



APEX
ANALYTICS

Squeezing Every Last Drop: An Evaluation of Nest Seasonal Savings

BEHAVIOR ENERGY & CLIMATE CHANGE CONFERENCE

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Thanks!



Scott Dimetrosky and Maegan McKee, Apex Analytics

Dan Rubado, Energy Trust of Oregon

Jesse Smith and Steve Morris, Demand Side Analytics

Michael Blasnik, Nest



SEASONAL SAVINGS BACKGROUND

Nest Seasonal Savings - Overview





the ONION®

Marital Frustrat

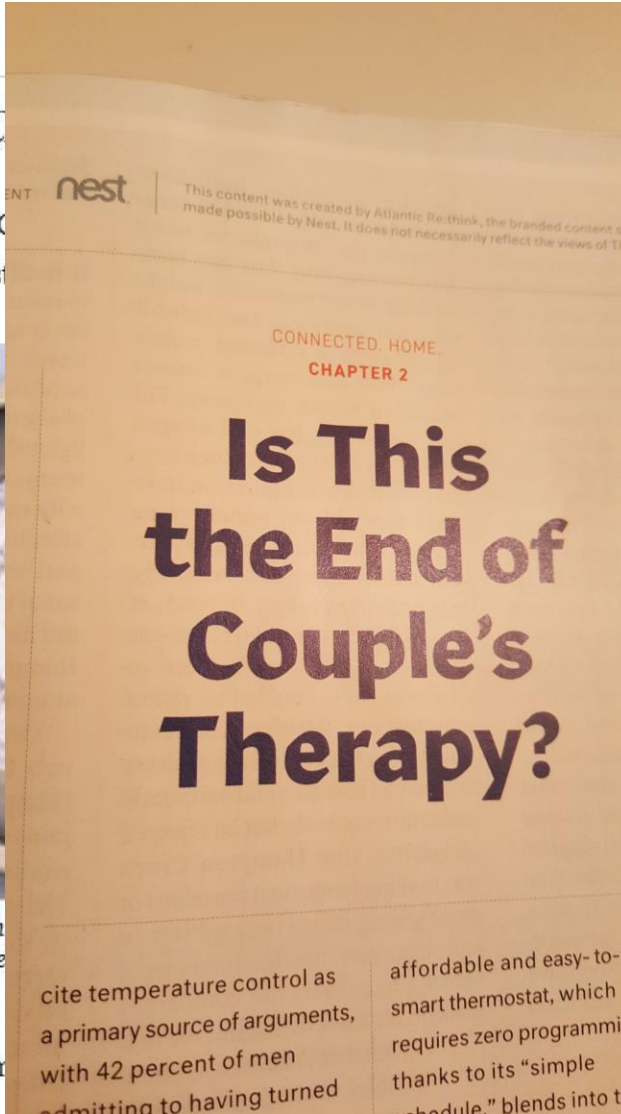


DULUTH, MN—C
their marital frust



The medium through
resentment is channe

money. That won



gh Thermostat

nt, Carl and Barb Kulick channeled
annual-control thermostat Monday.

ard Carl scream when he saw I turned
aid the understimulated, affection-
was chilly, and our grandson Cory was
son for a 4-year-old boy to feel Marital Frustrati
there? I didn't think so, but apparently,
ere thinks there is."

with Carl's long-standing rule that the
ay securely in the "off" position until
se of it could be interpreted as an act of

