November 7th

Momentum Savings Monthly Call


hello
MY NAME IS

IS "SMART" THE NEW "GREEN"?

Unraveling a New, Dynamic and Complex Market

November 7, 2018

Bonneville
POWER ADMINISTRATION

WHY DO WE CARE ABOUT THERMOSTATS?

1

Gain insights
into an evolving and growing market

2

Determine
how savings will be incorporated into the momentum savings model

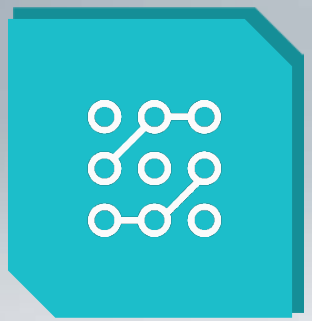
RESEARCH OBJECTIVES

Define
technologies in market

Learn
what others found

Understand
market dynamics

Assess
compatibility issues

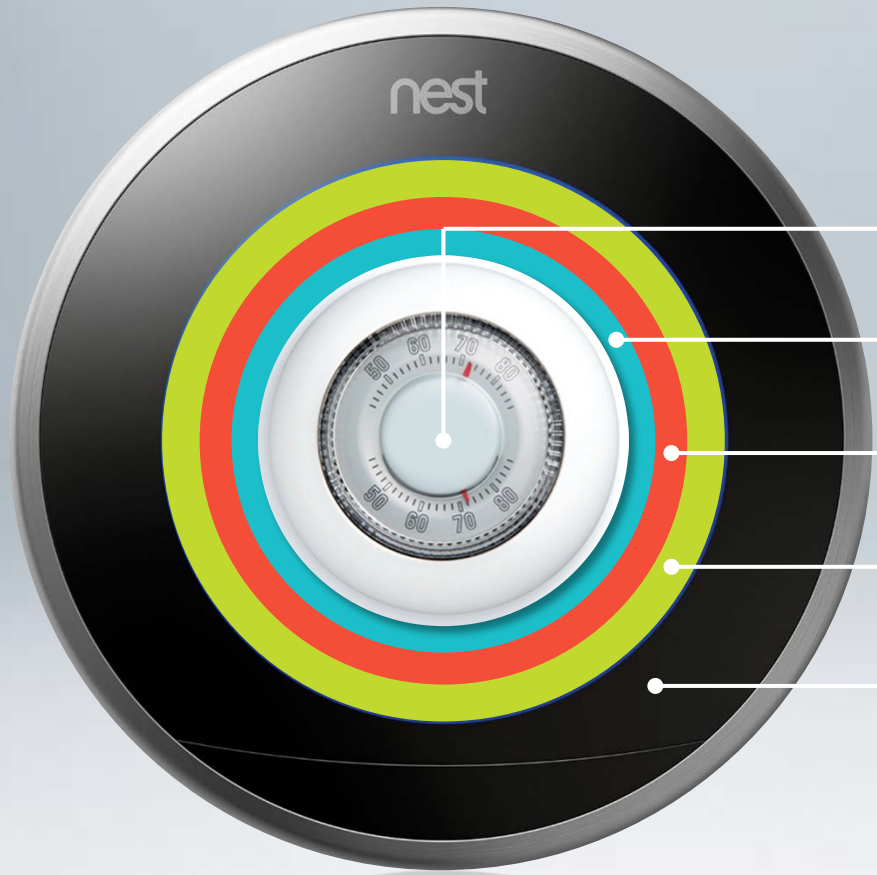


RESEARCH ACTIVITIES

Market Actor Interviews

Literature Review

WHAT IS A “SMART THERMOSTAT”?



MANUAL

PROGRAMMABLE

CONNECTED

SMART

ADVANCED SMART

MAPPING FEATURES TO DEFINITIONS

Connected

- Scheduled setbacks
- Adjust remotely / has an app

Smart

Connected+

- Proximity sensing (Geofencing)

