Cost-effectiveness & Evaluation Advisory Committee Meeting

Northwest Energy Efficiency Alliance

March 6, 2025

CLASSIFICATION LEVEL: PUBLIC

Introductions & Ice Breaker

- Name
- Organization
- If you could be anywhere else right now (but still attending this meeting, of course!), where would you be?

Susan Hermenet: Words of Wisdom

Agenda

9:00AM	Welcome/Agenda Review/Announcements
9:15	Dual Fuel Measurement Operational Guidelines
9:30	Key Inputs and Assumptions Update
10:00	State Energy Code Baseline and Key Assumption Review
10:15	BREAK
10:25	Market Research and Evaluation Update
10:40	Extended Motor Products (XMP) Market Progress Evaluation Report (MPER)
11:00	Montana Commercial Code Compliance Review
11:25	Montana Residential Code Compliance Review
11:50	Wrap Up

Efficiency Exchange 2025

Early Bird Registration

February 18 – April 25

neea.org/EFX

EFX25 Hybrid Conference

May 20-21 in Portland

In-person + Virtual

Memo pg. 3

Feedback Requested on NEEA Reports

- Assessing value/content of various NEEA reports
- **REQUEST**: Take survey by Fri Feb 21
- May lead to streamlining materials and/or communication channels

[See packet pg 24]

Dual Fuel Measurement Operational Guidelines and Work Group

Dual Fuel Developments

Jan 2024: Last workgroup meeting

- Reviewed first draft of Operational Guidelines
- Recommended review of NEEA Board policy statements prior to continuing

Mar 2024: HB 1589 Passed the WA legislature

- This bill restricted Puget Sound Energy (PSE)'s ability to provide rebates on residential gas appliances (excluding dual-fuel systems)

April - July 2024: NEEA refocused gas portfolio

- Refocused gas-funded portfolio for the 2025-2029 cycle prioritizing dual-fuel, fuel neutral, and commercial opportunities relevant to all funders

Nov 2024: Initiative 2066 passed in WA

- This initiative partially repealed HB 1589 and allows PSE to continue offering rebates on natural gas appliances

Fall 2024: NEEA Board committee policy review

- NEEA's Board committees reviewed and proposed changes to the organization's natural gas policy

Dec 2024: Board approval

- NEEA's Board approved the updated natural gas guiding principles

Q1 2025: Dual Fuel Measurement Guideline revision

- NEEA staff conducted an internal review and revision of the Dual Fuel Measurement Operational Guideline document and solicited feedback from the work group

New Natural Gas Guiding Principles

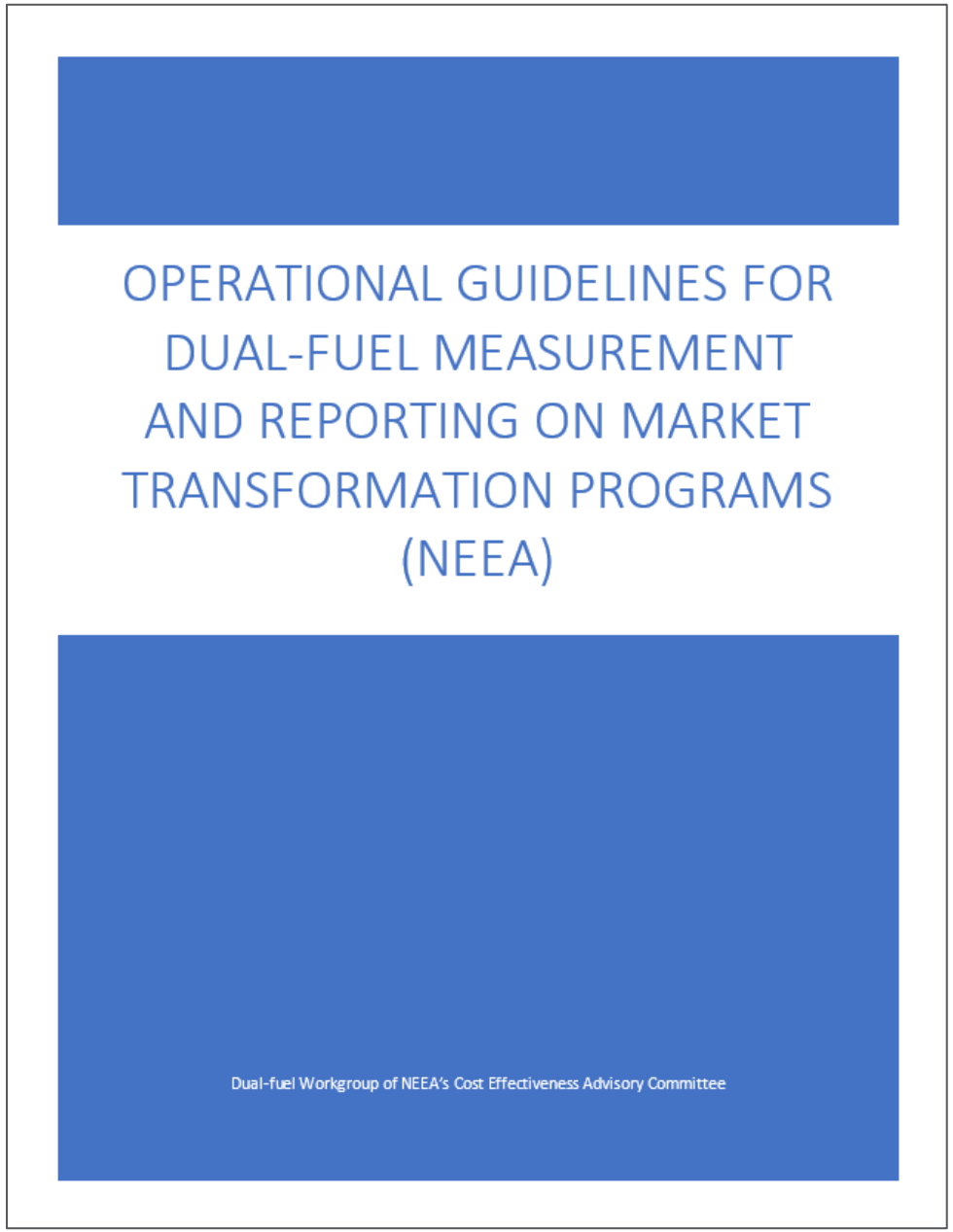
NEEA's Board of Directors approved in December 2024