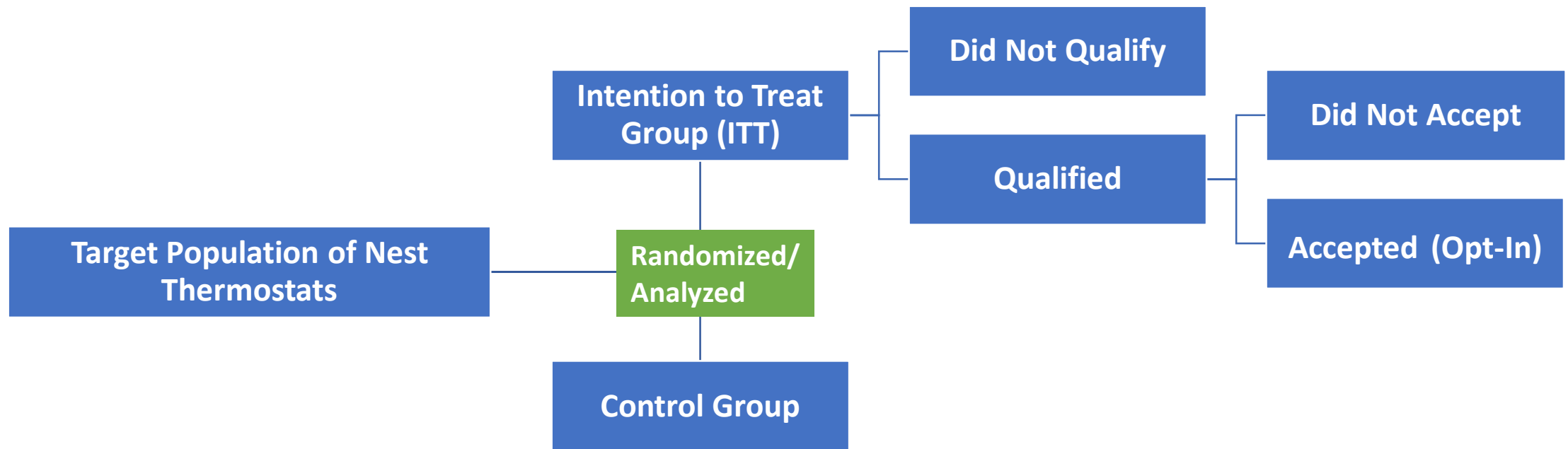
turn it on yet," said Carl, 64, who for 25
spected that his wife had an affair with
bury in 1981. "It's a goddamn waste of



Randomized Encouragement Design (RED)