Advanced Smart

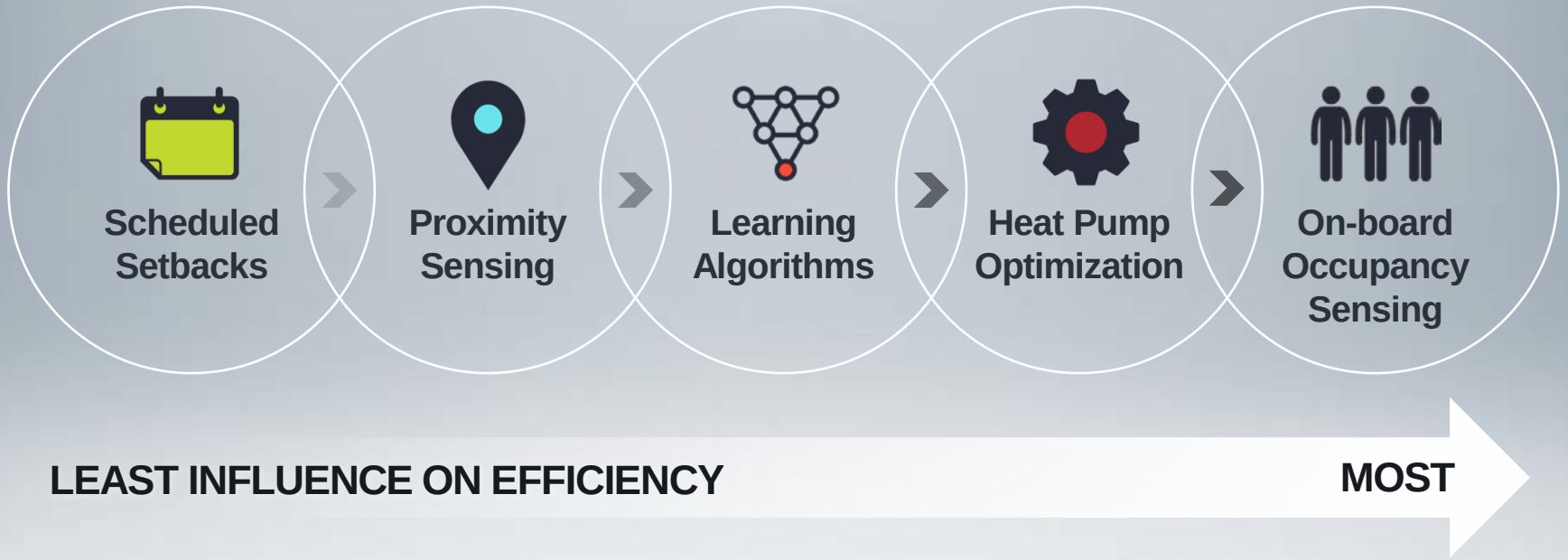
Smart+

- Onboard occupancy sensing
- Heat pump optimization
- Learning algorithms

REGIONAL DEFINITIONS OF "SMART" ARE INCONSISTENT

Entity	What is included in their "smart" definition?
BPA and Energy Trust	Advanced Smart Thermostats ONLY
RTF and RBSA II	Smart and Advanced Smart Thermostats
ENERGY STAR, PSE, and RBSA Wi-Fi category	Connected, Smart and Advanced Smart

WHAT FEATURES SAVE ENERGY?



