Low Income Energy Efficiency Workgroup Meeting

Date: March 7, 2018

Time: 10:00 a.m. – 1:00 p.m.

Location: Henry M. Jackson Federal Building, Room 440, 915 2nd Ave, Seattle, WA 98104

Join the meeting
Meeting number (access code): 903 189 863
Meeting password: n3yaHanE

Join by phone
+1-415-527-5035 US Toll

Agenda

10:00 Introductions-Carrie Nelson, BPA

- Introductions
- Safety/Building information
- Review Agenda

10:15 David Olivas, Weatherization Program Manager, Yakama Nation Housing Authority

- Followed by discussion of "healthy homes" programs across the region

11:00 Break

11:15 Phillip Kelsven, Hard to Reach Markets Analysis

12:15 Roundtable

- Update on DHP project in multi-family housing (Steve Jole)
- Measure Creation (Jess Kincaid)
- Next Meeting-Technical Training
- Updates on Manufactured Home Replacements

1:00 Adjourn

About this workgroup

BPA invites its public power customers and regional stakeholders to participate in the Low Income Energy Efficiency workgroup. BPA is convening this workgroup as agreed to as part of the Post-2011 Review public process. Background on that process and Workgroup 3 can be found here.

Facilitators: Carrie Nelson, Jess Kincaid BPA, 503-230-3000

Steering Committee

- Hans Berg, Washington Department of Commerce
- Todd Blackman, Franklin PUD
- Shawn Collins, The Energy Project
- Steve Jole, HACSA
- Travis Hardy, Northern Wasco PUD
- Wid Ritchie, Idaho Falls Power

Hard To Reach Markets Analysis

Background

- This analysis investigates the distribution of residential measures across BPA customer utilities
- The analysis attempts to answer the question, do we have hard to reach markets?
- Analysis conducted with a particular focus on the distribution by
  - Income
  - Housing Type
  - Owners & Renters
  - Language
  - Small Rural vs. Urban Large

Data Sources

- BPA residential participation data (IS 2.0) from 2012-2017 on sites with addresses
- American Community Survey Census data
  - Rolling 5 year sample by census block group

What is a Block Group?

- Unit of analysis is the Census Block Group
- There are 3,806 block groups in BPA utility territories that have claimed at least 1 residential measure associated with an address
- The average number of housing units in a BPA block group is 542
  - minimum is 11
  - maximum is 3,147

Methodology

- We are not getting characteristics of individual households
- We are getting the characteristics of neighborhoods
- Utility program participants may or may not be like the neighborhood
- Trends across neighborhoods that are consistent throughout BPA customer utility territories may be providing real insight into program participation trends

Methodology

- Participation rates per census block group are calculated
- Participation rate =

$$\frac{\text{Program Participants}}{\text{Number of Households}}$$

Context

- We are only considering data back to 2012
- Not including 30 + years of BPA program activity

Methodology

- Participants are widely defined as a residential households that is tied to any measure with an address:
  - Heat pump conversions and upgrades
  - Ductless heat pumps
  - Duct sealing
  - Insulation
  - Air Sealing
  - Windows
  - Energy Star / Built Green/ Montana House / NEEM
  - Clothes washers, Clothes dryers
  - Fridge and freezer decommissioning
  - Fridges and Freezers
  - Heat pump water heaters
  - Pipe insulation
  - Thermostats
  - Direct install or mail-by-request lamps, showerheads, power strips

Other definitions

- **Instant Savings Measures** (ISM) are:
  - Lamps & fixtures
  - Showerheads and thermostatic shut-off valves
  - Power strips
  - Delivered via direct install or mail-by-request (have an address associated with measure)
- **Major Measures** are not ISMs
- Participant data includes BPA EEI low income participants, but excludes the BPA low income grant program
- BPA EEI low income participants must be at or below 200% of federal poverty level which is $40,840 for a family of 3 in 2017

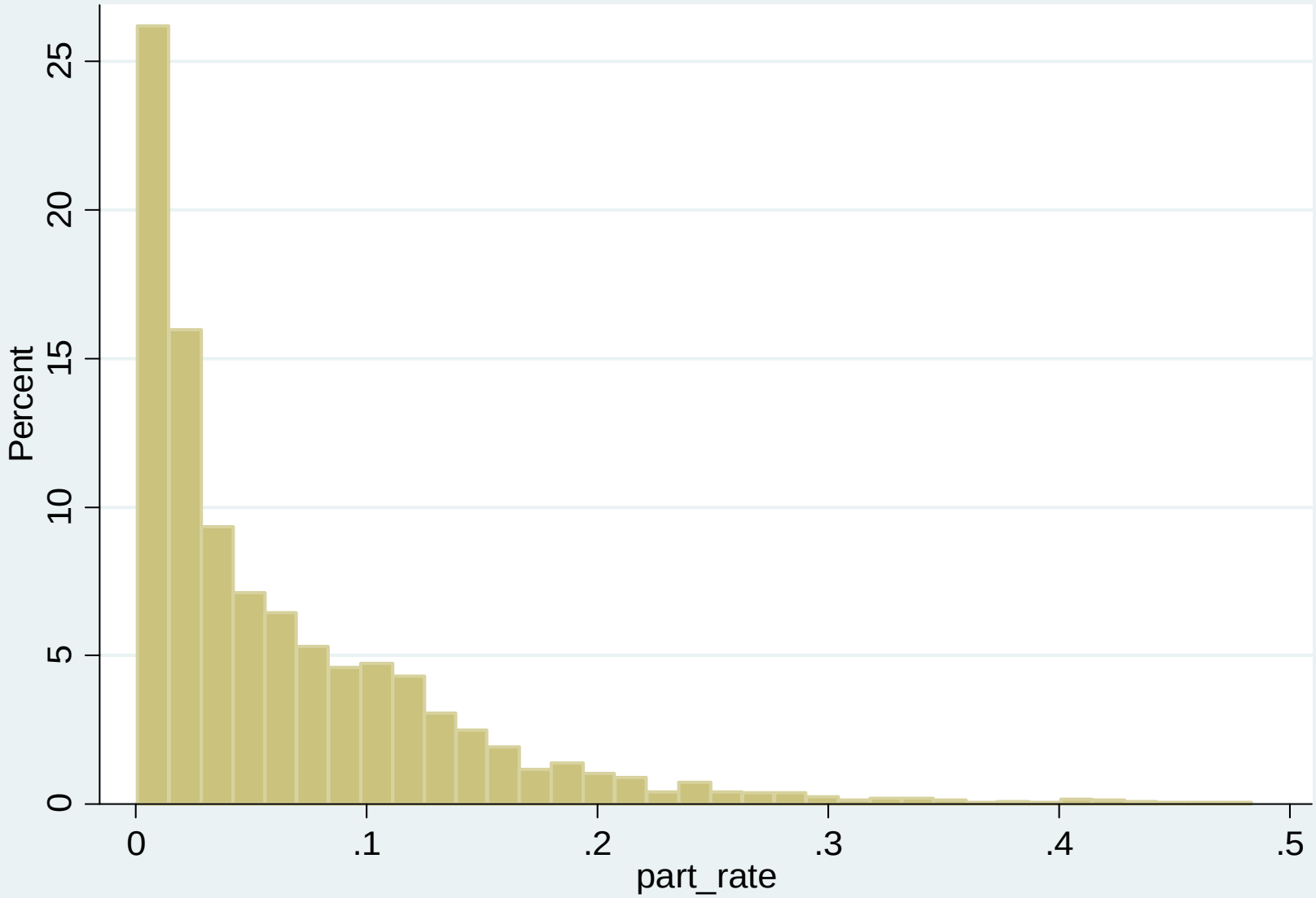
The Results

- Any questions first?

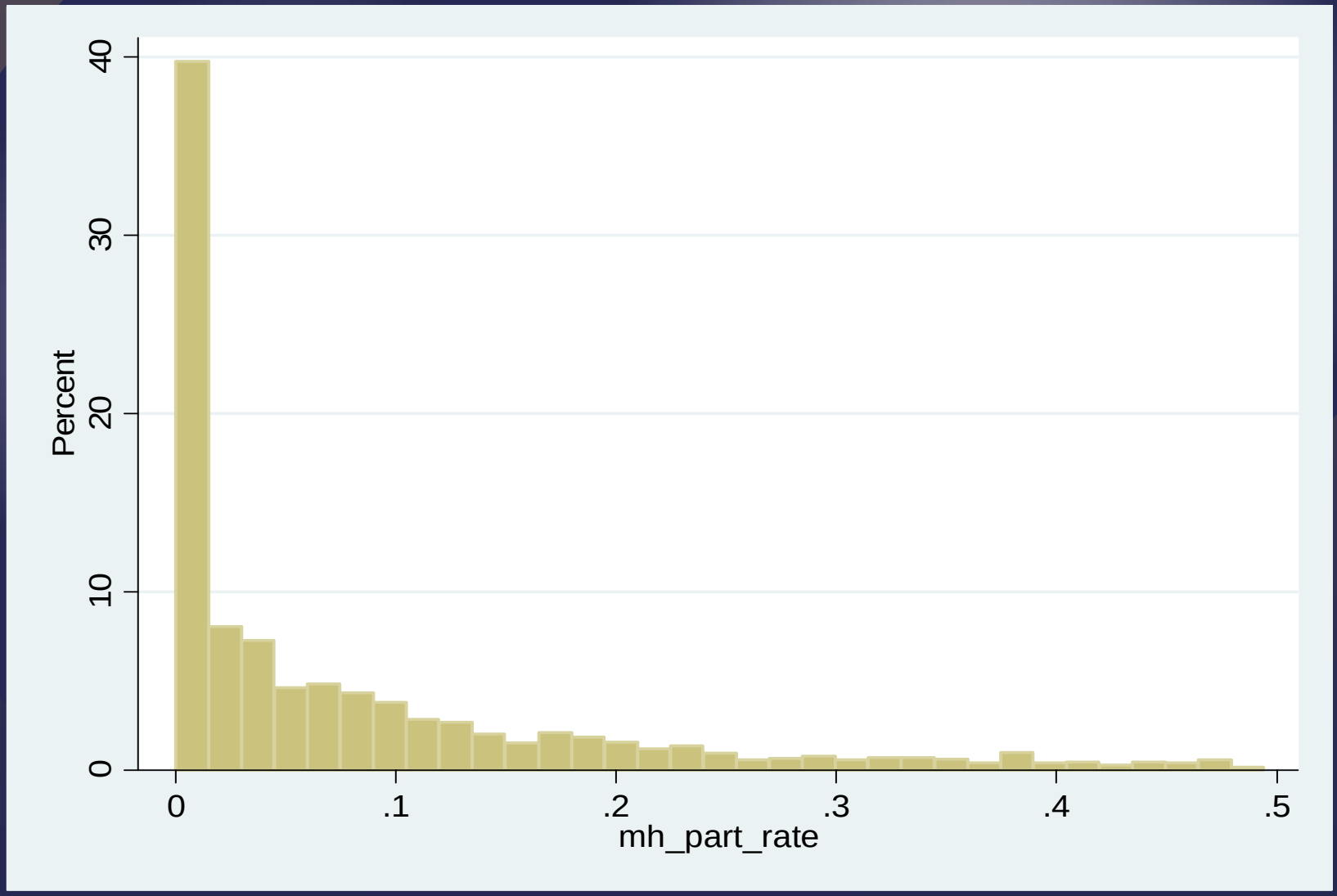
The BPA Universe

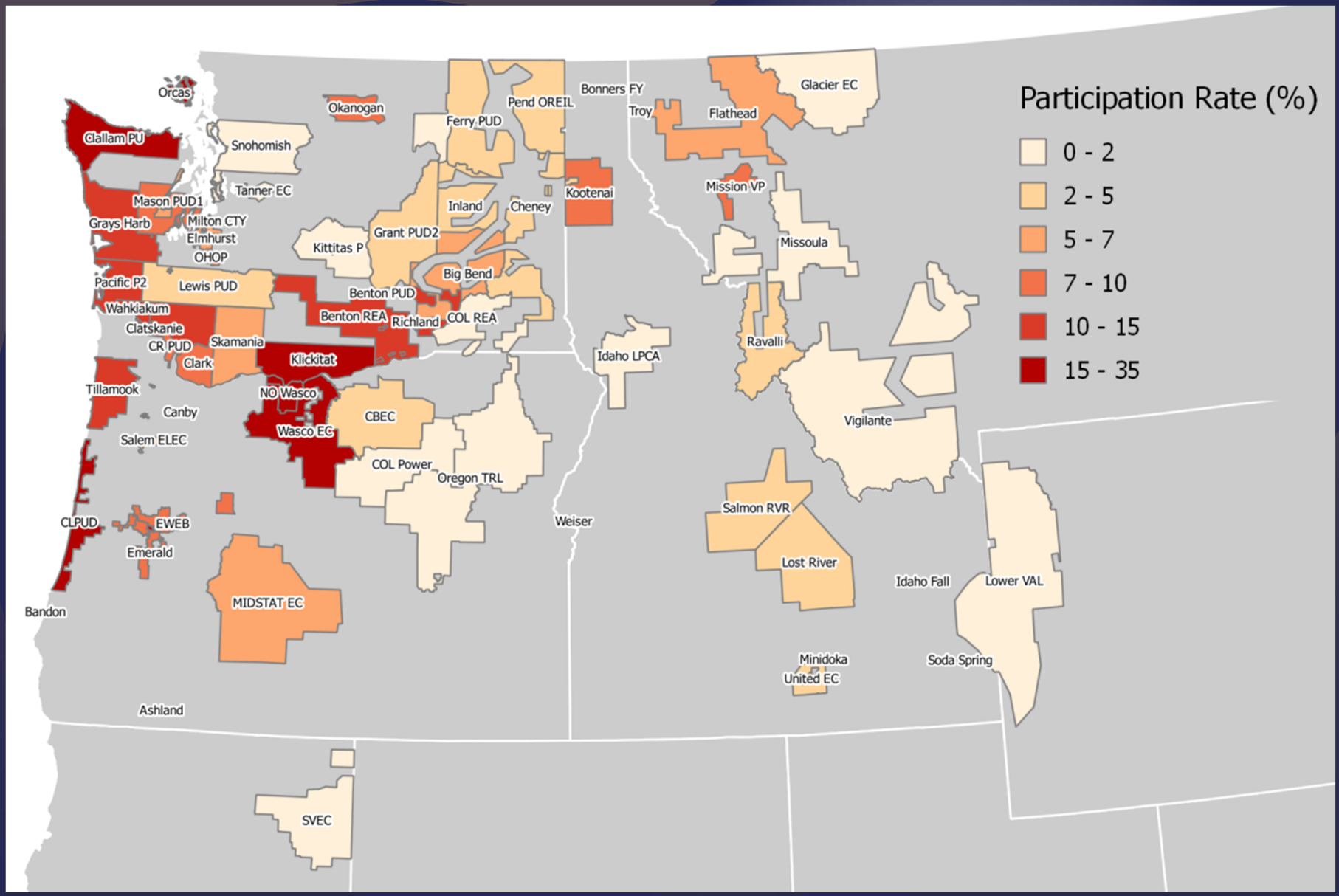
	Single Family	Multi Family	Manufactured Homes	Non Specific Sites	Total
Number of Housing Units	1,572,383	306,608	176,434		2,055,425
% of Total	76%	15%	9%		
Number of Utility Program Participants	88,885	1,803	24,226	14,755	129,669
% Housing Units Served	5.65%	0.59%	13.73%	0.72%	6.31%

Participation Rate – All Housing Types



Participation Rate – Manufactured Homes

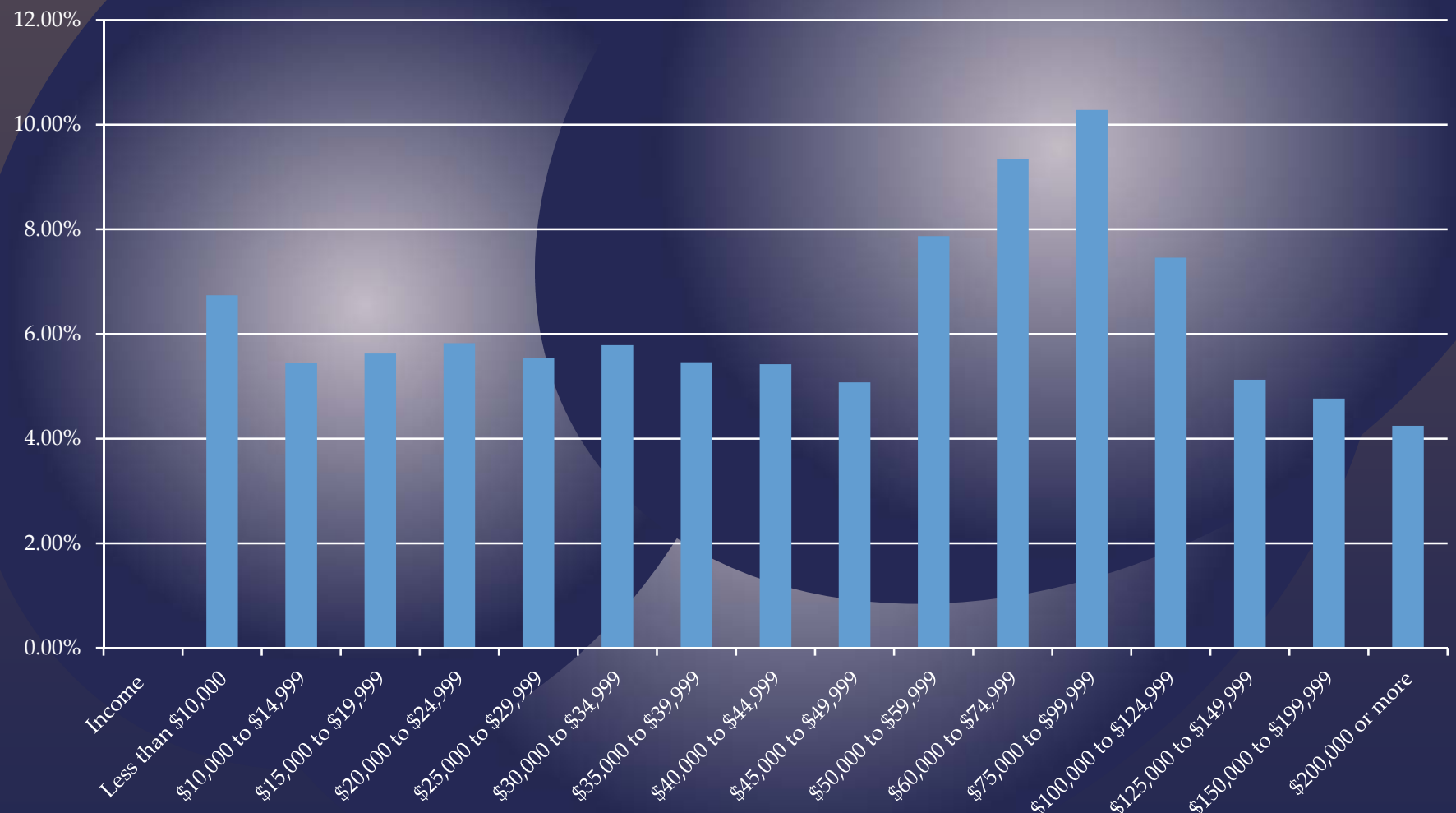



Participation Rate (%)
0 - 2
2 - 5
5 - 7
7 - 10
10 - 15
15 - 35
Orcas
Okanogan
Pend OREIL
Bonners FY
Troy
Flathead
Glacier EC
Ferry PUD
Clallam PU
Snohomish
Tanner EC
Kootenai
Mission VP
Mason PUD1
Inland
Cheney
Grays Harb
Milton CTY
Elmhurst
Grant PUD2
Missoula
Kittitas P
OHOP
Big Bend
Pacific P2
Lewis PUD
Benton PUD
Wahkiakum
Benton REA
Richland
COL REA
Clatskanie
Skamania
Ravalli
CR PUD
Clark
Klickitat
Idaho LPCA
Tillamook
NO Wasco
Canby
CBEC
Vigilante
Wasco EC
Salem ELEC
COL Power
Oregon TRL
Salmon RVR
CLPUD
EWEB
Weiser
Emerald
Lost River
Idaho Fall
Lower VAL
MIDSTAT EC
Bandon
Minidoka
United EC
Soda Spring
Ashland
SVEC

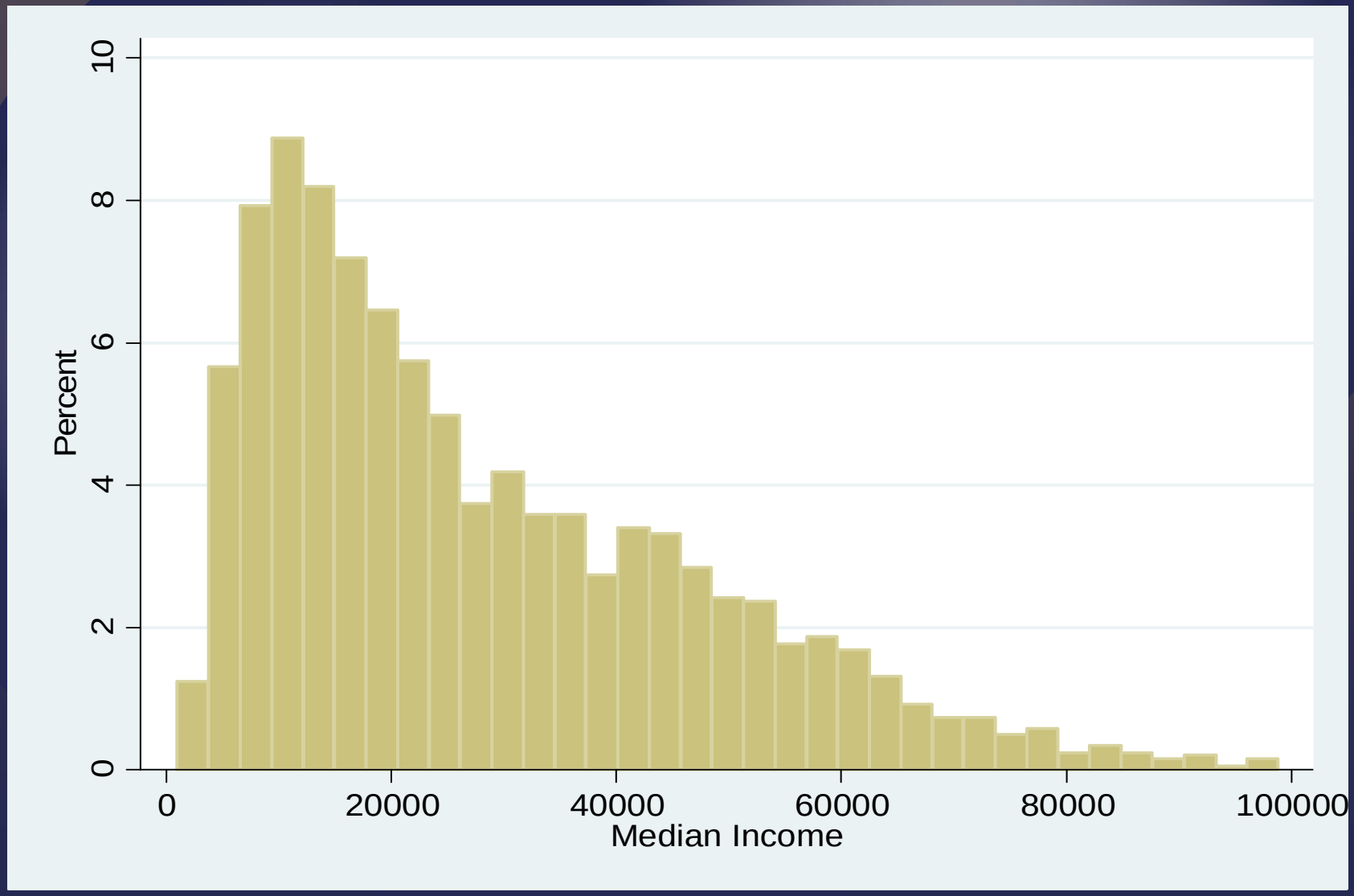
Income in the ACS

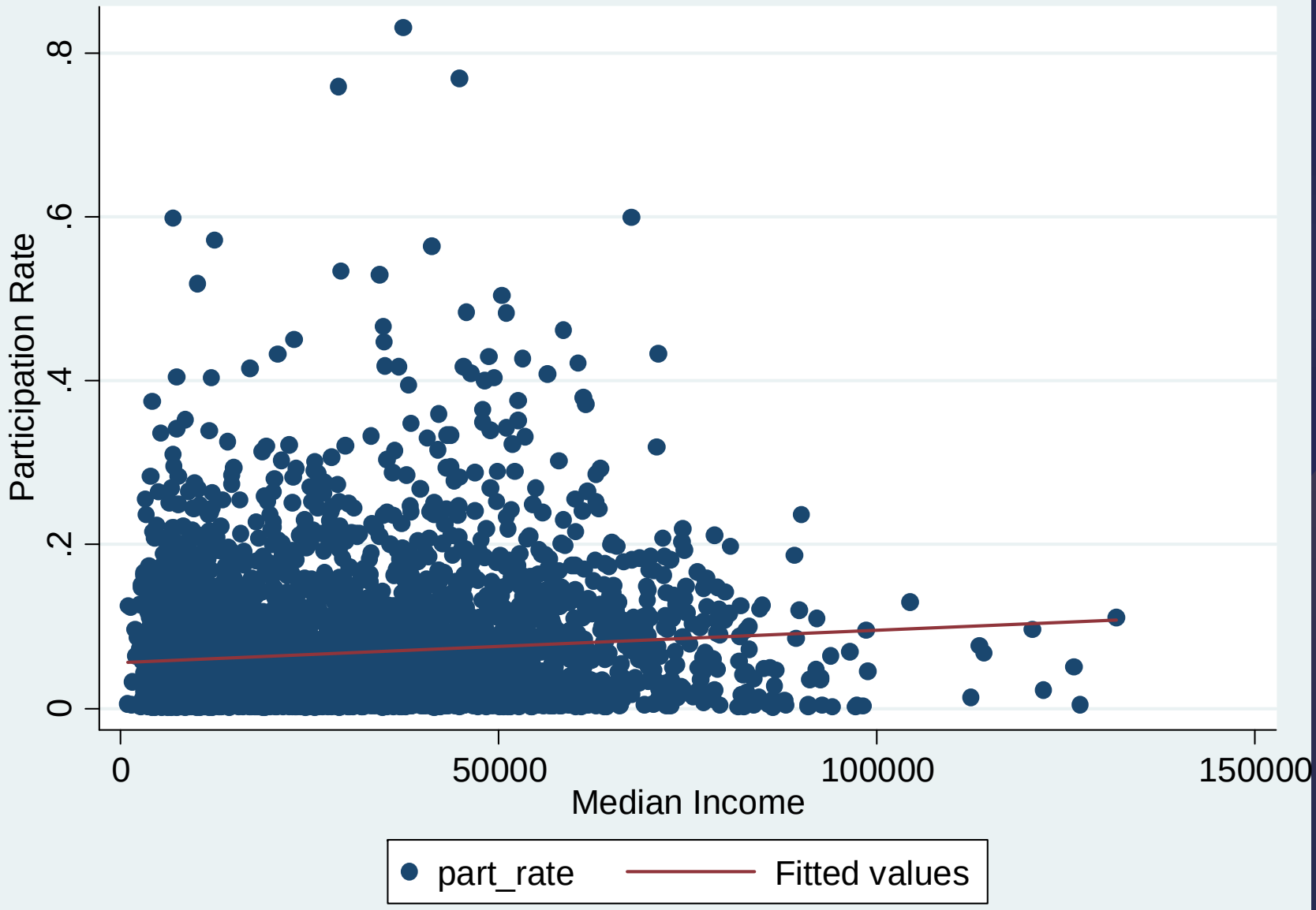
- The distribution of income is reported in census block groups by number of households in 16 different income categories
- Number of households in each income segment can be aggregated into categories of census block groups in any number of ways
- First we look at the lowest quartile of participation rates (bottom 25%) by census block groups compared to the highest quartile (top 25%) of participation rates
- We are comparing the income distribution of the entire BPA customer utility territories to the distribution of income of low and high participation segments

