Reduction
  - > 4 degree : 0.65 kW
  - > 50% cycling: 0.58 kW
- Average Aggregate Event Hour Load Reduction
  - > 4 degree : 0.60 MW (25.6%)
  - > 50% cycling: 0.56 MW (20.9%)
- Average Active Participants
  - > 4 degree : 923
  - > 50% cycling : 964



## SCTD – Energy Savings

- Energy conservation effects estimated using panel time-series regression analysis
  
- Monthly, daily, and hourly models
  
- Daily Model:
  - > Average program impact per weekday = 0.32 kWh (1.3%)

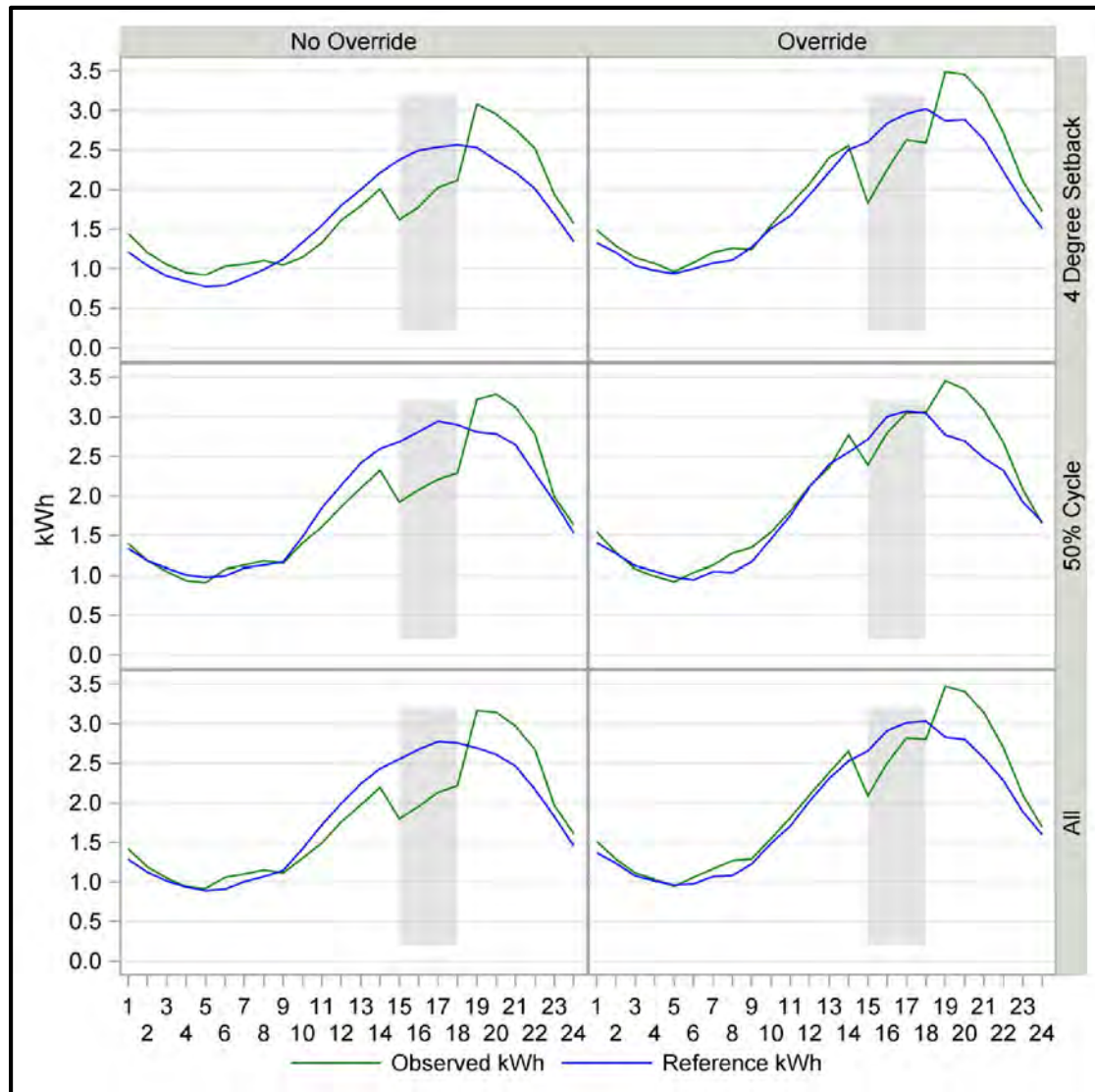
# SCTD - Energy Savings - Weekday Hours



## 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





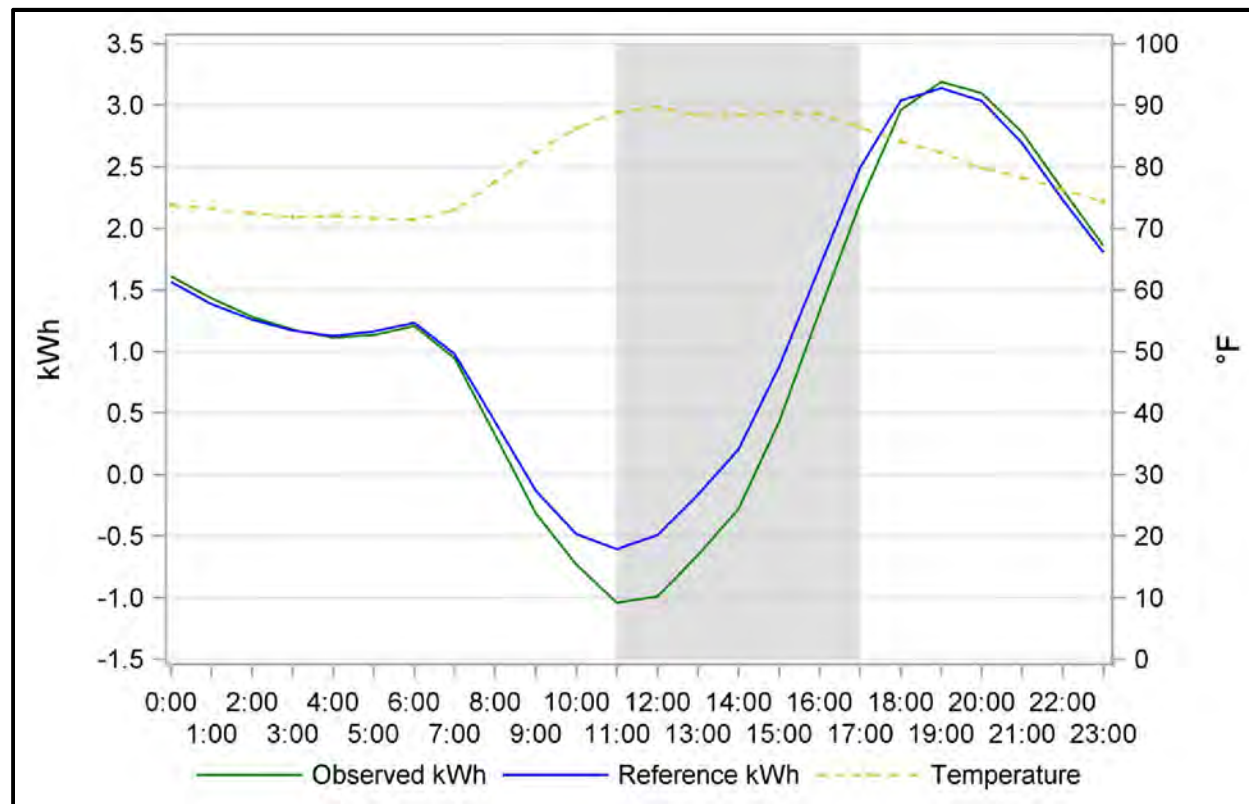
# Net Energy Metering

- 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