Natural Gas Guiding Principles for Decision-Making

1. NEEA's natural gas portfolio will increase market adoption of affordable energy efficiency solutions that result in reportable gas energy savings.
2. All activities and programs will be designed to align with state policies and/or other decarbonization efforts as applicable.
3. The focus of the natural gas portfolio will shift towards commercial, dual-fuel, and fuel-neutral products, systems, and practices.
4. **Dual-fuel equipment programs will be managed as part of the natural gas portfolio due to the increased end-use efficiency and reduction in natural gas usage.**

Operational Guidelines Review and Discussion

Overview of Current Draft



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Organization

Revision History

Key Terminology and Definitions

Operational Guidelines

- Purpose and Background
- Guiding Statements
- Foundational Criteria for Dual-fuel Market Transformation Programs
- Inputs Needed and Outputs Generated for Measure Impact Assessment
- Reporting to Stakeholders

Appendix A: Additional Calculation Guidance

- Measure Application and Baseline Condition
- Site Energy and Source Energy
- Avoided Emissions
- Peak load impacts and load flexibility benefits
- Cost effectiveness
- Naturally-Occurring Market Transformation Baseline

Appendix B: Work Group Participation

Operational Guidelines:
Purpose and Background

- NEEA is defining **dual-fuel market transformation programs** as those that include equipment that directly uses both electricity and gas for the same end-use and can do so interchangeably

- This **is not** intended to establish guidelines for any other organization, utility or jurisdiction.

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Operational Guidelines:
Guiding Statements

Impacts are assessed at the combined system level in addition to within each fuel

Impacts are assessed at the source level in addition to site level

Calculations and reporting follow existing policies and use existing methods where possible and appropriate

Guidelines will be updated as needed with review from the Cost Effectiveness and Evaluation Advisory Committee (CEAC)

Operational Guidelines:

Foundational Criteria for Dual-fuel Market Transformation Programs

- The efficient solution must lead to a **reduction in the combined system energy use** required to **provide the same or greater level of service** as compared to the appropriate inefficient alternative baseline condition for that measure. This **may include absolute usage increases** for one of the fuels involved.
- The efficient solution must be cost effective following NEEA's existing cost effectiveness guidelines.

Next Steps

Today: Share the working document at Mar 6th CEAC

Residential Dual Fuel HVAC Concept Advancement in 2025

Further revisions to guidelines as needed

Thank You Work Group Participants!!

Name	Organization
Laura Thomas	Regional Technical Forum
Peter Kernan	Oregon PUC
Jean-Pierre Batmale	Oregon PUC
Jennifer Snyder	WA Utilities and Transportation Commission
Jake Kennedy	Energy Trust of Oregon
Adam Schick	Energy Trust of Oregon
Jackie Goss	Energy Trust of Oregon
Michelle Wilde	Puget Sound Energy
Jesse Durst	Puget Sound Energy
Haixiao Huang	Northwest Natural Gas
Caleb Reimer	Cascade Natural Gas
Danie Williams	Northwestern Energy
Whitney Jurenic	Northwestern Energy
Bryan Russo	Tacoma Power
Jonathan Belmont	Bonneville Power Administration
Tina Jayaweera	Northwest Power and Conservation Council
Austin Oglesby	Avista Corp
Michelle Kelley	Bonneville Power Administration
Natasha Jackson	Northwest Gas Association

Thank You!

Ryan Brown

Manager, Planning and Analysis

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Key Inputs and Assumptions Update

Objective/Agenda

- Process reminder
- This quarter's topics:
  - Refrigerator Incremental Measure Cost
  - Manufactured Homes Savings Rates (packet only)

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Why do we have this standing agenda item?

CEAC Charter

Responsibilities

1. Review and advise regarding NEEA cost-effectiveness and savings information to inform annual reporting.
2. Review and advise regarding market transformation cost and savings measurement and estimation methods.
3. Review evaluation findings that affect cost and savings information to inform annual reporting.
4. Work with your organization to provide NEEA staff with relevant incentive data for regional tracking and reporting purposes.
5. Review and advise regarding new market research and evaluation methodologies.

Input Development and Review Process

Develop Inputs

NEEA staff develops Key Assumptions in alignment with the region through:

- Internal analysis,
- External studies,
- Regional Technical Forum

Validate Assumptions

NEEA staff commissions 3rd party evaluations for new Key Assumptions and for changes to Key Assumptions used in the reporting of savings.

Report Inputs and Assumptions

NEEA staff reviews new and updated Key Assumptions with CEAC every quarter. Additionally, NEEA staff will highlight any Key Assumptions that may warrant updating and solicit input from the committee for better data to inform a Key Assumption.

Post Inputs and Assumptions

Full set of regional key assumptions used for reporting is made available on NEEA Funder Portal

System of Documentation Available

Funder Portal
neea.org

Updated in April

Data Sources
List of data sources NEEA uses to estimate savings & cost effectiveness and explanation of approach
Cost Effectiveness Table
ProCost Inputs for programs in Market Development
Methodology Documentation
Report on energy consumption calculations, data sources and technical assumptions
Operational Guidelines
Overview on energy savings & cost effectiveness calcs

Refrigerators Incremental Measure Cost (IMC)

Data Collection: Web-Scraping

- Collected refrigerator information from **two** different retailers across Q1-Q3 2024
- Filtered out compact/mini refrigerators, replacement parts, and non-refrigerators.

