

Nest Thermostat Heat Pump Control Pilot

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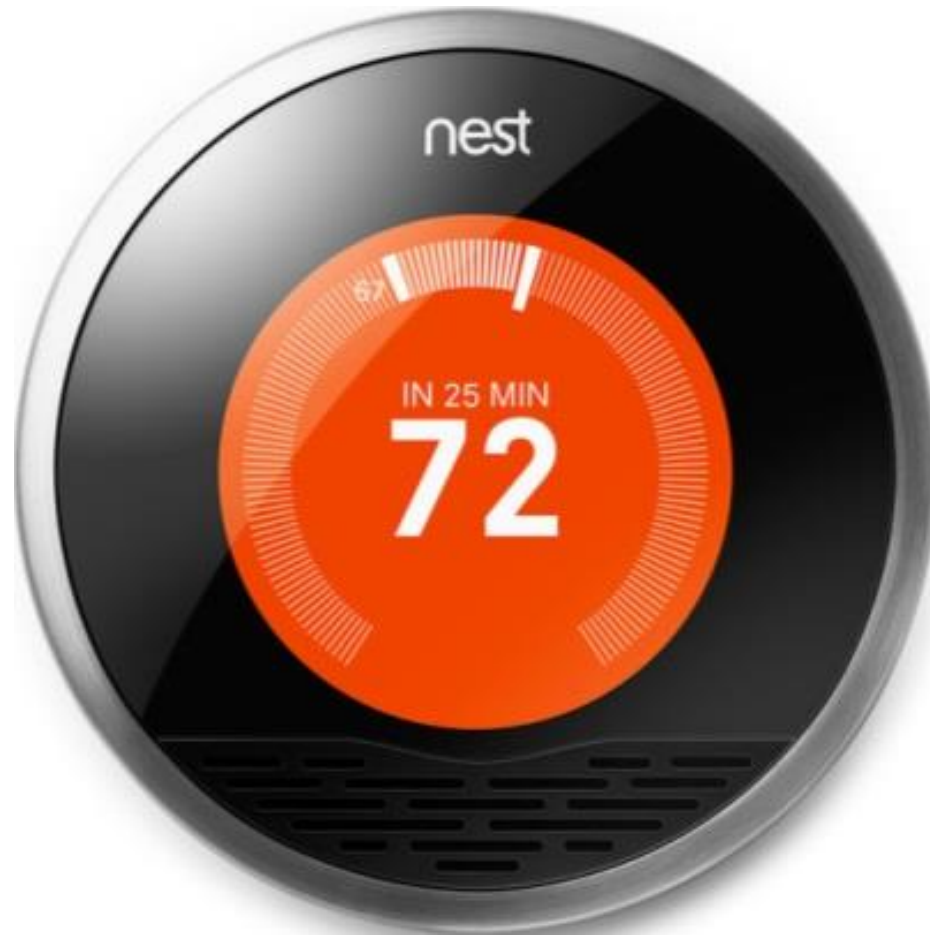
Only an Act of True Algorithm Can Warm a Cold House



Move over Hal9000, Here Comes Nest



Nest Thermostat Overview



Just How Smart?



Danger ahead!



Nest Heat Pump Control Pilot



174 Participant Homes



299 Comparison Homes

A.E.S.P.
ASSOCIATION OF ENERGY
SERVICES PROFESSIONALS

25
1990-
2015

Primary Research Questions



Process Evaluation - Surveys

- Two Participant web surveys:
 - Mid- and post-heating season
 - Initial impressions and changes
 - High response rates (62%, 79%)
- Program and implementation staff interviews

Impact Evaluation – Billing Analysis

- Analyzed 113 participants and 211 comparison
- Controlled for weather (HDD and CDD), home square footage and year built
- Estimated difference between groups in change of pre-to-post usage with interaction terms
- Tested various models and reference temps for best fit
- Computed annual savings from coefficients using HDDs for typical meteorological year

A blue-tinted background image of a financial candlestick chart. The chart shows price movement over time, with several candlesticks and a dashed trend line. The y-axis has numerical labels like 1.785, 1.7810, 1.7855, 1.7900, 1.795, and 1.800. The x-axis has numerical labels like 08.47, 11.12, 14.56, and 19.00. The text '• PILOT FINDINGS' is overlaid in the center of the chart.

