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Getting Smarter?
Evidence of Savings from the Nest Thermostat

2015 Behavior, Energy & Climate Change Conference
Sacramento, California

October 19, 2015

DISPUTES & INVESTIGATIONS • ECONOMICS • FINANCIAL ADVISORY • MANAGEMENT CONSULTING

Overview

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Overview

Hurdles encountered along the way

Research Objectives

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Research Objectives

1. Estimate Savings

- Gas (SoCalGas) and electric (Southern California Edison, Los Angeles Department and Water and Power, and Water and Power, City of Pasadena)
- 2014/2015 winter, 2014 summer
- Percent of total usage, percent of heating/cooling load, typical meteorological year

2. Customer Response

- Survey of participating and non-participating customers
- Willingness-to-pay for a smart thermostat

3. General Application of Findings

- Comparison of thermostat data across pilot population, general population

Pilot Implementation

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Pilot Implementation

All Households

Screened Out

- AMI
- Geographic targeting: Inland Empire, Palm Springs, Central LA, and the San Fernando Valley
- Excluded top and bottom 10%

Screened In

Target Population

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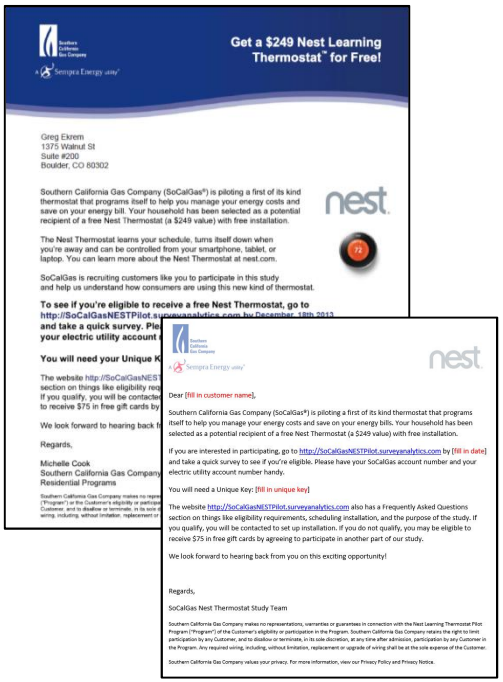
Pilot Implementation

All Households

Target Population

Screened Out

Screened In



- Direct mail and two email campaigns
- December 2013 through July 2014
- Free Nest thermostat with installation

Opt In

Do Not Opt In

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Pilot Implementation

All Households

Target Population

Screened Out

Screened In

Do Not Opt In

Opt In

Eligible

785

Not Eligible

1,793

- Single family residence, homeowner
- Gas furnace, central air conditioning
- One thermostat with wiring compatible with the Nest
- Wireless network and knowledge of wireless network ID and password
- Lived in residence for previous 12 months and plans to live in residence for next 12 months
- Customer must authorize release of billing data

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Pilot Implementation

All Households

Target Population

Screened Out

Screened In

Do Not Opt In

Opt In

Not Eligible

Eligible

- Assigned to treatment and control groups in sequence to ensure large enough group of participants
- Random sample of target population for each mailing campaign
- Installations took place December 2013 through May 2014

503

282

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Pilot Findings

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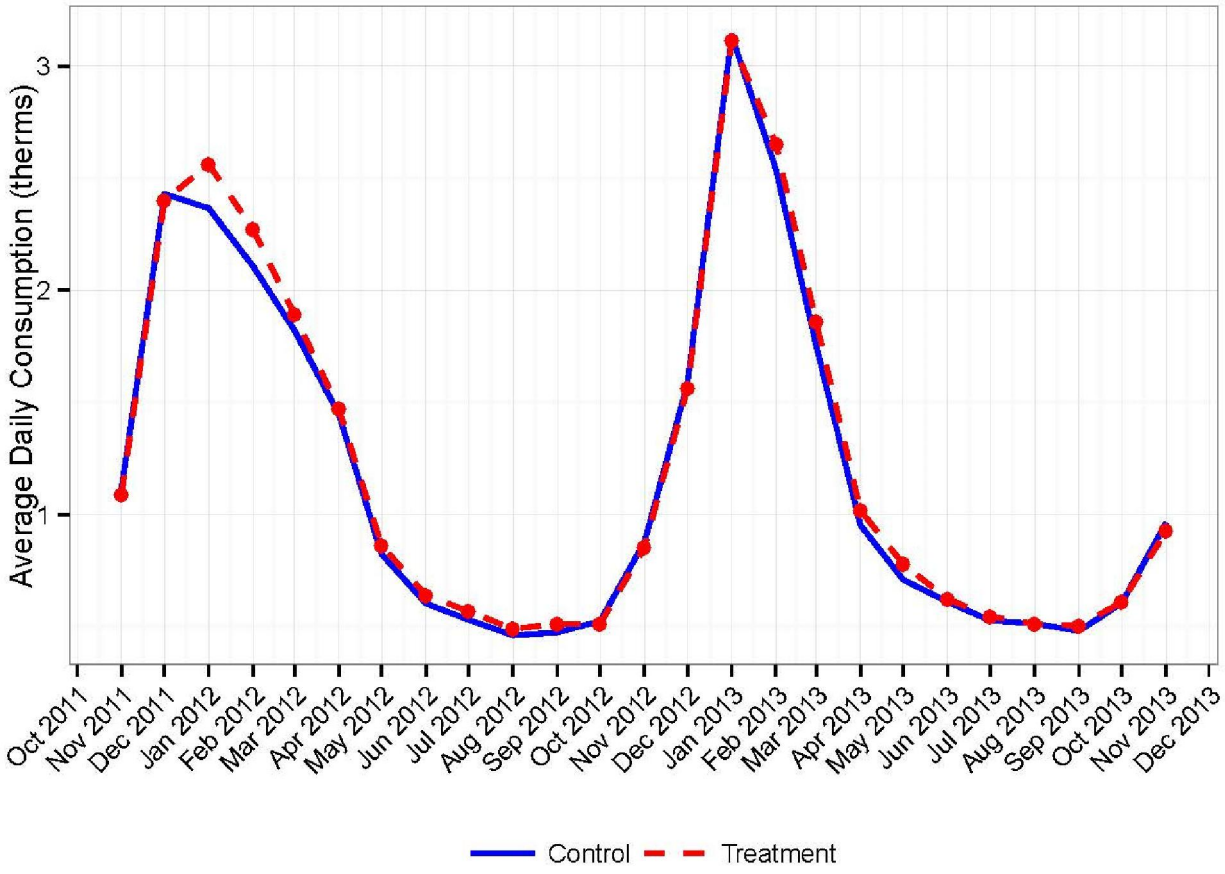
Pilot Findings: Randomization