ENERGY SAVINGS CAN EXIST… FOR ADVANCED SMART THERMOSTATS

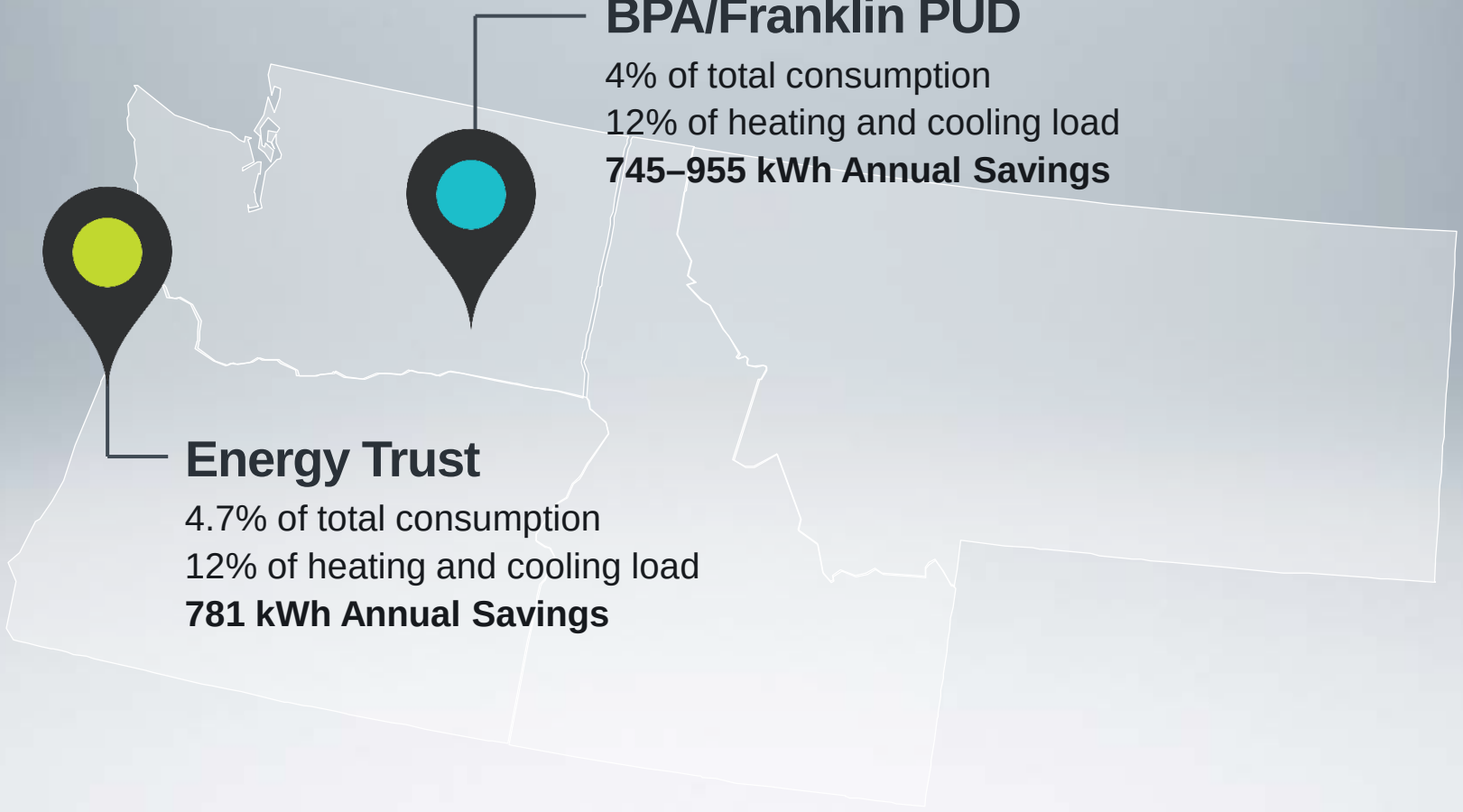
Nest-only studies

Nest & other

Nest & ecobee

ecobee-only

RESEARCH FINDINGS IN THE PACIFIC NW ARE FAIRLY CONSISTENT



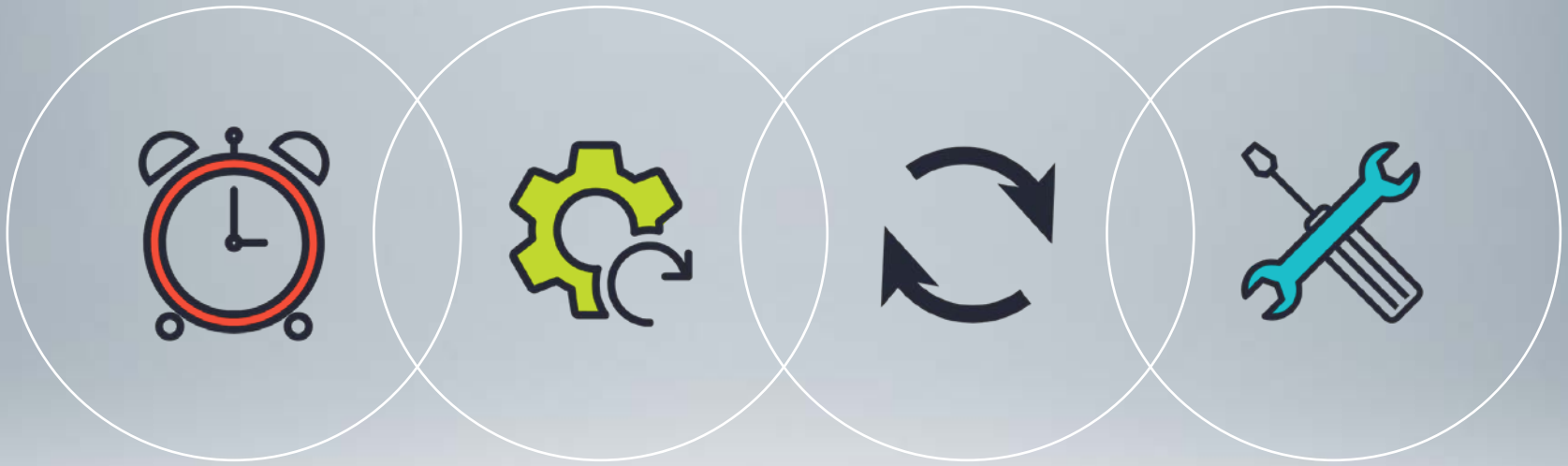
BPA/Franklin PUD

4% of total consumption
12% of heating and cooling load
745–955 kWh Annual Savings