- **PILOT FINDINGS**

What Did Nest Replace?

75% had programmable thermostat

- 85% claimed thermostat was programmed to adjust temperature

25% had manual thermostat

- 79% claimed they adjusted temperature at least daily

6% had thermostat with
lockout capability

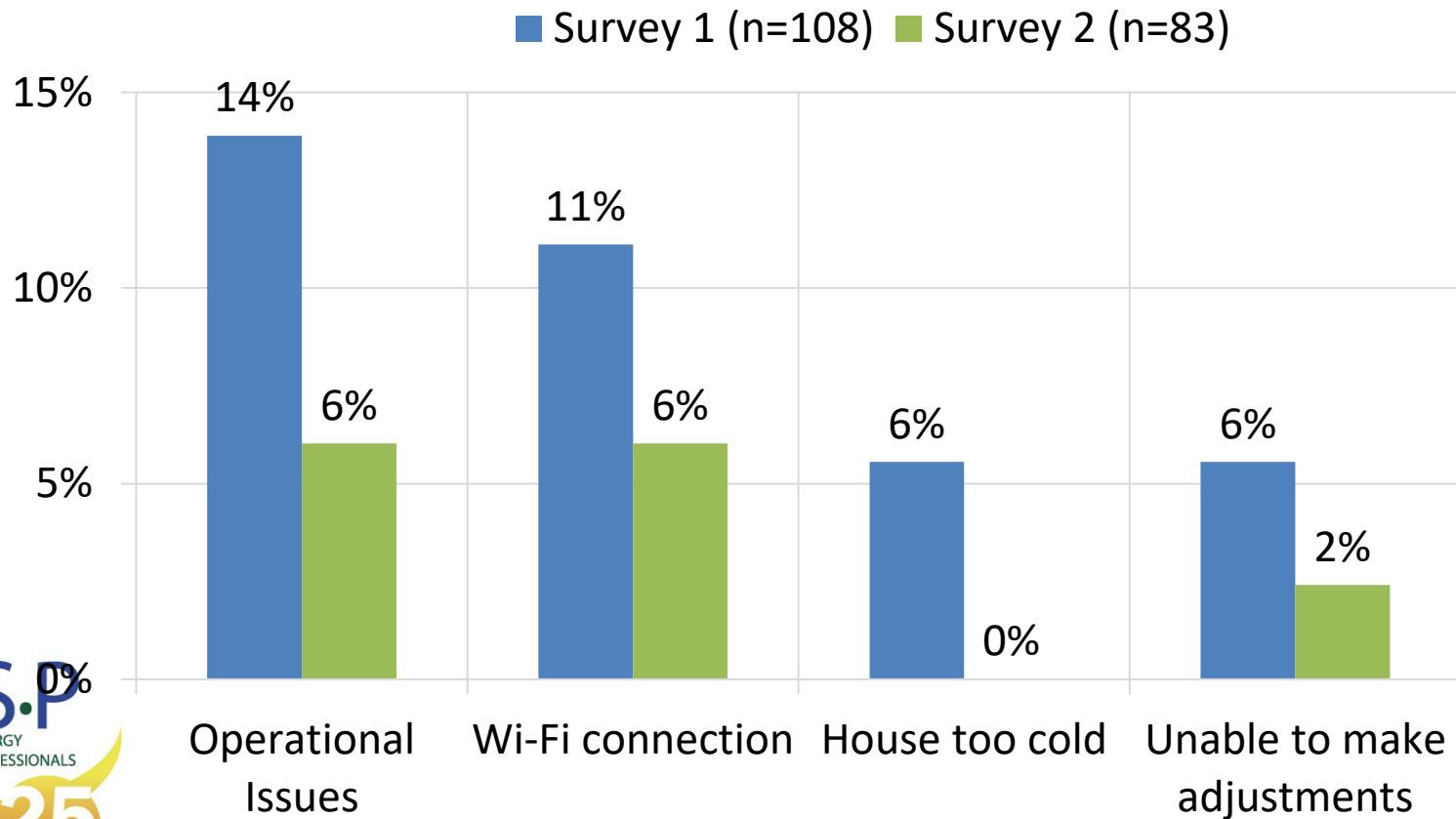


Installation Challenges