Randomized → Analyzed

Two rollouts: summer (2016) and winter (2016/2017)





Top 10 Mistakes in Behavior Change

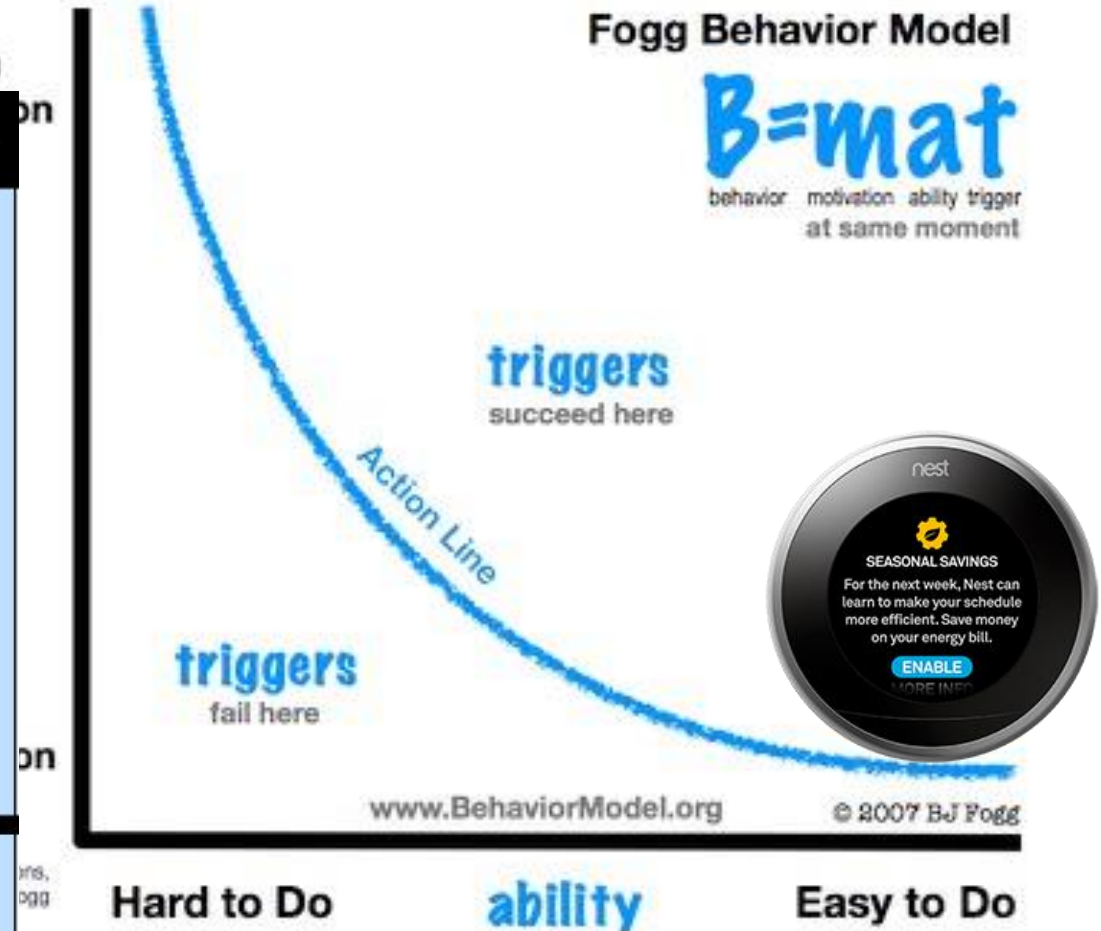
#2 Attempting big leaps instead of baby steps