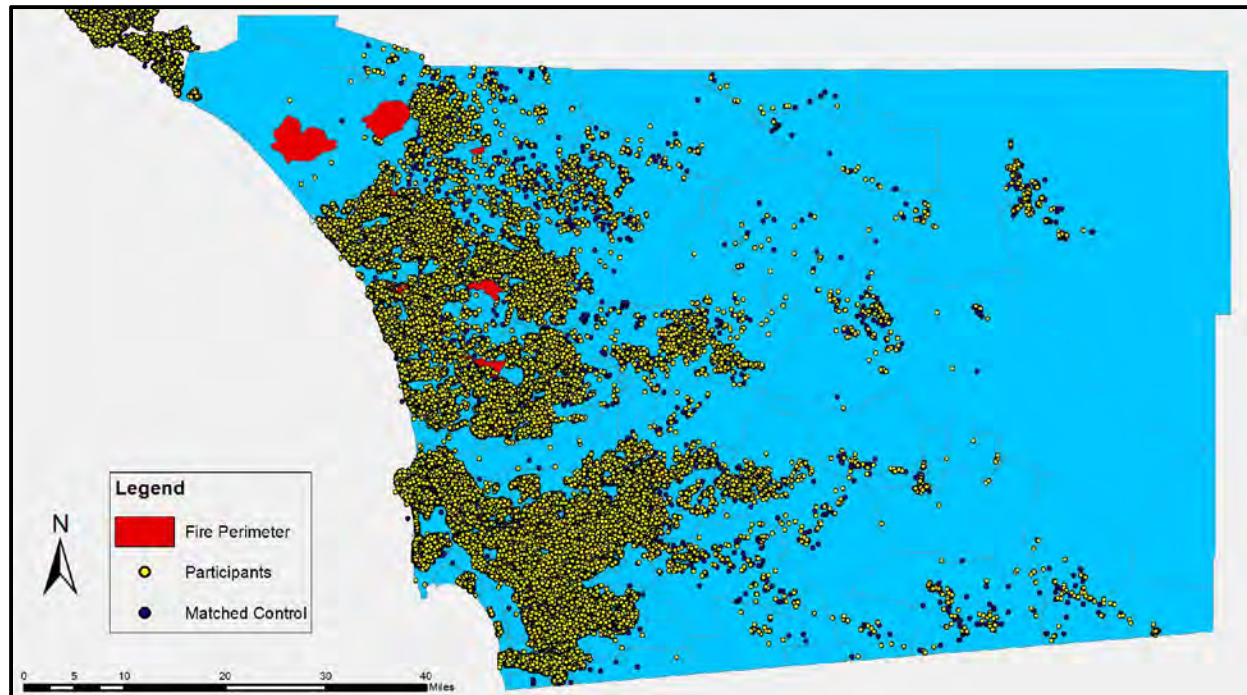
# Results – Net Energy Metering

- 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



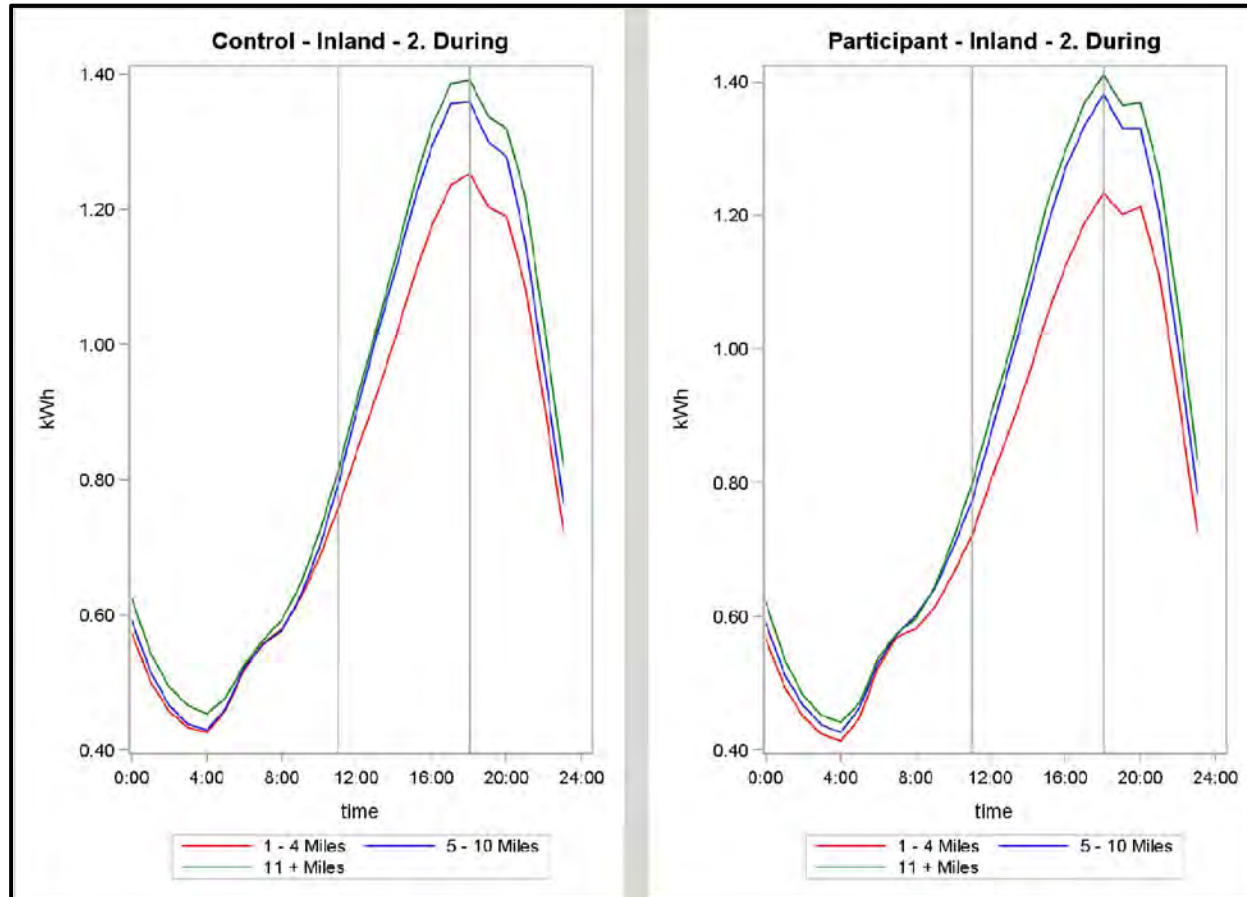
# Ex-Ante Estimates - Wildfires

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



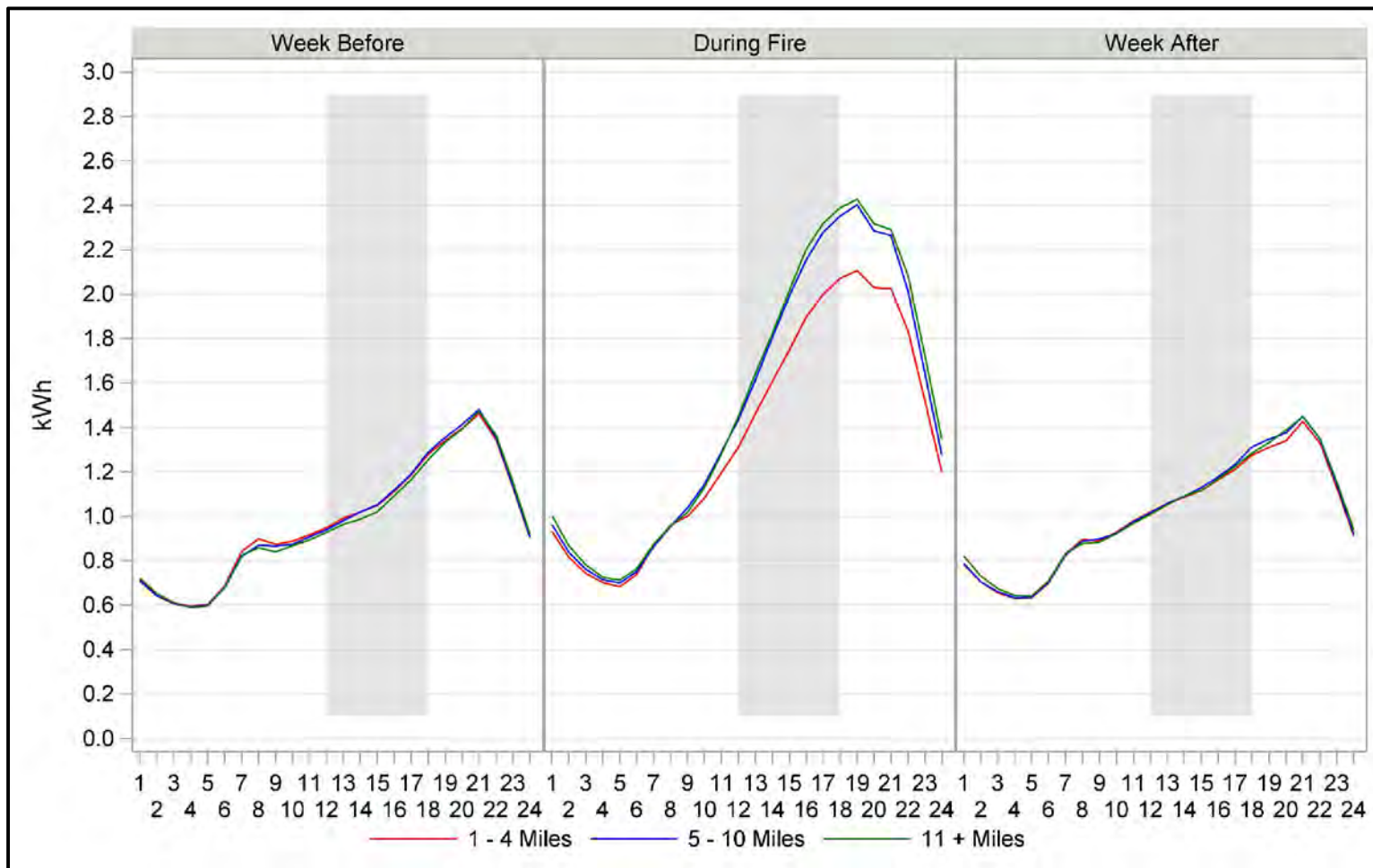
# Ex-Ante Estimates - Wildfires

- Comparison of Control and Participants by Distance to Fire



# Ex-Ante Estimates - Wildfires

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



## Ex-Ante Estimates

- Weather in 2014 was particularly hot
- Ex-post results align with 1-in-10 ex-ante weather

Program Segment and Weather Scenario			Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Temp. °F
PTR Only	Overall	1-in-10	1.57	1.48	0.09	5.8%	86.52
		1-in-2	1.37	1.30	0.07	4.8%	80.55
PTR/SCTD	4 Degree Setback	1-in-10	2.60	1.92	0.68	26.2%	87.44
		1-in-2	2.03	1.54	0.49	24.2%	81.07
	50% Cycle	1-in-10	2.63	2.07	0.55	21.0%	87.26
		1-in-2	2.05	1.65	0.40	19.4%	80.97
	Overall	1-in-10	2.62	2.01	0.60	23.1%	87.35
		1-in-2	2.04	1.60	0.43	21.3%	81.02

# Questions?



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