



Northwest Ductless Heat Pump Pilot Project:  
A Whole-System Approach to Market Transformation & Evaluation  
*Presented at the 2014 IEPPEC Conference in Berlin, September 9, 2014*

Ecotope, Inc.

NORTHWEST ENERGY EFFICIENCY ALLIANCE

# Agenda



- Pilot Project Objectives
- Evaluation Approach
- Evaluation Results
- Conclusions & Reflections

# DHP Outdoor Compressors



# Measure Background

- Displace electric resistance, baseboard heat
- Est. 3,500 kWh/year savings
- 1 million target homes (300 to 400 aMW total for all target homes)
- Approx. \$1,500 incentive
- Potentially \$1.5 billion investment in incentives alone
- **NEED TO HAVE RELIABLE SAVINGS**



Integrated pilot and impact/process evaluation

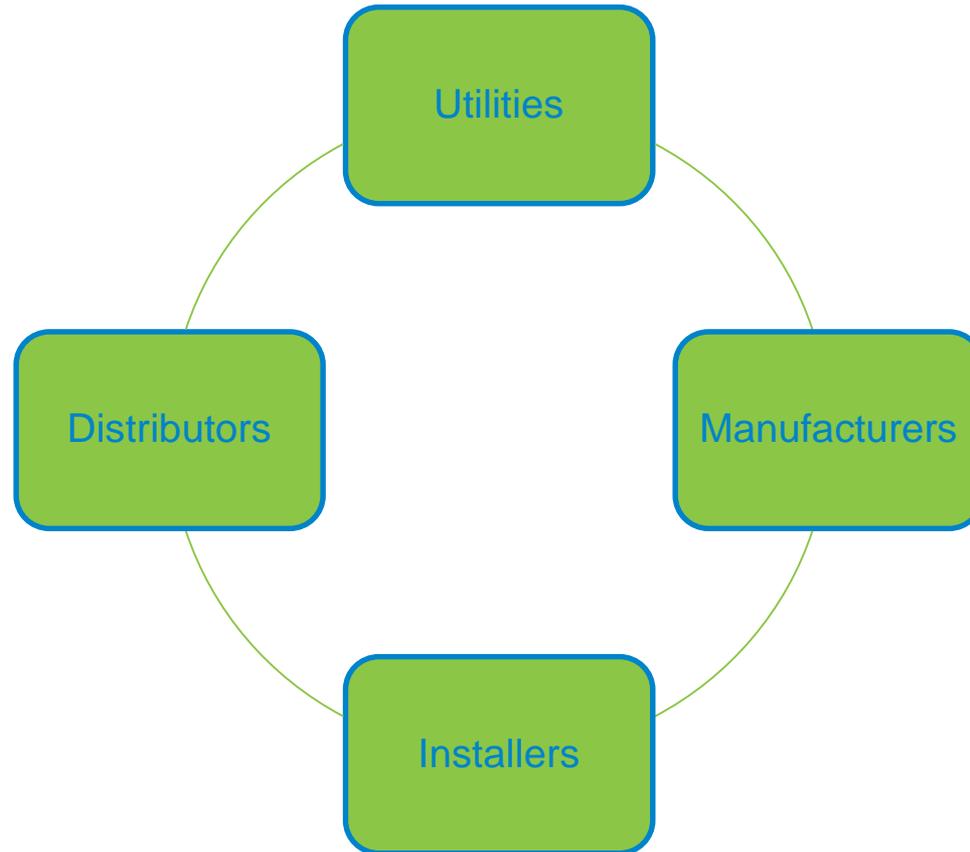
- Gain a deeper understanding of the technical and behavior driven determinants of savings

# Pilot Project Objectives

- Demonstrate DHPs as displacement technology for electric resistance space heat in existing Northwest homes
- Document pilot project implementation, e.g., costs and participant characteristics for evaluation\*
- Examine non-energy benefits and potential barriers to large scale implementation of DHPs
- Build a regional infrastructure to sustain and accelerate market growth