Retailer	Record Count before removing compact refrigerators	Record Count after removing compact refrigerators
TOTAL	**75,022**	72,978

Configuration	Record Count before removing compact refrigerators	Record Count before removing compact refrigerators
Bottom-mount	51,162	51,162
Side-mount	8,911	8,911
Top-mount	12,905	12,905
Compact	2,044	0
TOTAL	**75,022**	72,978

Data Collection: Pre-processing

- Removed outliers based on:
  - Price
  - Capacity

- Cutoff points
  - 1.5 Interquartile Range (IQR) larger than the 3rd quartile; *or*
  - 1.5 IQR under the first quartile

Configuration	Record Count before removing price outliers	Record Count after removing price outliers	Record Count after removing capacity outliers
Bottom-mount	51,162	47,085	47,085
Side-mount	8,911	7,617	7,560
Top-mount	12,905	12,520	12,440
TOTAL	72,978	67,222	67,085

Regression Analysis

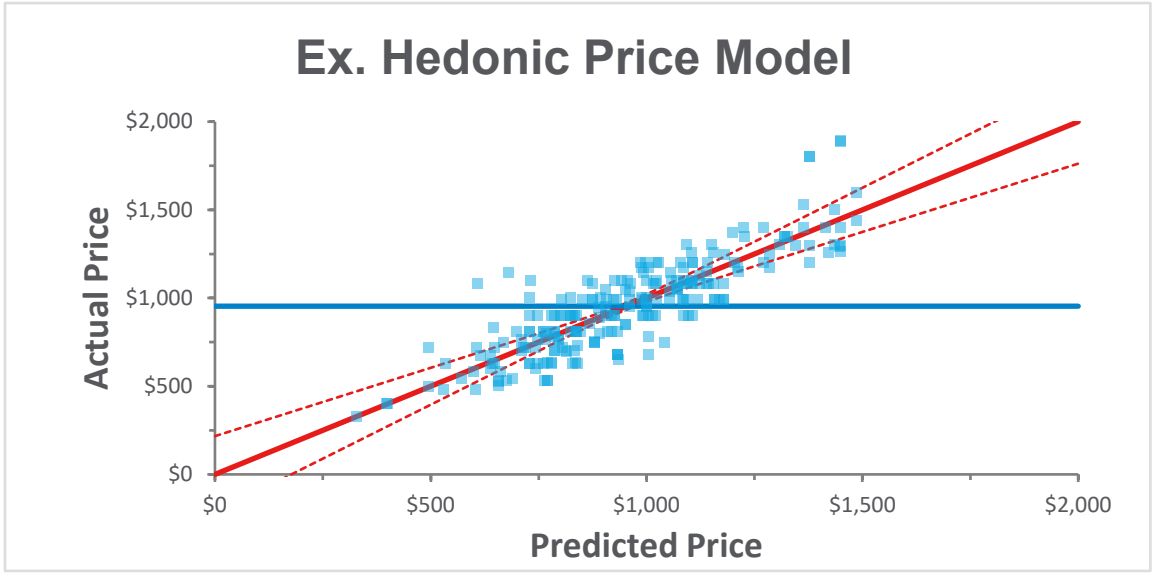
Methods: *Multiple Regression*

Hedonic price modeling

Assumes: $Price \approx f(Atribute\ 1, Attribute\ 2, Attribute\ 3 \dots)$

Controlling for variables using multiple regression

Generally: $Price = \beta_0 + \beta_1 (X_1) + \beta_2 (X_2) \dots + \beta_p (X_p) + \epsilon$



For example:

- *Price = Constant + β_{Cap}(Capacity) + β_{color}(Color) + β_{ESTAR}(ESTAR)*
- β for ESTAR estimates the effect of ESTAR on price, controlling for capacity (a numeric field) and color (a categorical field)

- Estimates coefficient (β) for each variable as well as the **95% confidence interval** for that β value

Results

Summary Table: *IMC Results*

(all values in 2024$)	Bottom-mount	Side-mount	Top-mount
ENERGY STAR Most Efficient IMC Estimate	-$69	$625	$102
95% Confidence Interval	-$200 to $60	$546 to $702	$91 to $114
No. of Data Points	45,940	4,630	12,440

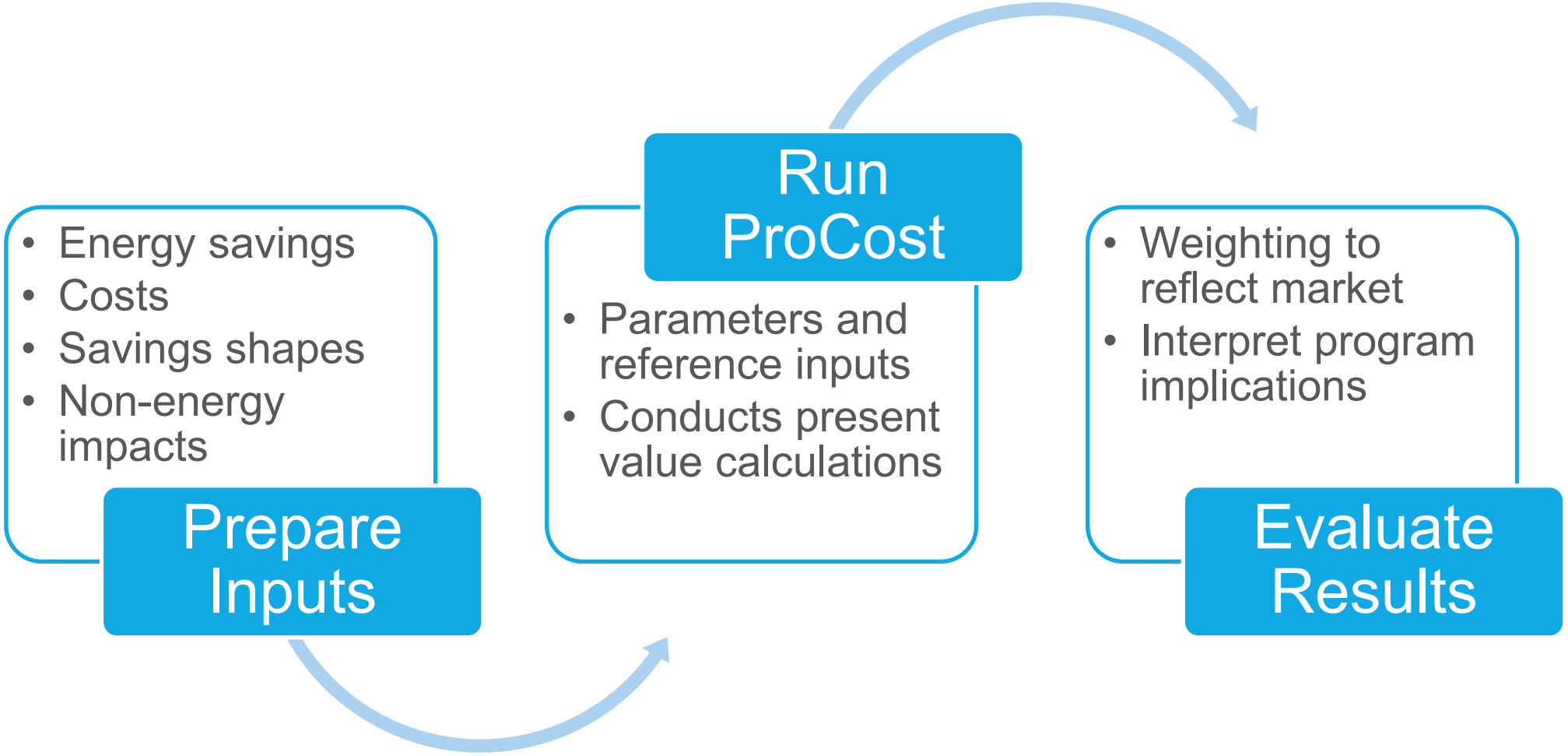
Sale Price For Bottom-Mount Refrigerators