BPA Territory Income

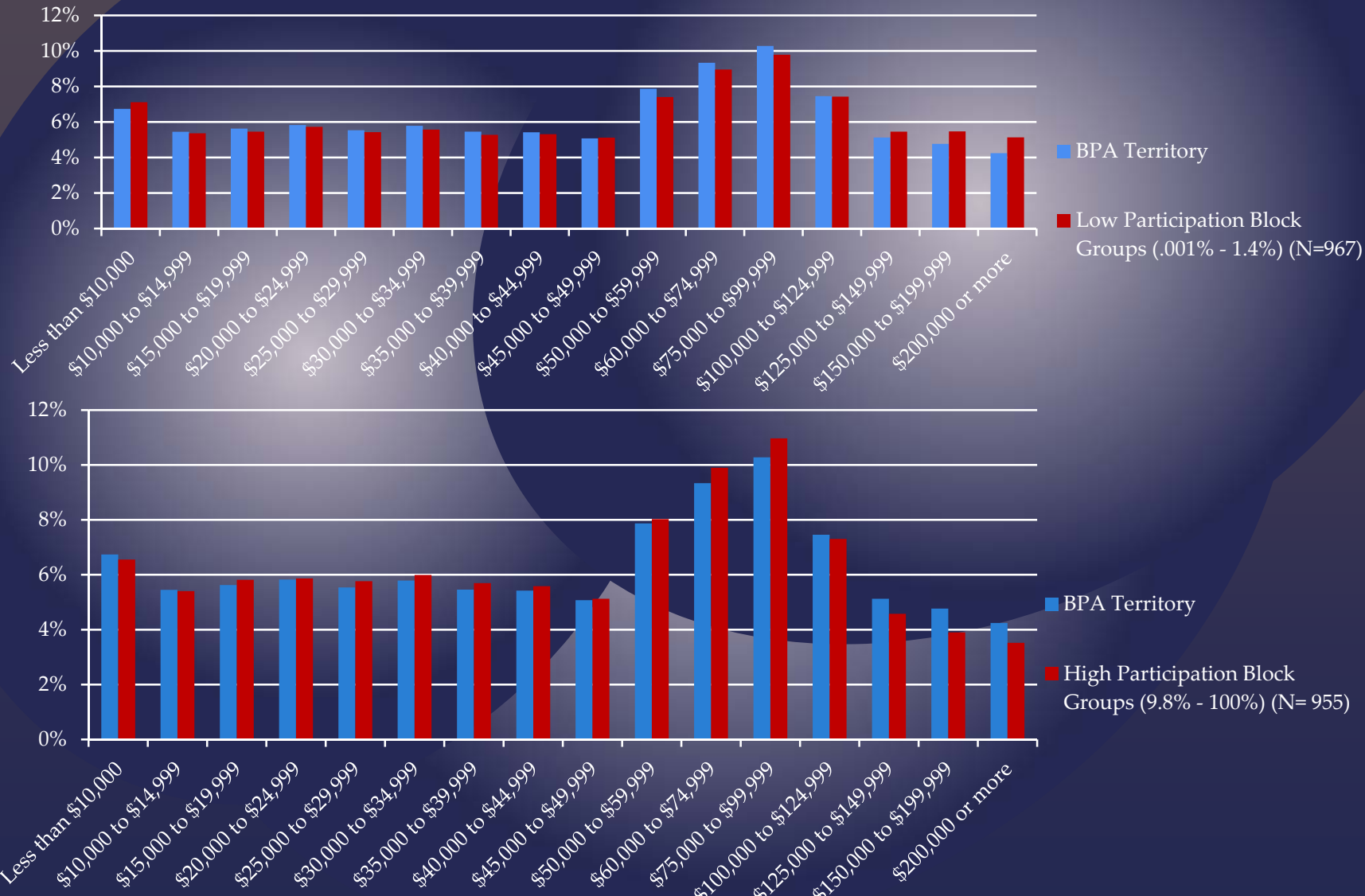


Median Income

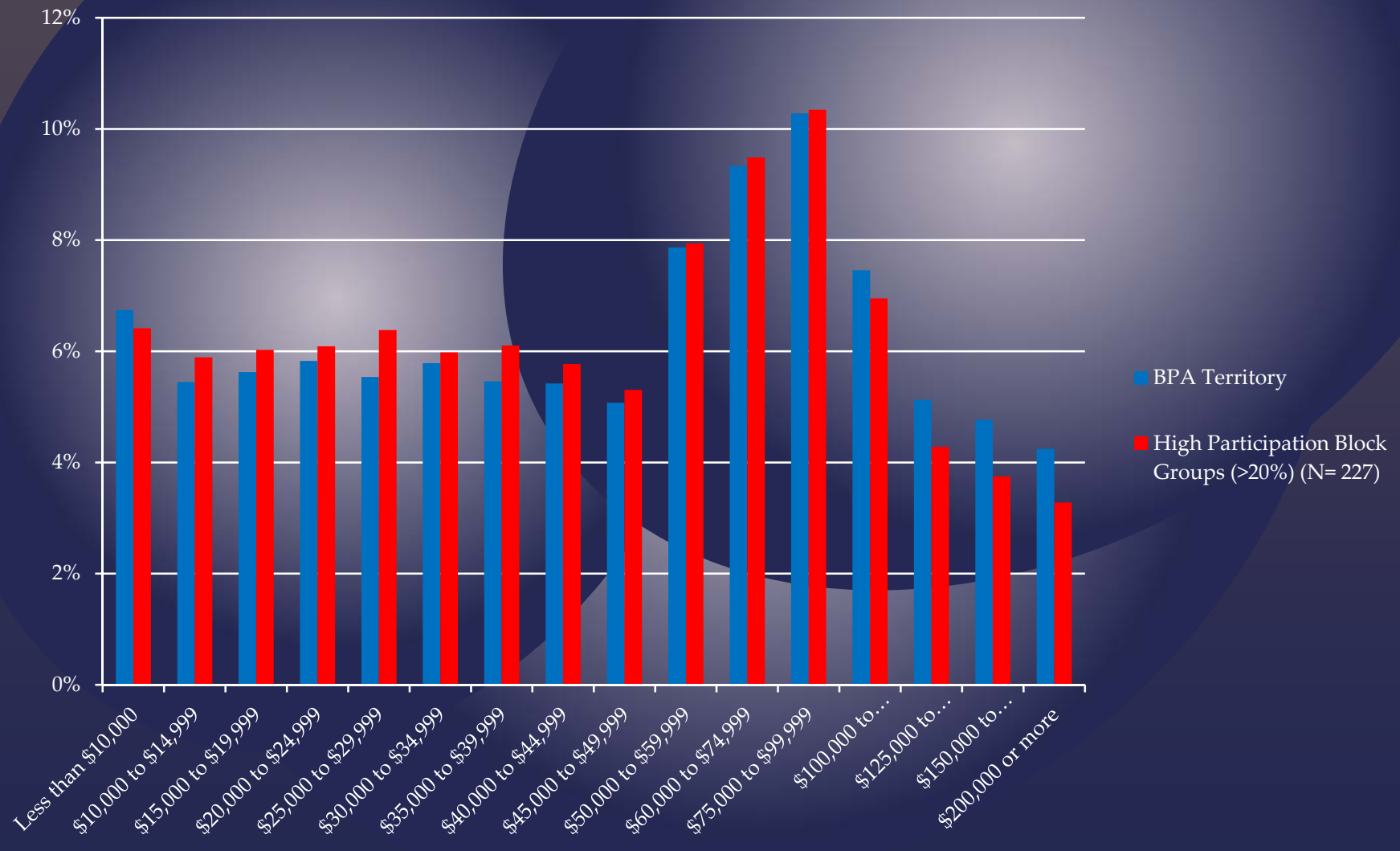



Participation Rate
0
.2
.4
.6
.8
0
50000
100000
150000
Median Income
part_rate
Fitted values

Participation by Income



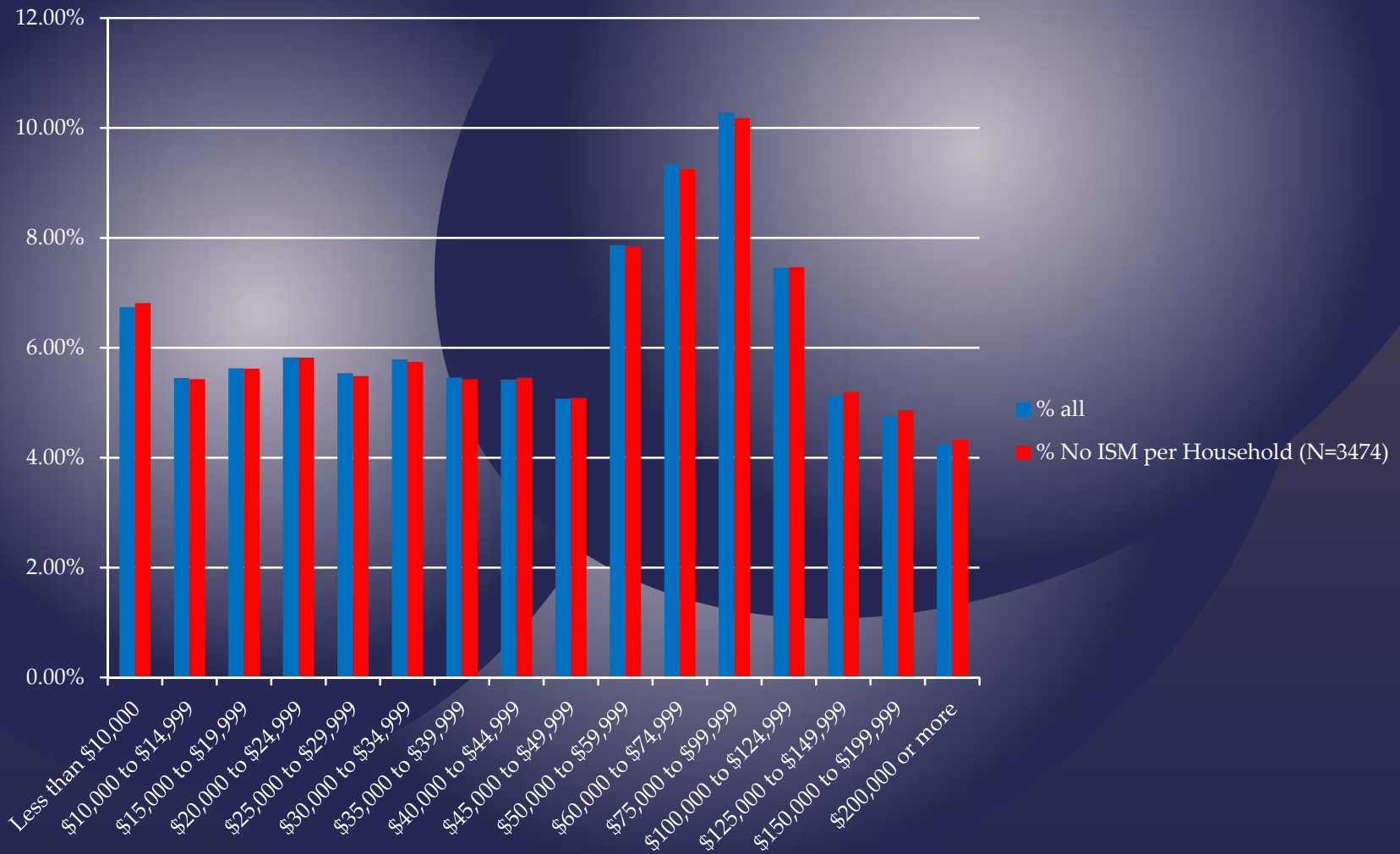
Participation by Income – > 20% Participation



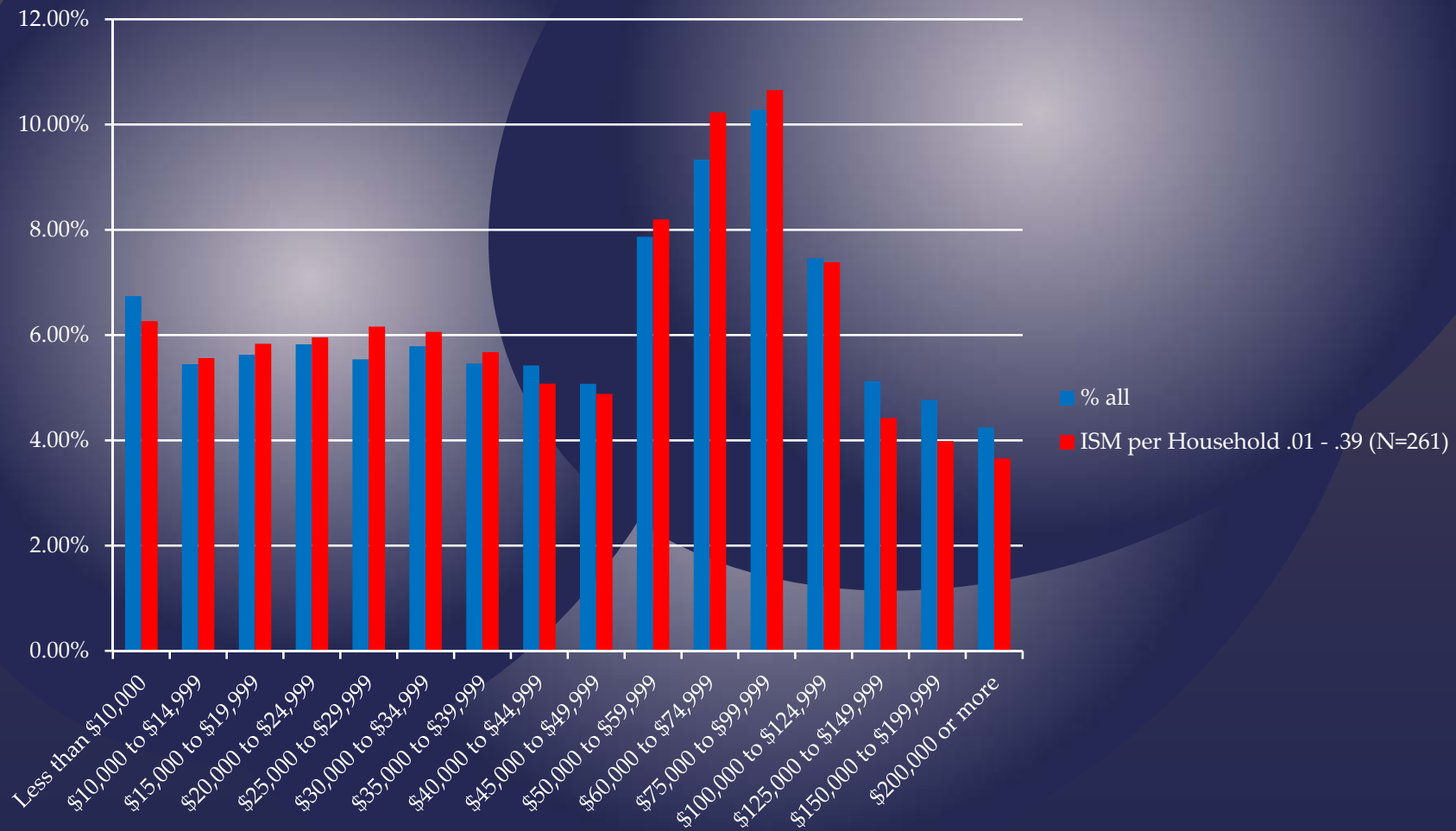
Instant Savings Measures (ISM)

- 396,959 ISMs delivered via mail, give away, or direct install
- ISMs are:
  - Lamps
  - Showerheads
  - Power Strips
  - Thermostatic Shut Off Valves
- Delivery Mechanisms:
  - Direct Install
  - Mail-by-Request
  - Mail Non-Request
  - Give Away

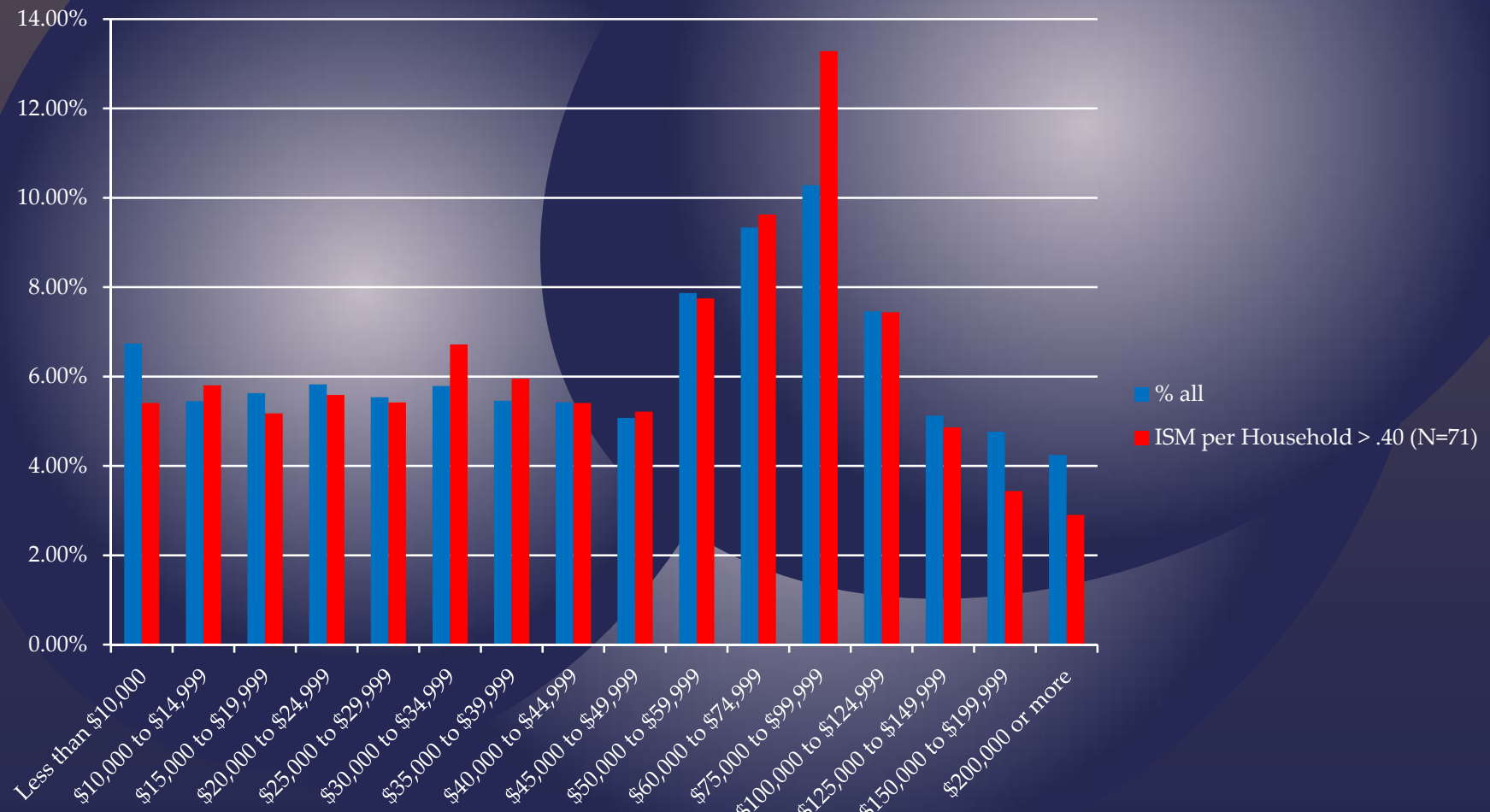
No ISMs


12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Less than $10,000
$10,000 to $14,999
$15,000 to $19,999
$20,000 to $24,999
$25,000 to $29,999
$30,000 to $34,999
$35,000 to $39,999
$40,000 to $44,999
$45,000 to $49,999
$50,000 to $59,999
$60,000 to $74,999
$75,000 to $99,999
$100,000 to $124,999
$125,000 to $149,999
$150,000 to $199,999
$200,000 or more
% all
% No ISM per Household (N=3474)

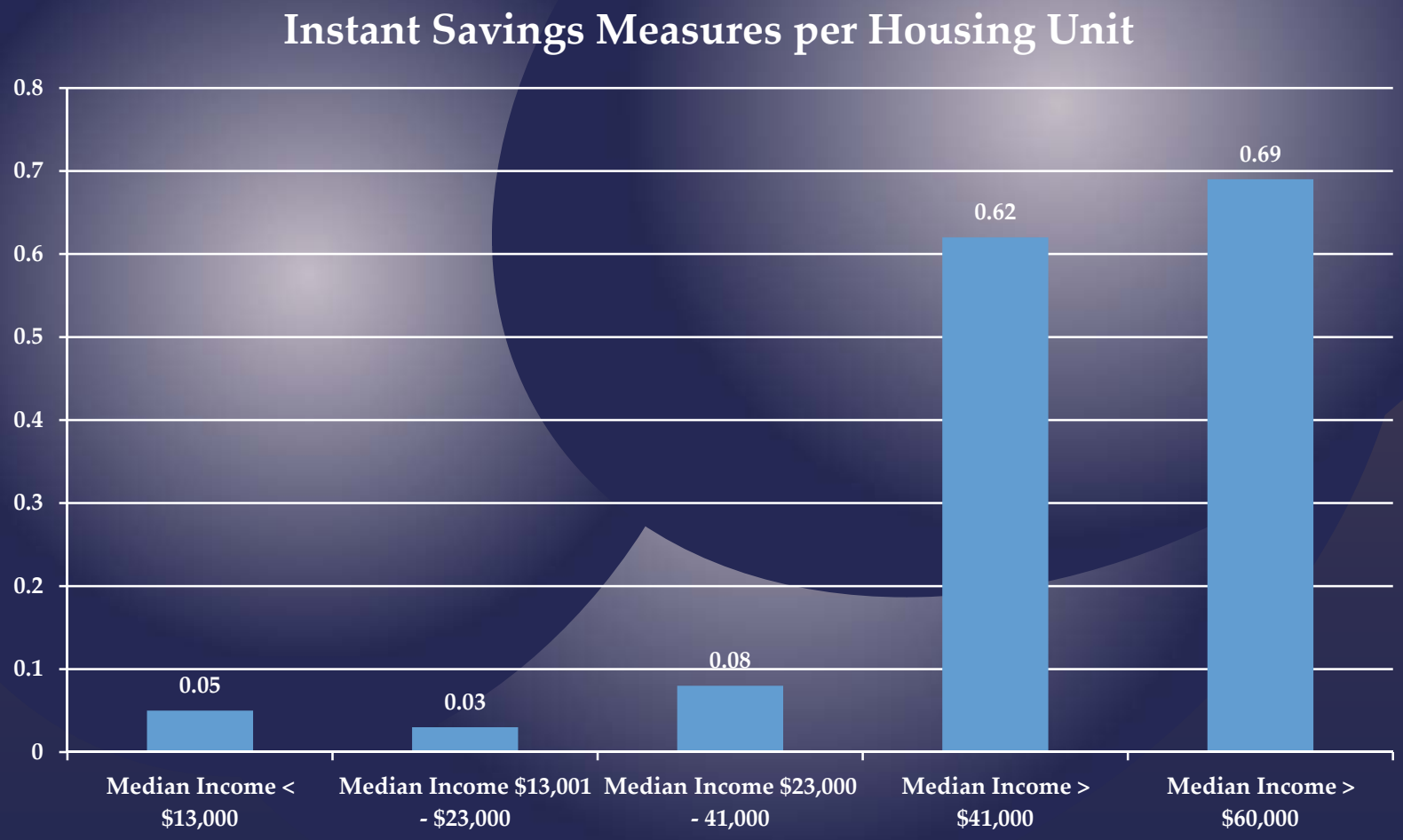
ISM - .01 - .39 Per Housing Unit



ISM > .40 Per Housing Unit



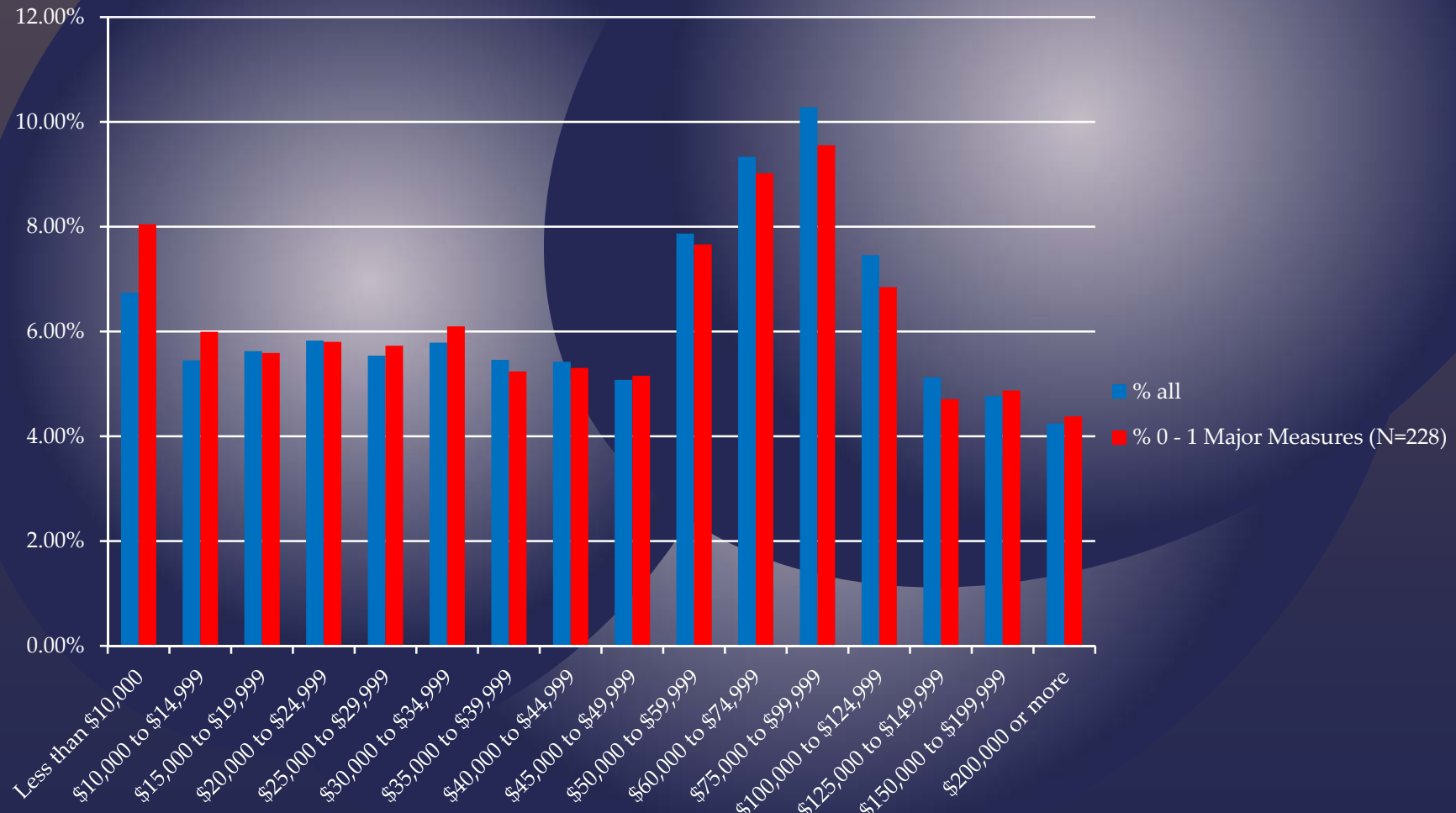
ISM by Median Income



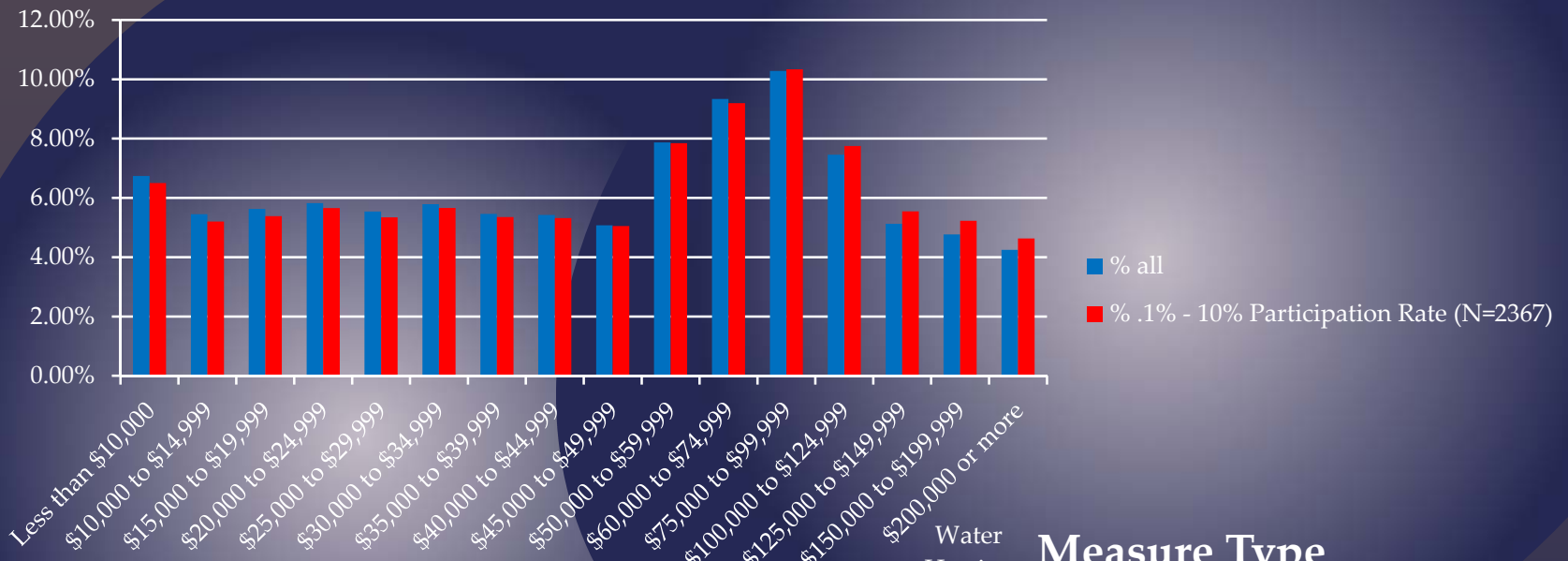
Major Measures

- Now lets look at only major measures
- If you only did an ISM, then you are not counted as a participant