Seek tiny successes
-- one after another.

By BJ Fogg, Kara Chanasyk, Margarita Quihuis, Neema Moraveji, Jason Hreha, Mark Nelson at . . .

Stanford University's Persuasive Tech Lab

<http://captology.stanford.edu>





**FINDING 1: A LOT OF PEOPLE
OPTED-IN – AKA “PREACHING
TO THE CHOIR”**

Pilot Opt-in and Attrition



- Consistently high opt-in rates $\sim 80\%$
- Attrition $< 5\%$ but remained as opt-in group
- Summer: Low & intermittent cooling load

Study Group	Summer	Winter
Control	5,873	6,024
ITT Group	5,954	9,144
Did Not Qualify	2,459	579
Did Not Accept	705	1,849
Opt-in	2,790	6,716
Qualification Rate	59%	94%
Opt-In Rate Among Offered	80%	78%
Effective Opt-In Rate	47%	73%



FINDING 2: BUT WE DIDN'T KNOW WHO

Participant Identification and Data Sharing



- Pilot recruitment → zip codes
 - No direct targeting of Energy Trust sponsor customers

- Survey

- Nest
- Col
- Lin

- Respo

- AMI c



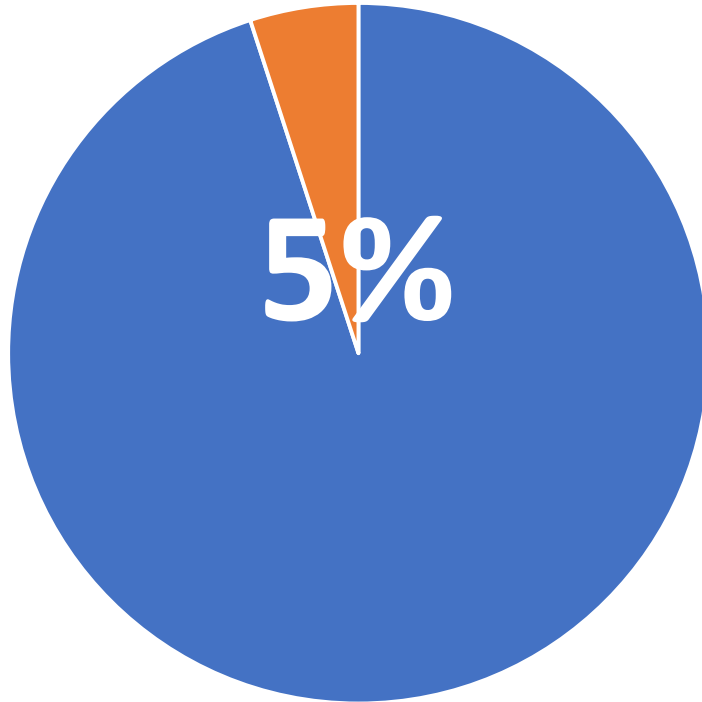
customers
respondents



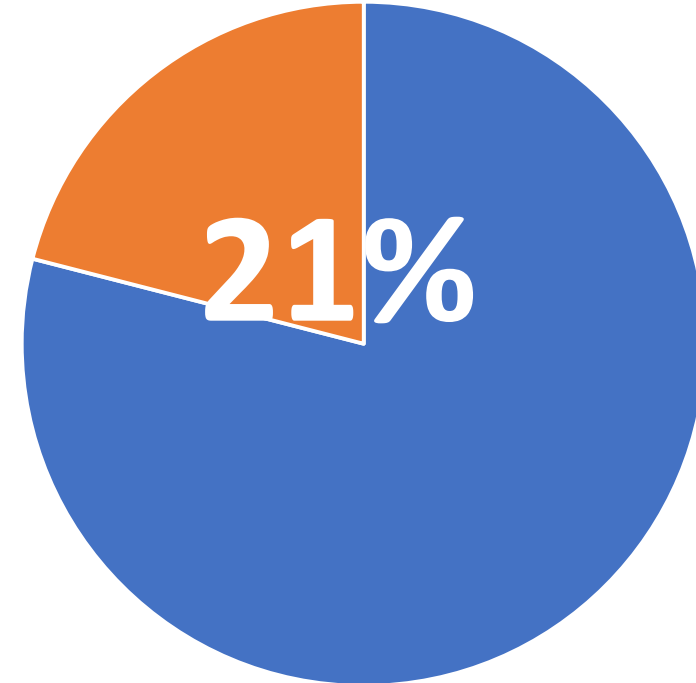