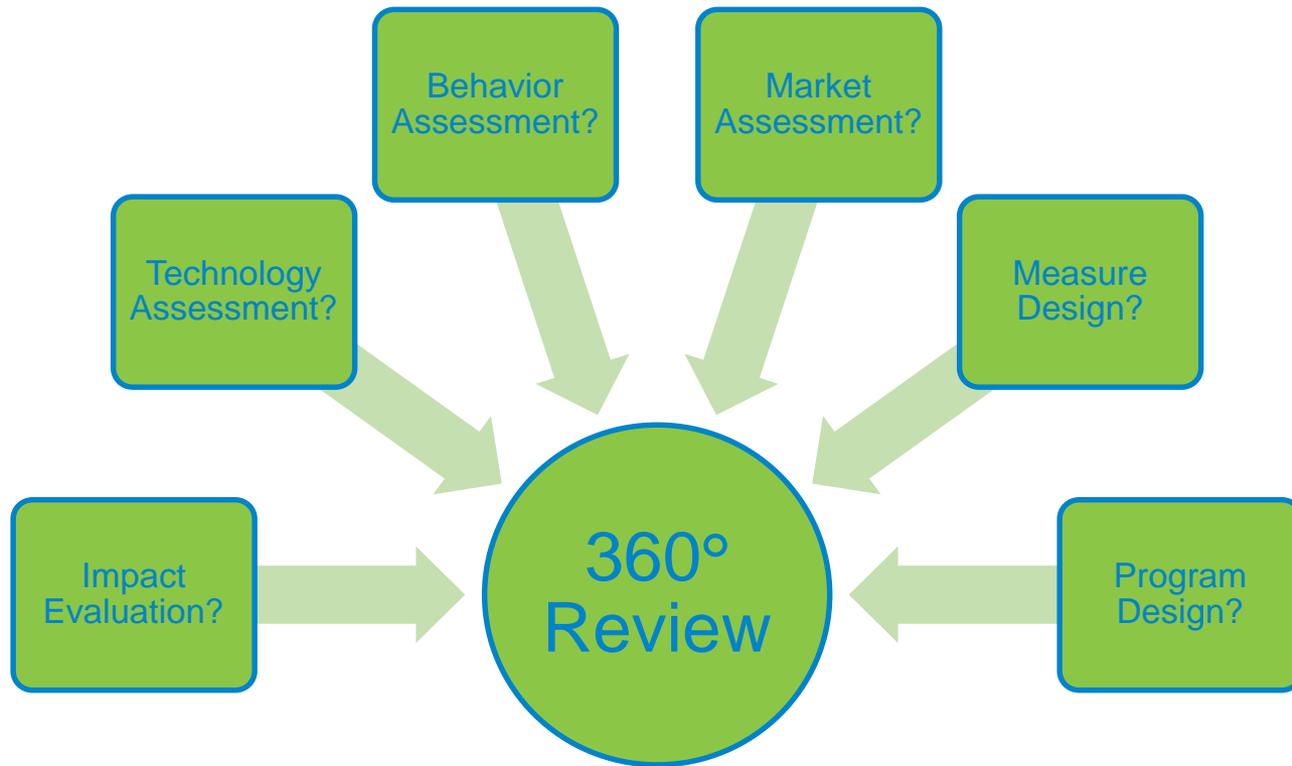
\*Pilot ran for 1 year (2009), evaluation ran for about 5 years (2009 to 2013)