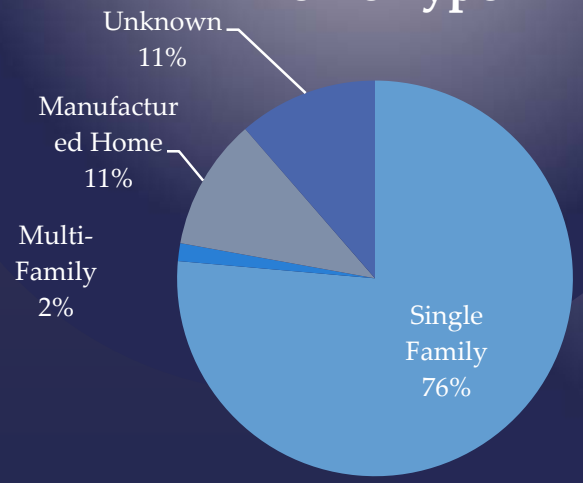
0-1 Major Measures



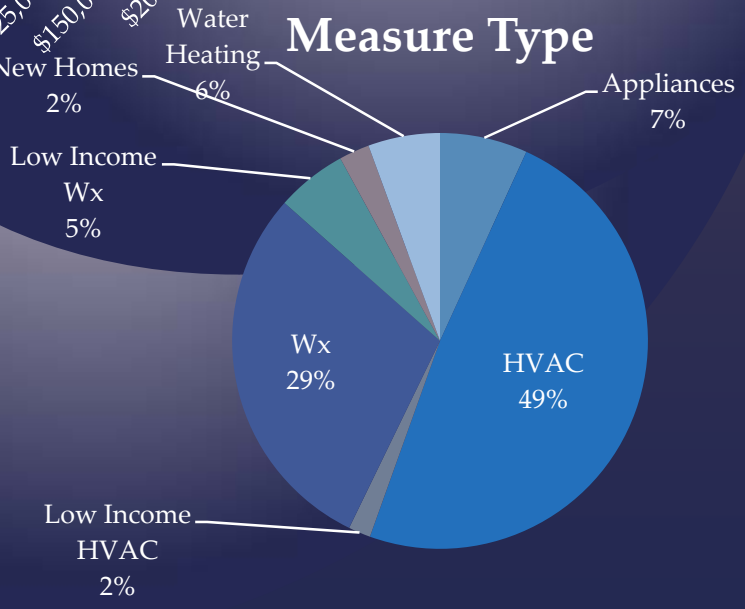
1-10% Major Measure Participation



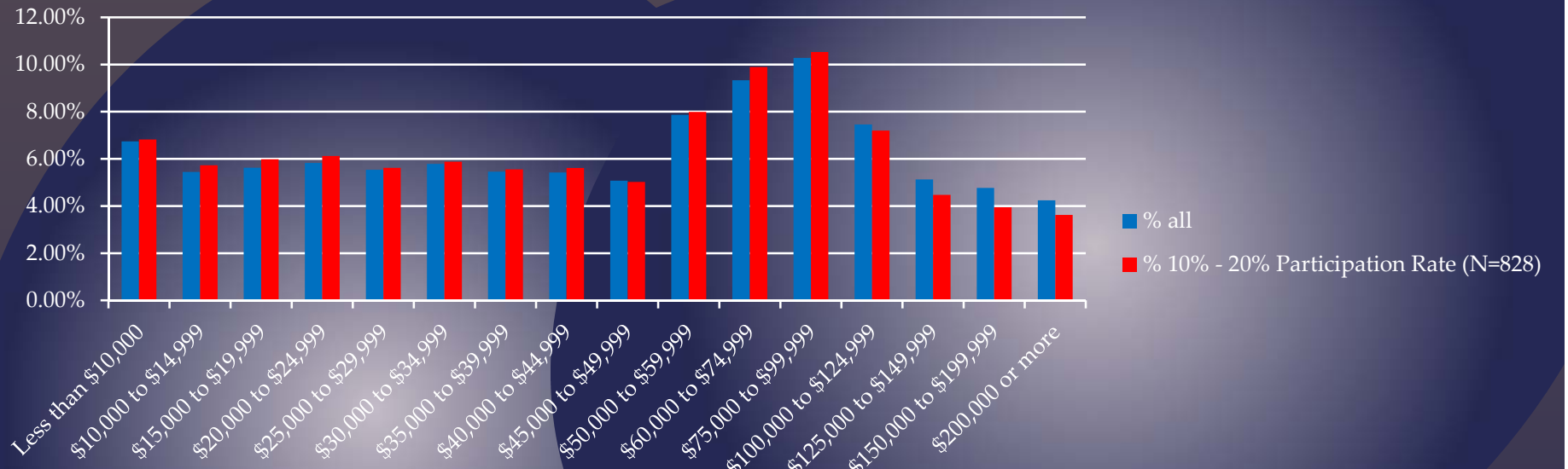
Home Type



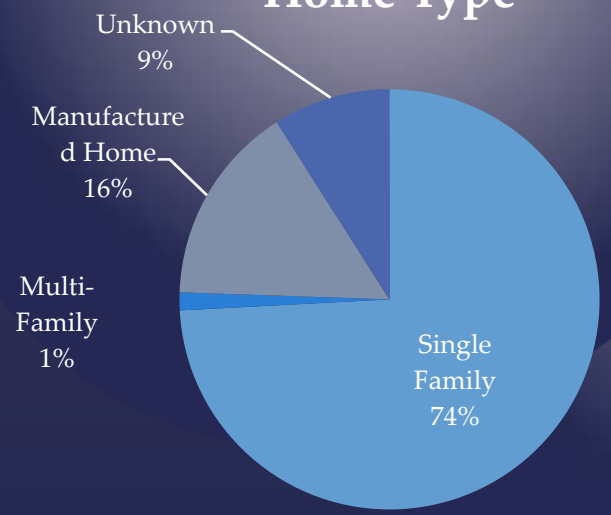
Measure Type



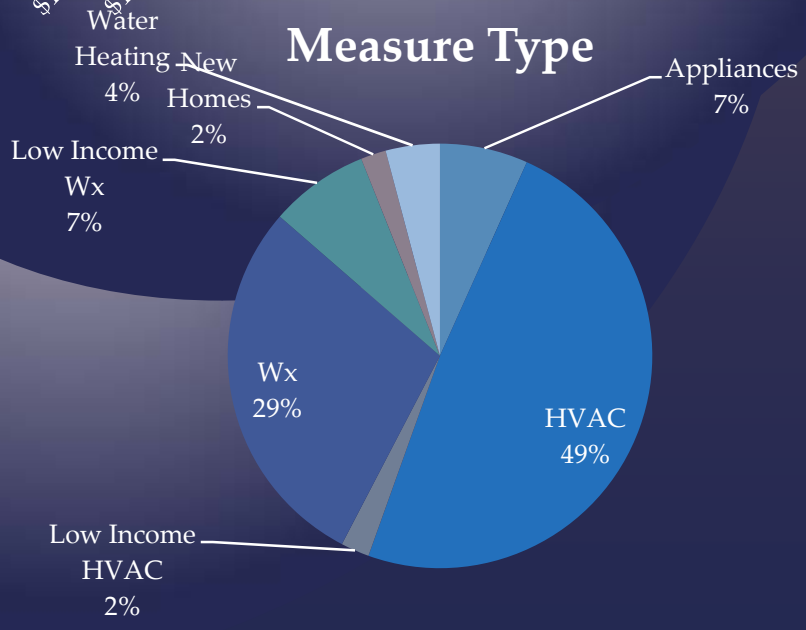
10-20% Major Measure Participation



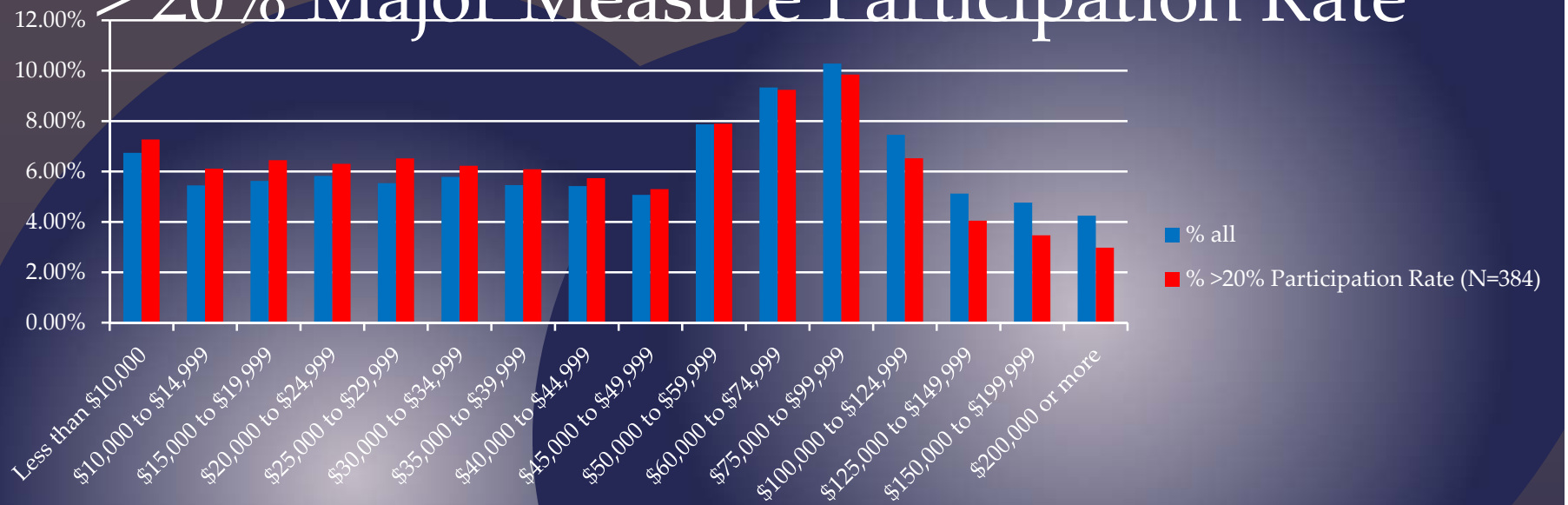
Home Type



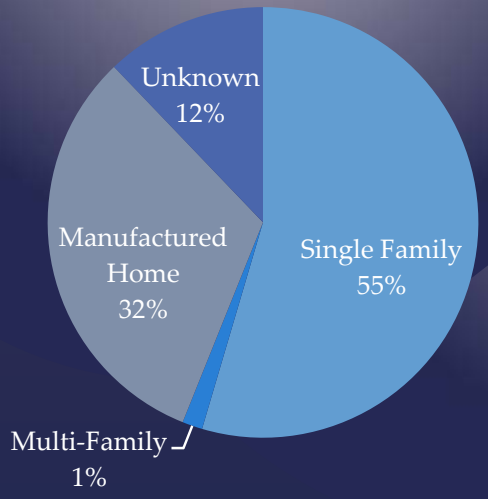
Measure Type



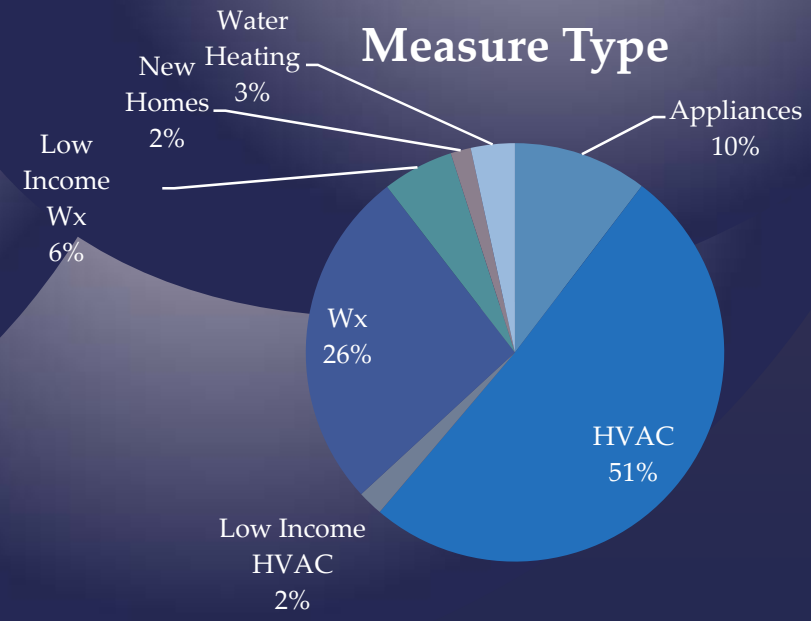
> 20% Major Measure Participation Rate



Home Type

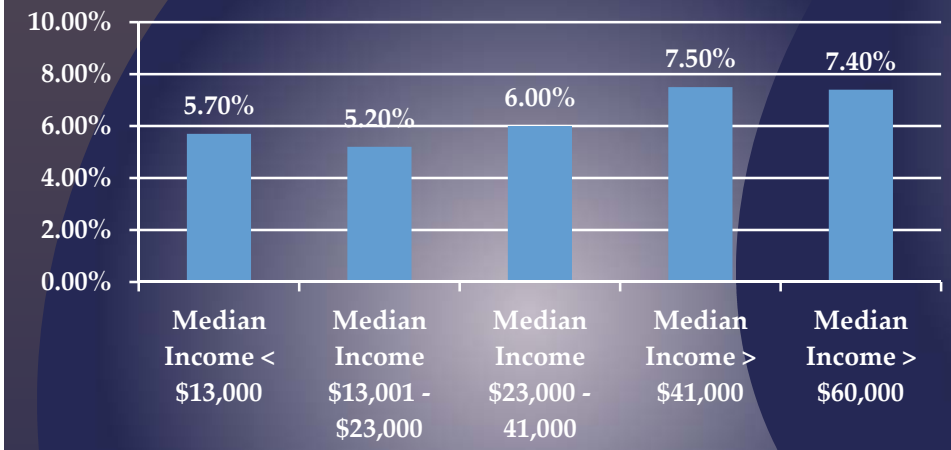


Measure Type

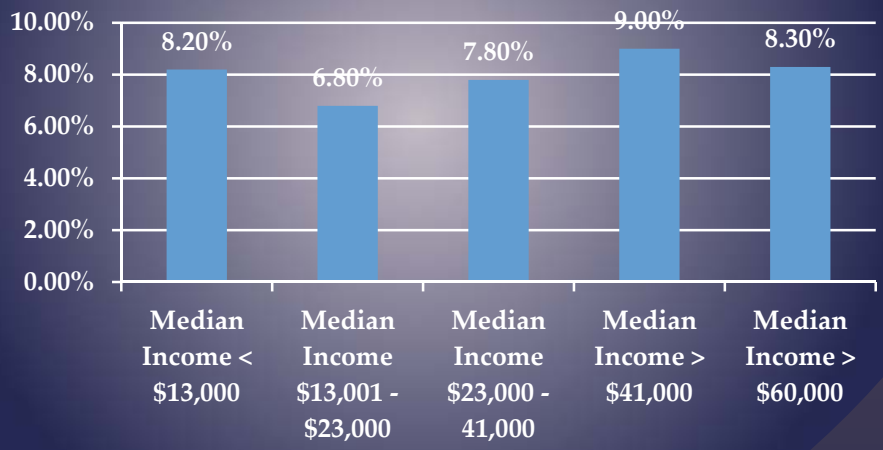


Participation Rate by Median Income

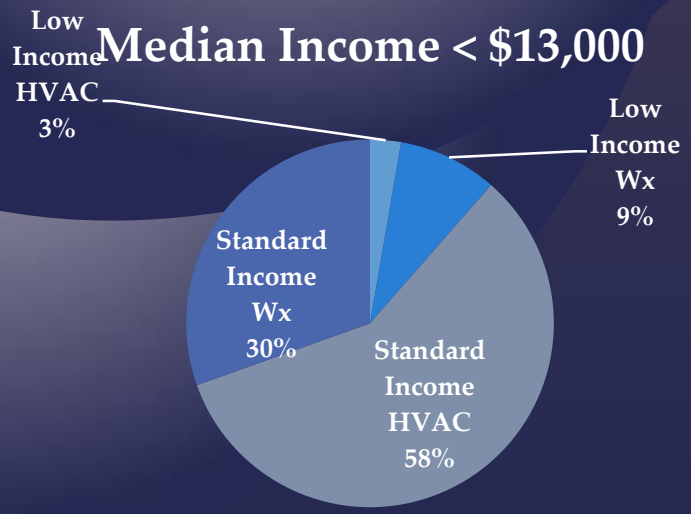
Major Measure Participation Rate

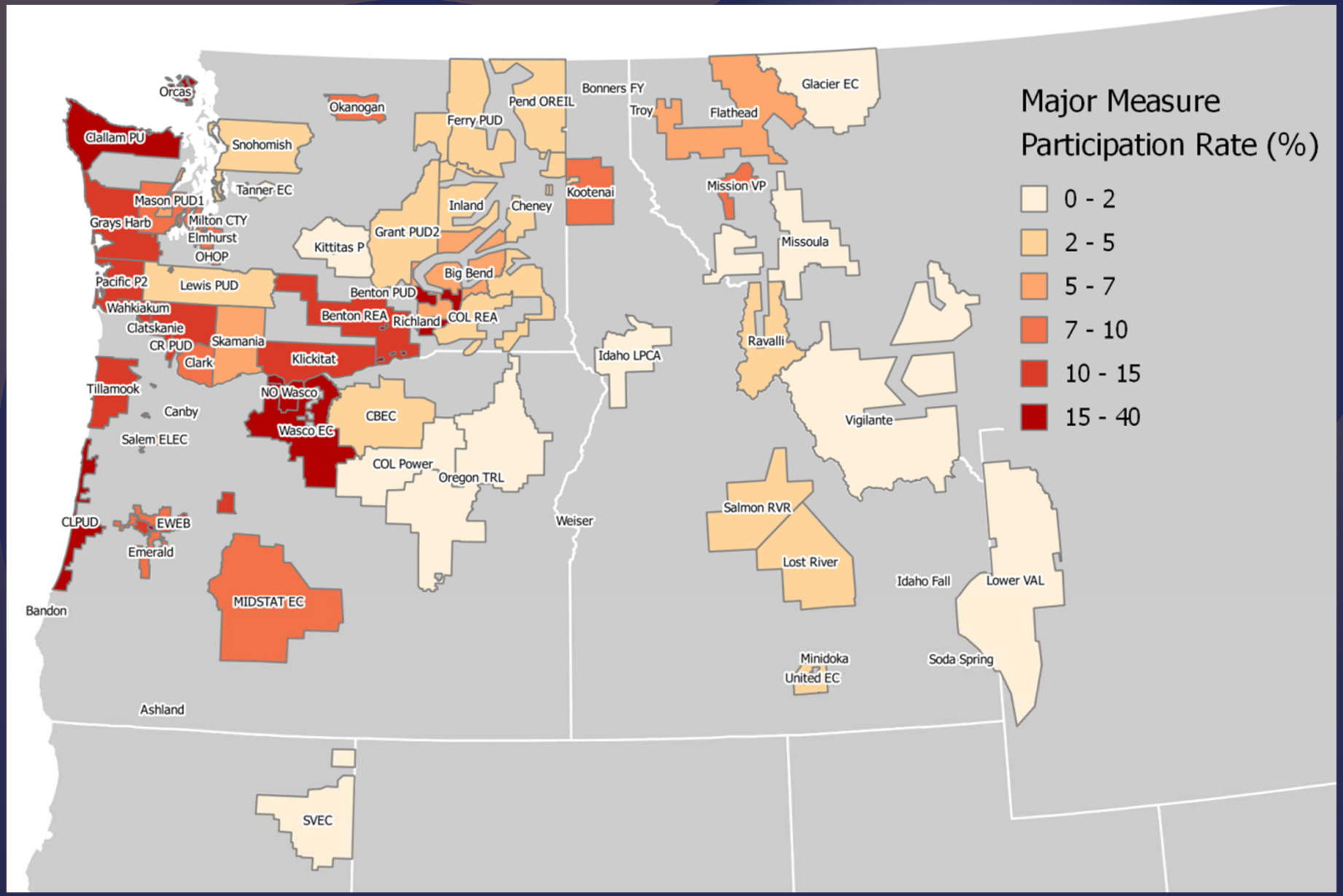


SF Major Measure Participation Rate



Median Income < $13,000




Major Measure
Participation Rate (%)
0 - 2
2 - 5
5 - 7
7 - 10
10 - 15
15 - 40
Orcas
Okanogan
Ferry PUD
Pend OREIL
Bonners FY
Troy
Flathead
Glacier EC
Clallam PU
Snohomish
Tanner EC
Kootenai
Mission VP
Mason PUD1
Inland
Cheney
Grays Harb
Milton CTY
Elmhurst
OHOP
Grant PUD2
Kittitas P
Missoula
Pacific P2
Lewis PUD
Big Bend
Benton PUD
Wahkiakum
Benton REA
Richland
COL REA
Clatskanie
CR PUD
Skamania
Clark
Klickitat
Idaho LPCA
Ravalli
Tillamook
NO Wasco
Canby
CBEC
Wasco EG
Vigilante
Salem ELEC
COL Power
Oregon TRL
Salmon RVR
CLPUD
EWEB
Weiser
Emerald
Lost River
Idaho Fall
Lower VAL
MIDSTAT EC
Bandon
Minidoka
United EC
Soda Spring
Ashland
SVEC

Participation by Income: Take Aways

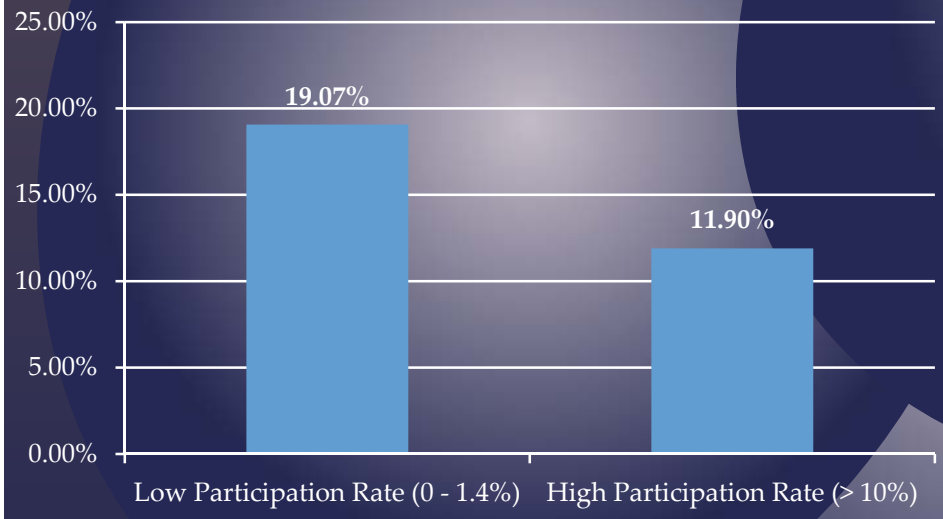
- There are not glaring disparities in distribution of measures by income
- Low participation neighborhoods tend to be overrepresented in high income segments = high income neighborhoods have lower participation rates
- Higher participation neighborhoods tend to be overrepresented in the middle-low income segments = middle – low income segments tend to have higher participation
- Highest participating neighborhoods is somewhat driven by large numbers of manufactured home duct sealing

Participation by Income: Take Aways

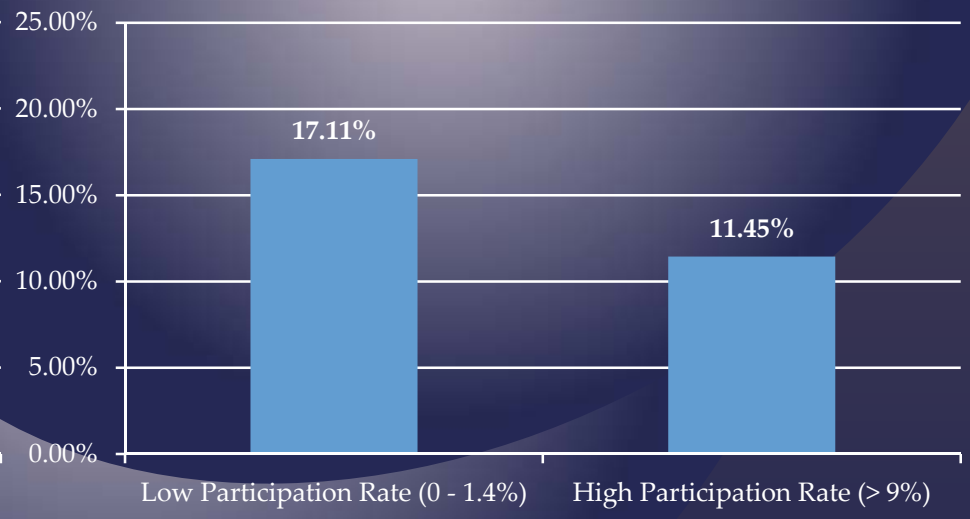
- Single Family dominates these income trends
- ACS income is not reported by housing type
- Multifamily is not informative due to low participation
- Trends in multifamily (if they existed) are hard to identify using this data

Language

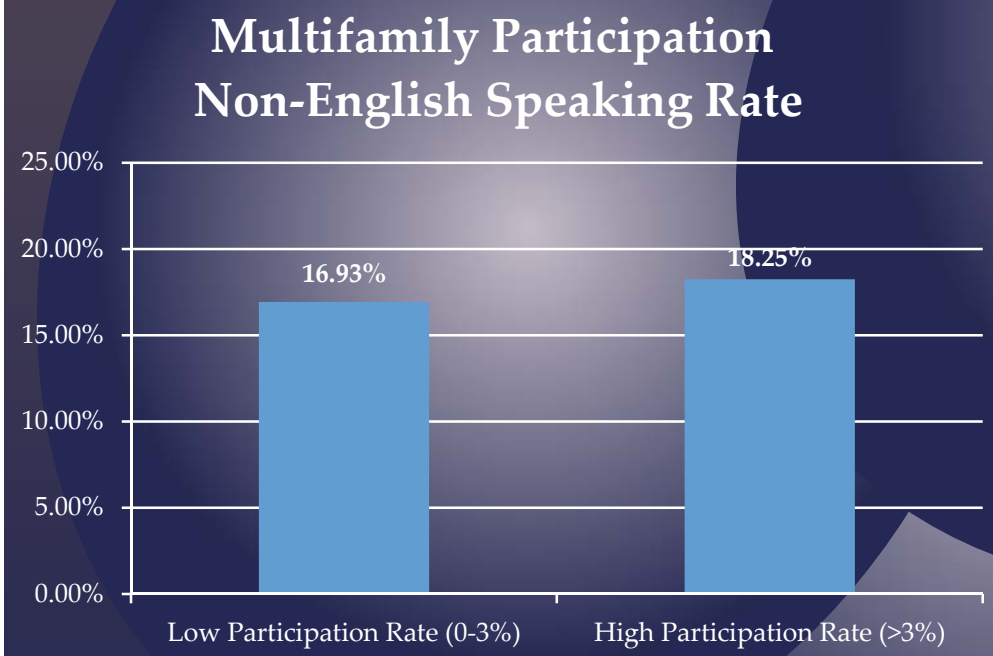
Non-English Speaking Rate

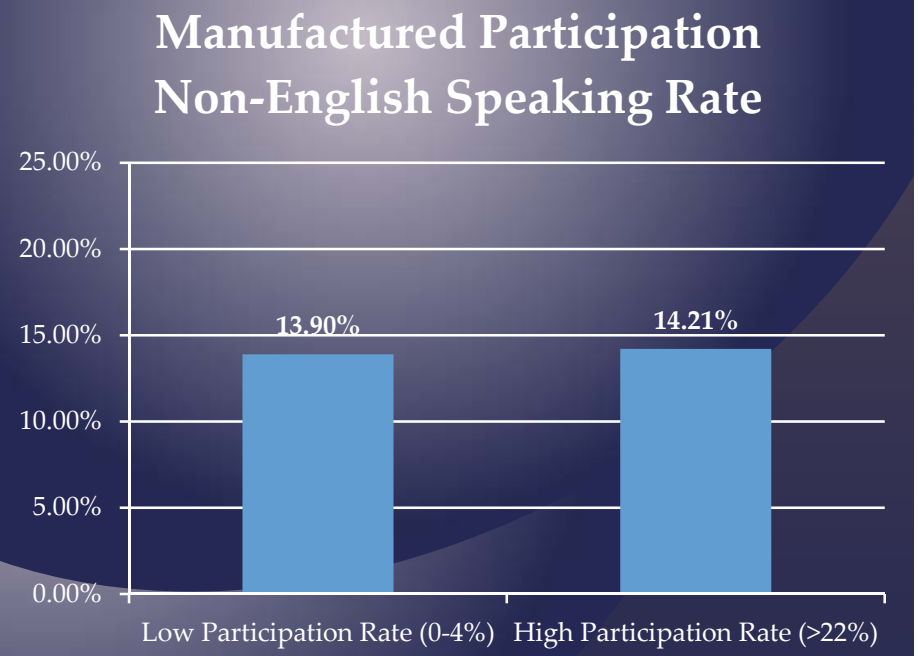


Single Family Participration - Non-English Speaking Rate

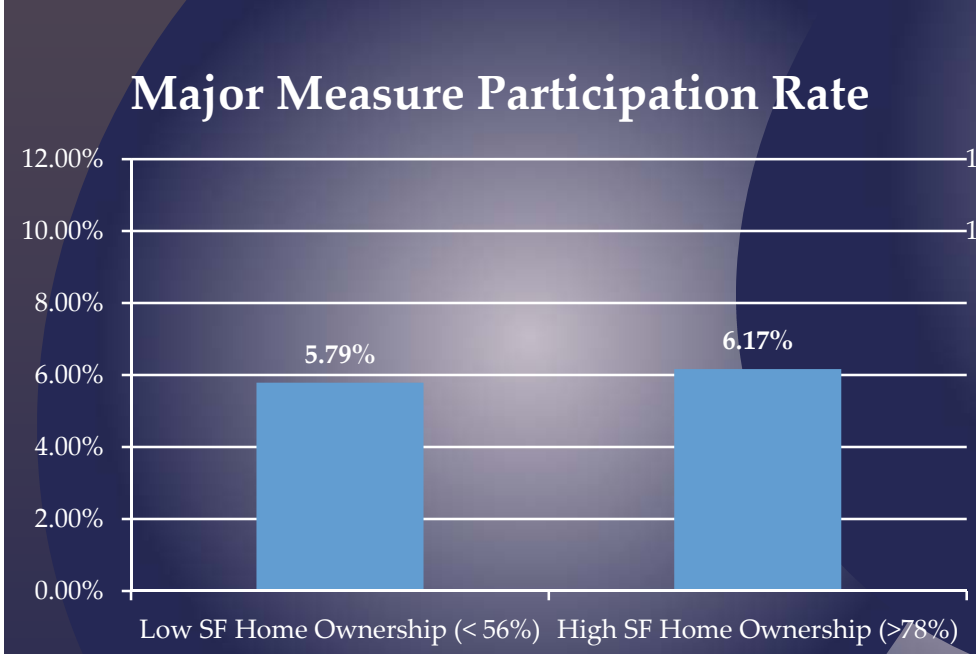


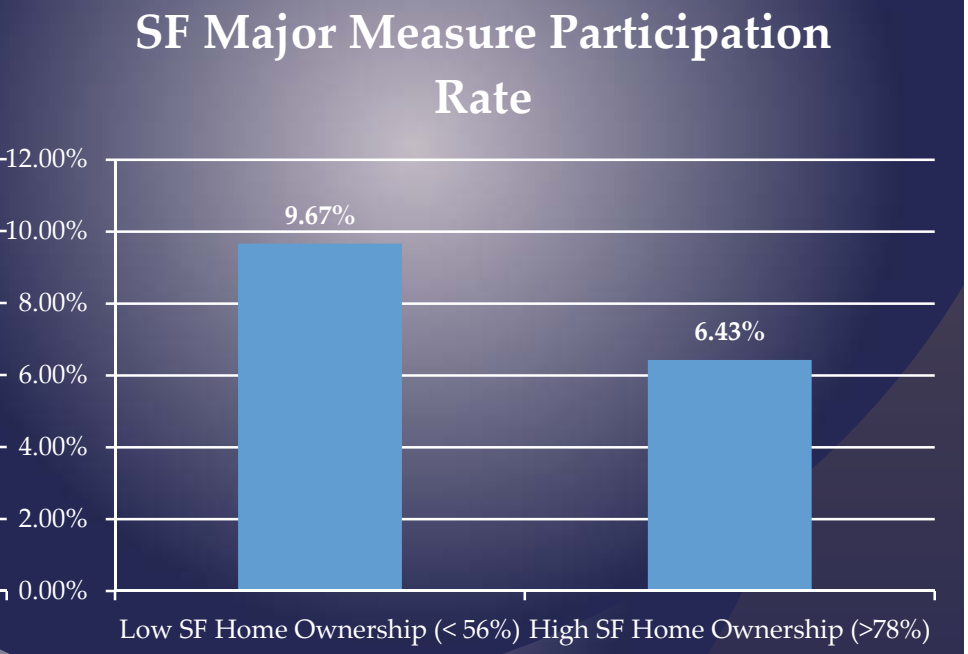
Language


Multifamily Participation
Non-English Speaking Rate
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
16.93%
18.25%
Low Participation Rate (0-3%)
High Participation Rate (>3%)