Straight Average

Sales Price

Sales-Weighted Average

Using ProCost to Calculate Results



Inputs

Configuration	Current IMC (2016$)	Prior IMC (2016$)	Current Savings Rate (kWh/yr)	Prior Savings Rate (kWh/yr)
Bottom-mount	-$69	$0.01*	153	105
Side-mount	$416	$160	170	118
Top-mount	$78	$51	27	34

**Prior analysis result was -$90 in 2016$*

- Unchanged:
  - Savings shapes
  - HVAC interaction factors
  - Measure life

ProCost Engine

Northwest Power and Conservation Council

Regional Technical Forum

- Council's tool
  - Regional perspective
  - Life-cycle view of costs and benefits
- ProCost computes
  - Regional cost-effectiveness (benefit-cost ratio)
  - Levelized cost of savings ($/kWh)
  - Many additional cost, savings, and other benefits

ProCost | Regional Technical Forum (nwcouncil.org)

Evaluating Results: Cost Effectiveness at Different Levels

Measure level	Single measure view Informs program strategy
Program level	Aggregate across measures based on program forecasts Advancement decisions within portfolio
Portfolio level	Aggregate across programs Market Transformation investment from societal perspective

Preliminary Outputs

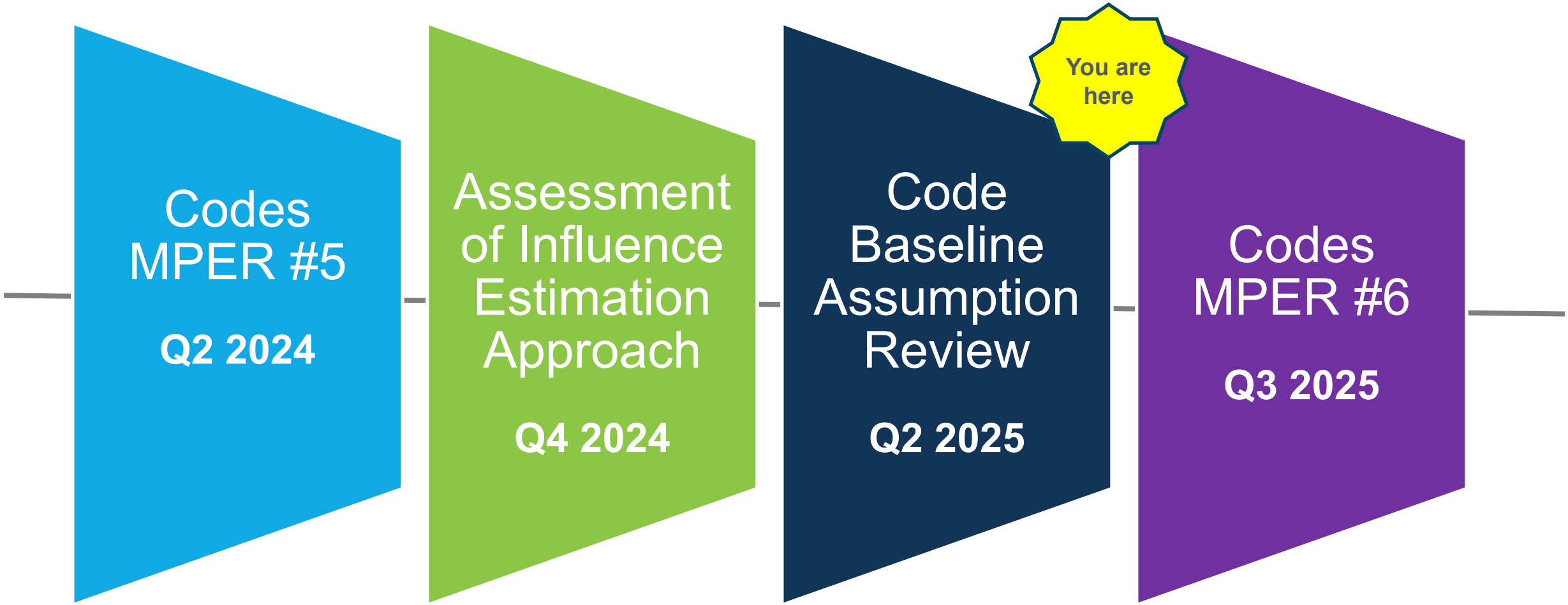
Benefit-Cost Ratio	Current	Prior
Program: Retail Product Portfolio	1.9-2.1	2.5
Product: Refrigerators	0.9-1.1	0.8
Measure: Refrigerators, Bottom-mount Freezers, ENERGY STAR Most Efficient	44	25
Measure: Refrigerators, Side-mount Freezers, ENERGY STAR Most Efficient	0.2	0.3
Measure: Refrigerators, Top-mount Freezers/Other, ENERGY STAR v5	0.2	0.2

- Some measures <1
  - Results weighted using forecasted regional units
- Program strategy
  - Focused on advanced adaptive compressors in bottom-mount configuration
  - Priority is test procedure and market differentiation

Questions?

State Energy Code Baseline and Key Assumption Review

Recent Code Evaluations & Reviews



Codes Natural Market Baseline Review

- NEEA's codes baseline approach was developed with CEAC in 2014
- A lot has changed since then
  - More parties representing a broader range of interests
  - Other factors driving efficiency (for example, state-level carbon reduction goals)
- Is NEEA's current approach still the most reasonable way to calculate code-related savings?