- Comparison of average daily therm usage in 25 months preceding pilot
- Significant differences identified in 8 of 25 months
- Approximately 0.1 therm difference (or 7% of average usage)
- Driven by geographic differences



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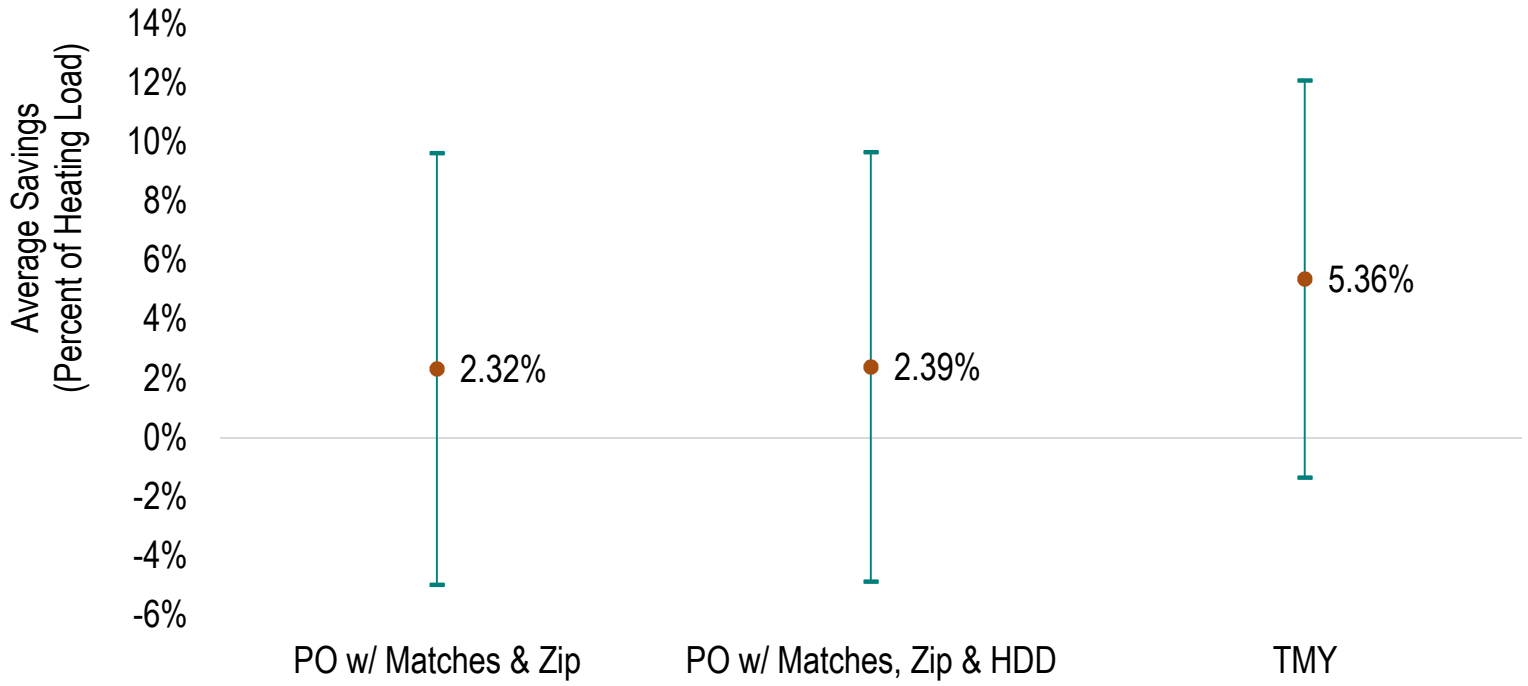
Pilot Findings: Gas Savings