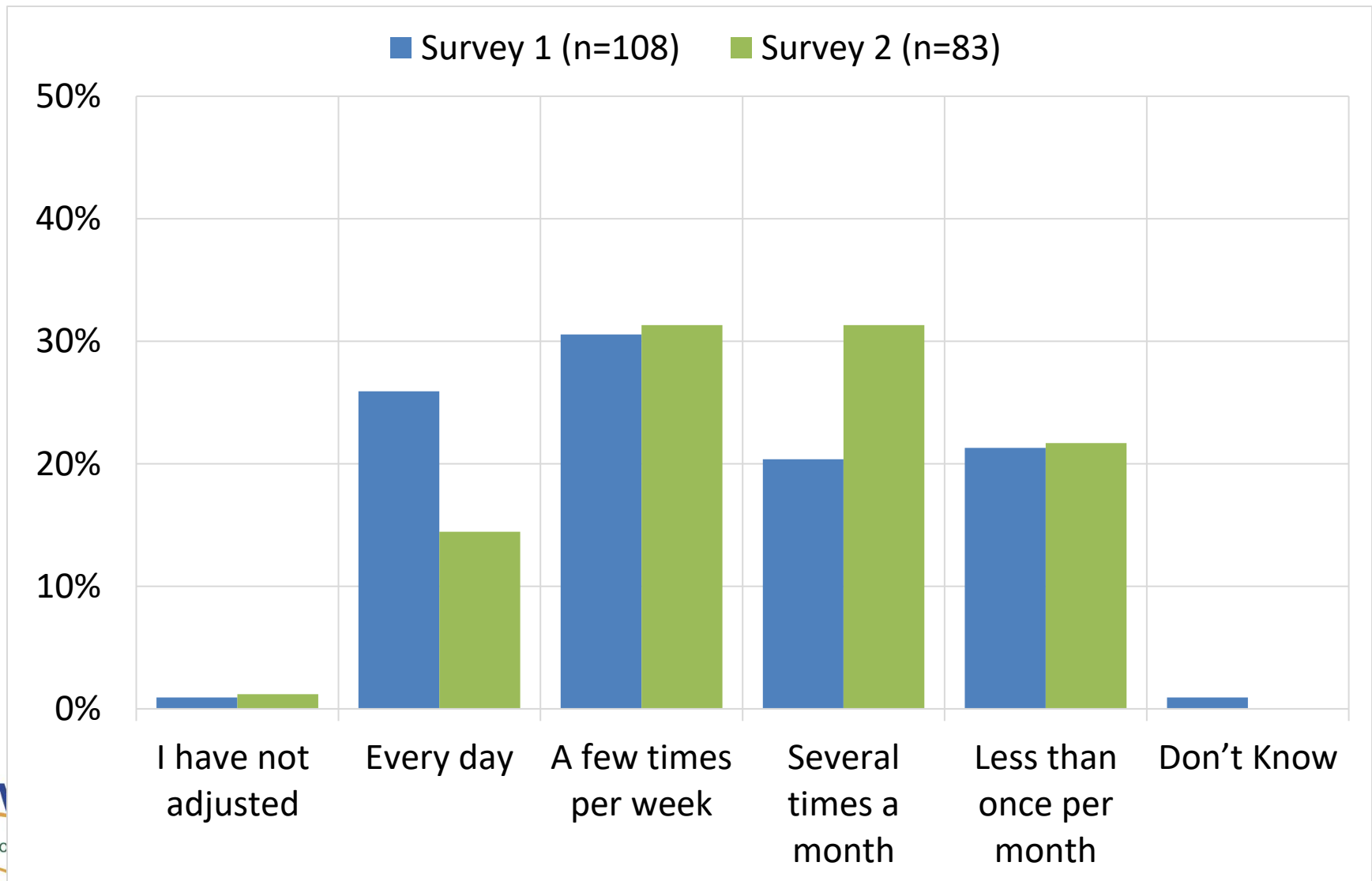
- Equipment eligibility
- Wi-Fi and router problems
- **5-7%** of sub-bases defective (1st gen)
 - 2nd gen sub-bases fixed the issue
- Wiring challenge with newer heat pumps with integrated controllers
- Elderly and non-tech savvy participants had difficulty setting Nest schedule