Research Context

- This evaluation requires an assessment of how the code development and adoption process has evolved in the Northwest over the last ~10 years
- The analysis should also consider what code development and adoption processes look like without the involvement of efficiency advocates like NEEA

Research Questions

- Is tracking 100% of the *Total Regional Savings* as *Co-Created Savings* for 10 years still the most reasonable way to calculate code-related savings?

- If not, how should NEEA update its baseline and/or other assumptions to more accurately capture NEEA and its partners' influence on code changes in the Northwest?

- Is it appropriate to apply the same approach to all states in the Northwest and to both the residential and commercial sectors?

In-Progress Research Activities

- Literature review
- 6 NEEA staff interviews
- ~8 code official and non-NEEA actor interviews

Timeline

- **April 30/May 1, 2025:** Overview of preliminary findings presented to CEAC for discussion

- **June 2025:** Report publicly available

Would you prefer to discuss implications and NEEA staff recommendations at the August CEAC meeting or at an interim meeting in May/June?

Questions?

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Thank You!

Meghan Bean

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BREAK

Market Research and Evaluation (MRE) Update

2024 Q4 Market Research & Evaluation Quarterly Newsletter

WHAT'S NEW:

Greetings to all of you!

Welcome to the Q4 2024 Market Research & Evaluation (MRE) newsletter. Inside are all the details about what NEEA's MRE team has been up to the past few months, as well as what's planned for the start of the new year.

It's been an eventful year. Nearly 40 studies were launched and/or completed in 2024, each of them endeavoring to support continuous improvement of alliance Market Transformation programs by delivering current and high value market insights and evaluation findings. Throughout December and January, look for ten reports to publish to NEEA's website, covering several portfolio programs, including residential code compliance evaluations for both Montana and Oregon, the first Market Progress Evaluation Report for the Extended Motor Products program, and two market research reports to support efforts to transform the gas water heater market.

Looking ahead to 2025, the team is taking time to reflect on the accomplishments of the past year. Thanks to all of our stakeholders for the continued partnership. Best wishes for happy holidays and a prosperous new year.

~ **Amy Webb, Sr. Manager**, Market Research & Evaluation ~

TABLE OF CONTENTS

At a Glance

MARKET RESEARCH & EVALUATION PROJECTS

		PLANNING*	FIELDING*	REPORTING*
Regional Studies	Northwest Market Characterization			✓
Integrated Systems	Efficient Fans: *Fan Manufacturer Representative and Specifier Market Research*		✓	
	Extended Motor Products: *Agricultural Pumps Market Research*		✓	
	Extended Motor Products: *Market Progress Evaluation Report #1*			✓
	Efficient Rooftop Units: *Market Progress Evaluation Report #1*		✓	
	High-Performance HVAC: *Market Progress Evaluation Report #1*		✓	
	Luminaire Level Lighting Controls: *Market Progress Evaluation Report #3*		✓	
	Luminaire Level Lighting Controls: *Exterior Luminaire Level Lighting Controls in Parking Lots*			✓
	High-Performance Windows: *ENERGY STAR Influence Study*			✓
Products	Retail Product Portfolio: *Market Progress Evaluation Report #3*		✓	
	Retail Product Portfolio: *Connected Consumer Products Market Research*			✓
	Advanced Commercial Gas Water Heaters: *Market Research on Existing Water Heaters in Select Commercial Buildings*			✓
	Efficient Gas Water Heaters: *Condensing Gas Water Heater Qualitative Market Research*			✓

DUAL-FUEL (Electric & Natural Gas) PROJECTS:

NATURAL GAS PROJECTS:

***PLANNING:** MRE projects from inception through proposal selection

***FIELDING:** MRE projects from kick-off through the completion of field work

***REPORTING:** MRE projects in the analysis/synthesis stage through report posting

At a Glance

MARKET RESEARCH & EVALUATION PROJECTS

	PLANNING*	FIELDING*	REPORTING*
Codes, Standards, New Construction			
Standards: *Battery Chargers Standard Evaluation*		✓	
Standards: *Portable AC and Air Compressor Standard Evaluation*		✓	
Codes: *NEEA Codes Baseline and Review*		✓	
Codes: *Market Progress Evaluation Report #6*		✓	
Residential Codes: *Home Energy Raters Market Research*			✓
Residential Codes: *Montana Residential Code Compliance Evaluation*			✓
Residential Codes: *Oregon Residential Code Compliance Evaluation*			✓
Commercial Codes: *Idaho Commercial New Construction Code Compliance Evaluation*		✓	
Commercial Codes: *Montana Commercial New Construction Code Compliance Evaluation*			✓
Long-Term Monitoring & Tracking			
Ductless Heat Pump Long-term Monitoring and Tracking, Year 3		✓	

DUAL-FUEL (Electric & Natural Gas) PROJECTS:

NATURAL GAS PROJECTS:

***PLANNING:** MRE projects from inception through proposal selection

***FIELDING:** MRE projects from kick-off through the completion of field work

***REPORTING:** MRE projects in the analysis/synthesis stage through report posting

Extended Motor Products (XMP) Market Progress Evaluation Report (MPER)

Extended Motor Products (XMP) Market Progress Evaluation Report #1

Chris Cardiel

Sr. Market Research and Evaluation Scientist, NEEA

March 6, 2025

Objectives for XMP MPER #1

- Research Objective 1: Review the program's Market Transformation theory, logic model, and Market Progress Indicators (MPIs). Make recommendations as appropriate.
- Research Objective 2: Assess program progress toward its logic model outcomes by tracking a subset of MPIs, including indicators related to stocking and sales of efficient products, awareness and use of the Energy Rating Label, and federal performance standards for pumps and circulators.