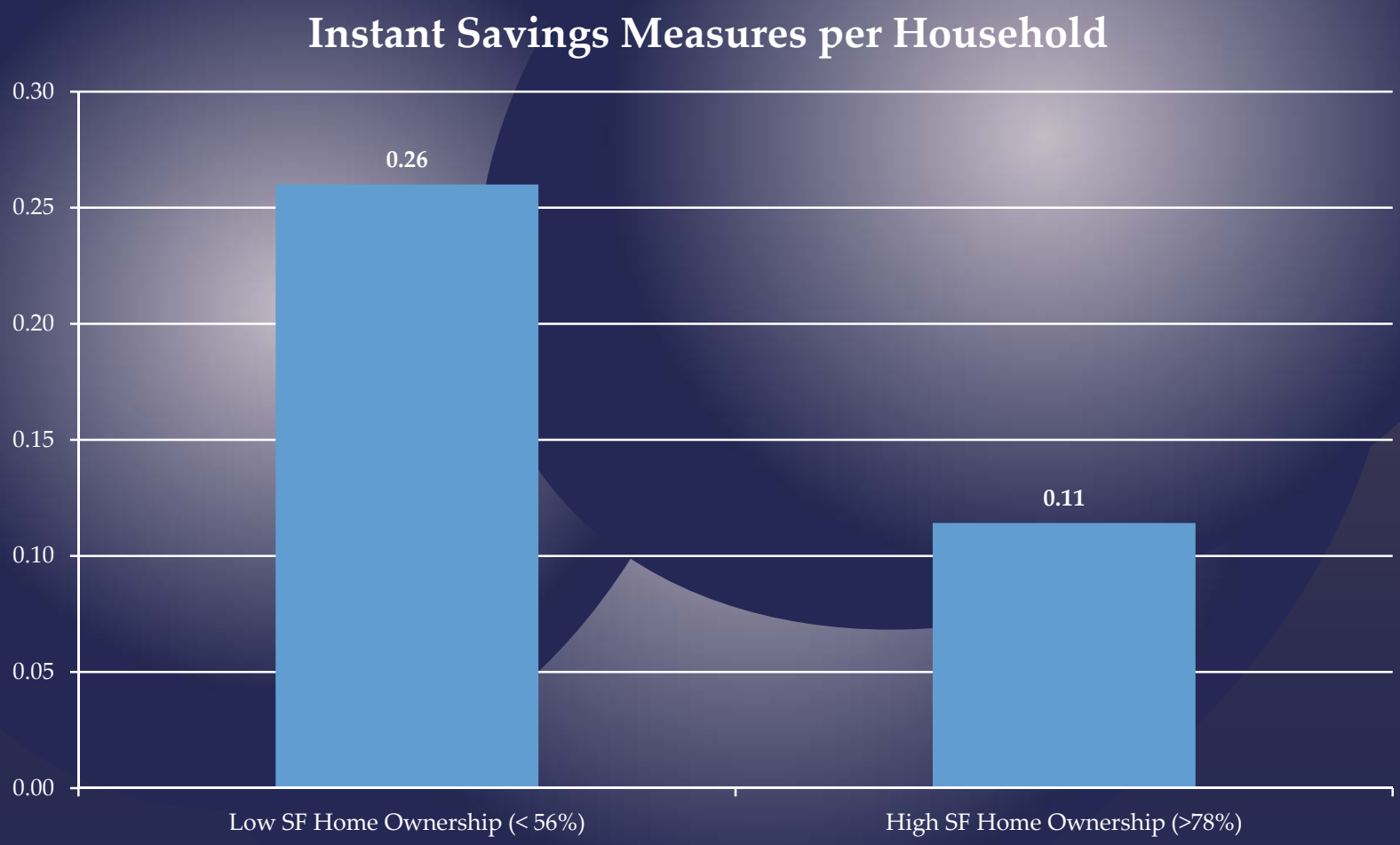

Manufactured Participation
Non-English Speaking Rate
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
13.90%
14.21%
Low Participation Rate (0-4%)
High Participation Rate (>22%)

Home Ownership





Home Ownership

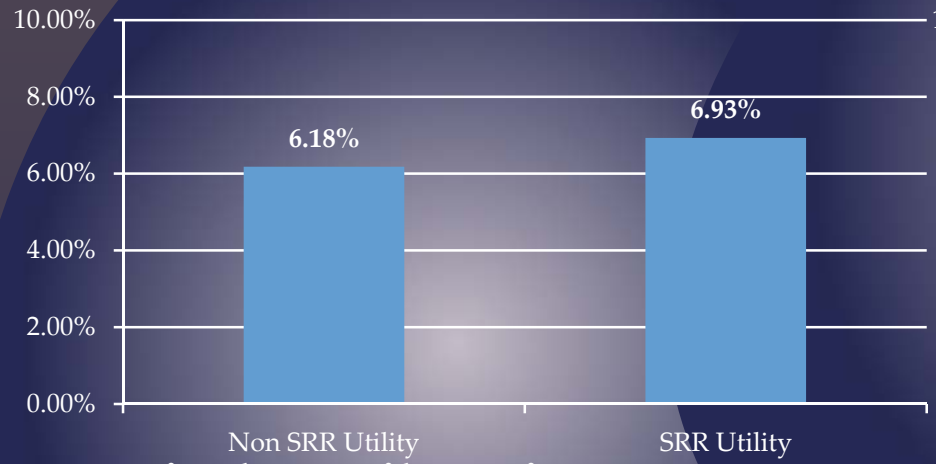


Small & Rural vs Urban & Large

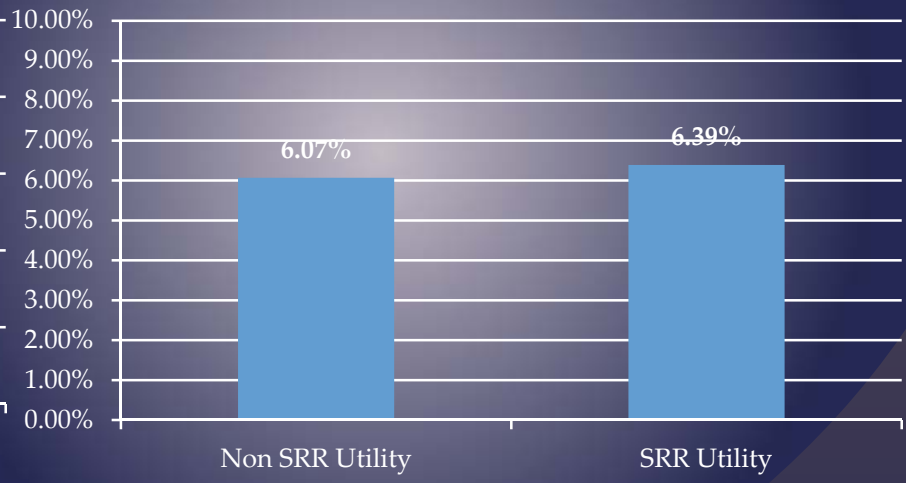
- Small, Rural, & Residential is defined by BPA as:
  - Forecast net requirement < 10 aMW
  - Fewer than 10 customers per line mile
  - Customers load is > 66% residential according to EIA
- BPA serves 57 small rural utilities
- 363,780 housing units
- 17% of BPA territory housing units

Participation Rates by SRR

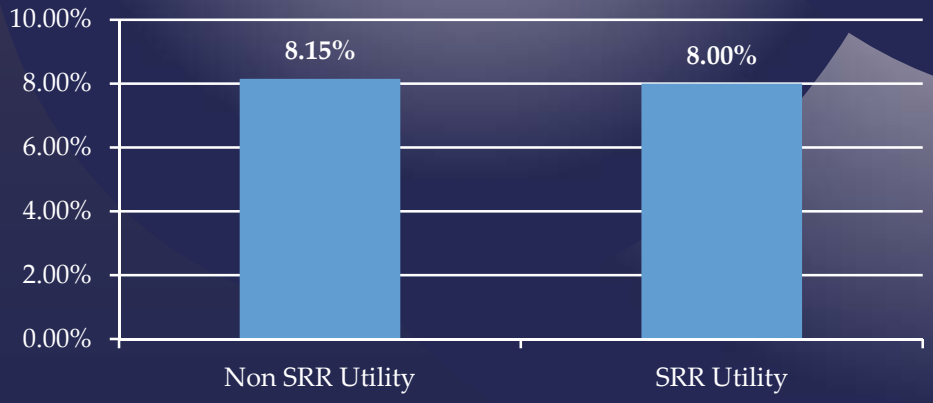
Participaton Rate



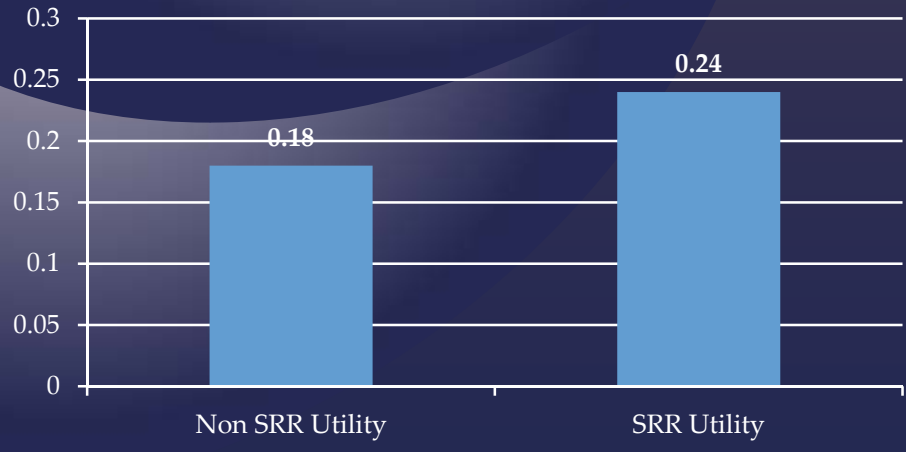
Major Measure Participation Rate



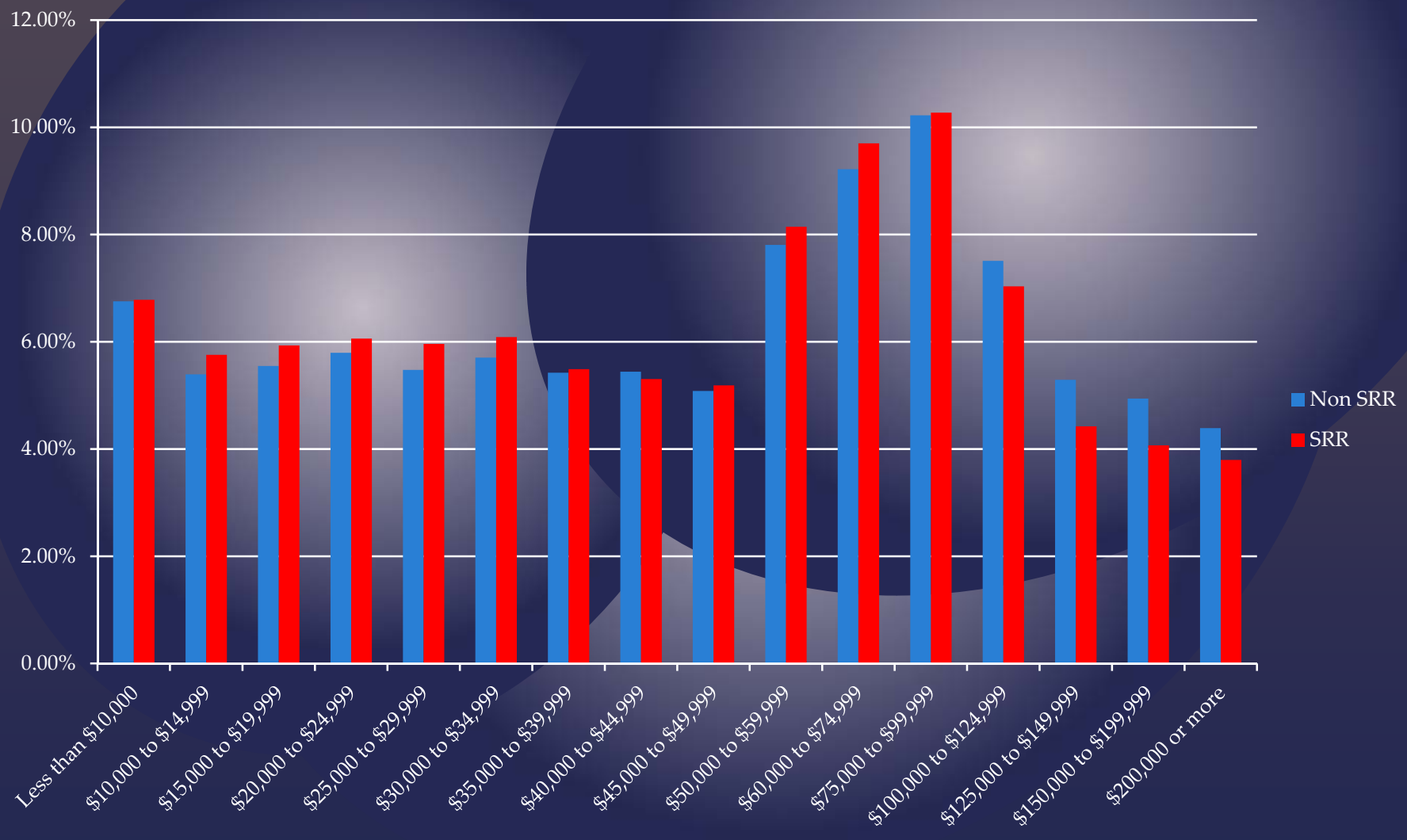
Single Family Major Measure Participation Rate