Post-Installation Problems Decreased

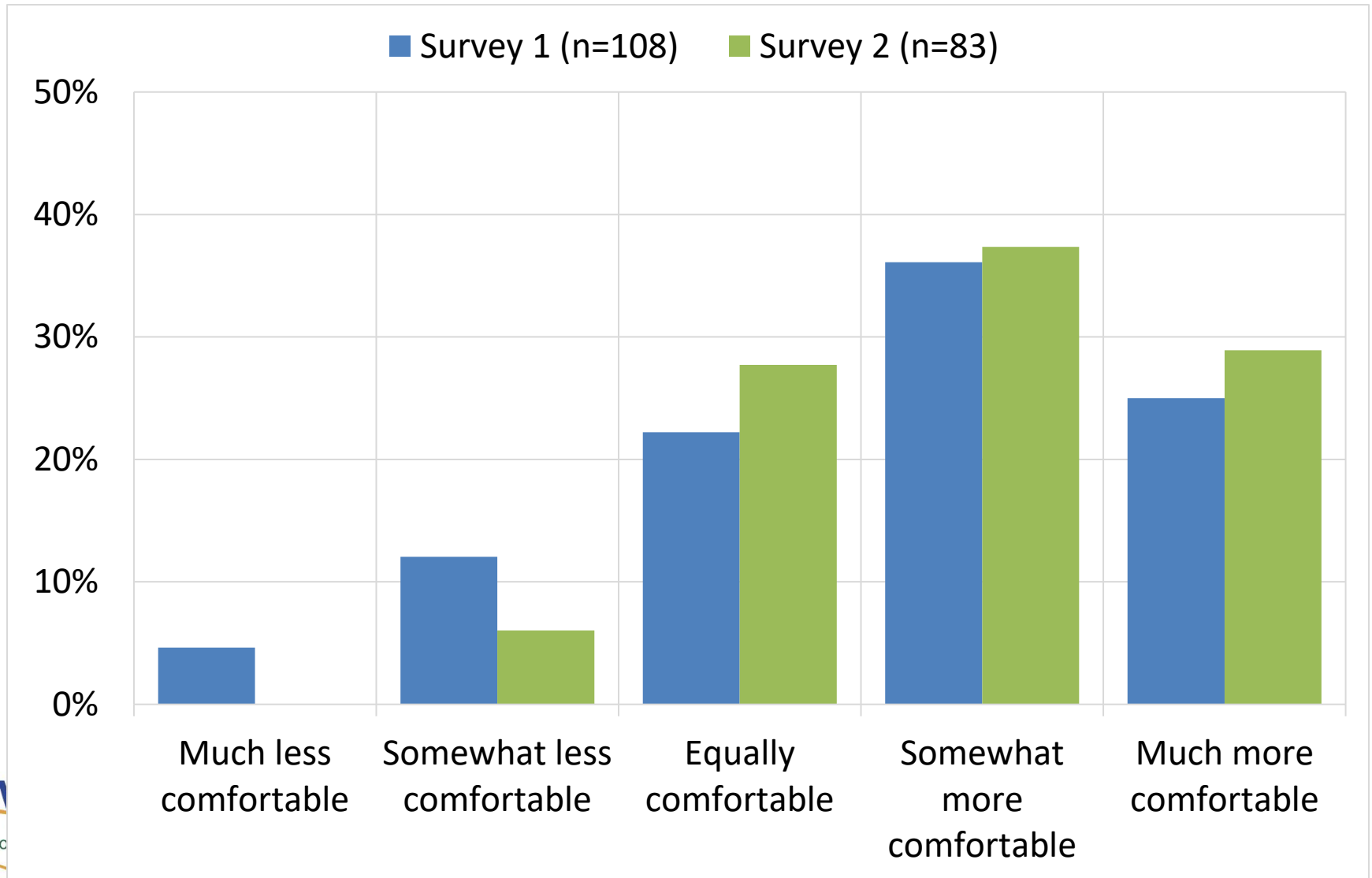
- **41%** reported a problem in first survey
- **17%** reported a problem in second survey