# Whole System Approach to Market Transformation

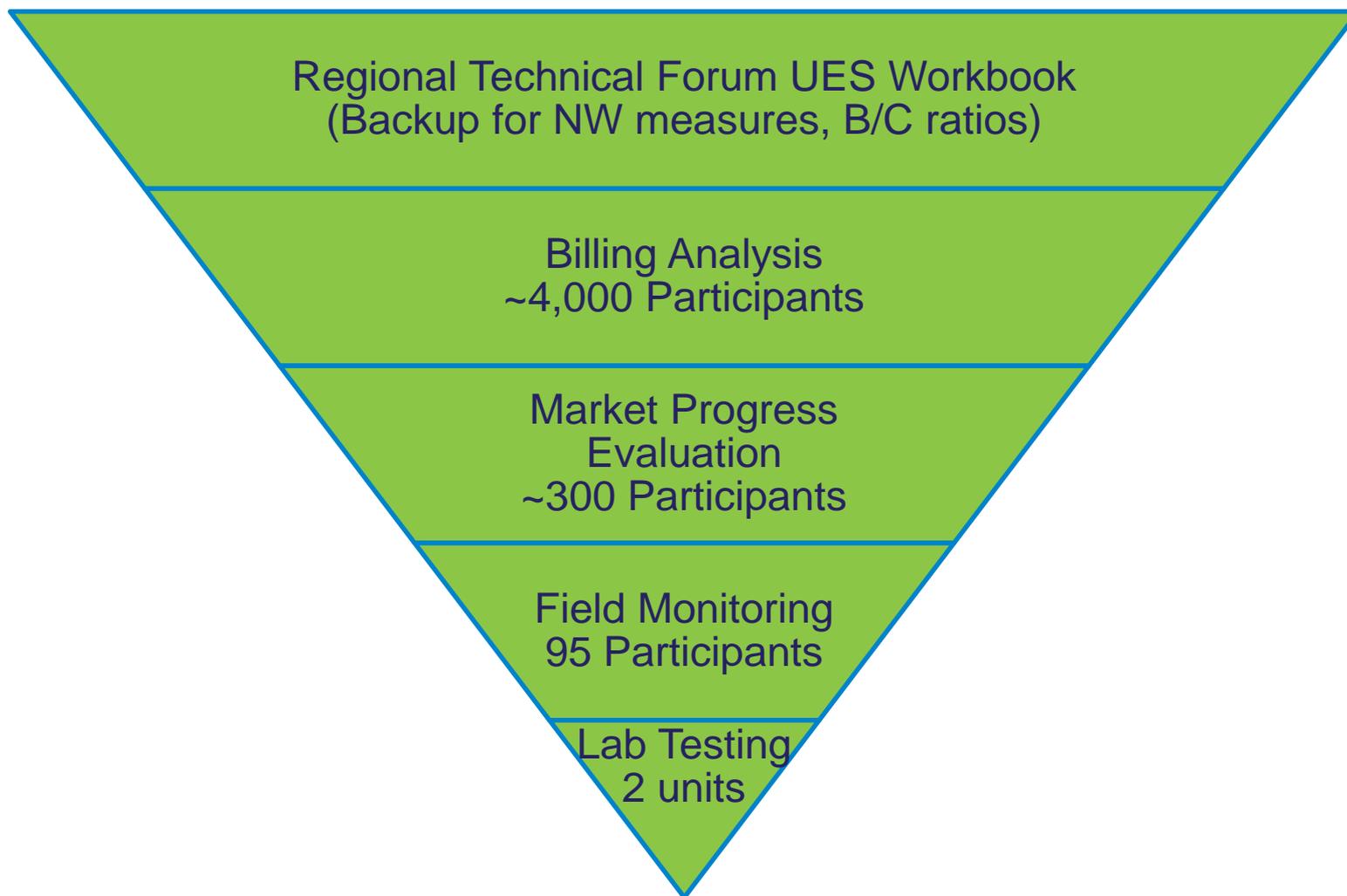




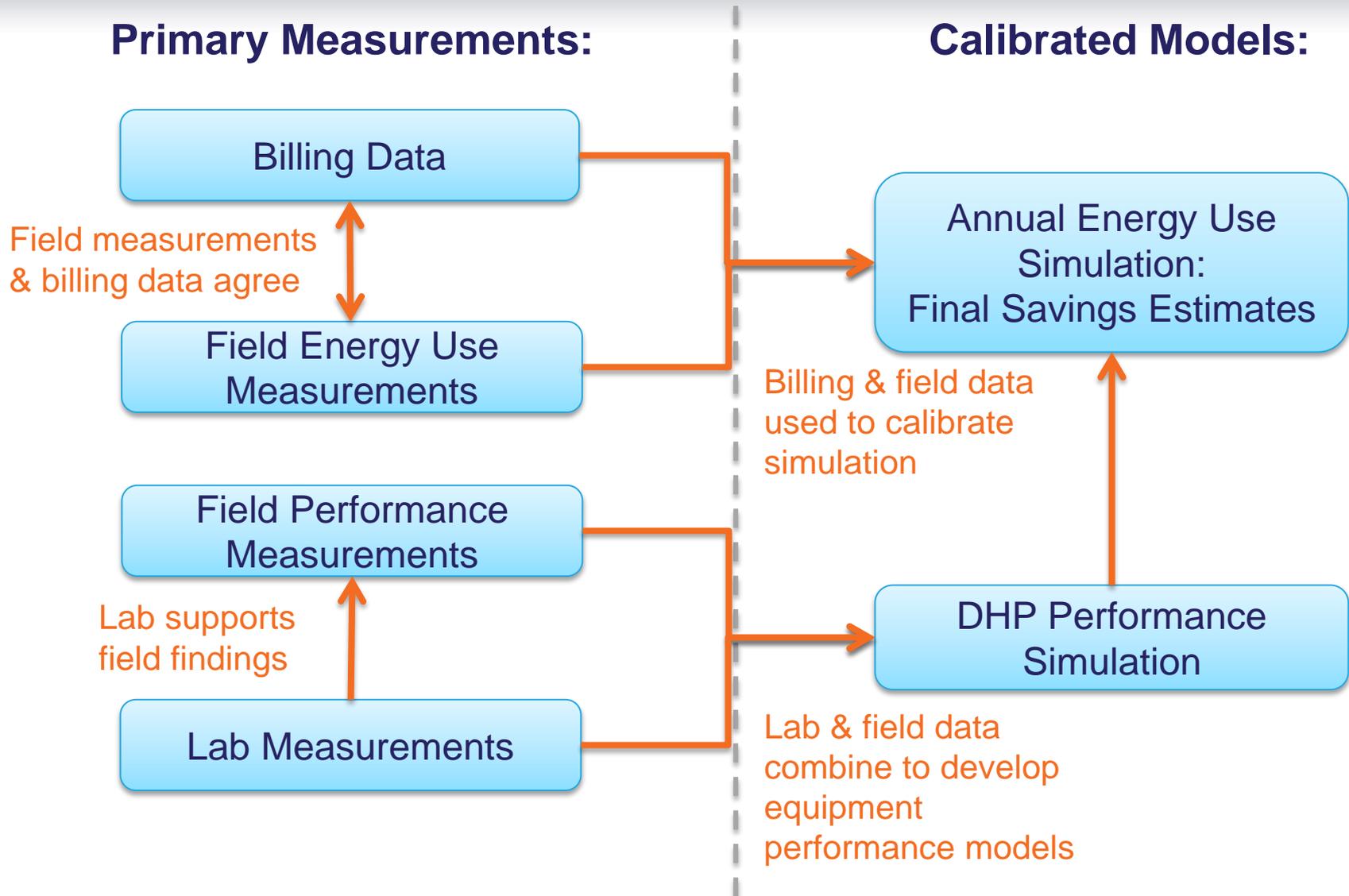
# Array of Drivers for Research Design



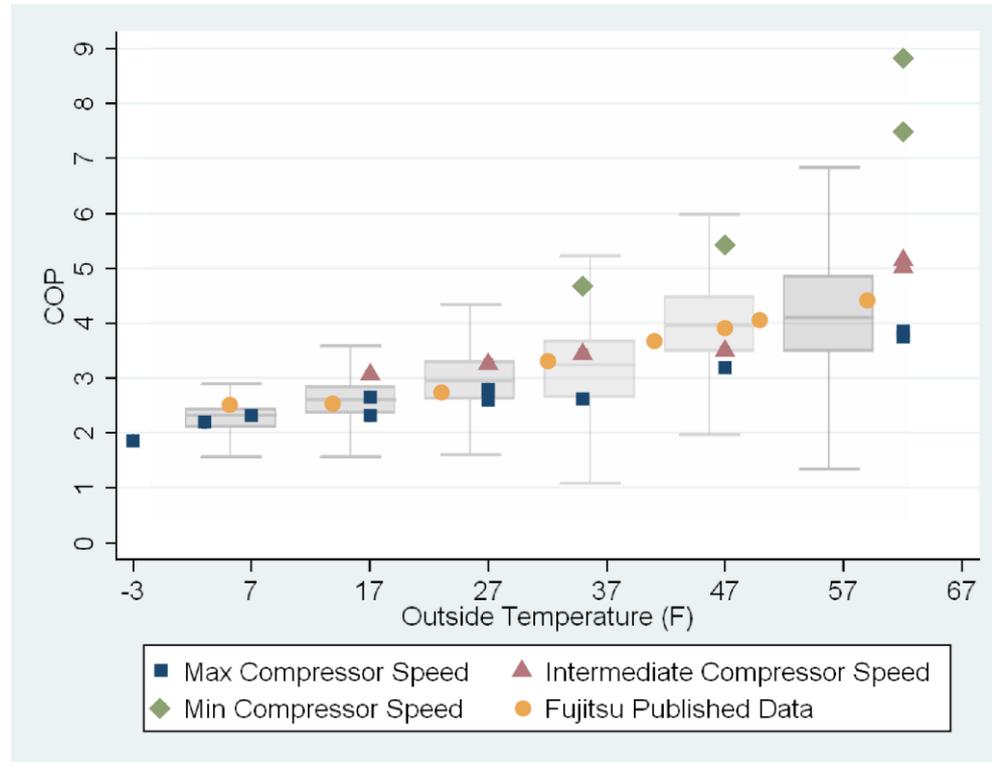