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Key Methods

- 8 group or individual interviews with participating manufacturer rep firms
- 12 individual interviews with specifiers and non-participating manufacturer reps
- 56 web- and phone-based surveys with contractors and project owners
- Group interviews with implementation staff and key program partner organizations
- Individual interviews with NEEA program team members
- Review of relevant literature

Other Important Details About Methods

- Survey samples were stratified by state based on commercial building square footage, per 2020 Commercial Building Stock Assessment data

State	% of NW Commercial Square Footage	% of Sample	
		Contractors	Project Owners
Idaho	10%	17%	9%
Montana	10%	10%	9%
Oregon	25%	31%	27%
Washington	56%	42%	55%

- Recruitment of specifying engineers was more challenging than anticipated

Updated 12.28.2024

Market Progress Indicators Assessed in this MPER

- MPI I: Proportion of incented efficient commercial pumps and circulators relative to non-efficient units (a) stocked and (b) sold by participating manufacturers' reps increases or does not decrease year-over-year (YOY)
- MPI II: Among (1) distributors and (2) specifiers, (a) awareness and (b) use of ER Label increases YOY
- MPI III: Number of (a) participating OEMs and (b) certified labs increases YOY
- MPI IV: Market share of (a) efficient commercial pumps and circulators and (b) commercial smart pumps increases or does not decrease YOY
- MPI V: Among (1) contractors and (2) project owners, (a) awareness and (b) use of ER Label increases or does not decrease YOY
- MPI VI: (a) Average and (b) sales-weighted average efficiency of commercial pumps and circulators sold increases YOY (market-wide and by manufacturer)
- MPI VII: (a) NEEA's Codes and Standards team provides documentation to DOE to support increased federal performance standards for pumps, (b) federal performance standards increase, and (c) NEEA's role in increased standards is documented by a third party

Status of Market Progress Indicators (MPIs)

MPI I: Proportion of incented efficient commercial pumps and circulators relative to non-efficient units sold by participating manufacturers' reps increases or does not decrease year-over-year

Year	All Units			Efficient Units		Smart Pumps	
	Pumps	Circs.	Total	Efficient Units Sold	Percent	Smart Pumps Sold	Percent
Participants (*n*=8)							
2022	2,999	18,231	21,230	5,523	26.0%	344	11.5%
2023	3,042	20,570	23,620	7,237	**30.6%**	451	**14.8%**
2024[1]	2,574	15,578	18,352	6,051	**33.0%**	414	**16.1%**
Total	8,623	54,579	63,202	18,811	29.8%	1,209	14.0%
Nonparticipants (*n*=5)							
2023-24	3,885	n/a	3,885	n/a	n/a	255	6.6%
Participants and Nonparticipants (*n*=13)							
Total	12,500	n/a	67,087	n/a	n/a	1,464	11.7%

[1] 2024 data is sales from January 1 to November 15, 2024.

[2] Data not available from nonparticipants because they could not report these numbers.

Status of MPIs, Continued

MPI II: Among (1) distributors and (2) specifiers, (a) awareness and (b) use of ER Label increases year-over-year

Resp. ID	Source of Awareness of ER Label	How has respondent seen ER Label used	Frequency using ER Label to assess client needs	Sold more energy efficient motor because of label	Sold controls because of label	Perc. of customers aware of ER Label
Nonparticipants						
NR1	Manufacturer	Label on pump box	0%	No	No	<25%
NR2	Manufacturer	Spec. in work proposal	<25%	No	No	<25%
NR4	Trade Association	Ad in trade assoc. publ.	0%	No	No	<25%
NR5[1]	Company Training	Training	25 to 50%	No	No	<50%
Participants						
XMP1	Manufacturer	Not applicable	0%	No	No	0%
XMP2	NEEA/Manuf.	Not applicable	0%	No	No	25-49%
XMP3	NEEA	Not applicable	<25%	No	No	<25%
XMP4	NEEA	Not applicable	<25%	No	No	<25%
XMP5	Manuf./Customer	Not applicable	<25%	No	No	DK[2]
XMP6	NEEA	Not applicable	50-74%	No	No	50-74%
XMP7	Manufacturer	Not applicable	<25%	No	No	0%
XMP8	Manufacturer	Not applicable	<25%	Yes	Not sure	<25%

[1] Respondent was reporting their guess for how others in the firm used the ER Label.

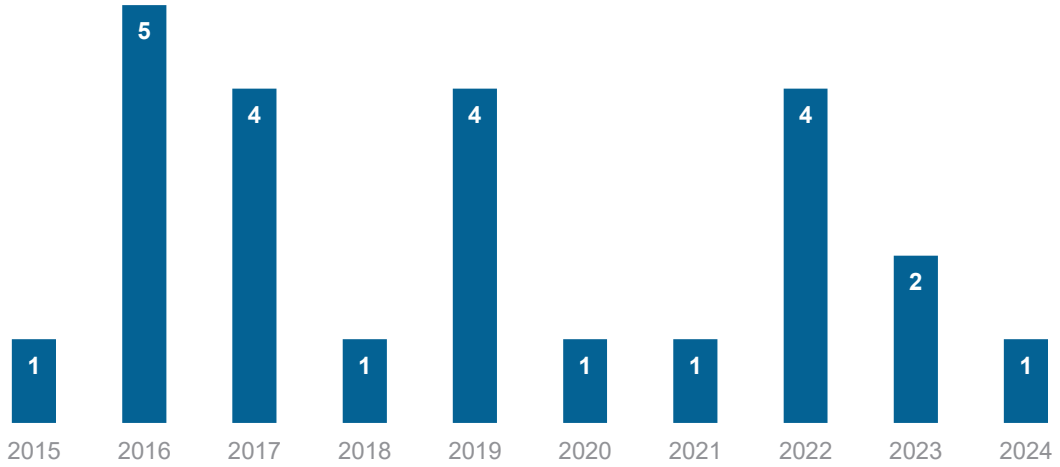
[2] DK = Don't know. Respondent was unable to provide an answer.

Status of MPIs, Continued

MPI III: Number of (a) participating OEMs and (b) certified labs increases year-over-year

The ER Label program has seen continued growth since its launch, with most manufactures including their products in the database. As of summer 2024, the Hydraulic Institute program database included **14,907 (roughly 88%)** of the approximately 17,000 eligible models available in the market.