**FINDING 3: OPT-INS HAD
LOWER SATISFACTION AND
COMFORT RELATIVE TO DEVICE**



Nest Overall Satisfaction

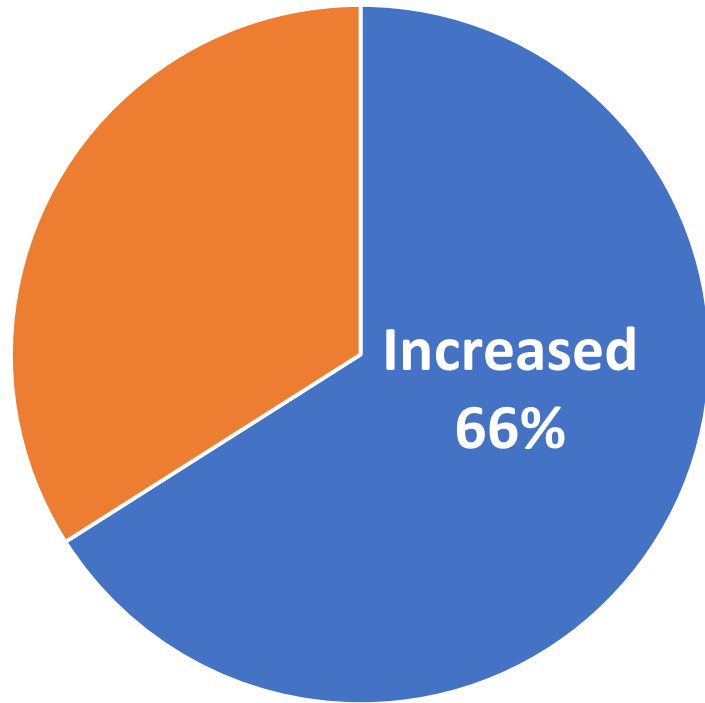


Seasonal Savings Overall Satisfaction

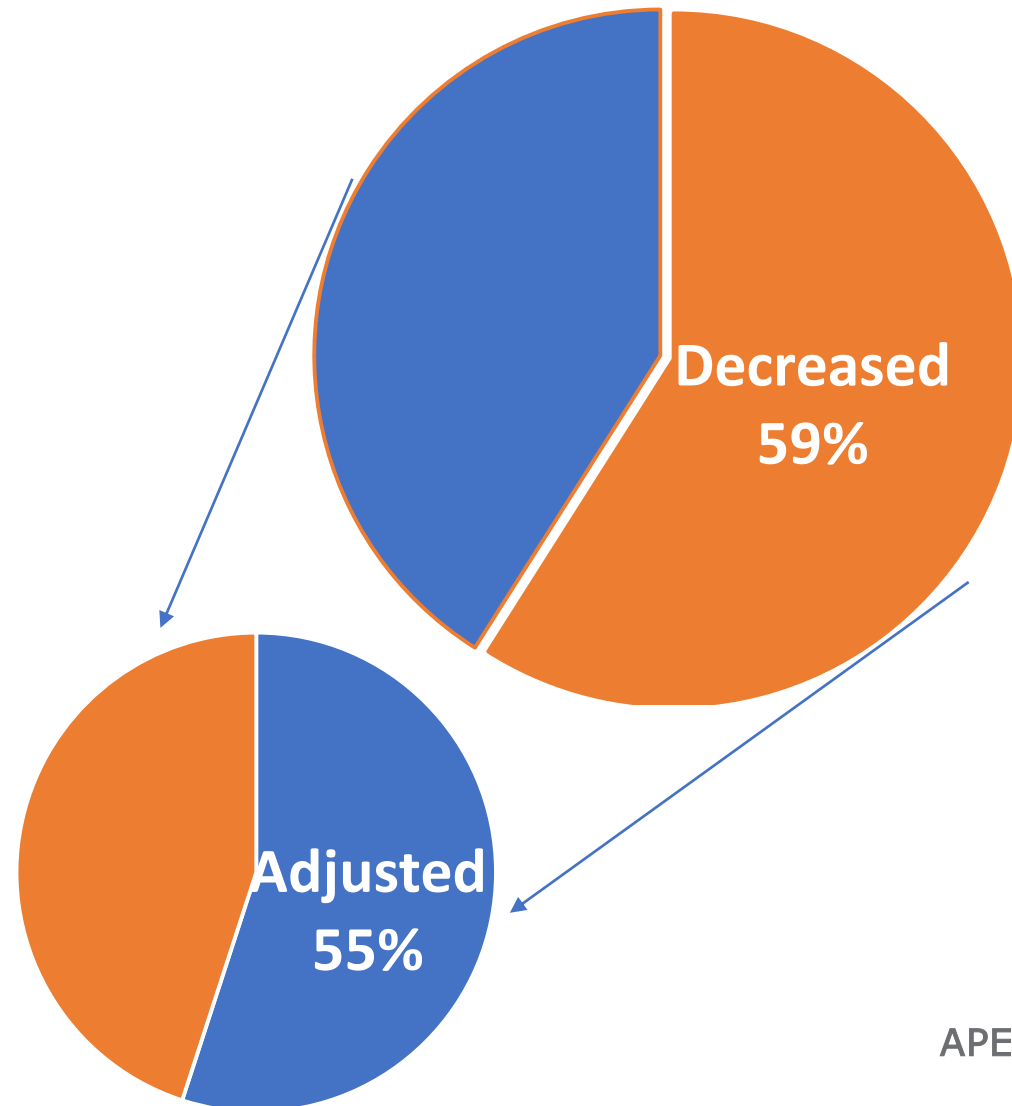




Nest Comfort



Seasonal Savings Comfort



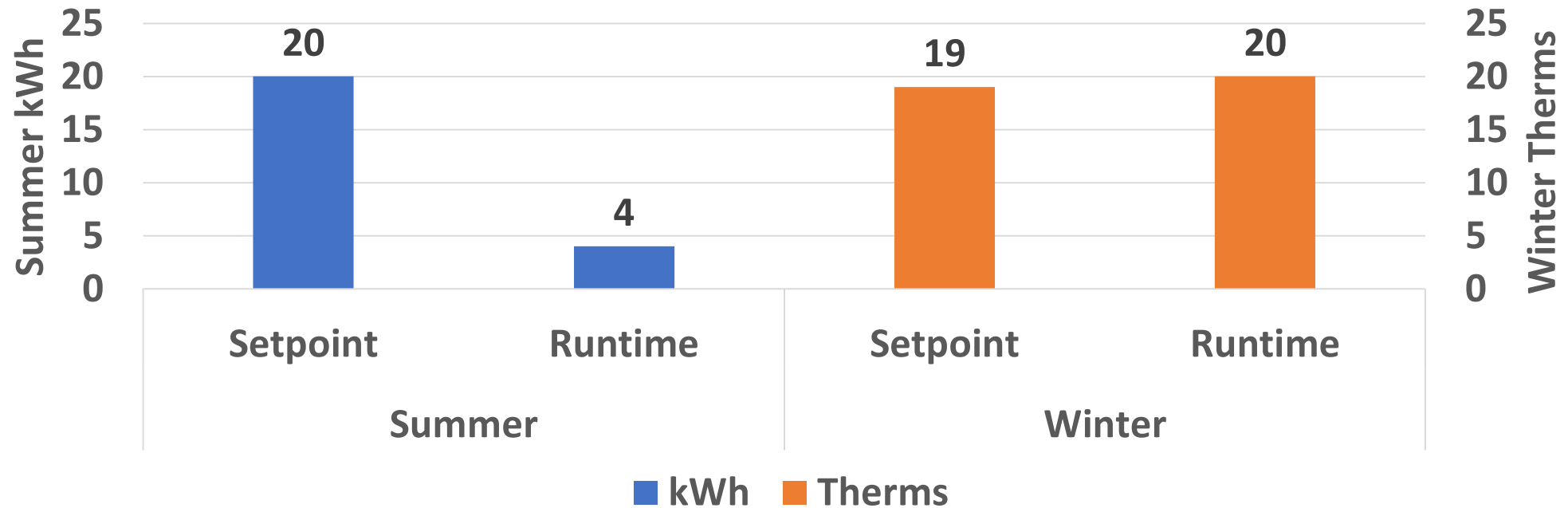


FINDING 4: DIFFERENCES USING SETPOINT VS RUNTIME FOR SAVINGS

Nest Runtime and Setpoint Analysis



- **Setpoint** → changes to thermostat
- **Runtime** → changes to system and energy use
- Nest used both for savings