# Tiered Evaluation Approach



# Tiered Research Approach Shows Agreement Among Various Performance Measurements

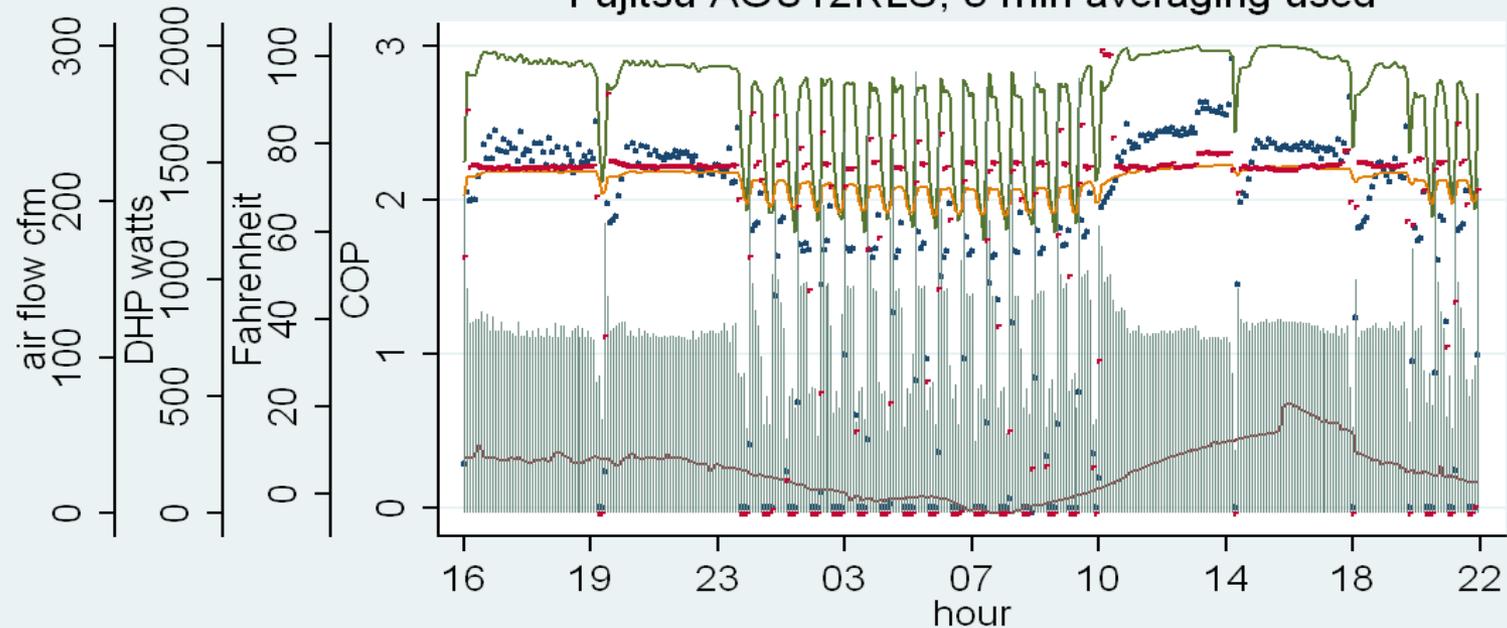


# Metered Data Aligns Well with Field Data

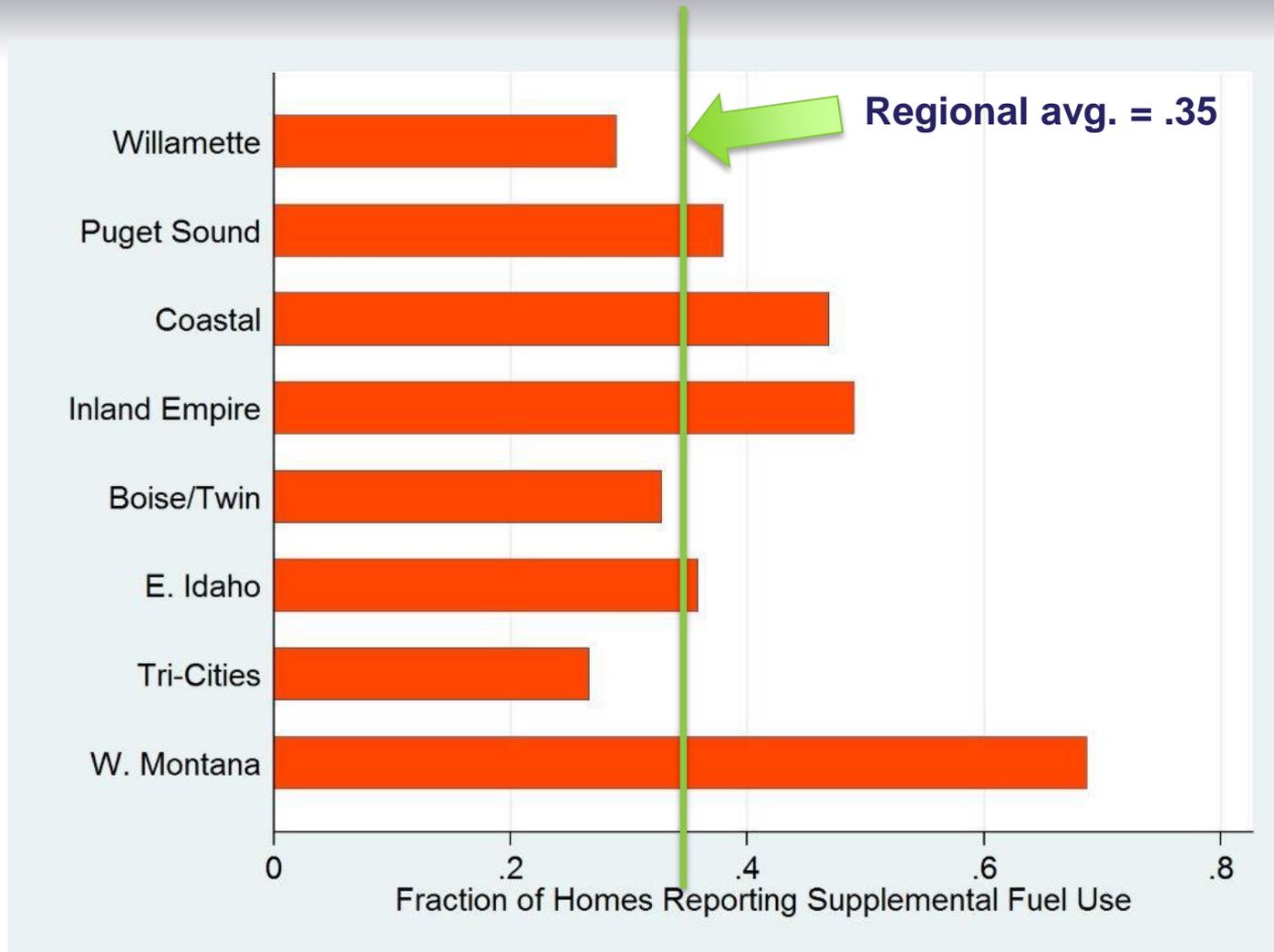