Energy Trust

4.7% of total consumption
12% of heating and cooling load
781 kWh Annual Savings

ADVANCED SMART THERMOSTATS DON'T NECESSARILY ALWAYS SAVE ENERGY



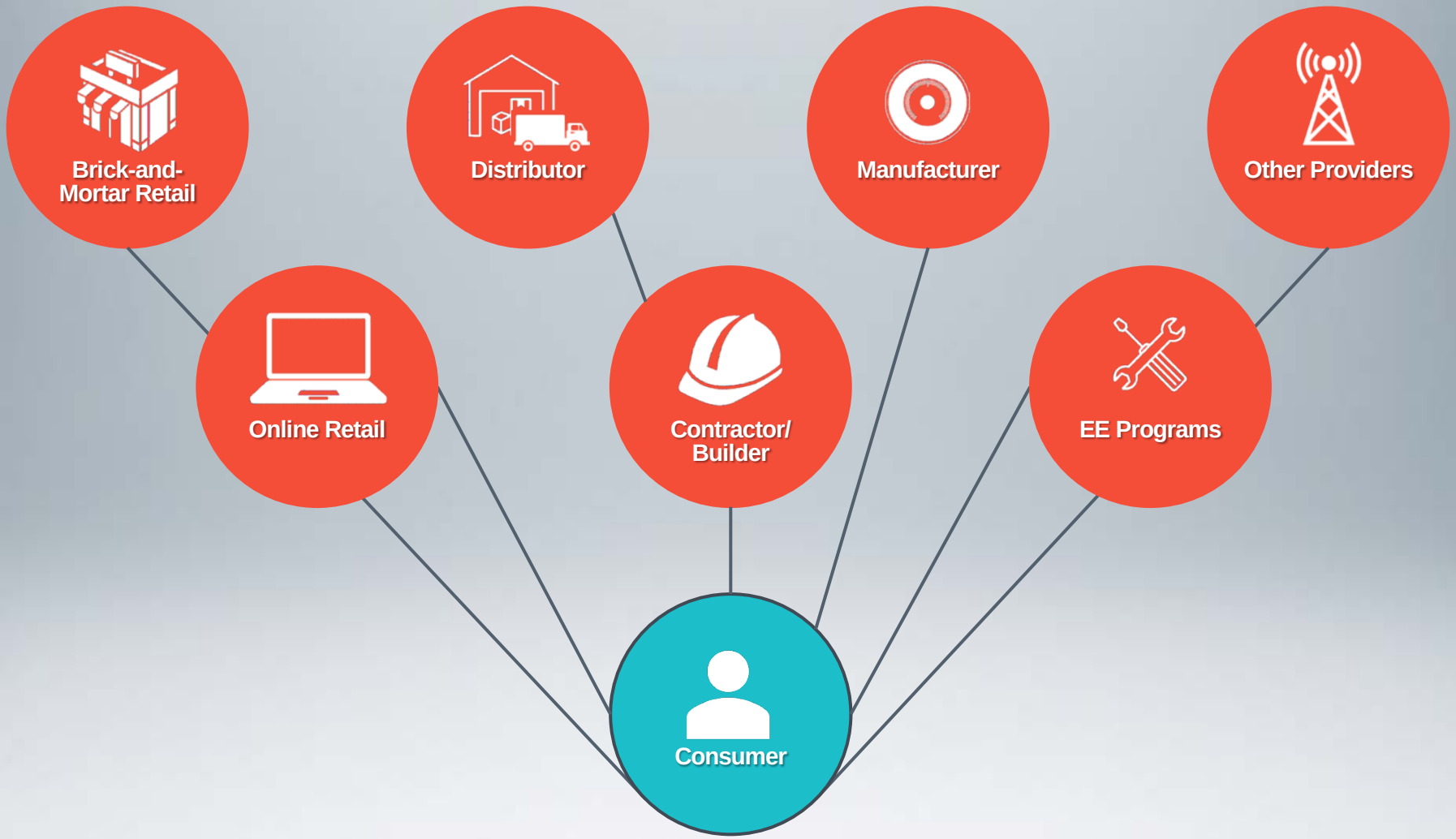