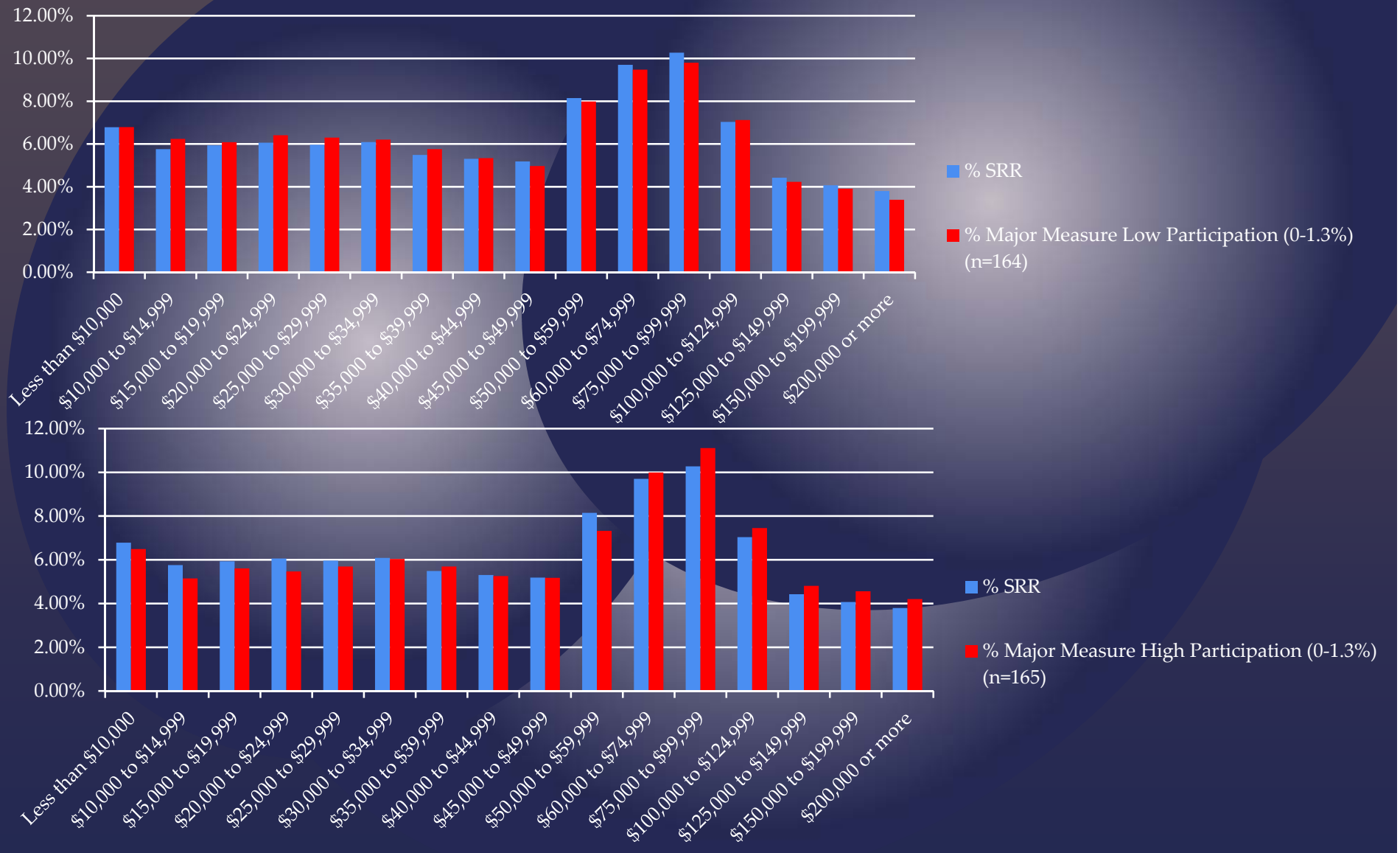
ISM per Housing Unit



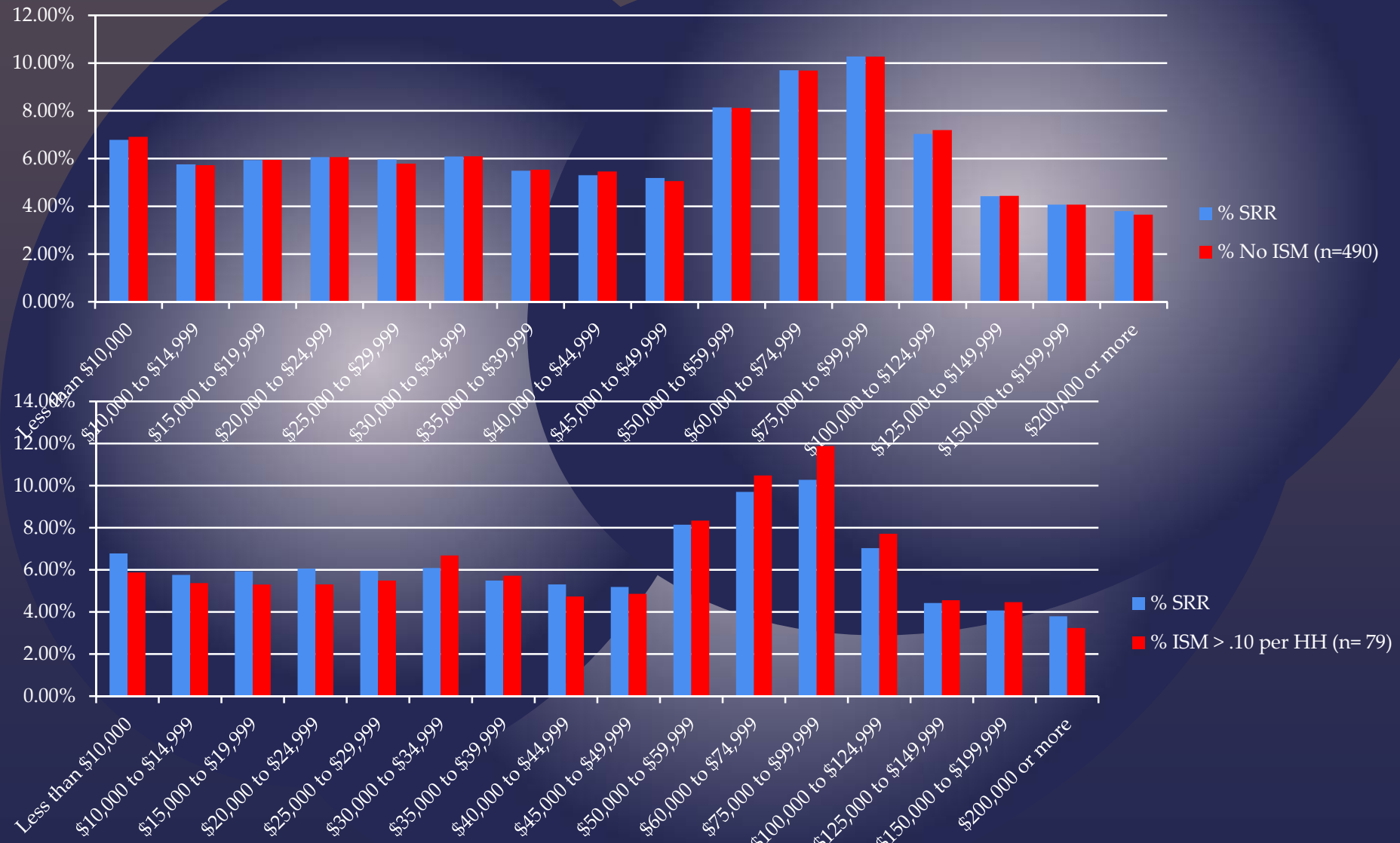
Income in SRR



Participation in SRR by Income

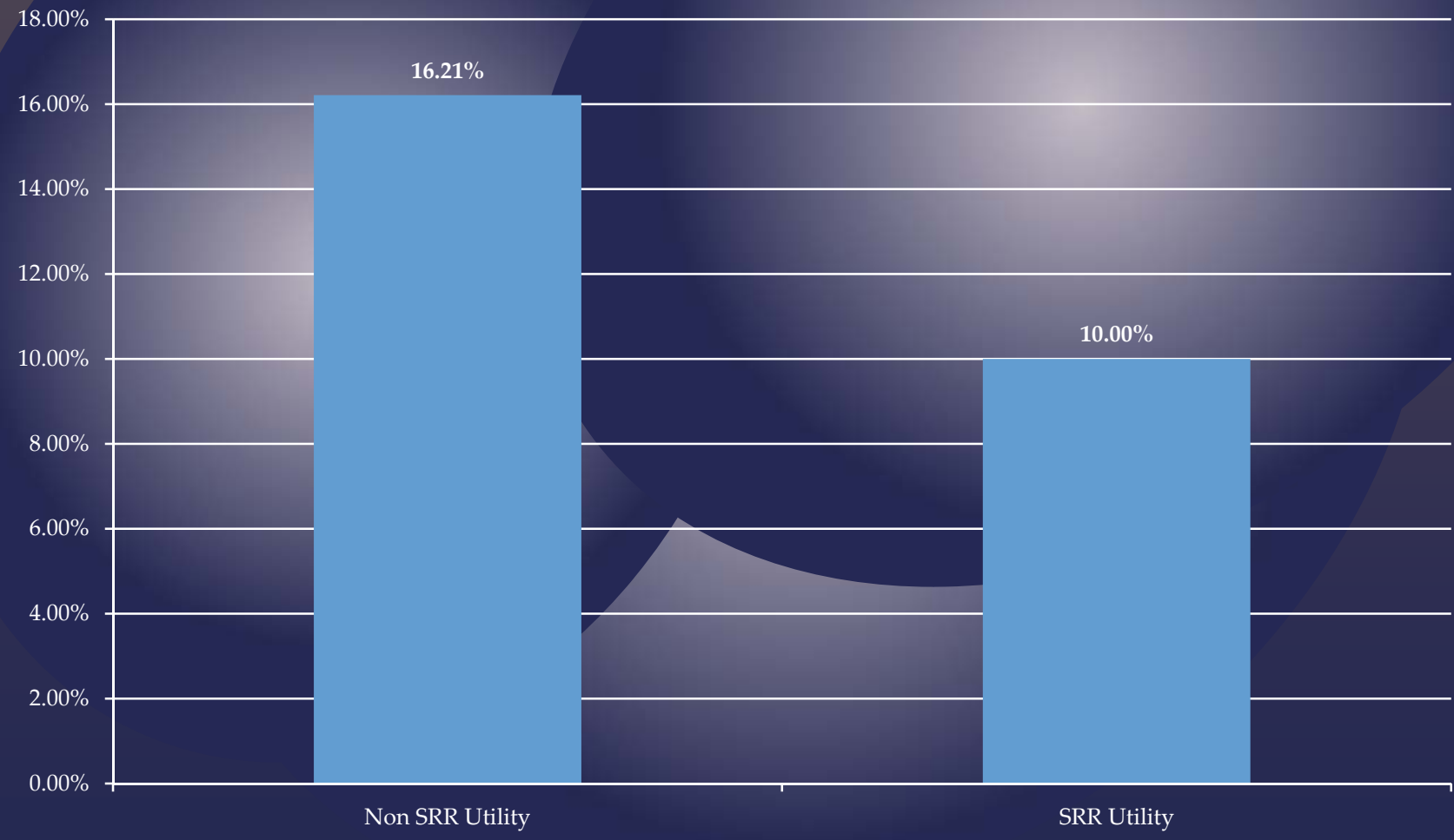


ISM Per Household by Income

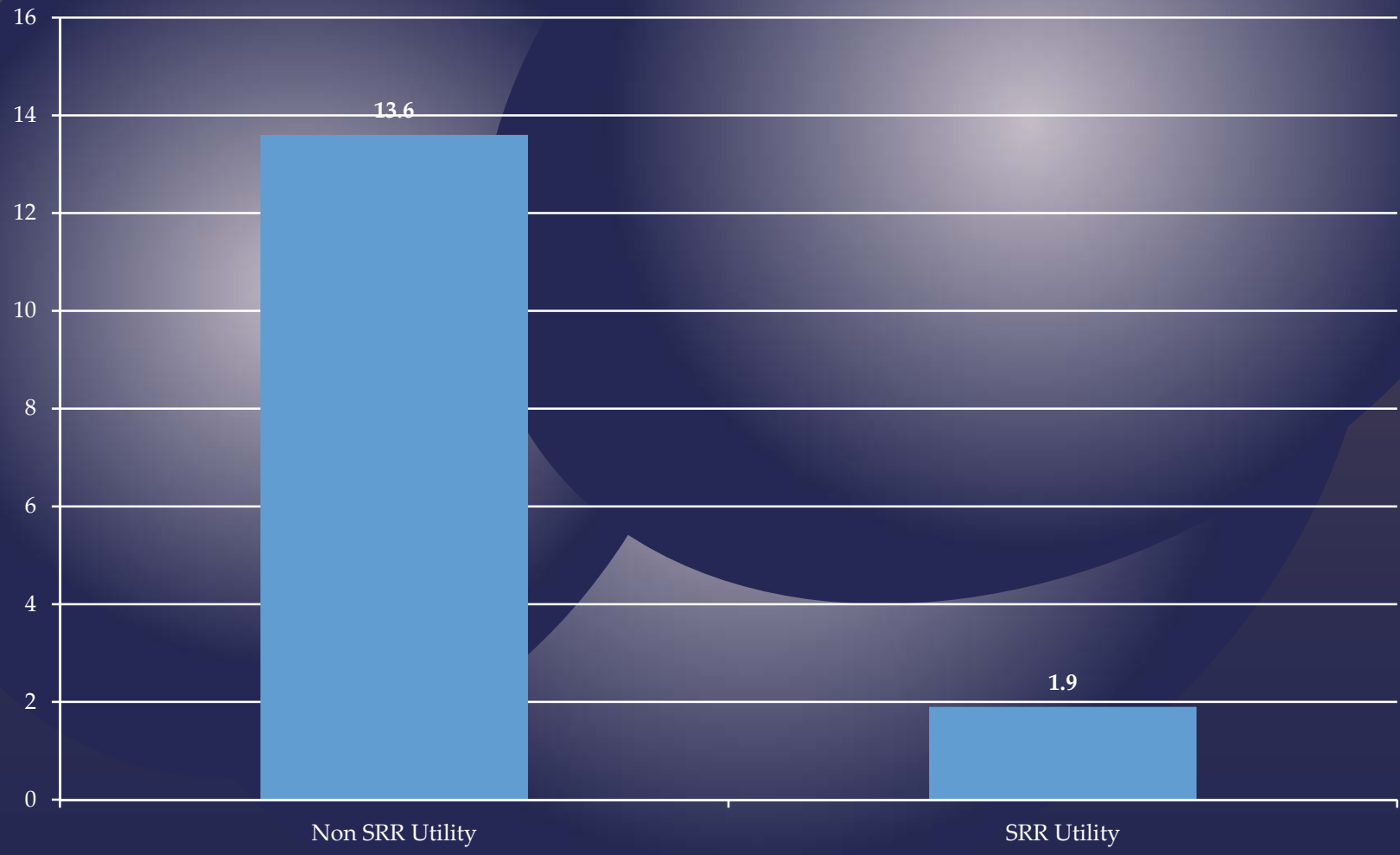


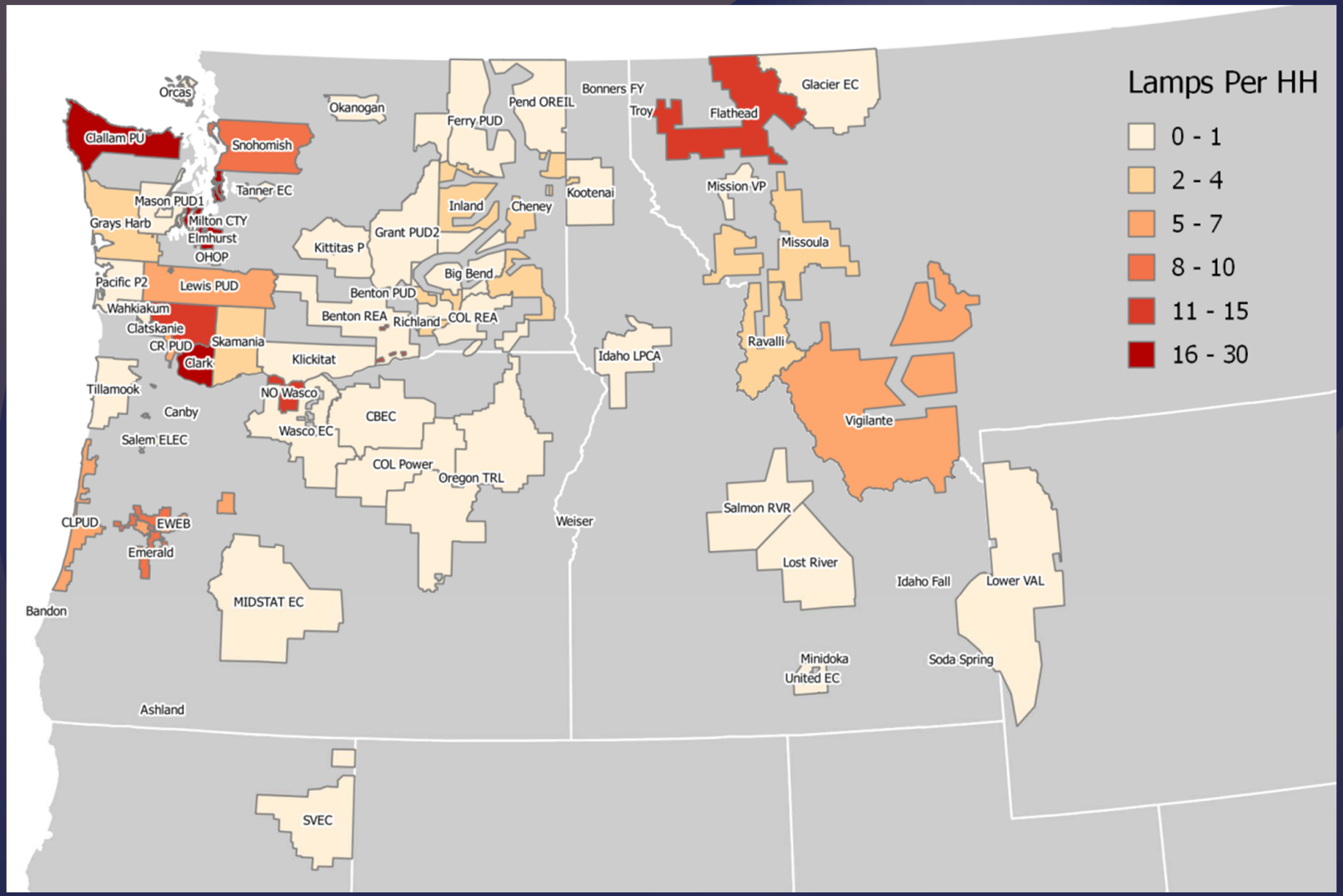
SRR Language

Non English Speaking Rate



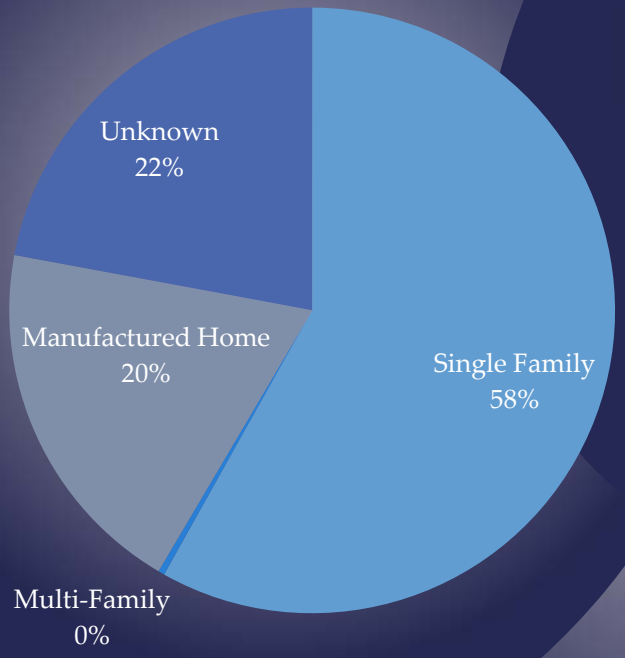
Lamps per Housing Unit



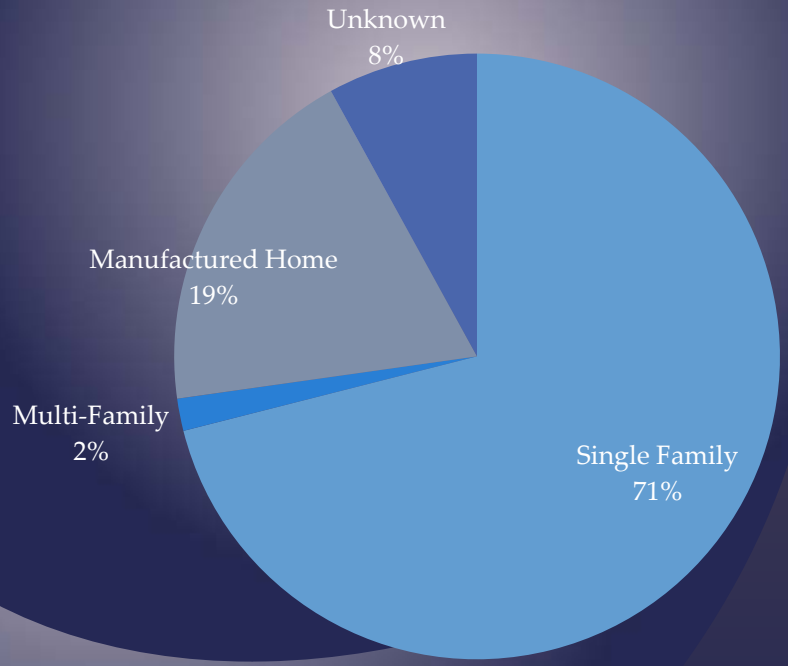

Lamps Per HH
0 - 1
2 - 4
5 - 7
8 - 10
11 - 15
16 - 30
Orcas
Okanogan
Pend OREIL
Bonners FY
Troy
Flathead
Glacier EC
Ferry PUD
Clallam PU
Snohomish
Tanner EC
Kootenai
Mason PUD1
Inland
Cheney
Mission VP
Grays Harb
Milton CTY
Elmhurst
OHOP
Grant PUD2
Kittitas P
Missoula
Big Bend
Pacific P2
Lewis PUD
Benton PUD
Wahkiakum
Benton REA
Richland
COL REA
Clatskanie
CR PUD
Skamania
Ravalli
Clark
Klickitat
Idaho LPCA
Tillamook
NO Wasco
Canby
CBEC
Vigilante
Wasco EC
Salem ELEC
COL Power
Oregon TRL
Salmon RVR
CLPUD
EWEB
Weiser
Emerald
Lost River
Idaho Fall
Lower VAL
MIDSTAT EC
Bandon
Minidoka
United EC
Soda Spring
Ashland
SVEC

Home Type by SRR

SRR Utility

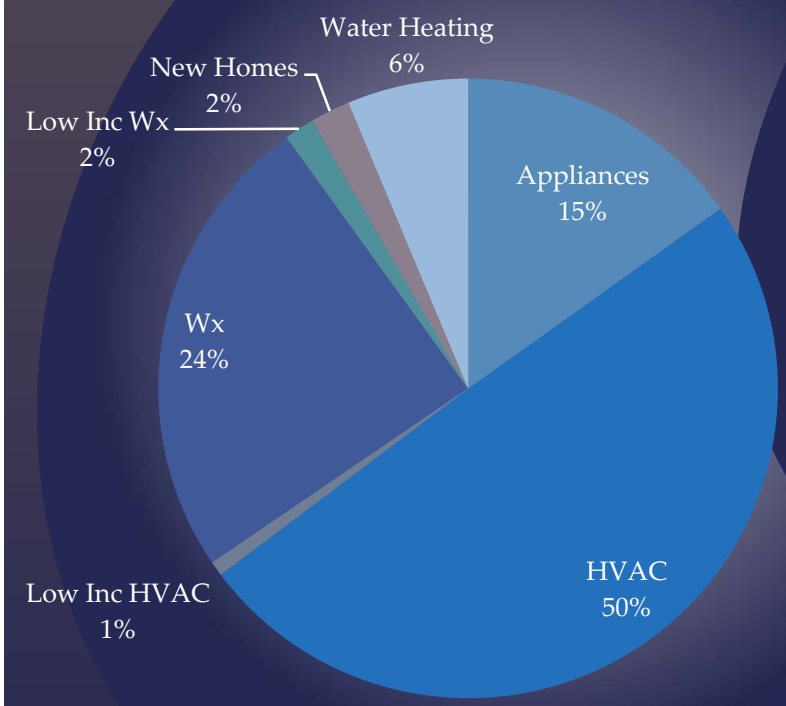


Non-SRR Utility

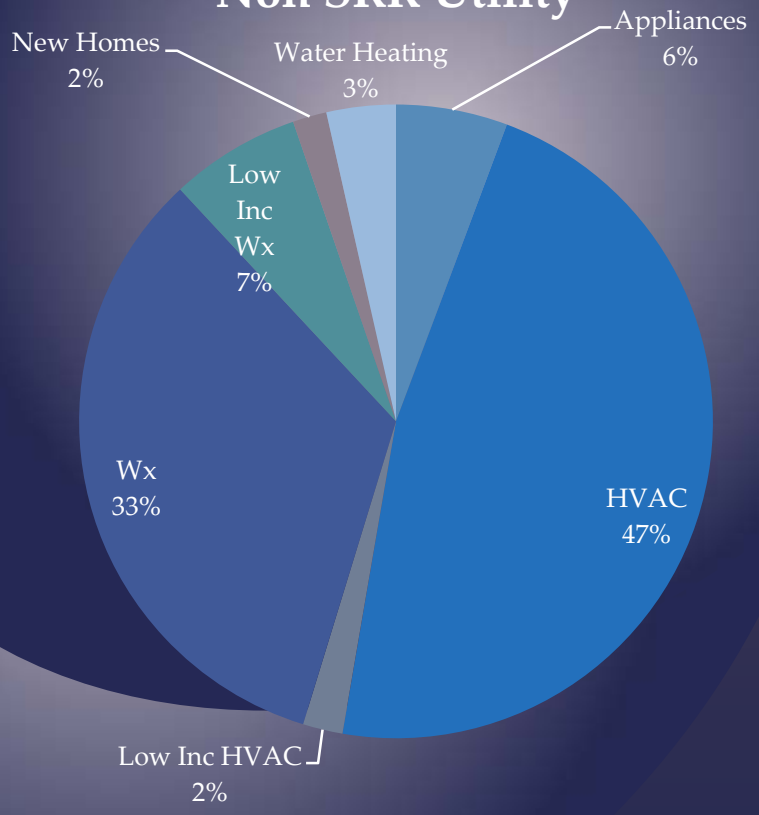


Measure Mix by SRR

SRR Utility



Non SRR Utility



Appliances – Clothes washers & dryers, fridges & freezers, decommissioning
Water Heating – Heat pump water heaters, resistance water heaters, pipe insulation

Summary

- There is not clear evidence of an equity issue in BPA's residential energy efficiency programs
- In fact, low income segments are overrepresented in the highest participating block groups in single family and manufactured homes
- Multifamily participation rate is very low, less than 1%
- Manufactured home participation is high due to duct sealing programs

Summary

- Mail by request and direct install ISMs appear to be going more towards middle to high income segments
- There are more non-english speakers in low participation block groups
- Retail programs are almost non-existent in small rural & residential utility territories

YNHA Wx Department

Mission Statement

The Yakama Nation Housing (YNHA) shall accomplish their mission, in a manner consistent with the requirements of the Native American Housing Assistance and Self Determination Act of 1996 (NAHASDA). Our Mission shall set forth operating capabilities in accordance to the approved, revised financial accounting policies and procedures consistent with 24 CFR, Part 85.20. Our mission statement is:

To provide safe, decent, affordable, and healthy housing for the families of Yakama Nation.

Yakama Nation Housing Authority (YNHA)

- 611 S. Camas Ave, Wapato WA;
- Located in Central Washington in Yakima County;
- Yakama Housing was formed around 1966-67;
- The reservation or service territory is 1.2million acres;
- Total area is across five counties: Yakima, Kittitas, Benton, Klickitat, & Skamania

YNHA Cont….

- YNHA manages 522 rental homes;
- Over 2000 homes are owner occupied by tribal members;
- Currently there are over 30,000 enrolled Yakama Nation Tribal Members & descendants;
- YNHA currently has a waiting list of 2,500 families seeking subsidized housing;
- YNHA Maintenance Department employs 30 staff to maintain rental homes;
- YNHA has a “Special Projects Department” with 12 employees to do all major construction projects

Weatherization (Wx) Department

- Wx Manager – David Olivas
  - 20yrs of construction experience 12 of those years are in Building Science.
  - BPI – Building Analyst, Quality Control Inspector, & Certified Lead Risk Assessor through WA State
- Wx staff of 8 employees:
  - 1 QCI, 1 Building Analyst/HVAC Technician, 5 Wx Installers, & 1 Wx Project Assistant

Wx Funding

- **WAP through Department of Commerce**
  - YNHA matches each FY Grant Award
  - Program started in 2010
- **BPA LIEE Grant**
  - Receiving this funding for over 10yrs
  - Funding started as training only and now has evolved to full array of BPA measures
- **Matchmaker (Wx Plus Health) through Department of Commerce**

Wx – "Other Duties as Assigned"

- Provides all rental homes with ventilation & insulation repairs
- All Special Project insulation work new construction & remodels
  - Quality Control Inspections for all HVAC work
  - We are the final say if work passes or fails
- This makes it very challenging to manage and schedule all of these projects.

Polyurethane Foam Insulation

Wx Assistance Program

- Since 2015 our program has completed between 12-16 projects each FY
- From 2010 to 2014 we completed 24 projects each of those FY
- What CHANGED?
  - In 2015 we started serving private homeowner's
  - What we discovered is that many of these homes have larger needs than YNHA managed homes

BPA LIEE

- BPA has been instrumental in the development of YNHA Wx Program
  - Prior to the inception of the WX Program at YNHA, BPA provided the following resources:
  - ➢ Building Science Training
  - ➢ Essential Tools and Equipment (i.e. Blower Door etc.)
  - ➢ Support and Other Valuable Resources

BPA LIEE CONTINUED..

- In 2015 the Wx Program (under new management) utilized additional funding to install 10 ductless heat pumps;
- In 2016 the Wx program installed 20 ductless heat pumps;
- In 2017 the Wx program installed 21 ductless heat pumps;
- Currently the Wx program has 18 ductless heat pumps waiting to be installed with an additional 10 more to be installed.

BPA LIEE CONTINUED..

- Since 2015 BPA has funded 2 Wx training programs through the Building Performance Center which included hands on training on:

➢ Complete pre and post diagnostic testing;

➢ Building envelope air sealing;

➢ Attic and crawlspace insulation;

➢ And exterior drill and fill wall insulation

Weatherization Plus Health

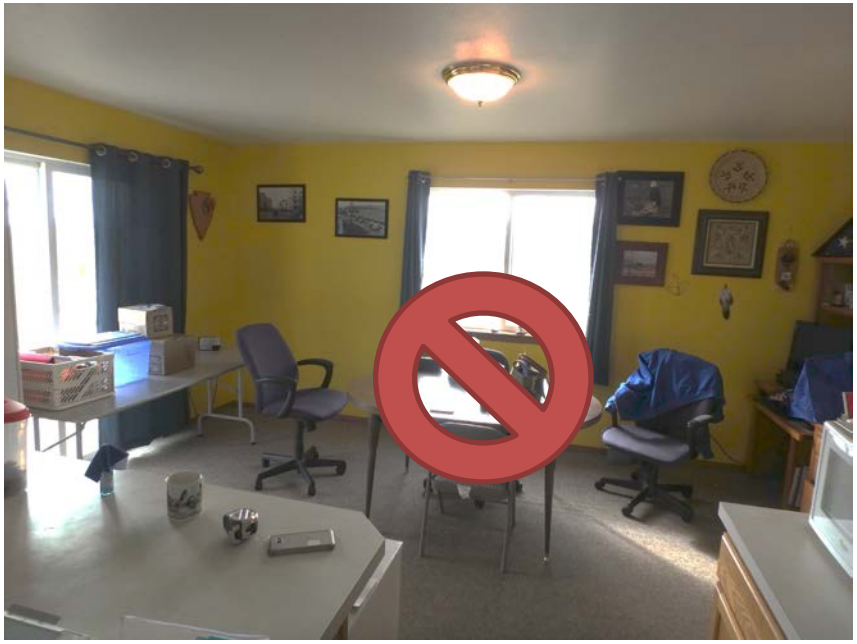
Wx Plus Health Cont….

Wx Plus Health Cont…

Wx Plus Health Cont…

Wx Plus Health Cont…

Before/Carpet



After/ Laminate Flooring

Wx Plus Health Cont…

Contact Information

- **David Olivas, Wx Program Manager**
- **Website: WWW.YNHA.ORG**
- **Email: David@YNHA.GOV**
- **Work Cell: 509.985.6950**
- **Office Line: 509.877.6171 ext.1102**

Low Income Energy Efficiency Workgroup Meeting

Date: July 26, 2018

Morning Session: 10:00-12:00 Pacific: Webinar

Afternoon Session: 1:00-5:00 Pacific: Hands-on, No Webinar

Location: Building Performance Center
3406 Redwood Avenue, Bellingham WA 98225

Join WebEx meeting
Meeting number (access code): 902 548 263
Meeting password: rQdJMTJy
Join by phone
+1-415-527-5035 US Toll

Agenda

Morning Session (meeting format)

10:00 Introductions-Carrie Nelson, BPA
- Call out to announce open spots on Steering committee
- Website one-pager on manufactured home replacement
- Lunch Orders (*please bring cash if you plan on staying for lunch*)

10:15 Building Performance Institute Overview

10:30 Resource Program Results, Danielle Walker, BPA
- Results and Energy Efficiency Goal Proposal

11:15 Smart Thermostats - Jess Kincaid, BPA

11:45 Round Table

12:00 – Lunch –

Afternoon Session (best practice/technical training with HVAC equipment geared towards program managers)

Best Practice Technical Training-Mark Jerome

1:00 Ductless Heat Pumps

2:30 Air Source Heat Pumps (PTCS)

3:45 Heat Pump Water Heaters

4:45 Q&A

About this workgroup
BPA invites its public power customers and regional stakeholders to participate in the Low Income Energy Efficiency workgroup. BPA is convening this workgroup as agreed to as part of the Post-2011 Review public process. Background on that process and Workgroup 3 can be found here.

Facilitator: Carrie Nelson BPA, 503-230-3000

Steering Committee

- Hans Berg, Washington Department of Commerce
- Todd Blackman, Franklin PUD
- Shawn Collins, The Energy Project
- Steve Jole, HACSA
- Travis Hardy, Northern Wasco PUD
- Wid Ritchie, Idaho Falls Power

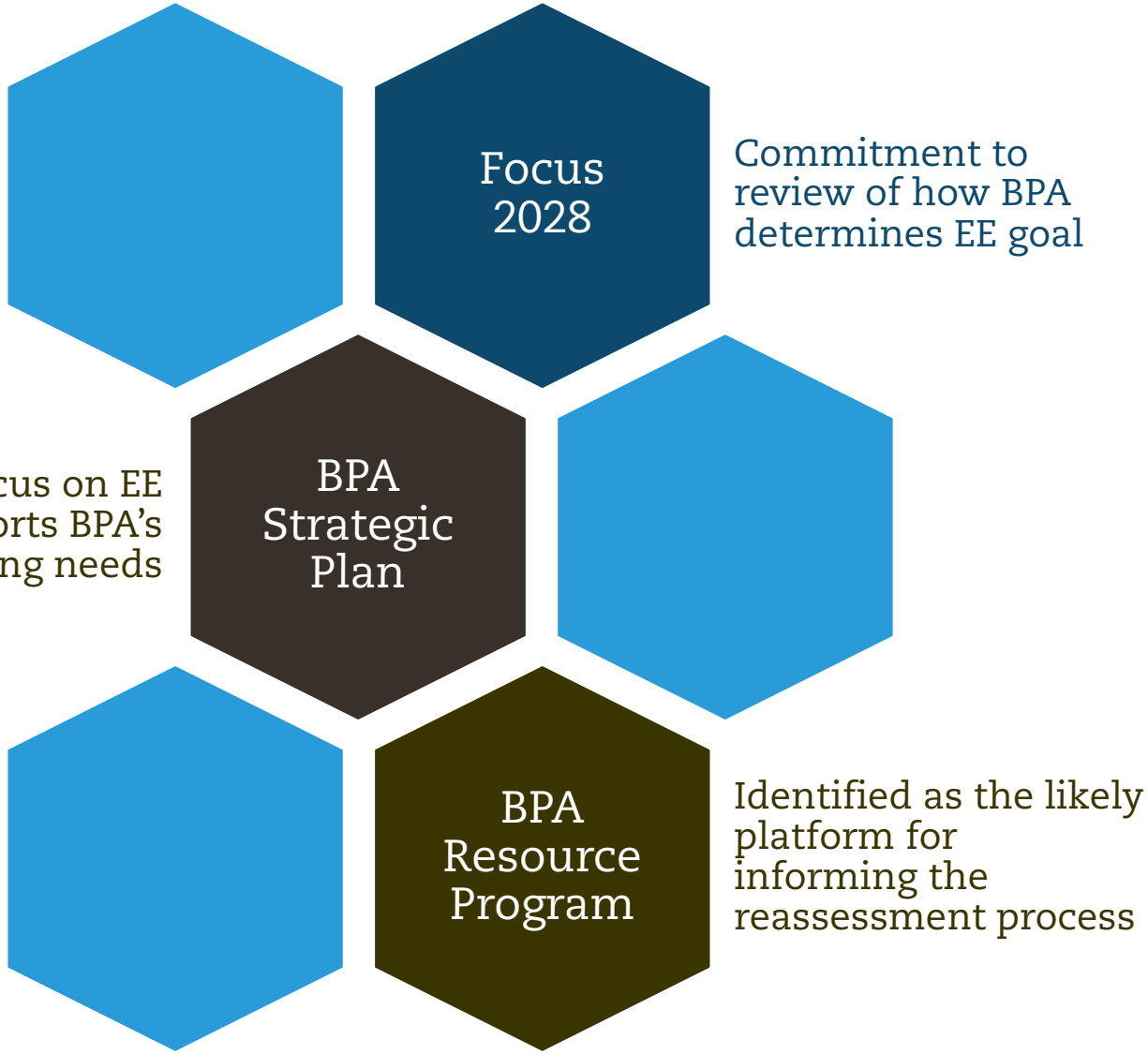
Bonneville
POWER ADMINISTRATION

BPA Resource Program Findings and What It Means for 2020-21 EE Savings Goal

LIEE Meeting

July 26, 2018

Background


Focus 2028
Commitment to review of how BPA determines EE goal
Increase focus on EE that supports BPA's evolving needs
BPA Strategic Plan
BPA Resource Program
Identified as the likely platform for informing the reassessment process

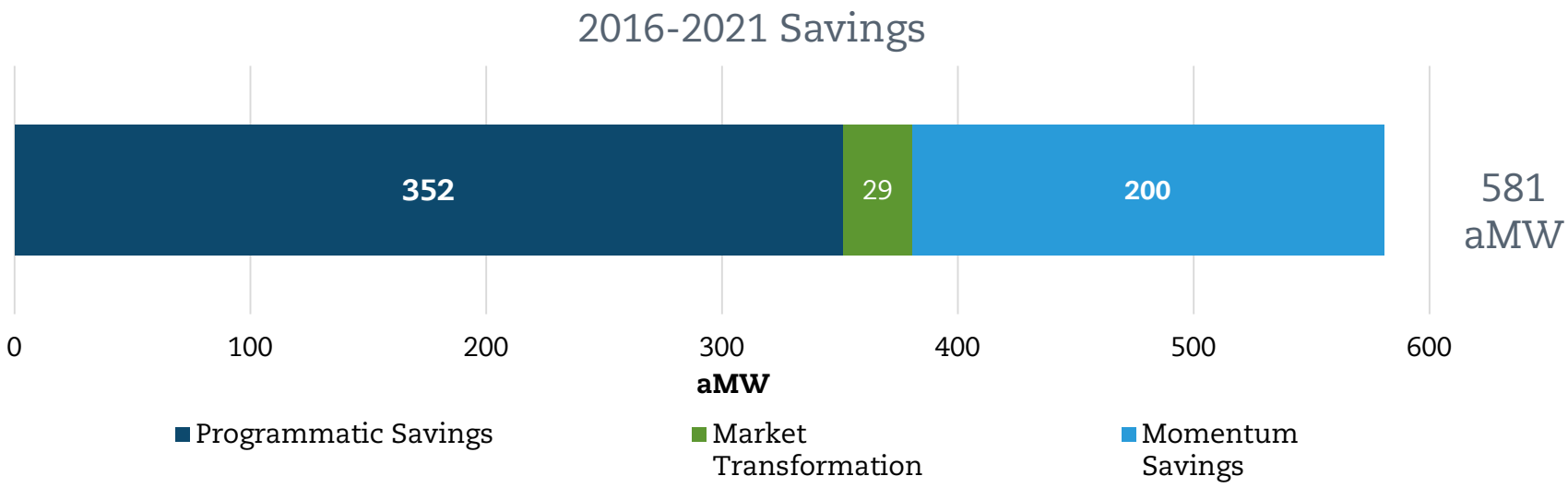
Today's Discussion

What were the findings?

What does this mean for our programs?

What comes next?

BPA's Energy Efficiency Action Plan



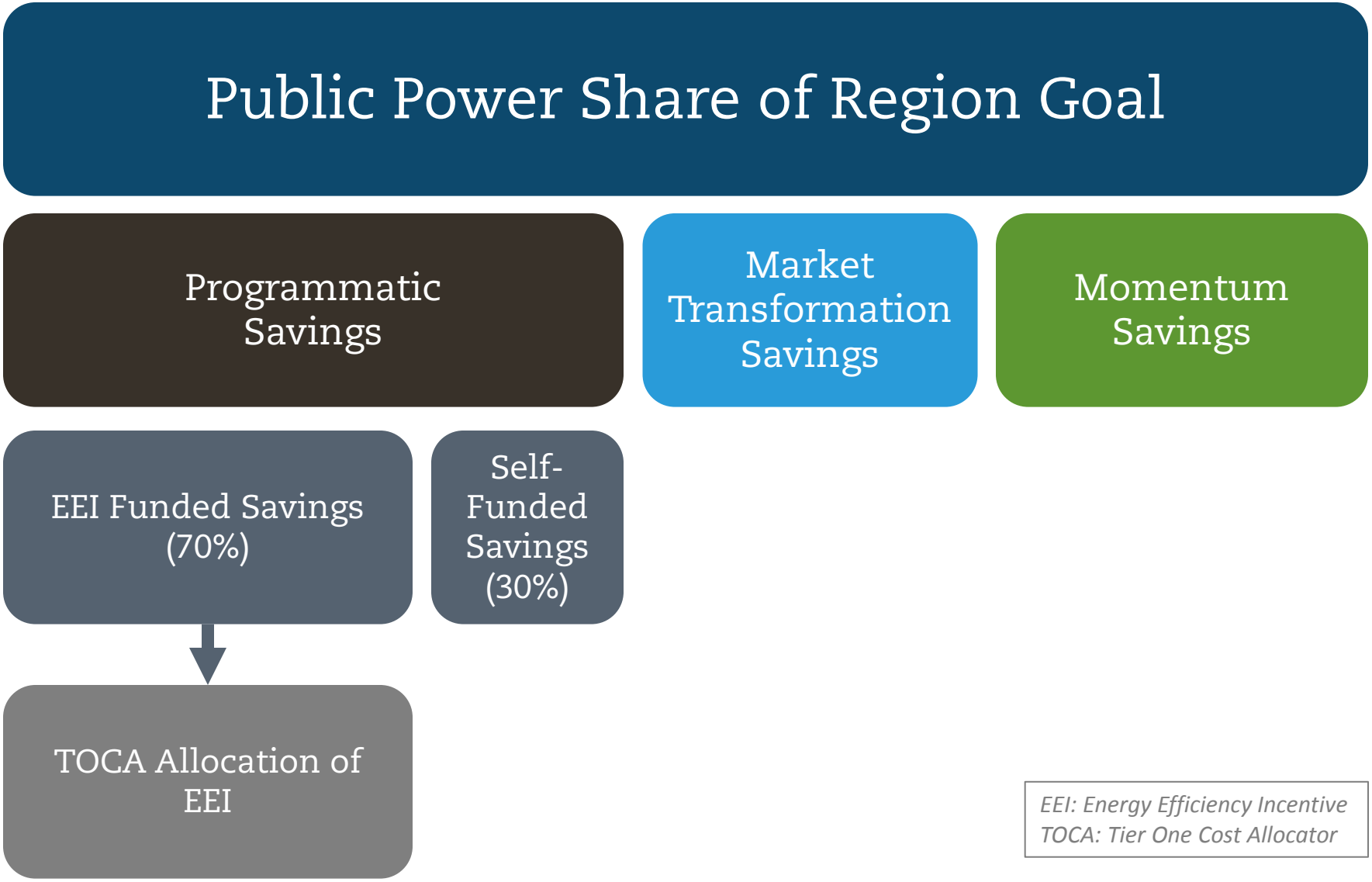
Current EE Program - Implementation

Our current portfolio is customer-service focused

Customer-service oriented program design

- Equity based allocation of acquisition funding: TOCA
- Broadest possible mix of measures and incentives to ensure local ability to deploy program
- No differentiation of measure support or BPA payment based on value to BPA system

Current EE Program - Planning



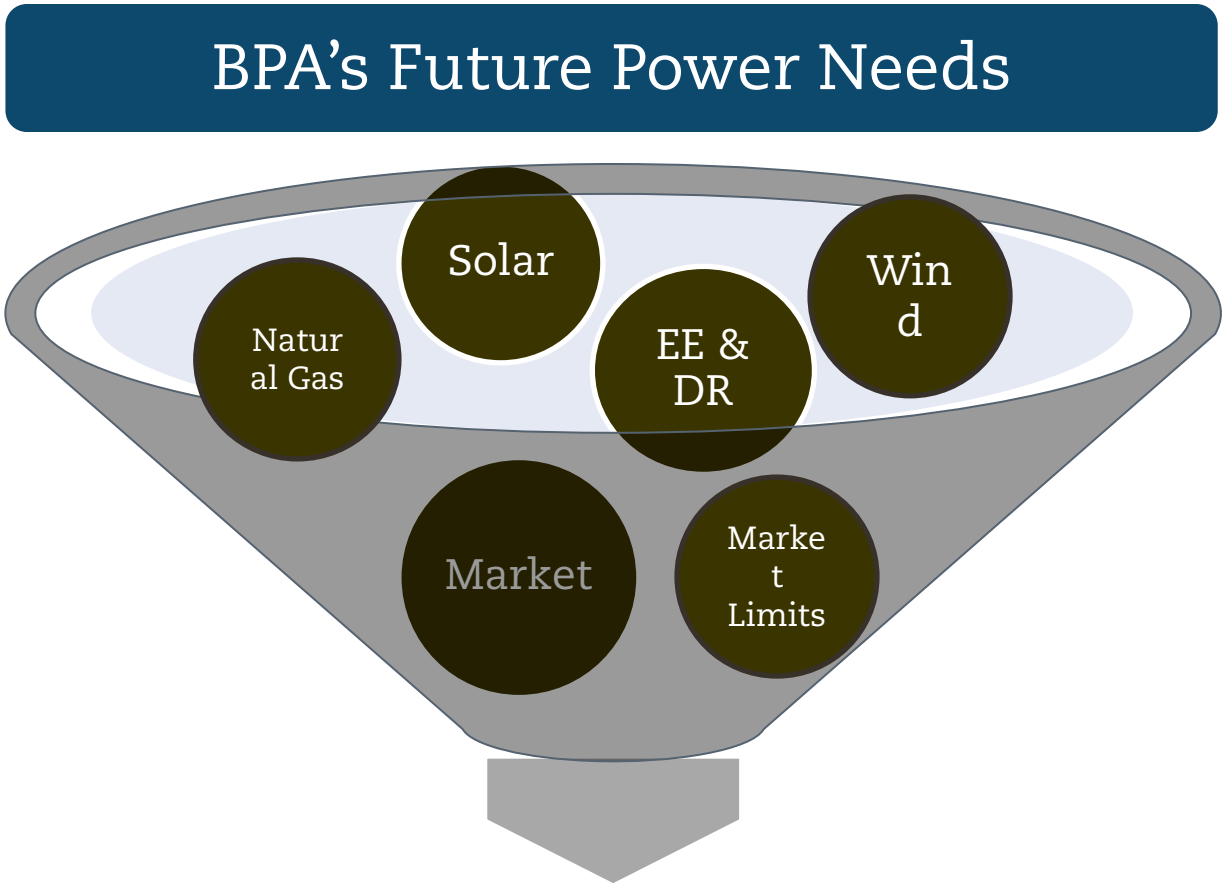
EEI: Energy Efficiency Incentive
TOCA: Tier One Cost Allocator