- Tested various modeling approaches to account for geographic differences
- Match on pre-usage and include a spatial fixed effect
- Power analysis suggests sample size of 5,000 was required
- Unusually mild winter in 2014/2015



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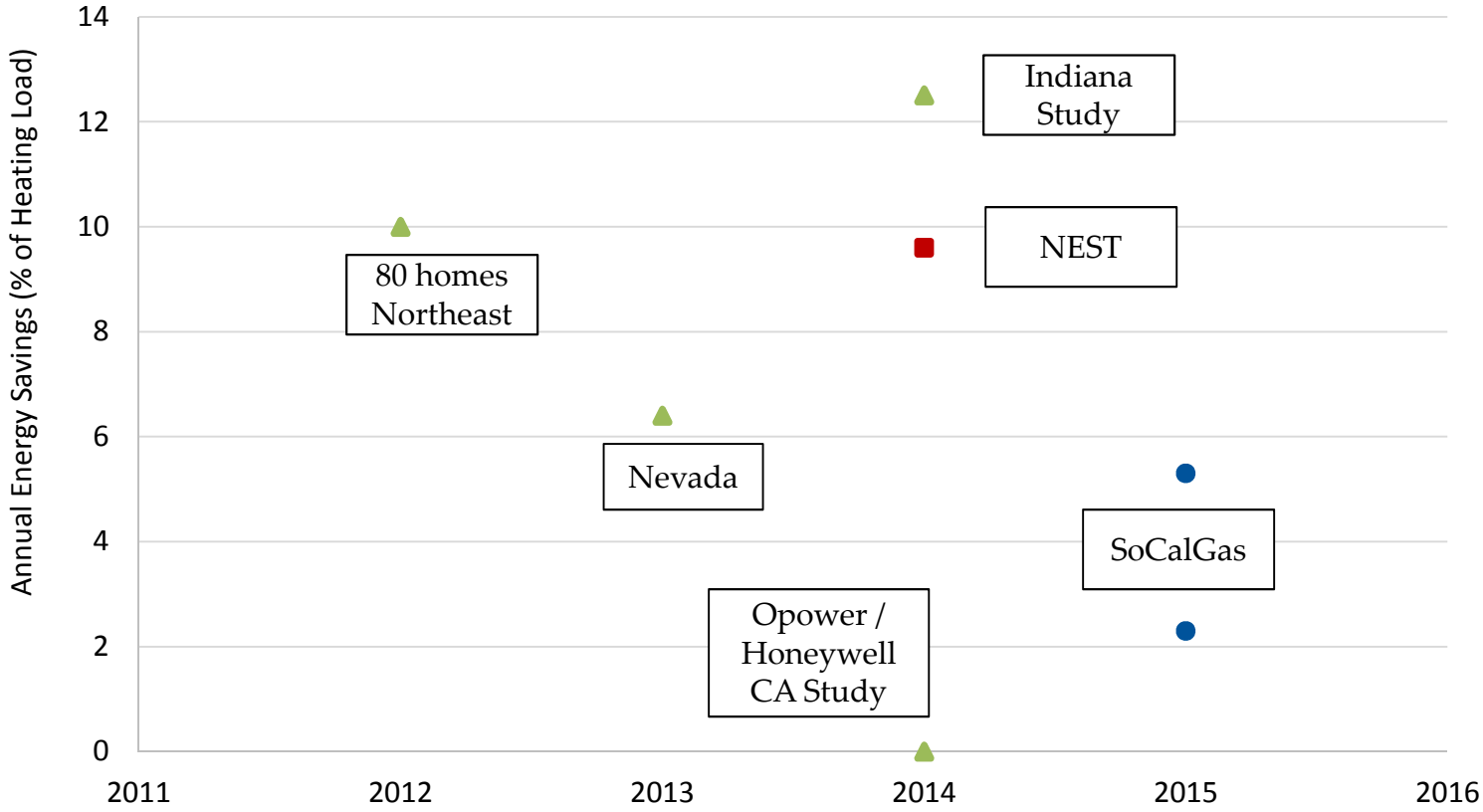
Pilot Findings: Gas Savings

- Relatively few studies
- Gas savings range from 0% to 12% for Tier III thermostats



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In Closing

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In Closing

- Nest thermostats seem to provide measurable gas savings

- Lessons learned include
  - There are many challenges associated with thermostat evaluations
  - Tradeoff between internal and external validity, as well as feasibility of implementation
  - Each new study provides better information for the next

- Next Steps
  - Electricity savings for summer period are currently being estimated
  - Assess customer satisfaction and willingness-to-pay for a smart thermostat
  - Obtain data from Nest to develop better insight into pilot population and compare to general population of Nest owners

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