Algorithms need time to learn

Default settings may not maximize energy savings

Users may change default settings

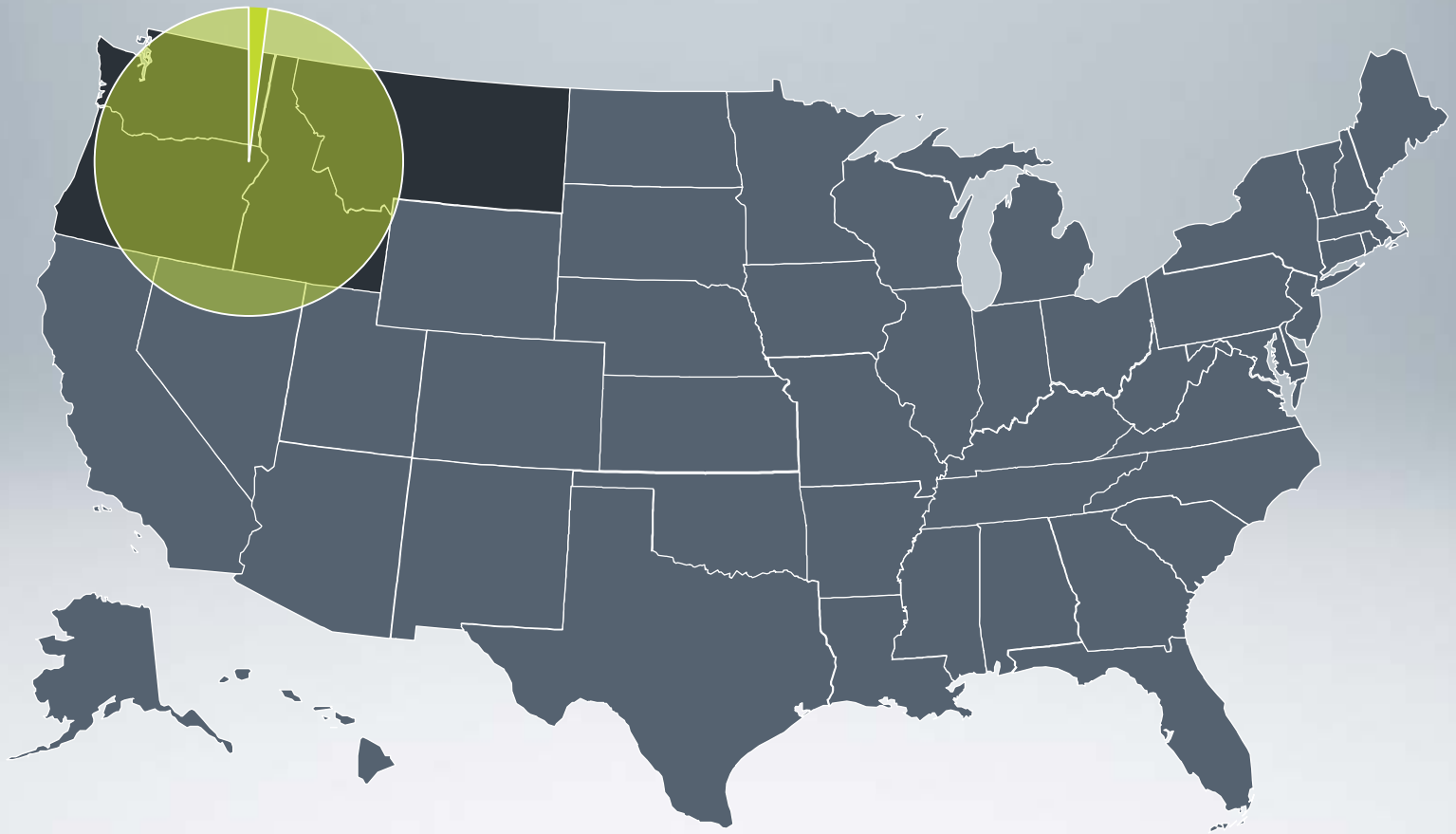
Incorrect installation can increase energy use