Number of Labs Certified in the Hydraulic Institute's Pump Test Laboratory Approval Program by Year



Status of MPIs, Continued

MPI IV: Market share of (a) efficient commercial pumps and circulators and (b) commercial smart pumps increases or does not decrease year-over-year

Year	All Units			Efficient Units		Smart Pumps	
	Pumps	Circs.	Total	Efficient Units Sold	Percent	Smart Pumps Sold	Percent
Participants (*n*=8)							
2022	2,999	18,231	21,230	5,523	**26.0%**	344	**11.5%**
2023	3,042	20,570	23,620	7,237	**30.6%** ↑	451	**14.8%** ↑
2024	2,574	15,578	18,352	6,051	**33.0%** ↑	414	**16.1%** ↑
Total	8,623	54,579	63,202	18,811	29.8%	1,209	14.0%
Nonparticipants (*n*=5)							
2023-24	3,885	n/a	3,885	n/a	n/a	255	6.6%
Participants and Nonparticipants (*n*=13)							
Total	12,500	n/a	67,087	n/a	n/a	1,464	11.7%

ID	Number of Pumps and Circulators Sold in Last 2 Years	Pumps			Circulators		Perc. of Revenue from Pump and Circulator Sales
		Const.	Variable	Smart	Hydro.	Dom. Hot Water	
NR1	3,000	40%	**55%**	**5%**	n/a	100%	20 to 39%
NR2	300	10%	**85%**	**5%**	33%	67%	40 to 59%
NR3	500	25%	**60%**	**15%**	n/a	n/a	80 to 100%
NR4	Don't know	50%	**35%**	**15%**	n/a	n/a	20 to 39%
NR5	85	60%	**40%**	**18%**	n/a	n/a	60 to 79%

Status of MPIs, Continued

MPI V: Among (1) contractors and (2) project owners, (a) awareness and (b) use of ER Label increases year-over-year

Awareness

Contractors

	Response	Count	Percent
Recall before shown picture of label	Yes	**2**	**9%**
	No	18	82%
	Not sure	2	9%
Recall after shown picture of label	Yes	**2**	**9%**
	No	7	32%
	Not sure	13	59%

Project Owners

	Response	Count	Percent
Recall before shown picture of label	Yes	**13**	**38%**
	No	16	47%
	Not sure	**5**	**15%**
Recall after shown picture of label	Yes	14	41%
	No	15	44%
	Not sure	5	15%

Use

Neither of the two contractors who indicated awareness of the ER Label reported any form of usage in the course of their work.

	Response	Count	Percent
Someone showed ER Label information when talking about pump or circulator systems?	Yes	**11**	**79%**
	No	3	21%
Respondent used information from ER Label when making decisions about pump or circulator systems?	Yes	**8**	**57%**
	No	5	36%
	Not sure	1	7%

Status of MPIs, Continued

MPI VI: (a) Average and (b) sales-weighted average efficiency of commercial pumps and circulators sold increases year-over-year (market-wide and by manufacturer)

Year	Average Rated Efficiency of Pumps Sold	Sales-Weighted Average Efficiency of Pumps Sold
2022	17.46	16.23
2023	21.18	20.64
2024	23.27	25.90

Status of MPIs, Continued

MPI VII: (a) NEEA's Codes and Standards team provides documentation to DOE to support increased federal performance standards for pumps, (b) federal performance standards increase, and (c) NEEA's role in increased standards is documented by a third party

The main way NEEA staff support increased pump and circulator performance standards is through their work with a coalition of efficiency partners. NEEA staff work with various efficiency partners to comment upon DOE standards, develop new standards, and deliver succinct and data-driven recommendations to DOE. Efficiency partners include the Northwest Power and Conservation Council, ASHRAE, ACEEE committees, California utilities, and the Hydraulic Institute, among others.

Staff noted several examples of ways the federal performance standards increased or will likely increase, including evidence of NEEA's influence on those changes. According to staff, working with a coalition of agencies and providing comments to DOE in a coordinated way increases the likelihood of successfully influencing standards at a national level. This coalition will work together to craft a combined response to DOE recommending new standards or defending existing standards.

Conclusions of MPER #1

- The logic model, theory of change, and MPIs are largely well-designed and appropriately aligned.
  - Contractor recommends highlighting the need for a more robust value proposition related to efficient pump products covered by the ER label
- XMP participants value the program's support and demonstrate active, if varied, involvement and commitment to underlying program principles.
- XMP participants differ from nonparticipants, especially in their sales of smart pumps.
- There is an inconsistent landscape of awareness and use of the ER Label (higher among manufacturers' representatives, moderate among project owners, and lower among specifiers and contractors).
- NEEA serves as a critical player in working to expand and increase federal performance standards for pumps and circulators.
- Specific market actor research is necessary to better understand the population of clean-water pump and circulator specifiers, contractors, and project owners.

The XMP logic model, while largely well-designed, may benefit from fine-tuning

In general, the logic model captures the theory of how the market will change with NEEA's intervention and aligns with program activities and those activities address the key barriers to the long-term outcome of increasing the number of efficient pumps in use in the market. However, the program's inaugural MPER offered several targeted opportunities for slight refinements and improvements.

Further refinement is needed to ensure ER Label supports program strategy

Emphasizing the non-energy benefits of efficient and smart pumps and circulators and tying that to the ER Label, if possible, may be one way to increase awareness and use of the ER Label and to further drive adoption of efficient and smart pumps. Program team discussion of the label's value proposition is ongoing, with MPER #2 offering an avenue for additional formative evaluation of ER Label opportunity.

Some evidence that pump end users may be gaining awareness of the ER label more rapidly than predicted

The program's current logic predicts that awareness and use of the ER Label will lag for further-downstream market actors (specifically contractors and project owners) compared with mid- and upstream market actor groups. The results of the first MPER, however, appear to suggest that end users are unexpectedly familiar with the label and may even be using it to inform their conversations. Further assessment is needed to validate and expand these findings.

Questions?

Thank You!

Chris Cardiel

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Montana Commercial Code Compliance Review

Montana 2018 IECC Commercial Code Compliance Evaluation

Chris Cardiel

Senior Market Research and Evaluation Scientist, NEEA

March 6, 2025

NEEA Code Compliance Evaluations

- Conducted at least once per five-year business cycle for each state (**residential**), or at least once every two business cycles for each state (**commercial**)
- Measure compliance with a specific state energy code
- Address other key objectives, including but not limited to:
  - Informing savings reporting
  - Gathering information about market response to energy code
  - Comparing results across jurisdiction types of interest

Montana Commercial Energy Code

- International Energy Conservation Code (IECC) 2018 with Montana amendments went into effect in February 2021

- Only in effect for 16 months, with amended 2021 IECC implemented in June 2022

Study Objectives

- Identify the path(s) to compliance taken by designers and builders; evaluate system and building compliance with code; and assess/forecast the resulting potential statewide energy savings of the current Montana commercial new construction code
  - Catalogue the major current design and engineering practices by building type, with focus on primary building systems including envelope, mechanical systems, lighting, and service water heating.
  - Assess compliance of new commercial buildings in Montana constructed under 2018 IECC, focusing primarily on the major systems but also including whole-building compliance.
  - Analyze the energy performance and energy savings of a subsample of buildings through the use of billing data which has been summarized, normalized, and disaggregated by end use.
- Assess the study methodology's effectiveness in generating reliable information about decisions made by builders seeking compliance with the commercial code, and whether this methodology is replicable over time and across states.