BPA Resource Program

Overview

- Begins with a forecast of BPA load obligations and existing resources and then determines needs
- Identifies and evaluates potential solutions to meeting the needs (energy efficiency, demand response, wind, solar, natural gas plants, etc.)
- Outlines potential strategies for meeting those needs

Optimization Model



Optimization Model Results – An Analogy

Cost Variance

Option 1:
Basic Package

Option 2:
All Inclusive

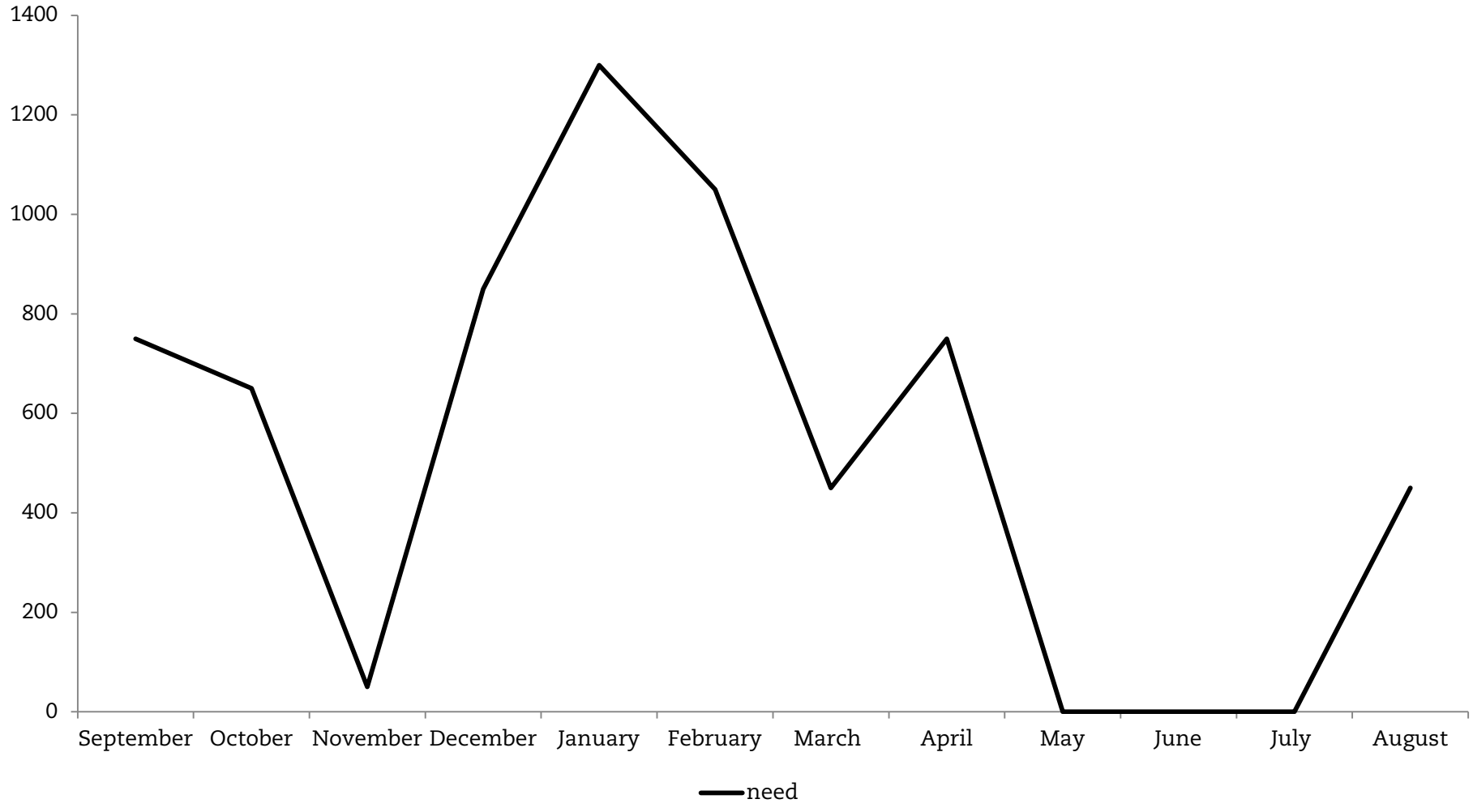
Total Cost

Resource Program Results

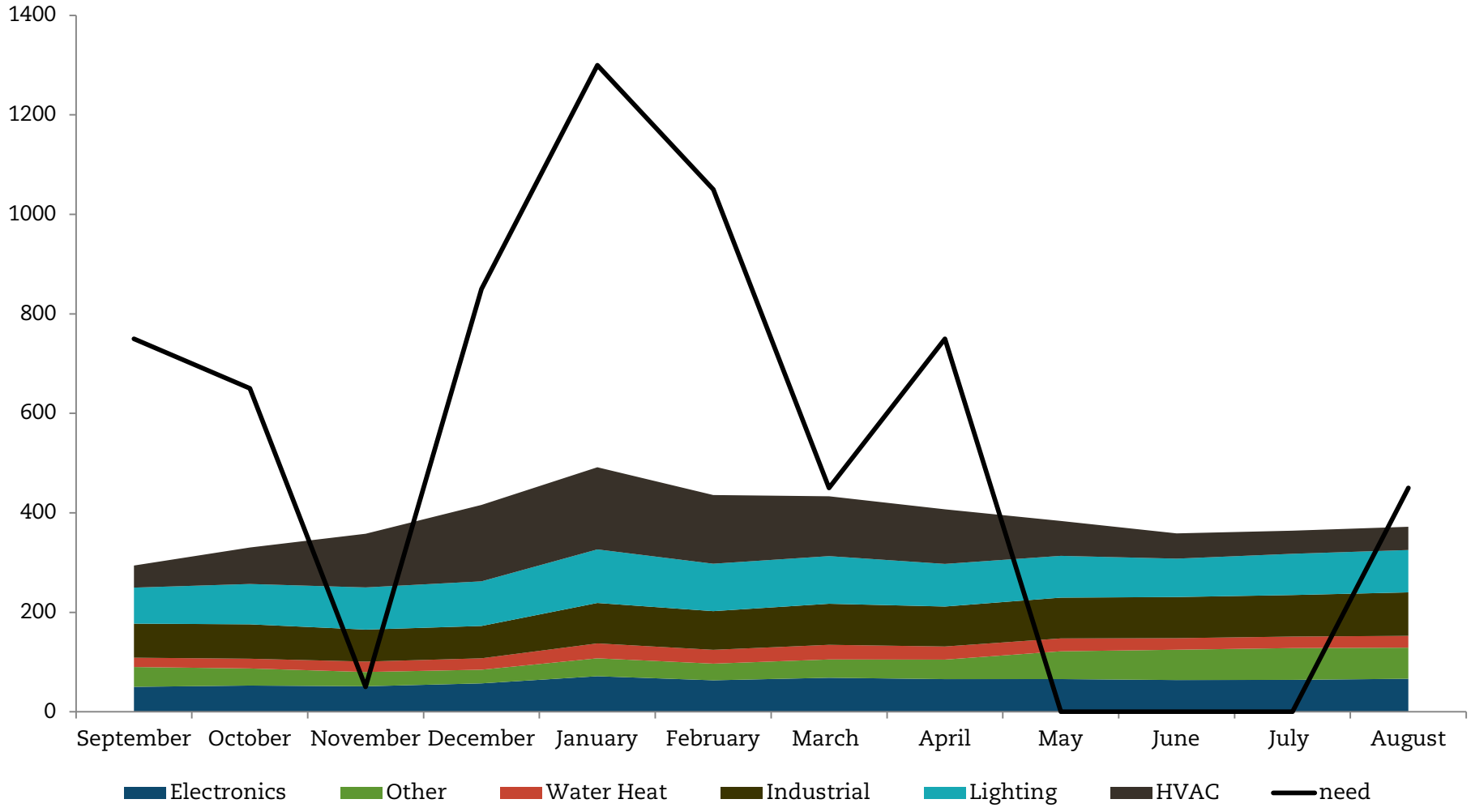
How much EE to acquire to meet our needs

The type of EE that best meets our needs

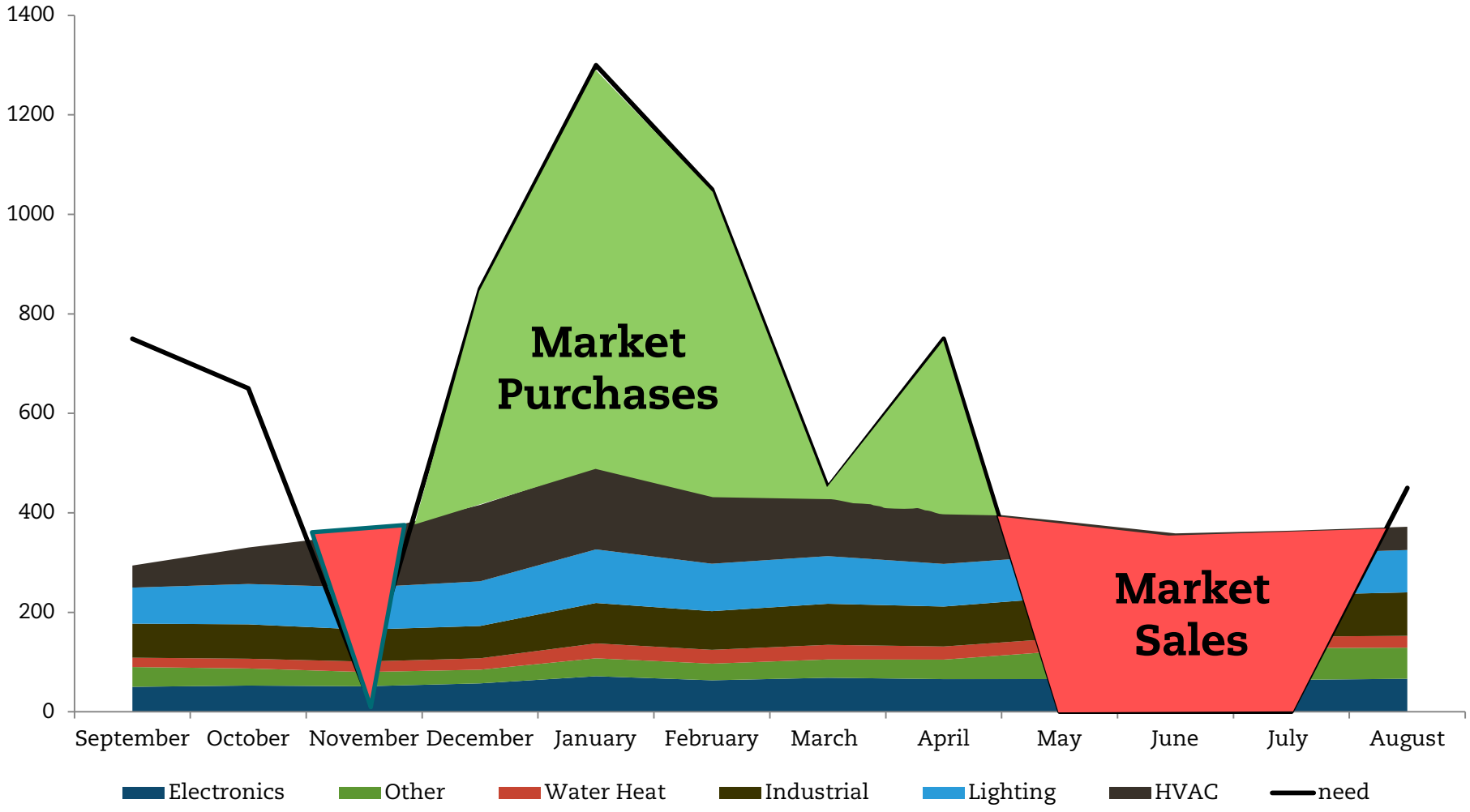
How EE Helps Meet Our Energy Needs



How EE Helps Meet Our Energy Needs



How EE Helps Meet Our Energy Needs



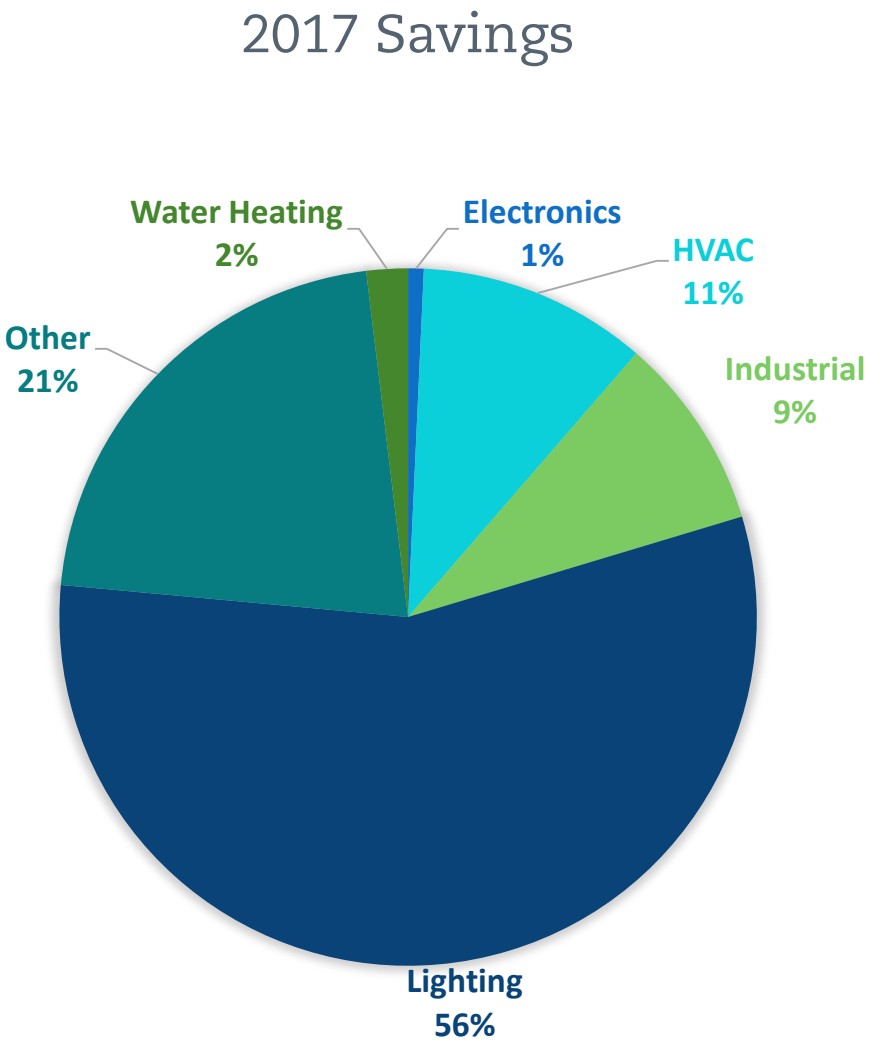
What We Learned

BPA can continue to meet its obligations with a mix of EE, DR and market purchases

EE is a significant component of a least-cost acquisition portfolio

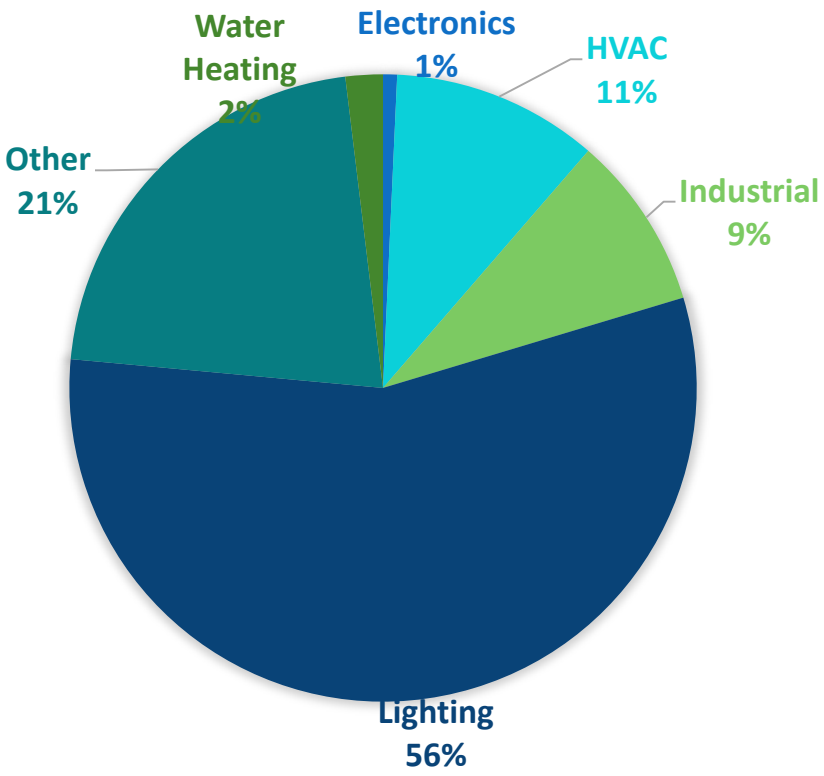
Some energy efficiency provides a greater contribution to our needs

Current Mix of EE Achievements

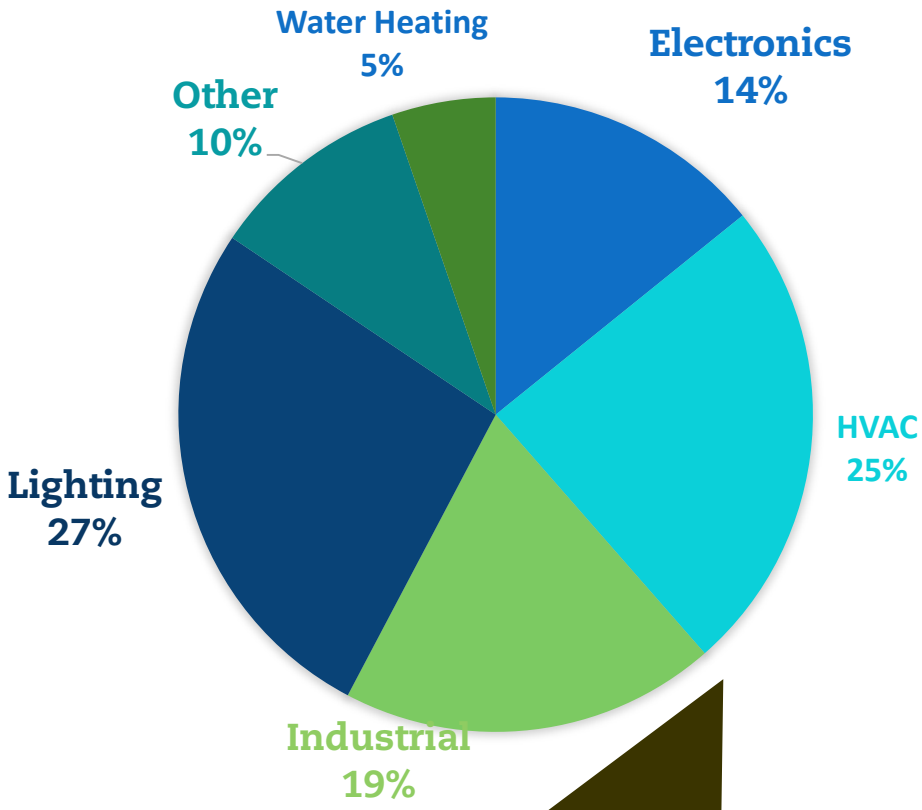


Current Mix vs Potential Mix

2017 Savings Achievements

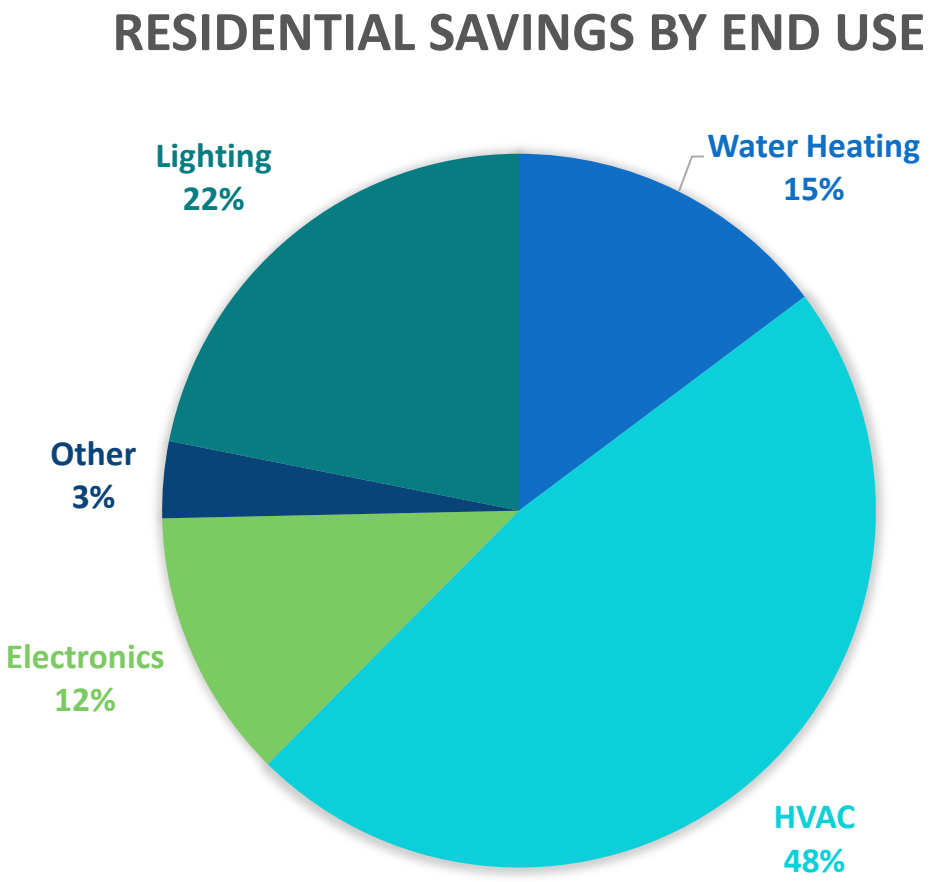


Resource Program Output



Better match to needs; higher barriers to achieve (cost and implementation)

Resource Program - Residential Savings by End Use



Total: 49 aMW

What does this mean for the EE program?

EE Program Principles

Maintain customer equity

Acquire savings that meet BPA's needs

Retain program stability

Recognize cost pressures, as well as goals of the BPA strategic plan


Begin Transition
Identify Measures and Programs
Assess Costs, Resources and Impacts on Goal
Develop a EE Program that more closely aligns with BPA's needs
What are the measures and program that support this goal? Which do not?
What will it take to achieve this savings? How much can we get?

EE Program Next Steps

Summer 2018

- Evaluate current portfolio and potential program adjustments

Fall/Winter 2018-2019

- Engage with customers and stakeholders on potential changes

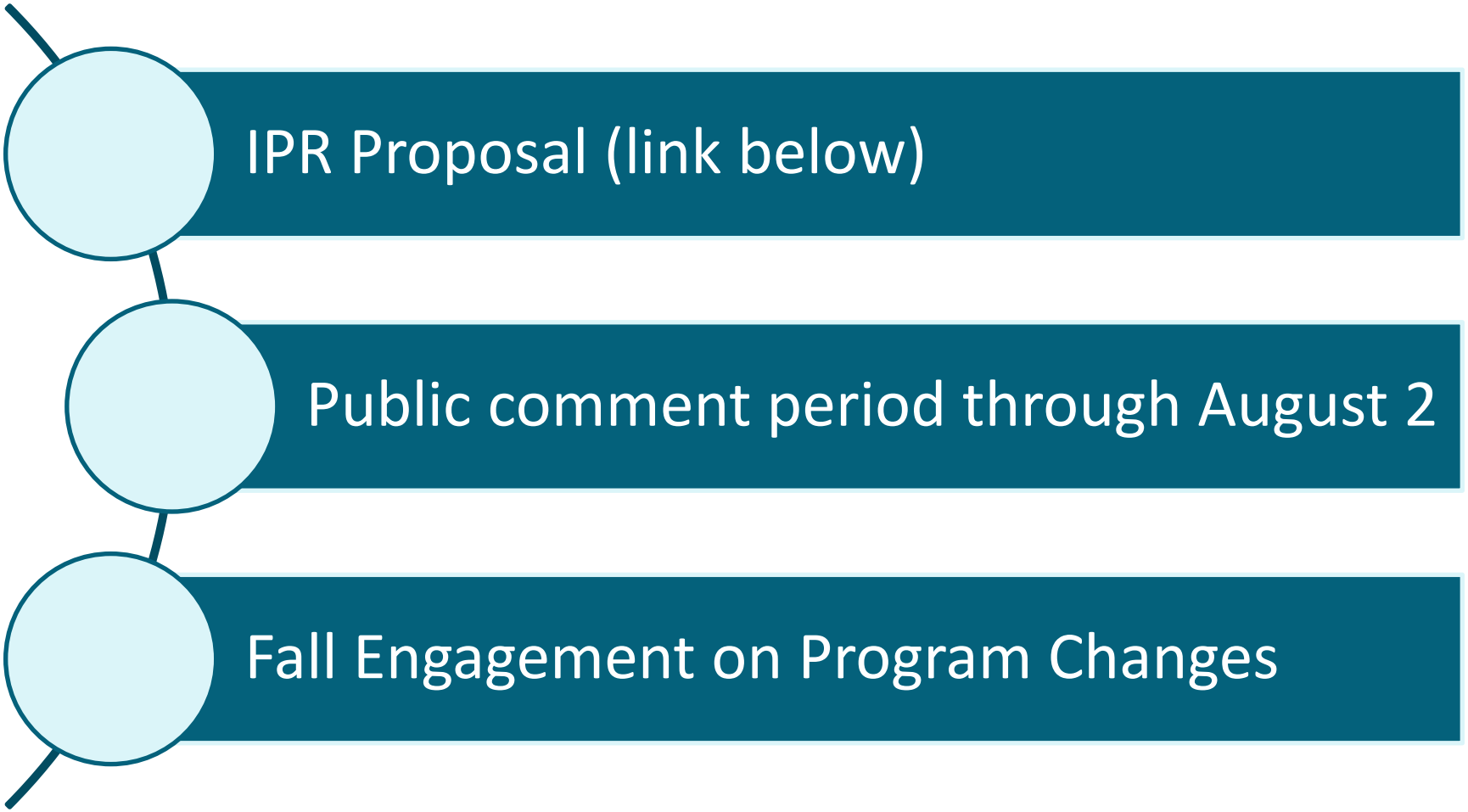
April 2018

- Announce changes in April Change Notice document

October 2019

- Implementation Manual Published

Stakeholder Engagement



https://www.bpa.gov/Finance/FinancialPublicProcesses/IPR/Pages/IPR-2018.aspx


QUESTIONS?

Hard To Reach Markets

- As part of the 7th Plan, the Council lead the region in a study to conduct data analysis to identify any proportionally underserved markets or populations
- The goal: improve the region's ability to provide all cost-effective energy efficiency by ensuring programs reach all segments of the population in a proportional manner
- Participants:
  - BPA, Idaho Power, Energy Trust of Oregon, Northwestern Energy, PacifiCorp, Ravalli Electric, Snohomish County PUD , Puget Sound Energy, Seattle City Light, Tacoma Power, NEEA

Summary of Findings

- **Low income segments** showed a wide range of results ranging from relatively strong participation in lower income brackets to low participation.
  - Low cost measures were adopted at above-average rates in the lower incomes while the high cost measures were adopted at below-average rates.
- The **highest income** brackets participated at the lowest rates, in most of the cases.
- **Manufactured housing** residents typically participated at higher rates than single family and multifamily housing residents.
- Most utilities found the **multifamily segment** to be somewhat or significantly underserved.
- **Rural customers** also appear to participate in programs at similar rates as urban customers, and for some utilities participated at greater rates than non-rural customers.

BPA Findings

- BPA serves low income residents at a slightly higher rate than the general population
  - High number of manufactured home duct sealing
- Our low income program is a small part of our overall residential portfolio
- SRR utilities often do not have access to retail mid-stream buy downs on lighting

Next Steps

- Draft report posted in May 2018, comment period closed July 16
- Council staff updating report and will present final draft to Council for approval

- Link to draft report:

https://nwcouncil.org/sites/default/files/Regional%20EE%20HTR%20Draft%20Report-NWPCC%20for%20Comment-2018-05.pdf

July 26, 2018

SMART THERMOSTATS at BPA

SMART THERMOSTATS
at BPA

- BPA Measure Requirements
- How Smart Thermostats Save Electricity
  - What they do
  - What they don't do
- Other Customer Opt-In Options
- New BPA Low-Income Payment

SMART THERMOSTATS
at BPA

Not all Smart Thermostats are the same.