# Detailed Metered Data Provides Deeper Understanding of the Technology and Behavior

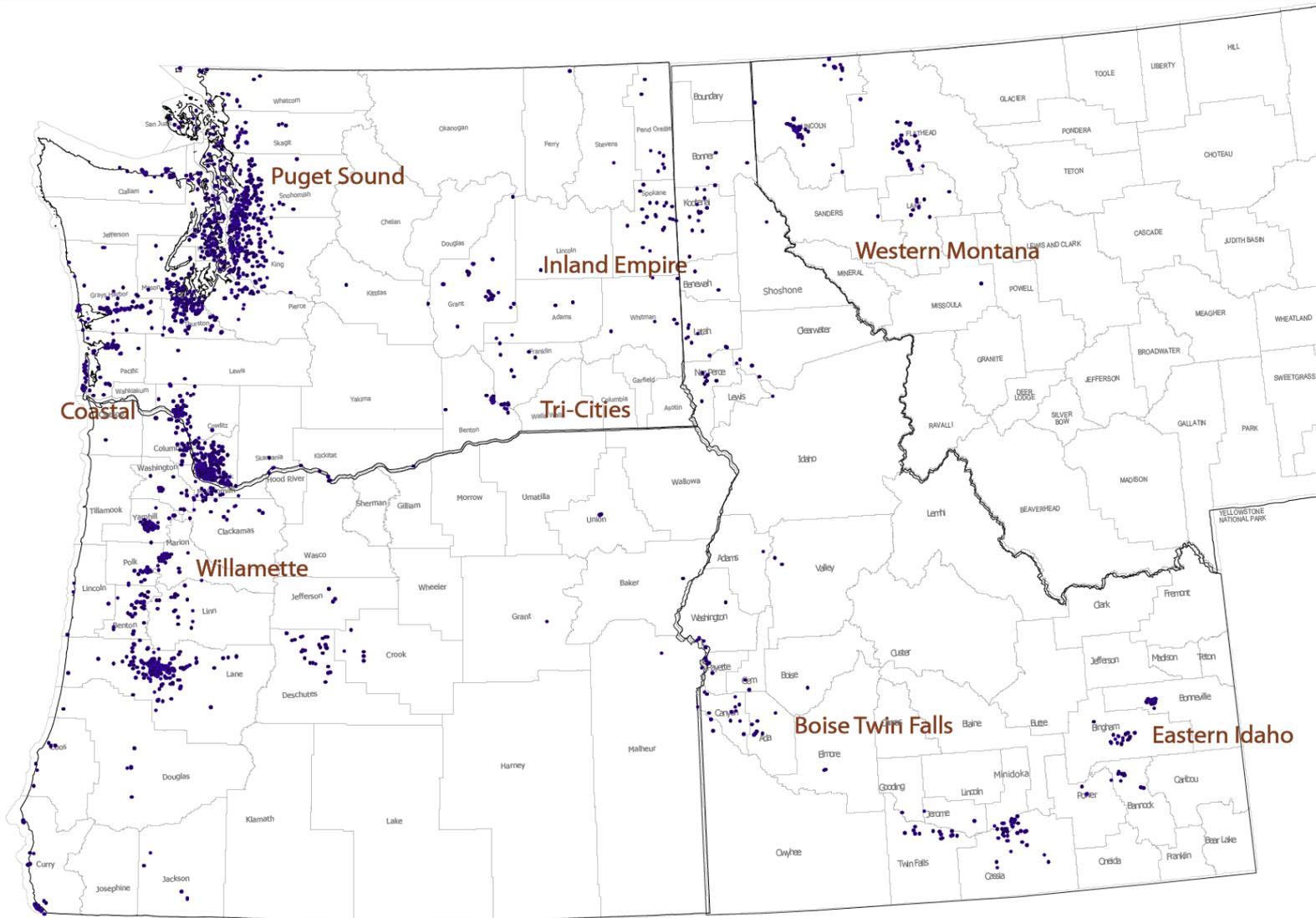
DHP data for 30 hrs from Dec 9, 2009 16:00  
site 13170 (2428698) Idaho Falls, ID  
Fujitsu AOU12RLS, 5 min averaging used