Adjustments- From Fiddling to Fine Tuning



Increased Comfort



Participant Setting Changes

13% reported changing heat pump balance

- 2/3 reset to “Balance”
- Primarily changed due to cold house

20% reported turning Auto Away off

- Primarily changed because Auto Away was triggered when people were at home

Satisfaction with and Value of Nest

93% said that Nest was easy to use

89% satisfied with Nest (4 or 5)

62% thought Nest was worth full retail price

– 34% said this even if no energy savings

- Lowering bills and savings energy were primary reasons for participating

A blue-tinted background image of a financial candlestick chart. The chart features white candlesticks on a grid, with several white lines overlaid, likely representing moving averages or technical indicators. The text 'ENERGY SAVINGS' is prominently displayed in the center in a bold, black, sans-serif font, preceded by a bullet point. The overall aesthetic is professional and data-oriented.

- ENERGY SAVINGS

Electric Savings Results

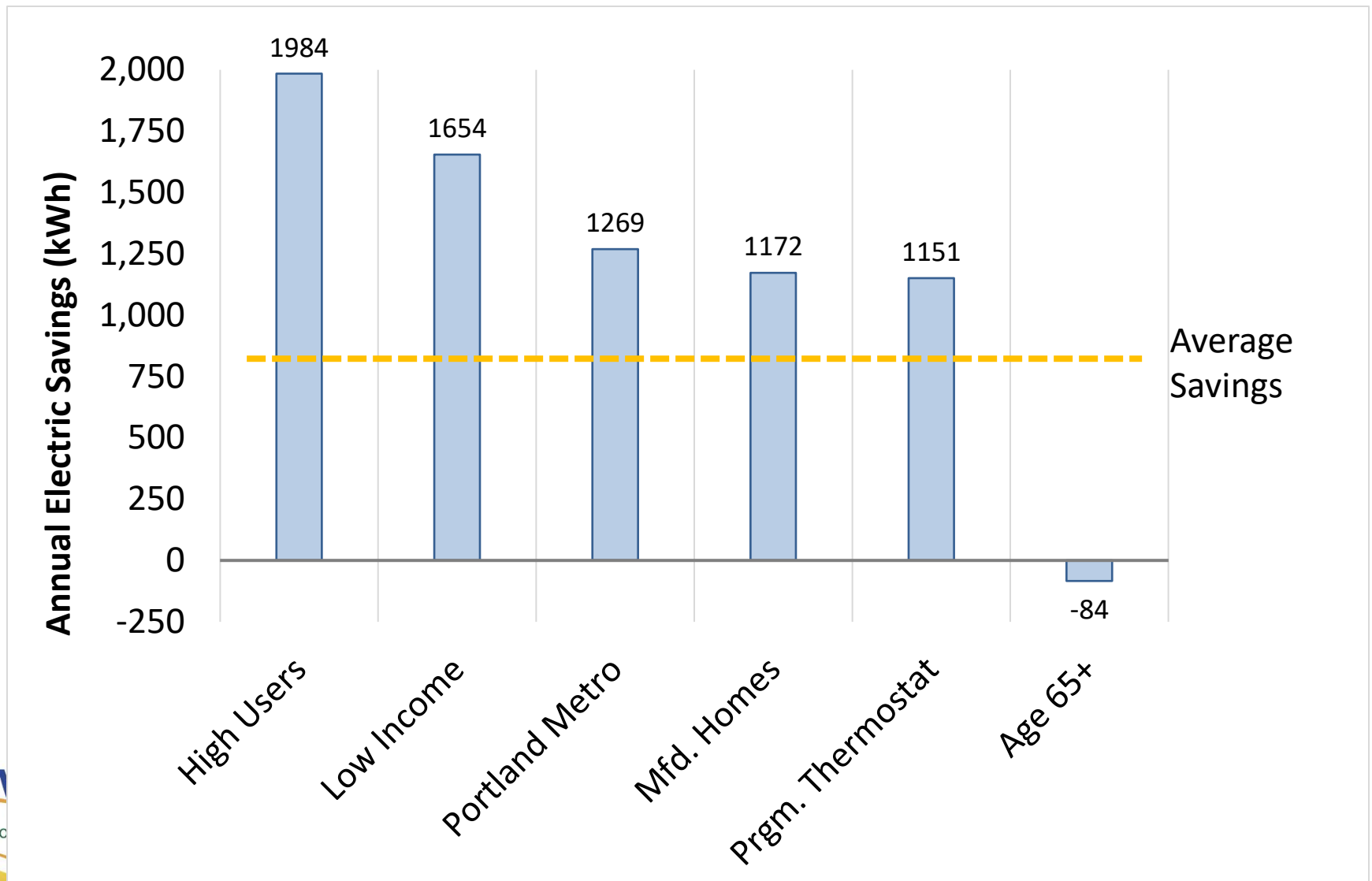
780 kWh / year electric savings (+/- 465)

4.7% total electric load savings

12% heating load savings

- Just heating savings – no cooling season data