BPA MEASURE REQUIREMENTS are STRINGENT:

1. Seven-day Programmable
2. Wi-Fi Enabled with Remote Access
3. Built in occupancy sensor
4. Heat pump auxiliary heat control and optimization
5. Independent evaluation or ENERGY STAR

Saves an average of 6% of heating bill with resistance heat, and 12% for ASHP—right out of the box

SMART THERMOSTATS
at BPA

BPA-Incentivized Thermostats Save Energy by:

- Learning your HVAC system operation
  - Ramping start up and cool down to run more efficiently
  - Optimizing ASHP controls (where applicable)
- Detecting occupancy
- Allowing opt-in geofencing to reduce set point when occupants are away

ecobee

Out-of-the-Box Technology—BPA Savings Basis

- Optimization algorithms offer energy efficiency savings through scheduling, occupancy detection and setbacks
- No Wi-Fi connection needed

End-Use Customer Opt-In Features

- Remote sensors capture occupancy and temperature data ensuring comfort and energy savings
- Dispatchable demand response leverages minor temperature adjustments to curtail load/flatten peaks as needed

NEST

Savings without Wi-Fi: Embedded Occupancy sensors

Additional opt-in services, if utility <u>and</u> customer opt-in:

Customer-Driven Energy Services

Rush Hour Rewards

Get paid to use less energy during peak periods.

Peak load management
Dispatchable demand response

Seasonal Savings

Nest helps you save energy by making small adjustments to your schedule as seasons change.

Incremental energy efficiency
Coincident peak load reduction

Time of Savings

Nest helps you save energy when it's most expensive. Save more, worry less.

TOU rate automation
Awareness of on-peak period

SMART THERMOSTATS
at BPA

New Low-Income Payment (October 2018)

- Measure is vetted and ready for broad implementation
- Must provide income documentation
- Payment up to $400, no repair costs
  - Goal: Prevent super high installation costs by direct install
- Must provide model, serial number, and site ID

Questions:

Jess Kincaid,
Residential Sector Lead

jbkincaid@BPA.Gov

The Value of Heat Pump Water Heaters

Helping Customers
Make the Best Water Heating Decisions

HOT WATER SOLUTIONS

neea

Northwest Energy Efficiency Alliance

HOT WATER SOLUTIONS

neea

HOT WATER SOLUTIONS

neea

State of the Market

HOT WATER SOLUTIONS

- Over **150,000** electric water heater replacements per year
- Utility **rebates** available
- Qualifying product from: A. O. Smith, Bradford White, Rheem, Sanden

neea

Program Resources

HOT WATER SOLUTIONS

neea

Savings to Upgrade – Utility Rebates

HOT WATER SOLUTIONS

Utility Rebates:

- **86** utilities participating
- Range from $120 to $1000
- Many are between $300 - $500
- For the current list of utility rebates visit: http://hotwatersolutionsnw.org/participating-utilities

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Resources to Get You Started

HOT WATER SOLUTIONS

Installer Resources

- Best Practices Installation Guide
- Homeowner Quick Reference Guide
- Hot Water Solutions Image Library
- Sales sheet
- Advanced Water Heater Specification
- Qualified Products List
- Incentive listings
- Events calendar

- Program Website: http://hotwatersolutionsnw.org/partners/resources

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HPWH Benefits

HOT WATER SOLUTIONS

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HPWH Benefits

HOT WATER SOLUTIONS

Up to $200 / annual savings

Immediate savings through incentives

Peace of mind through warranty

Same **reliable hot water** delivery

Avoids **average $4,000** water damage bill through leak detection

neea

HPWH Benefits vs. a Standard Tank

HOT WATER SOLUTIONS

FEATURES	BENEFITS	HPWH	STANDARD TANK
Reliable Hot Water	Hot water when you need it	✓	✓
10 Year Warranty	Peace of mind	✓	
Cuts cost by up to 60%	Save up to $200/year or over $2,000 over 10 years	✓	
Incentive and Tax Credits up to $1,100	Low upgrade costs lead to faster pay back of 2-3 years	✓	
Leak Detection	Avoids a $4,000 water damage invoice	✓	

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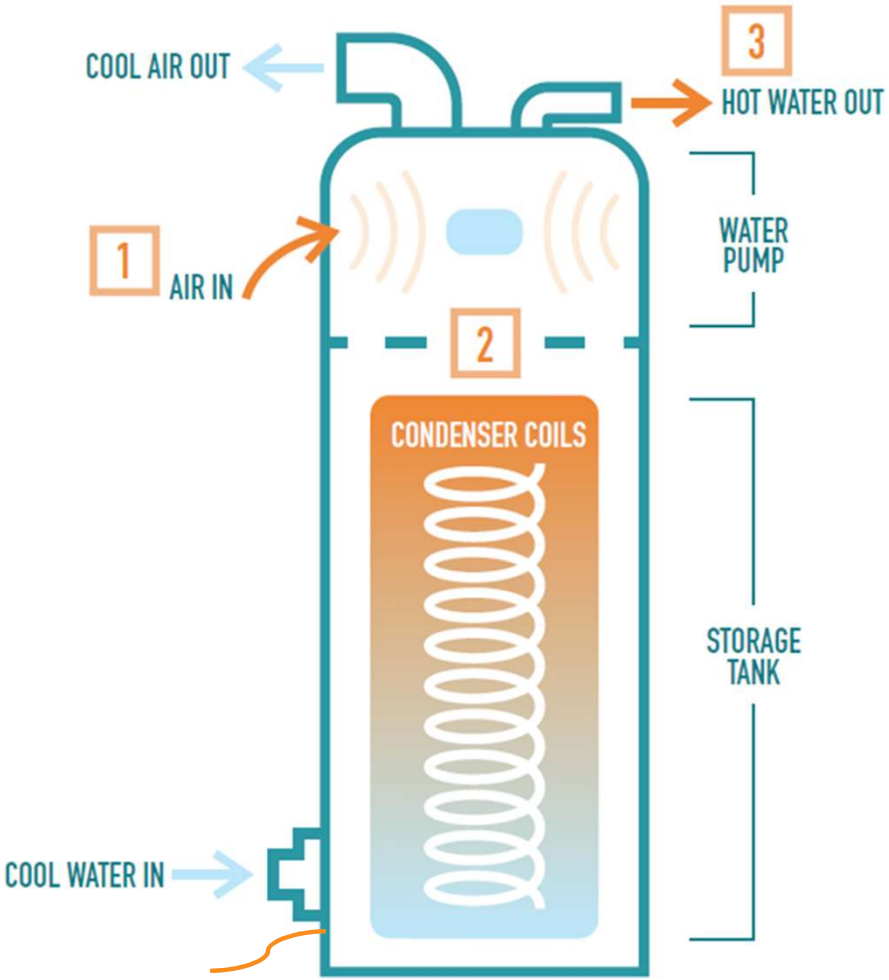
Explaining the Technology Features



Heat pump technology:

- Heat is moved from the surrounding air to the water in the tank
- Transferring heat allows for a 60% less energy use
- Most have leak protection
- 10 year warranty

Product Comparisons

HOT WATER SOLUTIONS

Standard Technology

Heat Pump Technology

neea

How would you respond?

HOT WATER SOLUTIONS

It's too expensive…

60% savings and incentives

I'm not sure these are Reliable…

10 year warranty

The technology is too new…

Heat pump technology has been around for over 60 years

I don't want to run out of hot water…

Same delivery as a standard tank

neea

Installation Information

HOT WATER SOLUTIONS

neea

Product Compatibility - Installation Considerations

HOT WATER SOLUTIONS

Space

- 700 cubic ft. of space or ducting or louvered door
- Check clearance requirements

Condensate

- Remove condensate
  - Pump or sloped system
  - Terminate into an existing drain or outside

Ducting

- Confined spaces or to move cold air

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Locations

HOT WATER SOLUTIONS

1. Insulated garage
2. Attic
3. Uninsulated garage
4. Laundry room
5. Heated basement
6. Basement mechanical room
7. Dugout crawl space
8. Closet built around existing water heater
9. Unheated basement
10. Low boy under the sink

neea

Locations

HOT WATER SOLUTIONS

1. Insulated garage
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neea

Cold Climate Considerations

HOT WATER SOLUTIONS

Performance

- Insulated vs. uninsulated garage/basement/utility room
  - Heat Pump switches to electric resistance at 35 degrees

Condensate

- Fast drainage to prevent freezing
- Limit outside exposure to prevent freezing

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HPWH Misperceptions

HOT WATER SOLUTIONS

- Technicians have to learn refrigeration
- They are noisy
- They always have to be ducted
- Homeowners won’t pay the higher cost
- Condensate neutralizer/ code difficulty
- Insufficient hot water delivery

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Available Product

HOT WATER SOLUTIONS

- Manufacturers have over 350 years of combined experience
- Products have 10 year warranties
- Top notch technical support
- Utility backing and product rebates

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Available Product

HOT WATER SOLUTIONS

- https://neea.org/img/documents/qualified-products-list.pdf

Advanced Water Heater Specification* Qualified Products List for Heat Pump Water Heaters

Last Updated: 02/08/2018

Product Tier	Product Brand	Model	Volume (gallons)	Maximum Recommended Household Size	Uniform Energy Factor NC†	Energy Factor NC†	Qualified Date
Tier 3							
	A. O. Smith	HPTU 50 120	50	2-3	2.9	--	6/24/2016
	A. O. Smith	HPTU 50N 120	50	2-3	2.9	--	6/24/2016
	A. O. Smith	HPTU 66 120	66	3	3.1	--	6/24/2016
	A. O. Smith	HPTU 66N 120	66	3	3.1	--	6/24/2016
	A. O. Smith	HPTU 80 120	80	4+	2.9	--	6/24/2016
	A. O. Smith	HPTU 80N 120	80	4+	2.9	--	6/24/2016
	A. O. Smith	HP10-50H45DV	50	2-3	2.9	--	3/14/2017
	A. O. Smith	HP10-80H45DV	80	4+	2.9	--	3/14/2017
	American	HPHE10250H045DV 120	50	2-3	2.9	--	6/24/2016
	American	HPHE10250H045DVN 120	50	2-3	2.9	--	6/24/2016
	American	HPHE10266H045DV 120	66	3	3.1	--	6/24/2016
	American	HPHE10266H045DVN 120	66	3	3.1	--	6/24/2016
	American	HPHE10280H045DV 120	80	4+	2.9	--	6/24/2016
	American	HPHE10280H045DVN 120	80	4+	2.9	--	6/24/2016
	Bradford White	RE2H50R10B-1NCWT	50	2-3	2.8	--	2/9/2017
	Bradford White	RE2H80R10B-1NCWT	80	4+	3.1	--	2/9/2017

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Installation Video

https://www.youtube.com/watch?v=m2lyEgx0J5U

Thank You

info@hotwatersolutionsnw.org

HOT WATER SOLUTIONS

https://hotwatersolutionsnw.org/what-is-a-heat-pump-water-heater

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PTCS® Air Source Heat Pump

The PTCS Program

- Pacific Northwest regional program promoting quality installation of AHRI rated high efficiency heat pumps and duct sealing.
  - Measures offered are:
    - Air Source Heat Pump
    - Variable Speed Heat Pump
    - Ground Source Heat Pump
    - Duct Sealing
  - **103*** participating Pacific Northwest Utilities
  - **800*** HVAC technicians certified since 2006
  - **98,600*** approved HVAC installations since 2006
  - **6 million** housing units in BPA territory

**As of April 2017*

Why Quality Installation Matters

- **Primary goal:** Ensure system performs as rating suggests; part box spec/part installation
- HSPF/SEER assumes system is properly sized with "perfect" airflow and refrigerant charge

- **Unit must be AHRI Certified**

- **PTCS Certified: 9.0 HSPF/14 SEER or greater**

- **Commissioning, Controls, and Sizing: Less than 9.0 HSPF/14 SEER***

* Some utilities do not offer a CC&S measure. Be sure to check with local utility before performing work.

Quality Installation: The Big Four

- **Sizing**
  - Balance point sizing: Target of 30 degree
- **Airflow**
  - At least 325 and up to 500 CFM/ton (or per manufacturer)
- **Refrigerant Charge** (Follow manufacturer procedure)
  - Heating: Temperature split
  - Cooling: Subcooling
  - Optional methods
- **Controls**
  - 35° or lower auxiliary (strip) heat lockout
  - 5° or lower compressor lockout or disabled/not installed

Quality Assurance Inspections

- At least 10% of all jobs are inspected for:
  - Equipment Type
  - External Static Pressure
  - Airflow
  - Refrigerant Charge
  - Control Set Up
    - Auxiliary (Strip) Heat Lockout
    - Compressor Lockout
  - Sizing

Sizing

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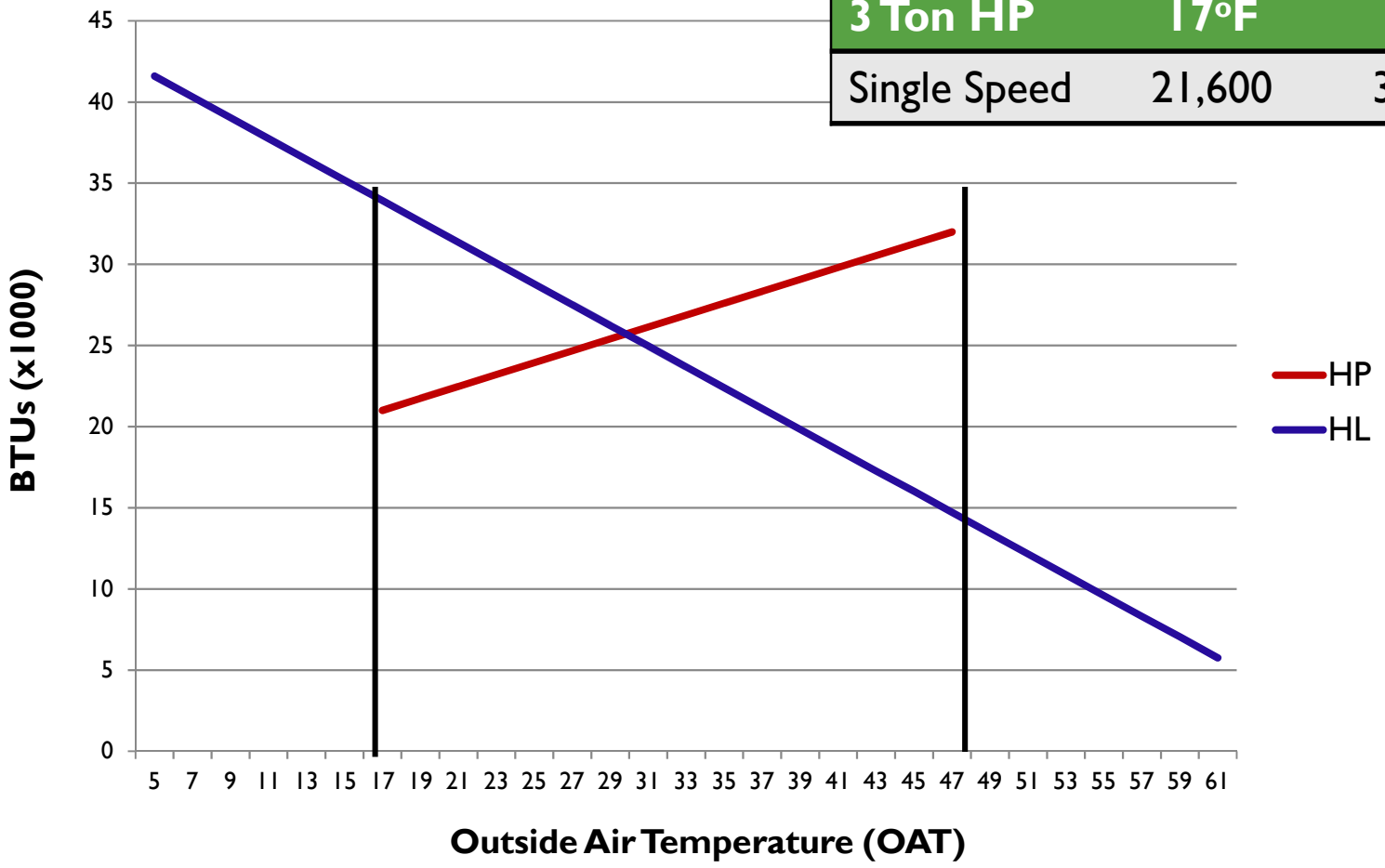
Balance Point Using AHRI Data

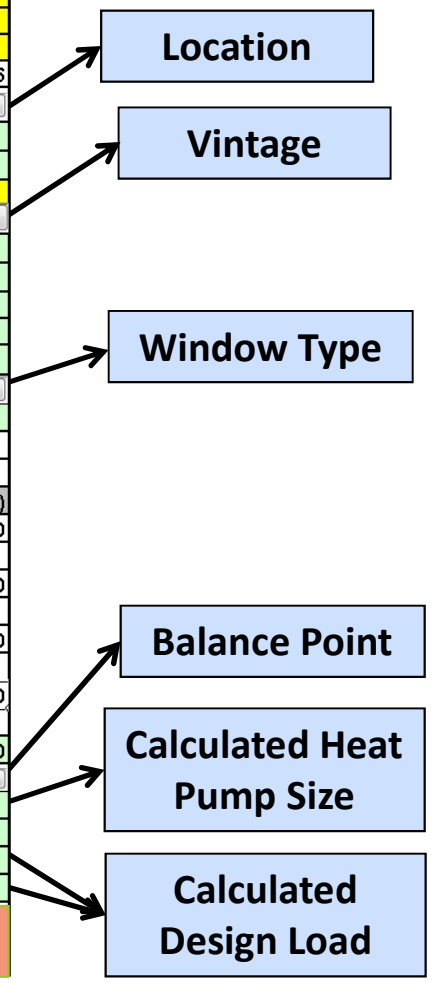
3 Ton HP	17°F	47°F
Single Speed	21,600	34,200



BPA's Heat Pump Sizing Calculator

PTCS Heat Pump and Central Air Conditioner Sizing Calculator		
Project Location		
Contractor		
Technician		
Equipment Description		
Calculator Version 3_7, Last Revised 09/29/11	Today's Date	1/20/2016
	Select Location=>	Portland
	Cooling Design Temperature for Selected Location (F)	85
	Cooling Design Delta-T for Selected Location (F)	7
	Enter Home Size (sq.ft.)	1200
	Select vintage that best matches home's insulation characteristics	Post - 2000
	Ceiling/Attic Insulation	R38
	Above Grade Wall Insulation	R21
	Below Grade Wall Insulation	R19
	Floor Insulation	R30
	Exterior Doors	Insulated Metal or Fiberglass
	Select Home's Window Type	NFRC Rated Window
	Enter U-Factor of NFRC Rated Window	0.55
	Enter SHGC of NFRC Rated Window	0.55
	Enter Window Area by Orientation (sq.ft.)	
	North	50
	North East	
	East	50
	South East	
	South	50
	South West	
	West	50
	North West	
	Total Window Area	200
	Select Heat Pump Balance Point (F)	30
	Heat Pump Size (Tons) - Heating	2.0
	Central Air Conditioner Size (Tons) - Cooling	1.0
	Design Load - Heating (Btu/h)	14,100
	Design Load - Cooling (Btu/h)	14,000

Note: Click on above image to link to online calculator



Airflow

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System Airflow

- Important for energy savings and comfort
- Heat transfer (system capacity and efficiency) depends on the flow of air across the indoor unit coil
- SPEC **Measured airflow: at least 325 to 500 CFM/ton**
- SPEC **External Static Pressure: shall not exceed 0.8 Inches H_2O or 200 Pa**

Note: Duct systems may require modification to meet flow requirements

Measuring Airflow

Measure External Static Pressure

Measure CFM with TrueFlow® Plate or Duct Blaster

Equipment DISCOUNT *Available*

Refrigerant Charge

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Refrigerant Charge Methods

- Heating
  - Measure sensible temperature split & compare to chart
- Cooling
  - Subcooling
- Alternative Methods
  - Manufacturer's methods
    - Approach or Superheat

Heating Temperature Split Chart

Outdoor Temp.	CFM/TON															
	300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450
5	13.0	12.6	12.2	11.8	11.4	11.0	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9.4	9.2	9.0
7	13.8	13.4	13.0	12.6	12.2	11.8	11.6	11.3	11.1	10.8	10.6	10.4	10.1	9.9	9.6	9.4
9	14.6	14.2	13.8	13.4	13.0	12.6	12.3	12.0	11.8	11.5	11.2	10.9	10.6	10.4	10.1	9.8
11	15.4	15.0	14.6	14.2	13.8	13.4	13.1	12.8	12.4	12.1	11.8	11.5	11.2	10.8	10.5	10.2
13	16.2	15.8	15.4	15.0	14.6	14.2	13.8	13.5	13.1	12.8	12.4	12.0	11.7	11.3	11.0	10.6
15	17.0	16.6	16.2	15.8	15.4	15.0	14.6	14.2	13.8	13.4	13.0	12.6	12.2	11.8	11.4	11.0
17	17.6	17.2	16.8	16.4	16.0	15.6	15.2	14.8	14.4	14.0	13.6	13.2	12.8	12.4	12.0	11.6
19	18.2	17.8	17.4	17.0	16.6	16.2	15.8	15.4	15.0	14.6	14.2	13.8	13.4	13.0	12.6	12.2
21	18.8	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.6	15.2	14.8	14.4	14.0	13.6	13.2	12.8
23	19.4	19.0	18.6	18.2	17.8	17.4	17.0	16.6	16.2	15.8	15.4	15.0	14.6	14.2	13.8	13.4
25	20.0	19.6	19.2	18.8	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.6	15.2	14.8	14.4	14.0
27	20.6	20.2	19.8	19.4	19.0	18.6	18.2	17.7	17.3	16.8	16.4	16.0	15.6	15.2	14.8	14.4
29	21.2	20.8	20.4	20.0	19.6	19.2	18.7	18.2	17.8	17.3	16.8	16.4	16.0	15.6	15.2	14.8
31	21.8	21.4	21.0	20.6	20.2	19.8	19.3	18.8	18.2	17.7	17.2	16.8	16.4	16.0	15.6	15.2
33	22.4	22.0	21.6	21.2	20.8	20.4	19.8	19.3	18.7	18.2	17.6	17.2	16.8	16.4	16.0	15.6
35	23.0	22.6	22.2	21.8	21.4	21.0	20.4	19.8	19.2	18.6	18.0	17.6	17.2	16.8	16.4	16.0
37	24.0	23.6	23.1	22.7	22.2	21.8	21.2	20.6	20.0	19.4	18.8	18.4	18.0	17.6	17.2	16.8
39	25.0	24.5	24.0	23.6	23.1	22.6	22.0	21.4	20.8	20.2	19.6	19.2	18.8	18.4	18.0	17.6
41	26.0	25.5	25.0	24.4	23.9	23.4	22.8	22.2	21.6	21.0	20.4	20.0	19.6	19.2	18.8	18.4
43	27.0	26.4	25.9	25.3	24.8	24.2	23.6	23.0	22.4	21.8	21.2	20.8	20.4	20.0	19.6	19.2
45	28.0	27.4	26.8	26.2	25.6	25.0	24.4	23.8	23.2	22.6	22.0	21.6	21.2	20.8	20.4	20.0
47	29.2	28.5	27.8	27.2	26.5	25.8	25.2	24.6	24.0	23.4	22.8	22.4	21.9	21.5	21.0	20.6
49	30.4	29.6	28.9	28.1	27.4	26.6	26.0	25.4	24.8	24.2	23.6	23.1	22.6	22.2	21.7	21.2
51	31.6	30.8	29.9	29.1	28.2	27.4	26.8	26.2	25.6	25.0	24.4	23.9	23.4	22.8	22.3	21.8
53	32.8	31.9	31.0	30.0	29.1	28.2	27.6	27.0	26.4	25.8	25.2	24.6	24.1	23.5	23.0	22.4
55	34.0	33.0	32.0	31.0	30.0	29.0	28.4	27.8	27.2	26.6	26.0	25.4	24.8	24.2	23.6	23.0
57	34.8	33.8	32.8	31.8	30.8	29.8	29.2	28.5	27.9	27.2	26.6	26.0	25.4	24.8	24.2	23.6
59	35.6	34.6	33.6	32.6	31.6	30.6	29.9	29.2	28.6	27.9	27.2	26.6	26.0	25.4	24.8	24.2
61	36.4	35.4	34.4	33.4	32.4	31.4	30.7	30.0	29.2	28.5	27.8	27.2	26.6	26.0	25.4	24.8
63	37.2	36.2	35.2	34.2	33.2	32.2	31.4	30.7	29.9	29.2	28.4	27.8	27.2	26.6	26.0	25.4
65	38.0	37.0	36.0	35.0	34.0	33.0	32.2	31.4	30.6	29.8	29.0	28.4	27.8	27.2	26.6	26.0

Controls

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Feel the difference. Count the savings.

About Controls

- Prioritize use of compressor to heat house
- 

Auxiliary (strip) heat lockout set to 35ºF or lower
- 

Compressor lockout set to 5° or lower
  - **disabled/not installed is allowed**
- Controlled through thermostat; Wi-Fi weather or outdoor thermistor

Thermostats

- Setting controls on various thermostats
- Thermostat support sheets
  - https://www.bpa.gov/EE/Sectors/Residential/Documents/Tstat_Support_Sheets_ALL.pdf

Resources

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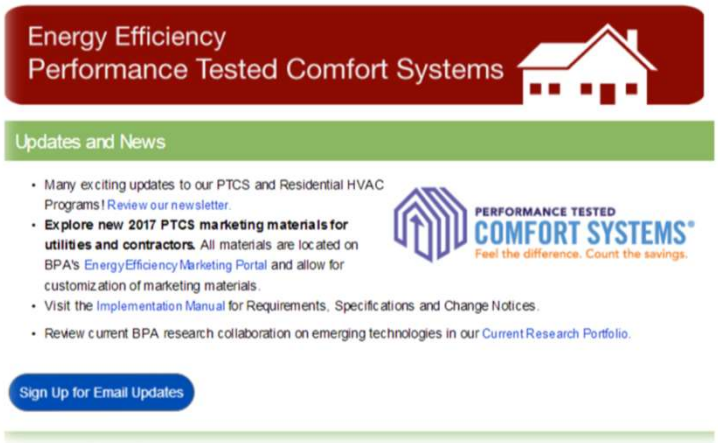
Program Website

- All of the following on are on this website: www.bpa.gov/goto/reshvac
  - Specifications
  - Requirements
  - Resources
  - Training Resources
  - Online Registry Resources
  - Link to Online Marketing Portal
  - Forms



Mobile Registry

- Online registry optimized for use on any mobile device
  - Not an app you download
- Save progress function to complete entered data later
- Times out after 4 hours of inactivity
- Informational bubbles explaining some program components
- Some limitations
  - No offline entry mode. Can't use without internet access.
  - Optional forms available to record data for later entry, but not required to submit.

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Bomba de calor de fuente de aire PTCS®

Capacitación para certificación

Marketing Materials: Free & Customizable

- Contractor Focused
- Accessed through BPA's Marketing Portal: https://www.bpa.gov/EE/Utility/marketing/Pages/BPA-Marketing-Portal.aspx
- PTCS General Marketing: logo and program poster
- Air Source Heat Pumps:
  - Ad
  - Bill Stuffer
  - Homeowner Brochure
  - Postcard
  - Several orientations of web banners

Stay Informed!

- Updated specifications
- Online registry changes
- Common issues in the field
- Updated program requirements
- New technical support resources

Go to **www.bpa.gov/goto/reshvac** or email **ResHVAC@bpa.gov** to sign up.

We guarantee we will not spam you or sell any of your information.

Technician Orientation Video

PTCS Heat Pump Program Orientation:

https://www.youtube.com/watch?v=9GI7pTNHVis

Thank You!

Questions?

Comments?

Contact the PTCS Team:

Phone: (800) 941-3867

Email: ResHVAC@bpa.gov

CLEAResult®

Ductless Heat Pumps

Low Income Workgroup
Bellingham WA
July 26, 2018

We change the way people use energy™

Installation

CLEAResult®

Keys to a Quality Installation

- Equipment Manual
- System Compatibility
- Tools
- Placement of Indoor and Outdoor Units
- Refrigerant Connections & Charging
- Condensation
- Defrost
- Homeowner Education

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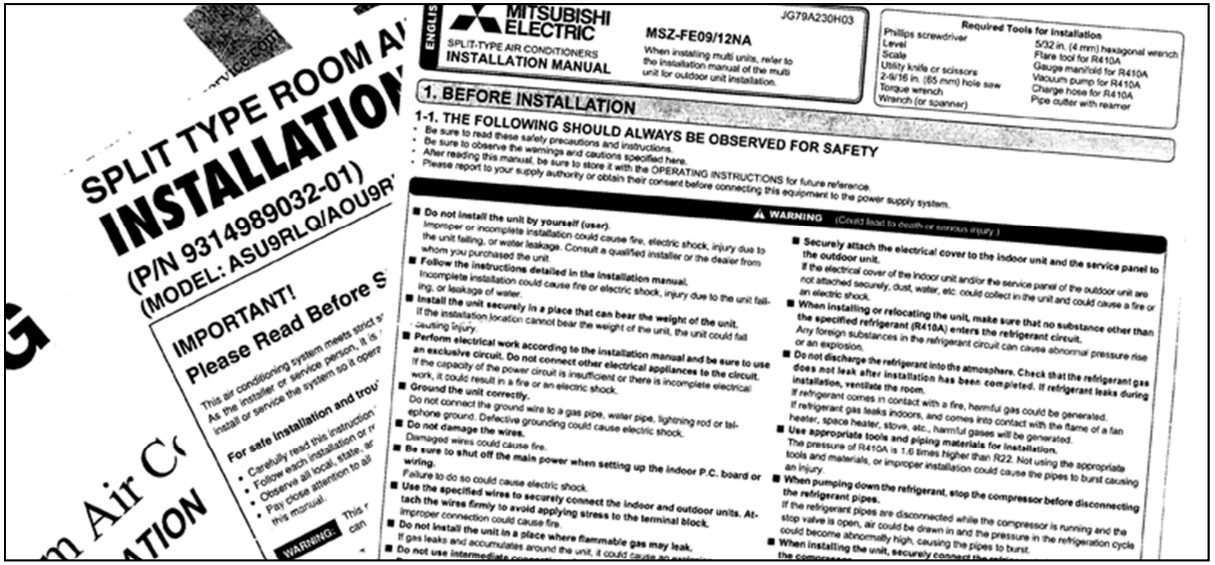
Read the Manual!

- **<u>ALWAYS</u> FOLLOW MANUFACTURERS' INSTALLATION INSTRUCTIONS**
  - Each unit comes with installation instructions specific to make and model



SPLIT TYPE ROOM A
INSTALLATION
(P/N 9314989032-01)
(MODEL: ASU9RLQ/AOU9R

IMPORTANT!
Please Read Before S

MITSUBISHI ELECTRIC
SPLIT-TYPE AIR CONDITIONERS
INSTALLATION MANUAL
MSZ-FE09/12NA
JG79A230H03

1. BEFORE INSTALLATION
1-1. THE FOLLOWING SHOULD ALWAYS BE OBSERVED FOR SAFETY

WARNING (Could lead to death or serious injury.)