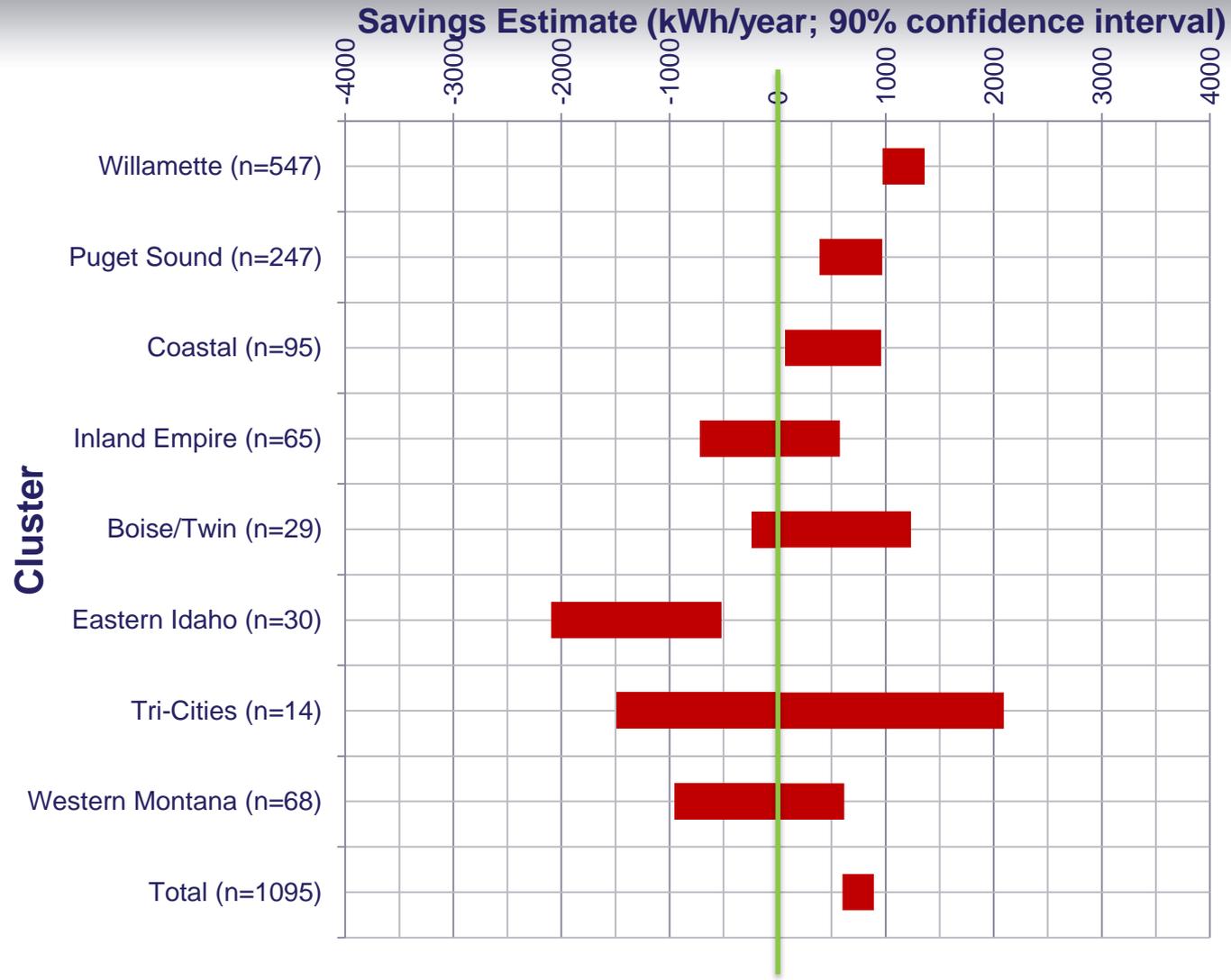
# Supplemental Fuel Use by Pilot Population