**FINDING 5: BILLING ANALYSIS
FINDINGS VERIFIED BUT
CONSTRAINED BY SAMPLE SIZE**



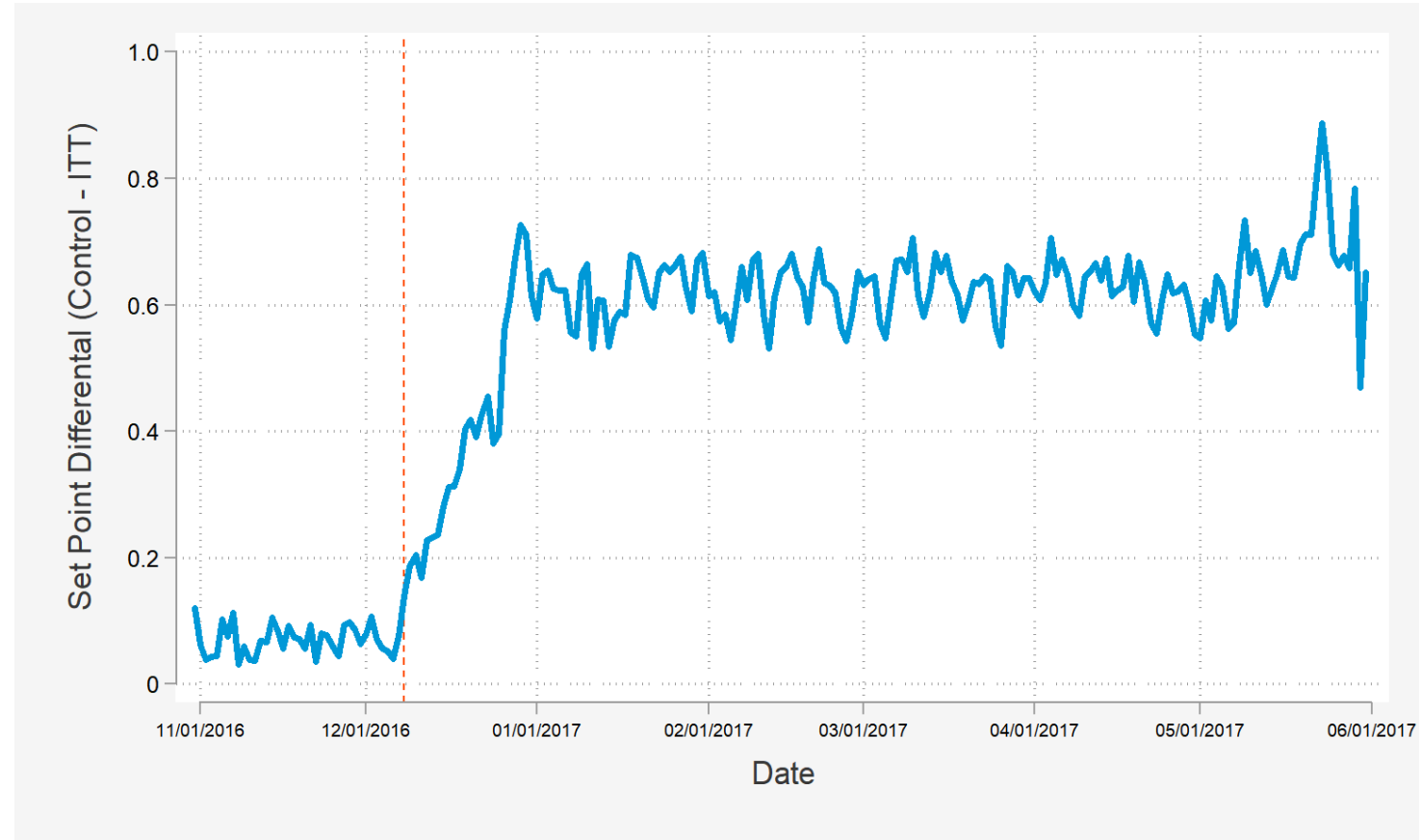
- Summer season
 - Temperate climate
 - Low cooling and savings
 - Billing data estimated cooling load (3 kW)
- Heating season savings
 - Validated runtime estimate (~20 therms)
 - But +/- ~ 100%
- Cohort analysis was directional, not significant
- Higher users did not show higher savings



FINDING 6: PERSISTENCE ONLY ACROSS SINGLE SEASON



- No savings degradation for winter savings
- Longer time frame required for > 1 year findings
- Revisit analysis next season – settings carryover



CLOSING REMARKS



- Technology & behavior: Push-button opt-in
 - High opt-in rates $\sim 80\%$
- Overlapping territories: Partner or estimate leakage
- Cooling season: No
- Heating season: Yes
- Persistence: TBD, but highly likely
- **Impacts on marriage issues!: What says the audience?**



Final Overall Pilot Impacts

Season	Fuel	Equipment Capacity Assumption	# Opt-In Thermostats	Per Device Impact	Aggregate Impact
Summer	Electricity	3 kW	2,790	4 kWh	11,379 kWh
Winter	Natural Gas	65 kBTU/hour	6,276	18 therms	111,748 therms
Winter	Electricity (Fan)	0.56 kW		15 kWh	96,275 kWh
Winter	Electricity (Heat Pump)	3 kW	440	121 kWh	53,198 kWh