NEW COMPLEXITY IN SUPPLY CHAIN

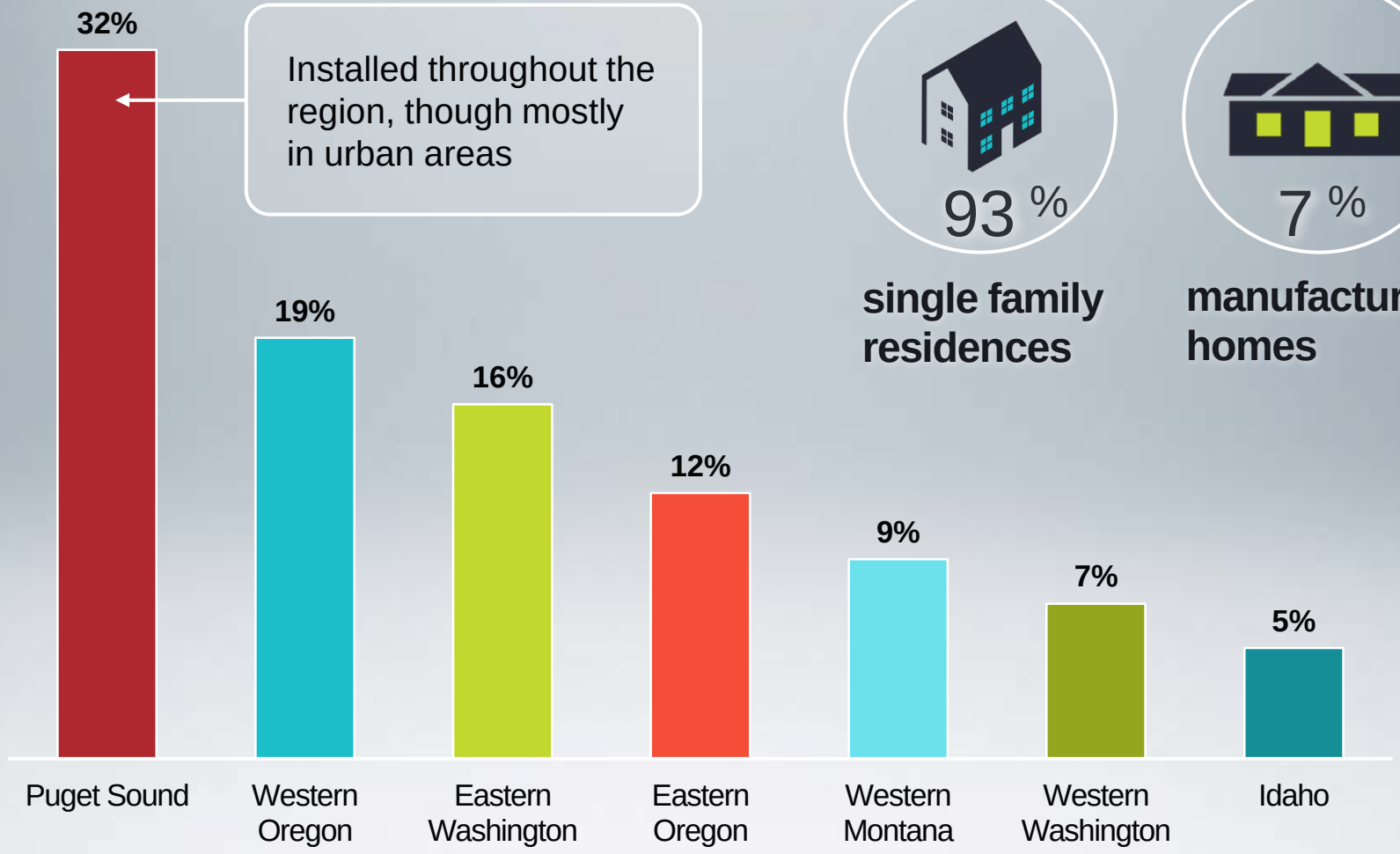


COUNTING IS CHALLENGING

Analysis of RBSA II data suggests regional saturation of advanced smart thermostats was about 2% in 2016.



WHERE ARE THEY INSTALLED?



WITH WHAT SYSTEMS ARE THEY PAIRED?