- Resistance heat ran twice as much for homes that switched max efficiency off

Savings by Subgroup



Conclusions

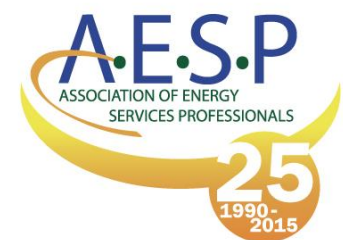
- Many disqualifications and technical issues encountered at first, but resolved
- Participants were highly satisfied with Nest
 - Drivers: Energy savings and comfort of home
- Significant heating savings for heat pumps
 - Valid for direct-install only, not self-install
 - Varied by subgroup

Recommendations

- Early Identification of breaking-points
- Test alternative delivery and HVAC applications
- Results as deemed savings
- Subgroup findings → target customers
- Emphasize energy savings and home comfort

Next Steps for Energy Trust

- Expanding incentive and promoting Nest for heat pump homes
- Different delivery, HVAC, and verification methods (direct-install vs. self-install)
- Target tech savvy population, high users, lower income and manufactured homes
- Move forward with an advanced thermostat pilot for gas furnaces



Save The Dates

May 19-21, 2015

AESP's Spring Conference
Portland, OR

August 25-27, 2015

AESP's Summer Conference
Niagara Falls, ON

February 1-4, 2016

AESP's National Conference
Phoenix, AZ

For more information - www.aesp.org