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Ensure System Compatibility

- **VERIFY INDOOR AND OUTDOOR UNITS ARE COMPATIBLE**
  - Manufacturers and distributors outline compatibility, but ultimate responsibility lies with the installer
  - Multi-zone systems have many possible combinations

Multi-Split Systems

Outdoor Units	Wall Mounted Indoor Units				
Heat pump	CTXS 07JVJU	CTXS 09HVJU	CTXS 12HVJU	FTXS 15HVJU	FTXS 18HVJU
2MXS 18GVJU	●	●			
3MX 24JVJU	●	●	●	●	●
4MXS 32GVJU	●	●	●	●	●

Allowable Combinations

41 Combinations Based on BTU (Over 300 Combo's Based on Indoor Type and BTU)

AOU18RLXFZ (Dual Zone)

Zone 1	Zone 2	Total Connectable Capacity	Total BTU	Connectable Capacity
7,000	7,000	14,000	18,000	77.8%
7,000	9,000	16,000	18,000	88.9%
9,000	9,000	18,000	18,000	100.0%
7,000	12,000	19,000	18,000	105.6%
9,000	12,000	21,000	18,000	116.7%

Remember: These systems ***do not*** require branch boxes or separation tube assemblies.

AOU24RLXFZ (Dual or Tri Zone)

Zone 1	Zone 2	Zone 3	Total Connectable Capacity	Total BTU	Connectable Capacity
7,000	7,000		14,000	22,000	63.6%
7,000	9,000		16,000	22,000	72.7%
9,000	9,000		18,000	22,000	81.8%
7,000	12,000		19,000	22,000	86.4%
9,000	12,000		21,000	22,000	95.5%
7,000	7,000	7,000	21,000	22,000	95.5%
7,000	7,000	9,000	23,000	22,000	104.5%
12,000	12,000		24,000	22,000	109.1%
7,000	18,000		25,000	22,000	113.6%
7,000	9,000	9,000	25,000	22,000	113.6%
7,000	7,000	12,000	26,000	22,000	118.2%
9,000	18,000		27,000	22,000	122.7%
9,000	9,000	9,000	27,000	22,000	122.7%

Required Tools for Installations

RATCHET FLARING TOOL

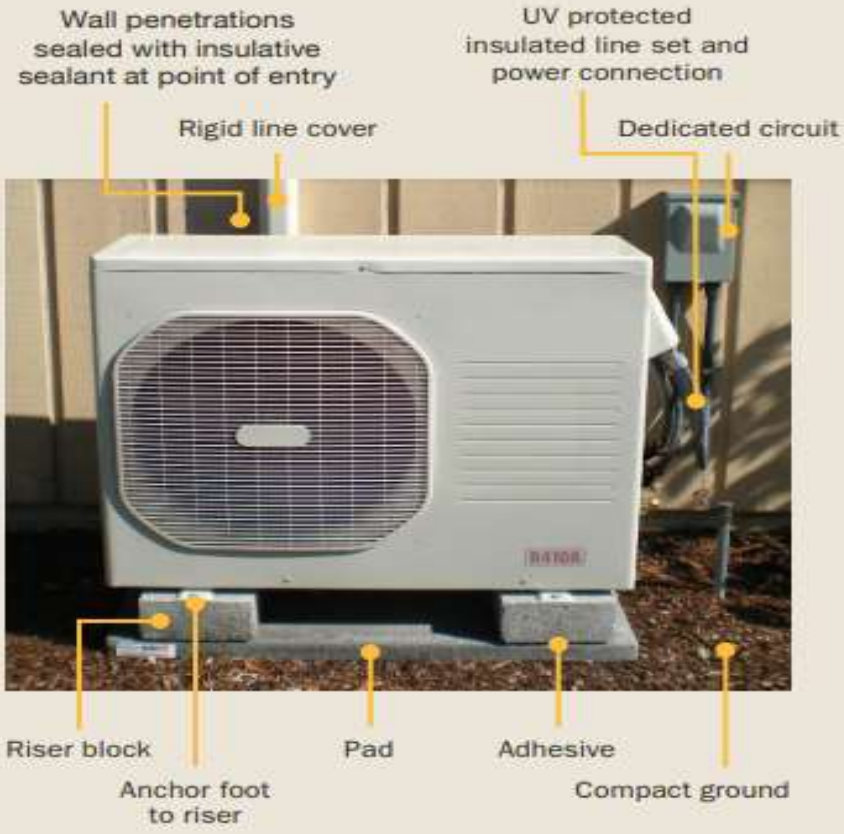
R410A GAUGE AND HOSE SET

TORQUE WRENCH

PROGRAMMABLE REFRIGERANT CHARGING SCALE

VACUUM PUMP

PROPERLY INSTALLED OUTDOOR AND INDOOR UNITS



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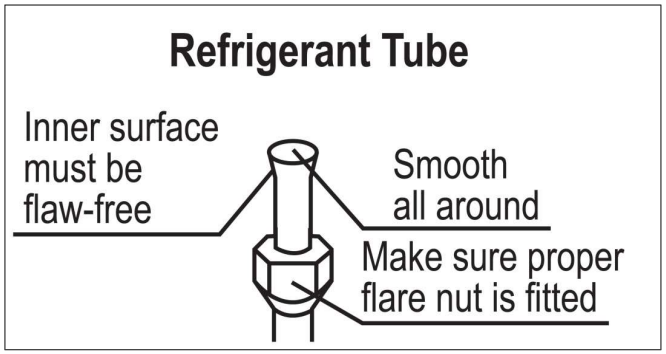
Refrigerant Tubing

- **DO NOT REUSE** factory tubing flares and fittings
- Create new flares using appropriate **R410A flaring tool** and measurement gauge
- Apply refrigerant oil to the end of each flare
- Connect tubing on indoor units and outdoor units with **R410A nuts** (supplied with units) using a torque wrench tightened to manufacturers' specifications



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Insulating and Protecting Line Set

- Insulation must cover entire length of line set
- Protect outdoor portion of line set from UV degradation and physical damage
- Weatherproof wall penetration

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Running Drainage

- Condensate drain
  - Must slope downhill and can either be routed with the line set or run to a different termination point
  - Cannot terminate in a crawlspace or on a pathway

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Defrost Discharge and Drainage

- Defrost discharge
  - In cold weather, outdoor units can discharge considerable amounts of water
  - Frozen discharge water poses serious safety hazards – place outdoor units accordingly

- Cold climate installations
  - Use a pan heater to avoid defrost discharge freezing inside compressor unit
  - Increase clearance under outdoor unit to promote easy drainage and reduce snow and ice build up
  - Consider wall-mount brackets to maximize outdoor unit clearance

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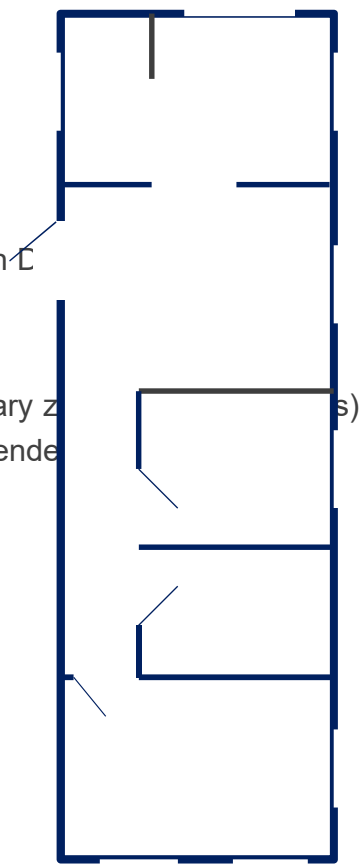
DHP as Primary Heating System

- Integrate the ductless system
  - Thermostat location and settings
  - Remote thermostat sensors
  - Set electric resistance heat thermostat back to avoid competing with D
- Backup heat sources
  - Existing zonal electric system or 120-volt space heaters for secondary z s)
  - Consider turning off electric resistance heat system at breaker, depende
- Homeowner perception
  - Zonal heating
  - Comfort and savings expectations
- Devise a heating control strategy for each homeowner!



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Cold Climate DHP's

- Compressor must be variable capacity
- Maintains 100% of rated capacity at 5° F without electric resistance backup heating
- The ratio of maximum to minimum heating output at 47° F (aka the "turn down ratio") should be at least 4.0, preferably 5.0 or better to minimize short cycling under low load conditions.
- Indoor and outdoor units must be part of an AHRI matched system
- ENERGY STAR certified
- COP @5° F >1.75 at maximum capacity (available on NEEP qualified products list)
- HSPF >10 for single indoor head systems or HSPF >9 ducted mini-split systems
- Must have a drain pan heater

Resources

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List of Resources

- NW Ductless Project Website
  - Partner Website
    - https://goingductless.com/partners
  - Consumer Website
    - https://goingductless.com/
- Qualified Contractor List
- Qualified Product List
- BPA supported Marketing Materials
- Homeowner Guide
  - https://goingductless.com/assets/documents/uploads/DHP_Homeowners-Guide_FNL_REF.pdf

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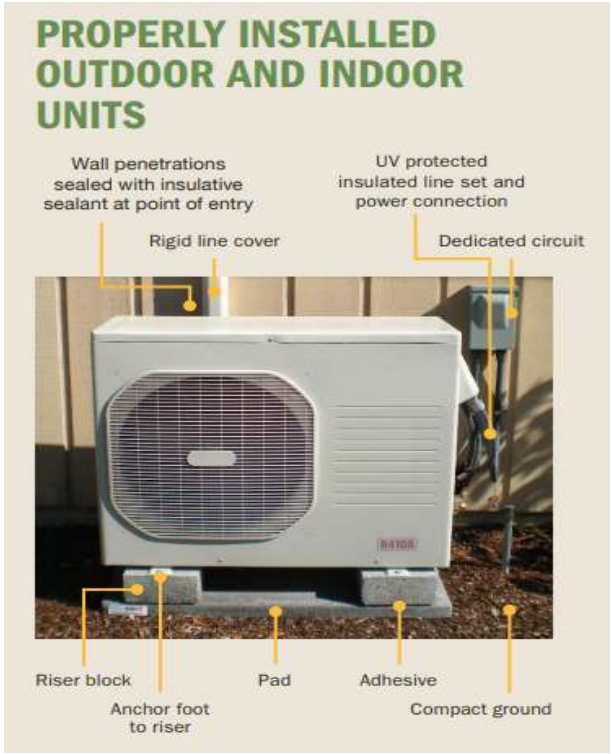
Best Practices Installation Guide

- https://www.bpa.gov/EE/Sectors/Residential/Documents/Installer-BestPractices-Guide.pdf



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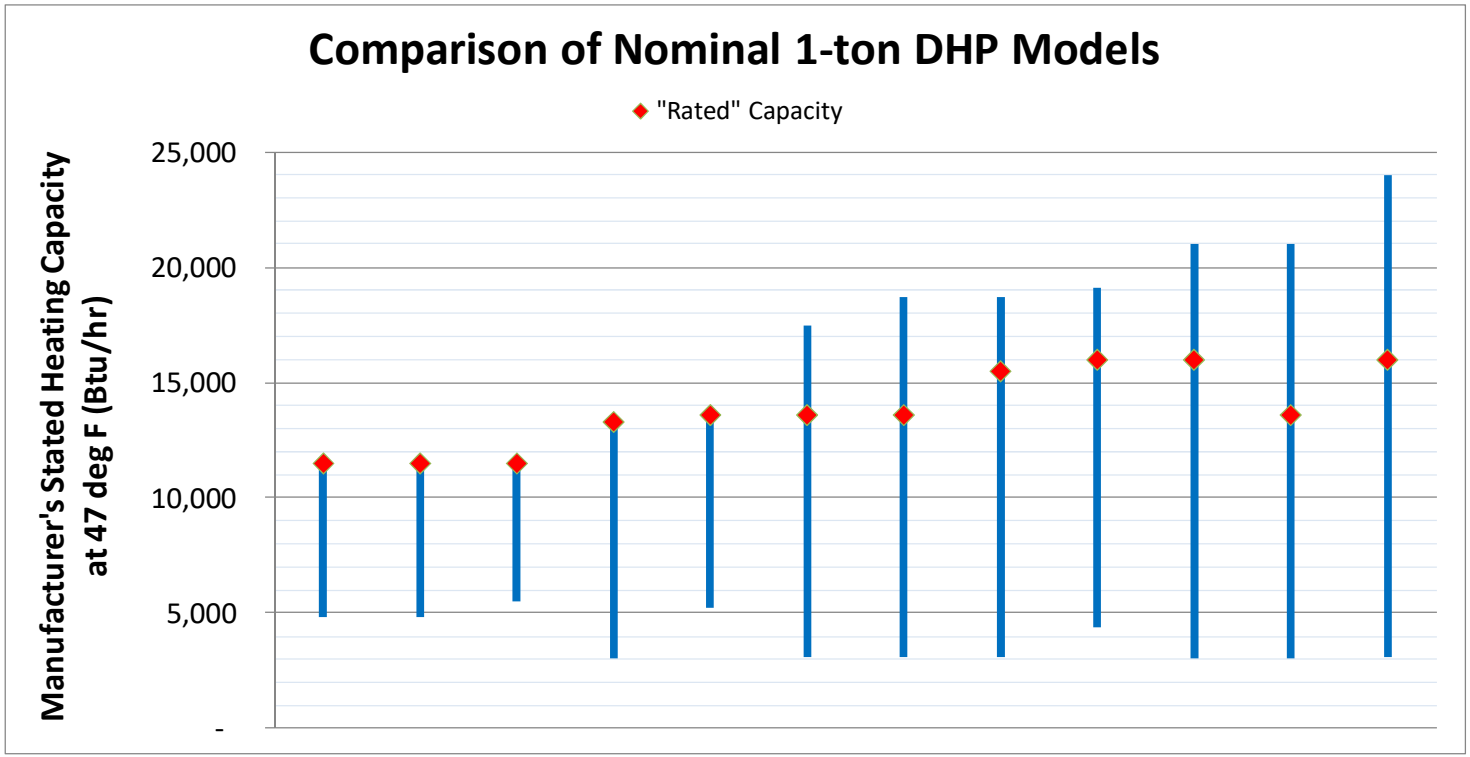
NEEP Resource

- http://www.neep.org/initiatives/high-efficiency-products/emerging-technologies/ashp/cold-climate-air-source-heat-pump

Sizing Ductless Heat Pumps



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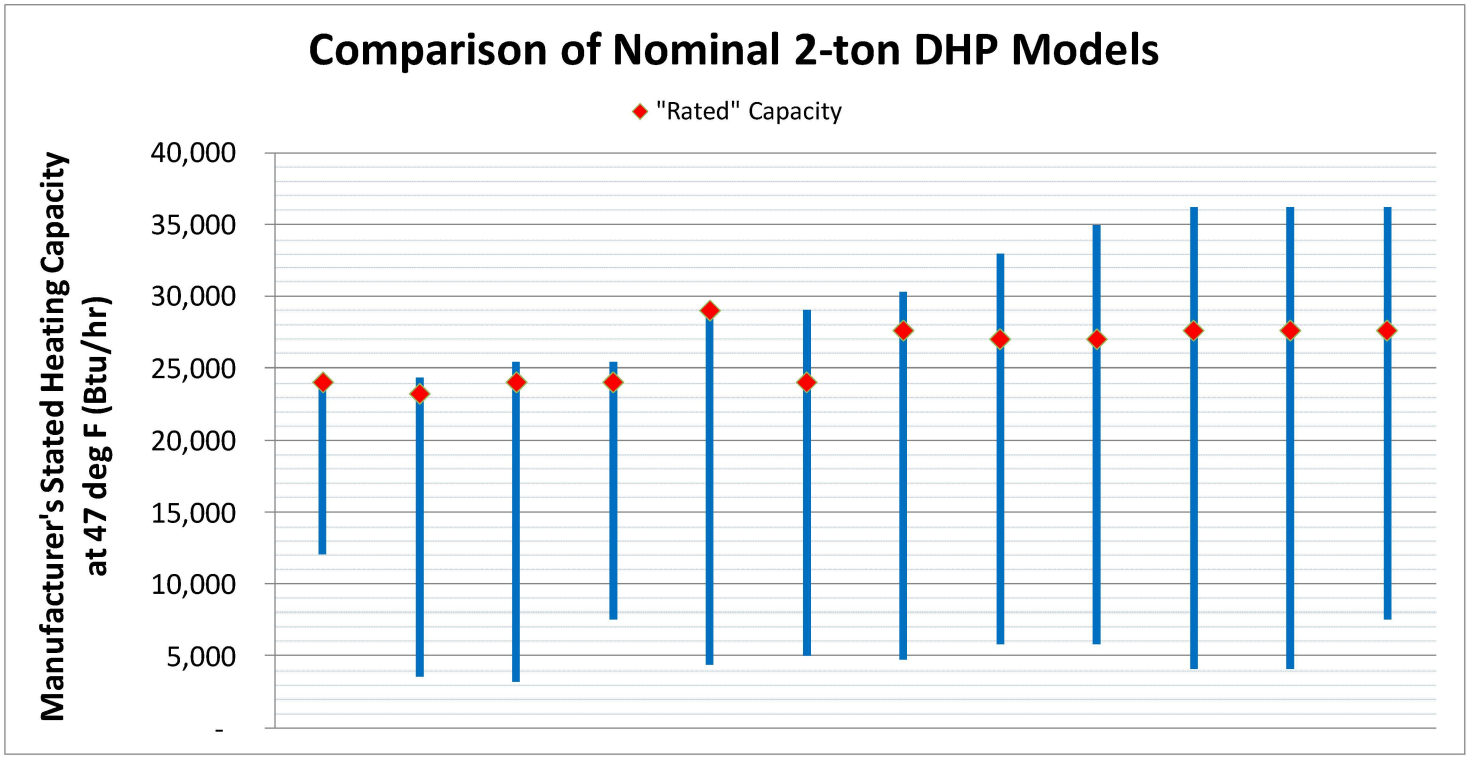
Sizing Ductless Heat Pumps



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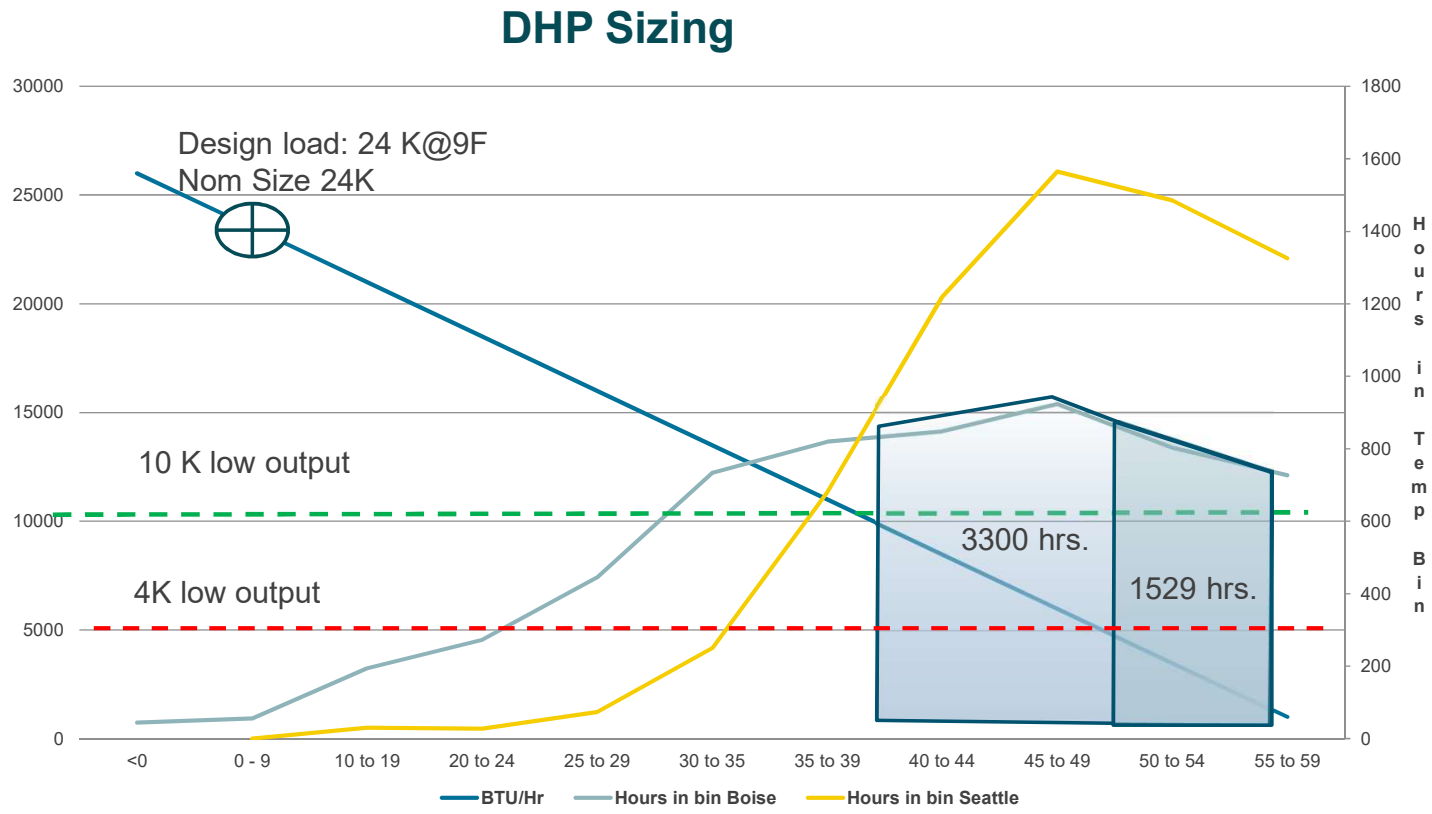

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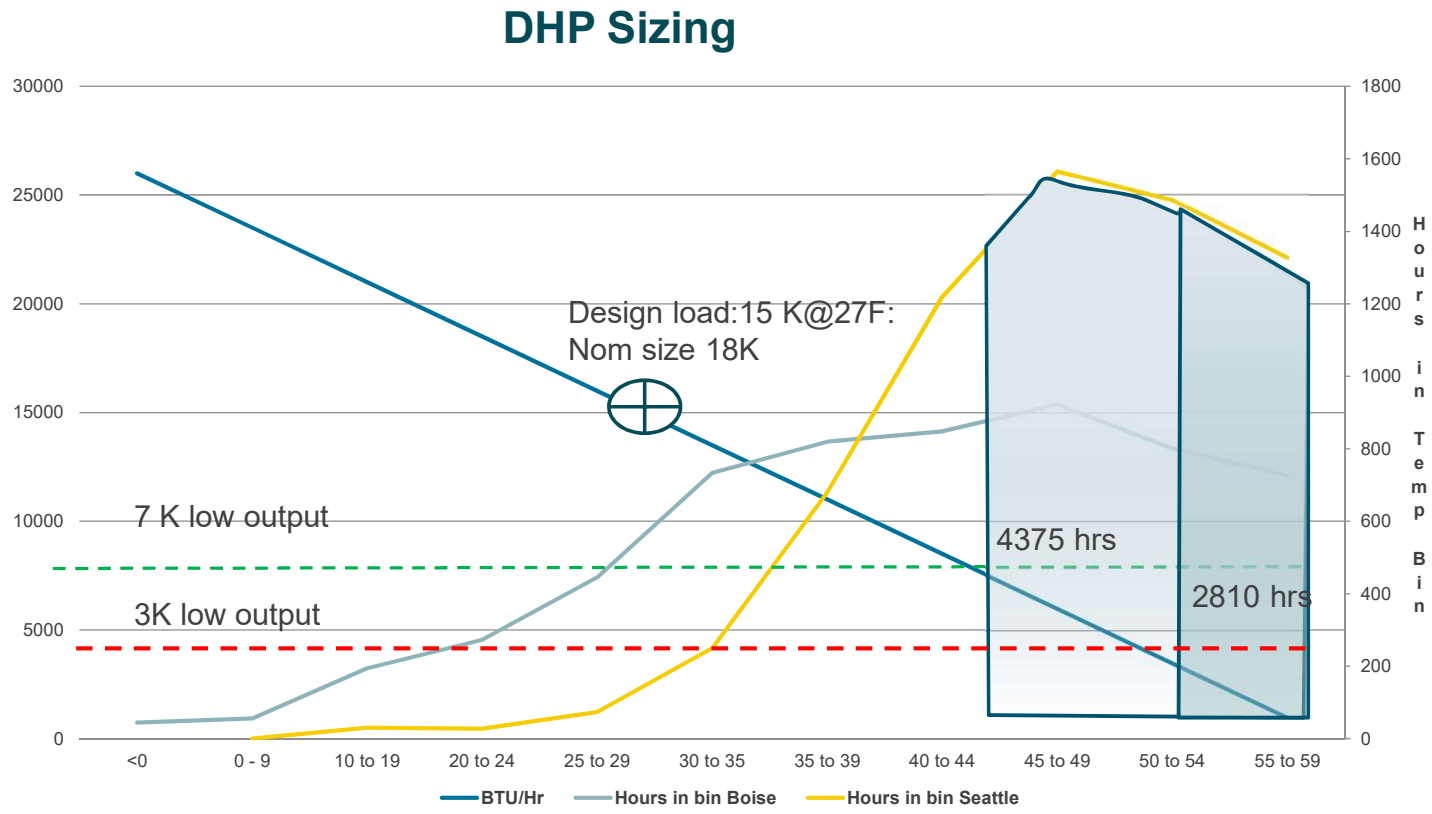

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Sizing Cold Climate DHP's

Load Calculations & System Sizing

- Avoid oversizing a DHP system. A cold climate heat pump does not require the "old-school" oversizing rules for heat pumps, they can deliver warm air even when it is very cold out. Calculate the design load as accurately as possible, without "padding" the estimates with additional safety factors. Under no condition size greater than 125%.
- Use capacity tables for sizing, not the nominal rated capacity of the DHP system (they are rarely the same)
- While a room by room heat loss calculator is the gold standard for proper sizing, a cold climate heat pump with a good turn down ratio (greater than 4.0) will be perform well within these guidelines:

House Description	Sizing Guide
Pre 1970's, and/or poorly insulated	500 ft^2 per ton of rated heating capacity
Average 2x6 construction	650 ft^2 per ton of rated heating capacity
Homes newer than 2004	750 ft^2 per ton of rated heating capacity

- Use a room by room design calculator (e.g. SpecPro) when the zone being heated or cooled:
  - has more than 25% window to floor area.
  - has large unshaded south or west facing windows with potentially very high cooling loads
  - Is isolated from the rest of the home (a "peninsula" with only one or two shared surfaces)

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- Mark Jerome
- 541-670-8495
- mark.jerome@clearesult.com

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July 26, 2018 Low-Income Workgroup Meeting, Bellingham, WA

Attendees: *On the Phone (only)* - Marsha Lemon, Michelle Olette, Jessica Taylor, Christina Zamora, Pat Didion, Eric Miller, Tanya Beach, Terry Mapes, Melissa Podezswa, Dena Hilde, Robert Frost, Cheryl, Oriana Magnera, Brandy Neff, Paul Hawkins,

Present In the room in Bellingham - Jess Kincaid, Carrie Nelson, Michelle Lopez, Steve Jole, Mark Jerome, Jeremy Stewart, Travis Hardy, Shawn Collins, Cameron Daline, Paula Morrier, Danielle Walker, Randy Olson, Doug Dickson, Britt Pomush, Suzi Asmus, Sandy Sieg, Chris Clay, Todd Blackman, Keith Kueny, Aaron Dumas, Desiree Shernoff

10:00 Introductions and Workgroup Update, Carrie Nelson, BPA

The Steering committee has two vacancies - one utility and one non-utility position. Once names of those interested are submitted, the committee will make a determination.

For information the notes from manufactured home replacement workshop have been posted on the website (LINK HERE)

10:15 Intro to Building Performance Center – Chris Clay, Technical Trainer & Quality Assurance Manager

The Building Performance Center a Non-Profit Organization that is part of the Opportunity Council. The Building Performance Center provide testing for BPI for certifications and the Opportunity Council performs weatherization in three different counties. They have a training center for weatherization programs, audits and installers both on site and around the country, in the field and in their facility customizing to user's needs. They also have equipment and facility rentals.

10:30 Resource Program Findings and what it means for 2020 - 2021 BPA EE Savings Goal – Danielle Walker, BPA Energy Efficiency Planning Representative

The energy efficiency portion of the Resource program an initiative to align BPA's energy efficiency offerings with our strategic plan.

Historically quantification of energy efficiency potential has been based on load, but load is not directly correlated with savings potential, so BPA took on this effort to quantify savings potential within BPA's service area. –Currently, if energy efficiency is cost effective and savings are reliable we offer measures it, the timing or location of kWh doesn't matter.

The Resource program takes the power and capacity needs across our service territory and determines the least cost and least risk strategy for meeting the needs through an optimization model. Then determines which approach is right to keep costs as low as possible. Demand response was chosen in every portfolio. Now we're trying to figure out which measures from EE to help best meet our needs by helping reduce load when we have needs without increasing the surplus.

The outcomes - BPA can continue to meet goal through EE, DR and market purchases but not all savings are equal, some provide more value under the resource program, but the goal is a lot less lighting, a lot more HVAC and a little more industrial.

We will come back to the group in a few months when we know what it means for programs. Next steps are to begin transition, identify measures and programs, and assess costs, resources and impacts on goals. Will begin implementing in the next rate period.

More information is available on the IPR web page.

11:15 Hard to Reach Markets / Underserved Update – Danielle Walker, BPA Energy Efficiency Planning Representative

Hard to Reach Market analysis is an action item from Seventh Power Plan to look at markets that may be underserved and see whether they are served in proportion to other markets. The goal is to see whether anecdotes are true and if so what strategies could reduce barriers. Coalition of willing utilities participated and a paper was just published, it has all of the data for low-income. The study found that low cost measures are actually being shared proportionate to their percentage of the population. The highest income brackets participate the least. Manufactured housing residents participate at higher rates than single and multifamily housing and the multifamily housing had lower participation.

BPA findings were that BPA serves low- income residents at a slightly higher rate and small rural utility areas are served but do have barriers.

11:30 Smart Thermostats – Jess Kincaid, BPA Energy Efficiency Steering Committee Representative

Smart Thermostats are a simple measure with significant savings potential and an optional ASHP optimizing function. Energy savings can be achieved without use of a smart phone or computer, but both help utilize additional convenience features. Saves an average of 6% of heating bill with resistance heat, and 12% for ASHP—right out of the box.

Requirements for the forthcoming low-income measure are to provide income documentation as other low-income measures and up to a $400 payment, no repair costs will be allowed with this measure - to prevent high installation costs. Like the standard income measure, customers will be required to provide model, serial number, and site ID.

Wrap Up and Next Steps

Next meeting agenda suggestions:

Best practices for smart thermostat installations
What can we do in multifamily (what measures work?)