Cooling

54% paired with central air conditioners

46% paired with air source heat pumps

Heating

54% paired with gas furnaces

35% paired with air source heat pumps

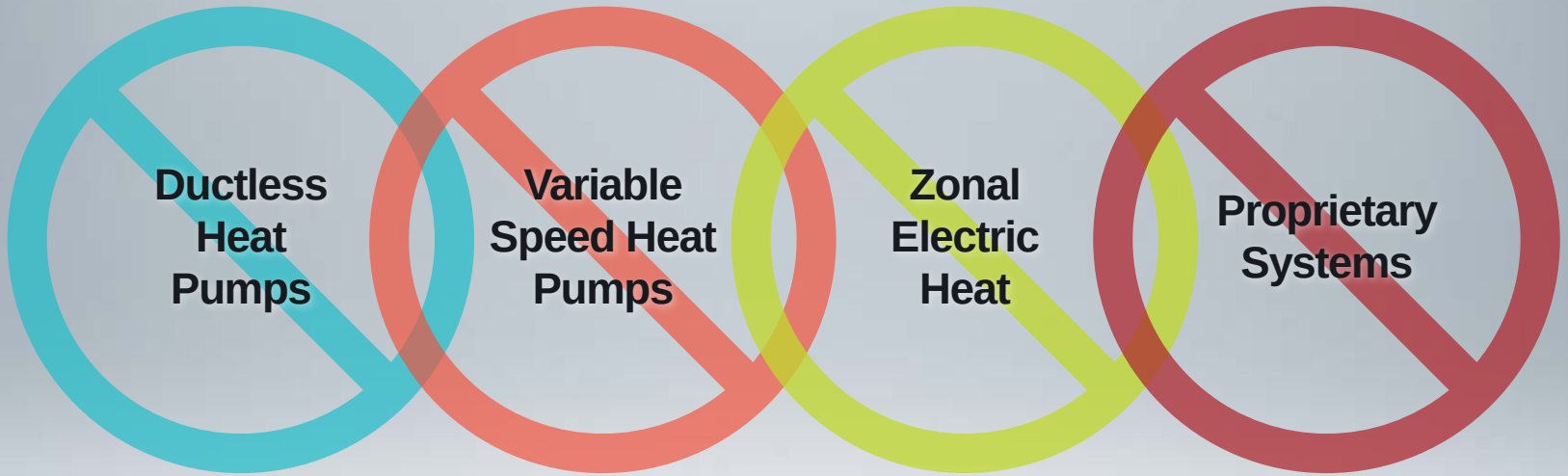
6% paired with propane furnaces

4% paired with electric furnaces

1% paired with boilers

EXPLOSIVE GROWTH IS EXPECTED

THEY DON'T CURRENTLY WORK WITH EVERYTHING



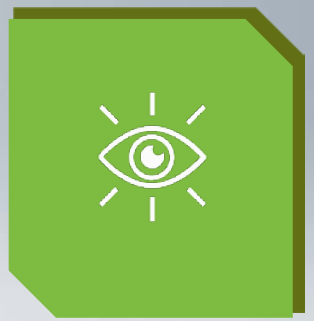
RECOMMENDATIONS

Coalesce
Around Definitions

Strategy
for Tracking Market Change and Savings

Research
and Data on Growth and Performance

Awareness
of New Products



CONTACT

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Get a copy of the detailed memo:
https://www.bpa.gov/EE/Utility/research-archive/Pages/hvac-market-research.aspx

Bonneville
POWER ADMINISTRATION

Heat Pump Field Study: Pilot Results

11.7.2018

Study Objectives

- Assess baseline Air Source Heat Pump (ASHP) Commissioning, Controls, and Sizing (CC&S) practices of HVAC contractors in the region
- Inform RTF current practice baseline for Unit Energy Consumption (UEC) estimates

Current Plan

- Sample frame from permit records of homes who installed heat pump in last three years
- Regional study, IOUs and public power, two domains, east and west of Cascades
- Sample is budget driven, estimating 100 home sample
- 4-6 hour site visit includes heat pump testing, blower door and duct leakage tests, house audit to inform PTCS sizing tool and Ecotope tool developed for Idaho Power

Status

- 4 home pilot is complete
- Finalizing full study plans
- Will be reaching out to utilities soon, followed by participant recruitment
- Phillip will reach out to IOUs, BPA EERs reaching out to BPA customer utilities

Pilot Results

- Two homes in PSE, two homes in Inland Power
- Two variable speed and two single or multi-speed systems
- Generally found:
  - Systems are undersized
  - Aux heat lockout settings vary (and could be more aggressive); newer thermostat terminology takes some getting used to
  - Compressor lock outs showed mixed results
  - Air flow good
  - Capacity (temp split) good
  - Ducts in one home were leaky
  - Blower door tests found significant air leakage, not uncommon in homes of this age (1963-1981)

Sizing

Site	Installed Tons	PTCS	Idaho Tool	Spec Pro
Inland 1	3	3.5	3.5	3.5
Inland 2	3	4.5	5	5
PSE 1	3	3.5	4	4
PSE 2	3	4	4	4