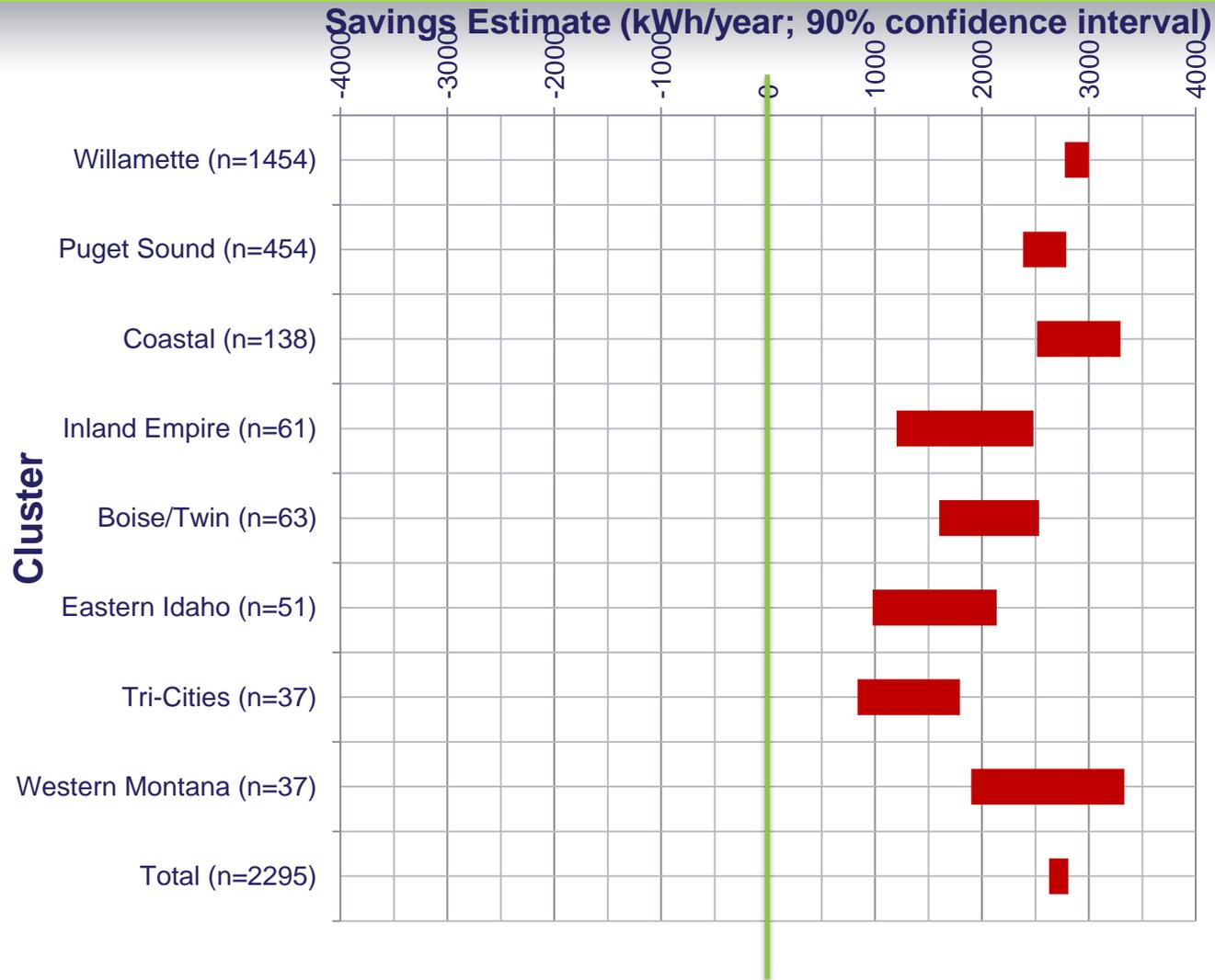
# Distribution of DHP Pilot Sites (n=3,899)



# Space Heating Savings: Supplemental Fuels

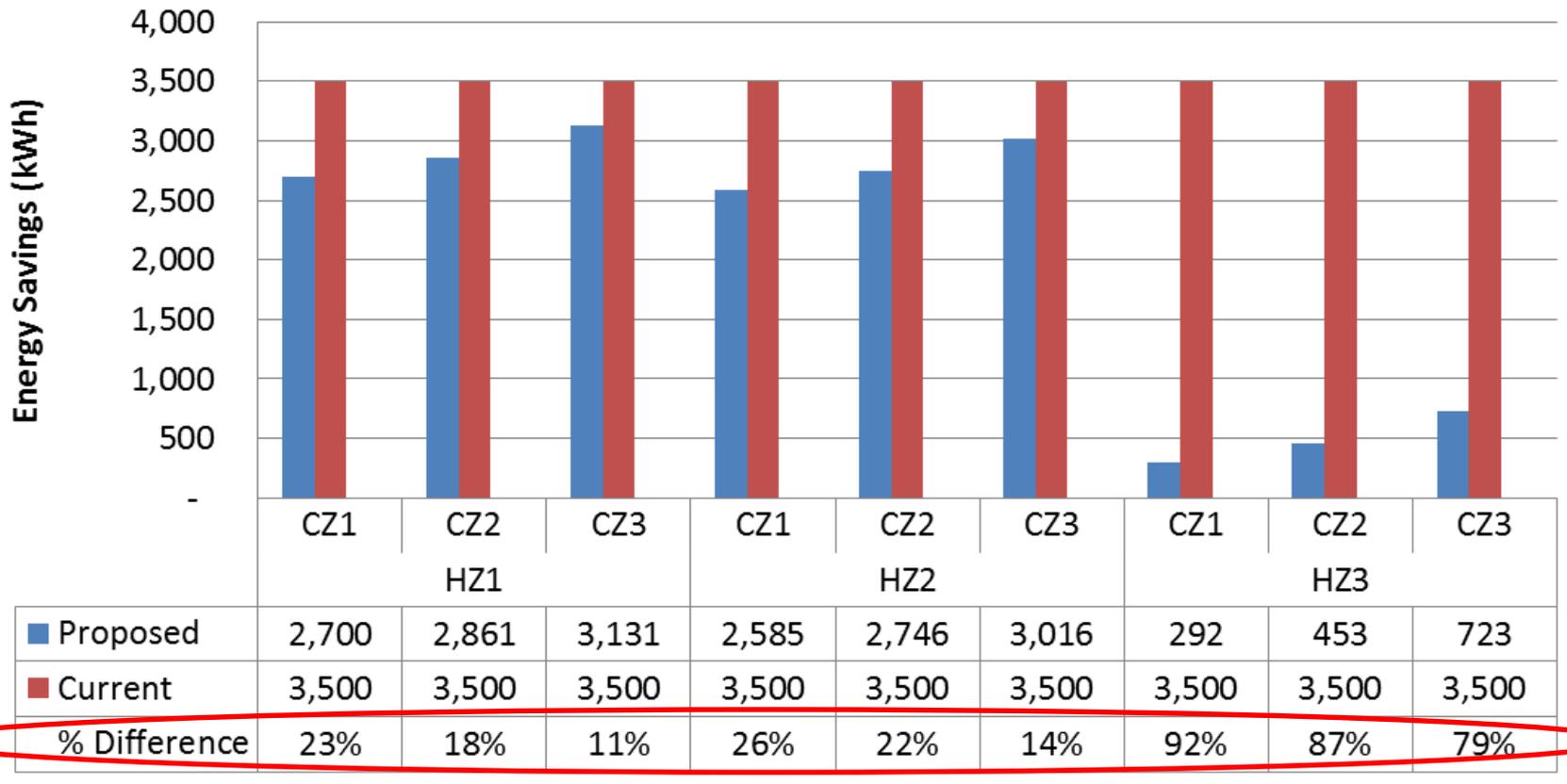


# Space Heating Savings: No Supplemental Fuels



# Unscreened Measure Likely not Cost-Cost Effective Across all Climate Zones

## Proposed vs. Current UES (Unscreened)



# Market Acceptance

- Manufacturers site pilot as primary driver for growth in Northwest DHP market
- Increased availability of DHPs
- Installers report ease of installation; many kinks were resolved through installation QC and evaluation feedback
- ~\$1,500 incentive helped overcome cost barrier
- Participants reported high-level of satisfaction and they like the cooling
- Non-energy benefits included comfort, ease of control, air infiltration

# Conclusions & Reflections

# Program Design Implications

- The DHP technology can deliver high savings from a technical perspective, even in cold climates
- Cooling helps drive purchase decisions and has little impact on annual kWh
- Behavior and supplemental fuel use major drivers for savings
  - Thermostat settings increased post-install; opportunity for behavior change
  - High pre-install electric heating use biggest driver for savings
  - Screening is advisable in most areas and likely mandatory in some
  - Larger utilities should tailor program design to align with service territory characteristics to get most reliable savings

# Overall Reflections on Approach

- Opportunity to build relationships with many market actors; sustainable change delivers high value in long run (marathon not a race to achieve 300-400 aMW savings)
- Higher cost and longer timeline than most evaluations
- Appropriate for measure and program design purposes
  - Delivered granular data and insights for program design and future evaluation
  - Much better understanding of performance-based vs. behavior-based determinants of savings, which is critical for good program design (which levers can you pull?)
  - Too much information? Sometimes hard to fully utilize or transition to program design setting.
- Results likely applicable in other regions

# Links to Final Reports & Measure Analysis

- Ductless Heat Pump Impact & Process Evaluation: Lab-Testing Report  
<http://neea.org/docs/default-source/reports/ductless-heat-pump-impact-process-evaluation-lab-testing-report.pdf?sfvrsn=18>
- Ductless Heat Pump Impact & Process Evaluation: Market Progress and Evaluation Report #1  
<http://neea.org/docs/default-source/reports/nwDuctlessHeatPumpPilotProject1027F6F74B193.pdf?sfvrsn=8>
- Ductless Heat Pump Impact & Process Evaluation: Market Progress and Evaluation Report #2  
<http://neea.org/docs/default-source/reports/HeatPumpPilotProject261187AB9D1CC.pdf?sfvrsn=14>
- Ductless Heat Pump Impact & Process Evaluation: Field Metering Report  
<http://neea.org/docs/default-source/reports/ductless-heat-pump-impact-process-evaluation-field-metering-report.pdf?sfvrsn=31>
- Ductless Heat Pump Impact & Process Evaluation: Billing Analysis Report  
<http://neea.org/docs/default-source/reports/ductless-heat-pump-impact-process-evaluation--billing-analysis-report.pdf?sfvrsn=6>
- Ductless Heat Pump Unit Energy Savings (UES) Regional Workbooks for Zonal Electrically Heated Homes  
<http://rtf.nwcouncil.org/measures/measure.asp?id=131>

# Contact Info

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