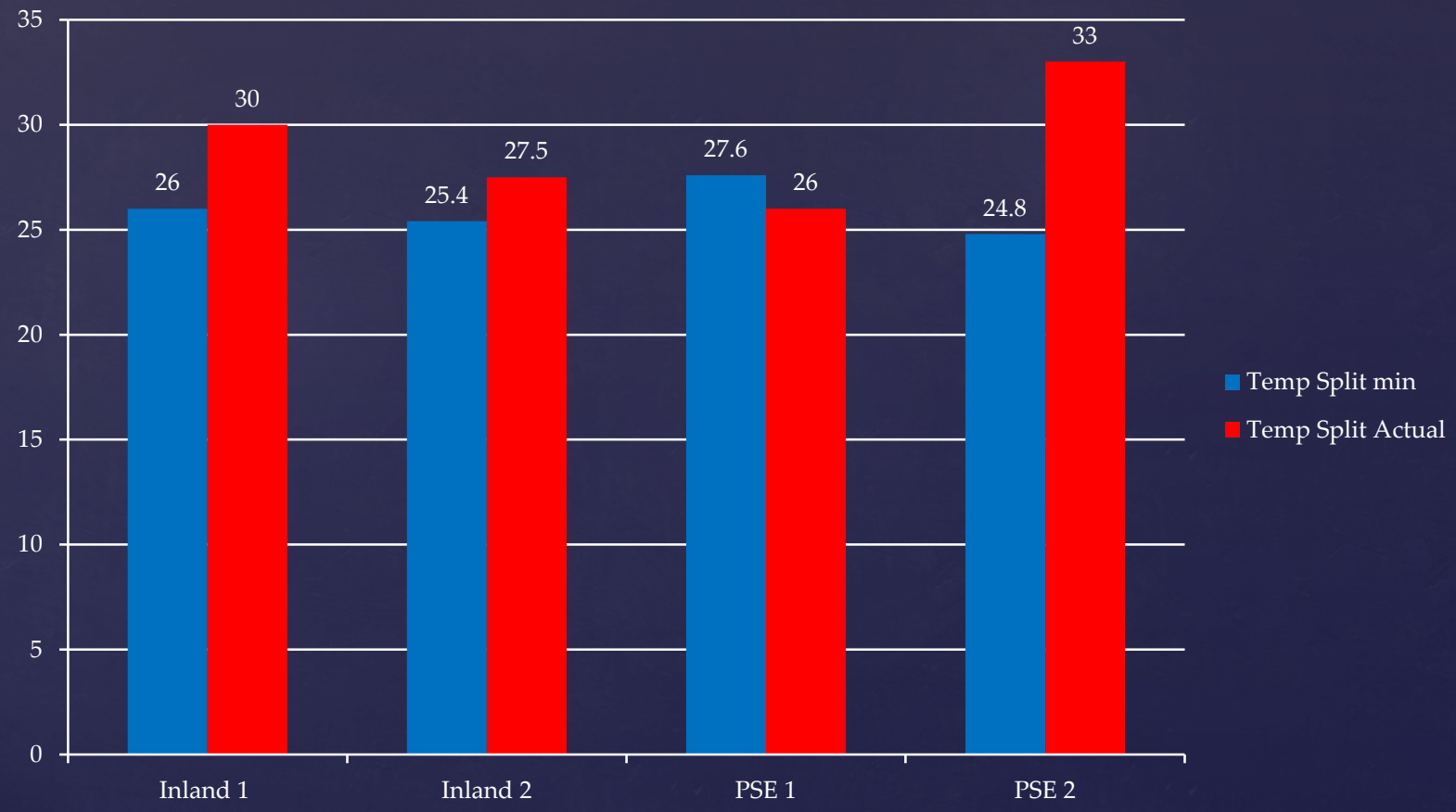
Lockout Controls

Site	Aux lock out (PTCS 35F)	Compressor lock out (PTCS 5F)
Inland 1	NA	5
Inland 2	NA	-4
PSE 1	55	50
PSE 2	40	NA

Air Flow (CFM)

Site	Air Flow (325-500)
Inland 1	240 - 446
Inland 2	417
PSE 1	357
PSE 2	425

Capacity Test (temp split)



Duct Leakage

Lessons Learned

- Recruitment went well, 11% of homes we mailed recruitment letters to took survey and would have been eligible for site visit
- Calls to schedule site visits were effective: 5 of 6 sites called agreed to site visit, 1 home was ineligible due to having two heat pumps
- Thermostats are now more complicated; getting installation manuals on line before site visit is helpful
- Site visits are taking longer than expected

Next Steps

- Final sample design (November)
- Outreach to utilities (November)
- Participant recruitment (November – December)
- Field work (Dec-April)
- Results (May – June)

Contact

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See you
December
5th!