Methods

Sample Development

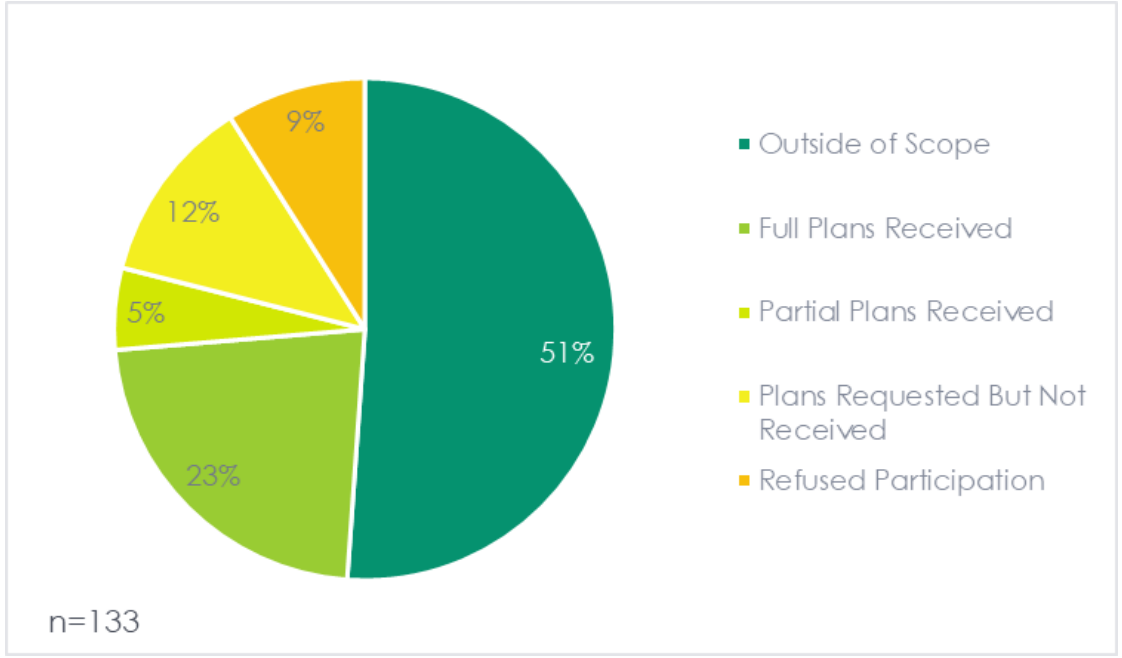
- Initial sampling frame based on Dodge Construction Network “building starts” 2/13/21–5/31/22
- Identified 133 commercial buildings likely to be constructed under 2018 IECC
- Due to the low number of buildings constructed under 2018 IECC, shifted from the proposed stratified random sample approach to a census attempt

Building Type
Office
Retail
Education
Multifamily (5+ units)
Other

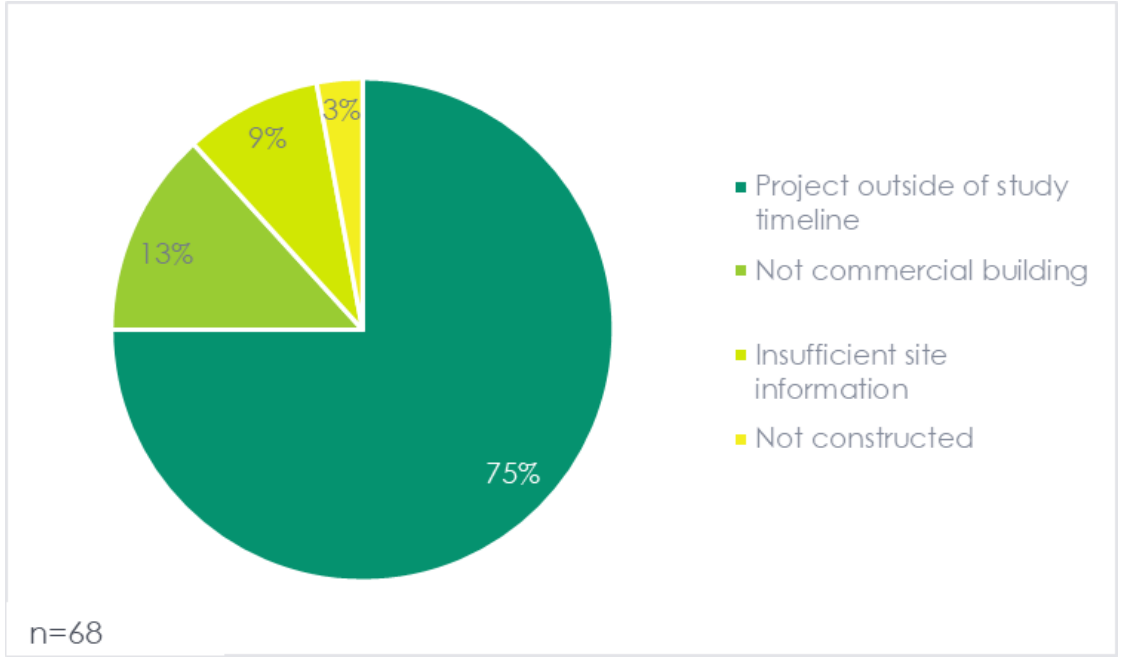
Building Size
Small (less than 20k SF)
Medium (20k to 99,999 SF)
Large (100k SF and above)

Building Plan Reviews

- NEEA applied a six-month grace period to the sampling period, beginning sample at August 13, 2021
- Of 133 buildings initially identified, 65 determined to fall within study scope
- After accounting for plans not received, final sample included 28 buildings



Dispositions of Buildings Likely to be Constructed Under 2018 IECC



Reasons for Building Being Out of Project Scope

Recruitment Limitations

- Only two building operators (representing a total of three buildings) agreed to participate in comparative site visits
  - Results of these site visits were used both to enrich compliance analysis and assess as-built vs. as-permitted status
- Likewise, only two building operators agreed to participate in billing data collection
  - On this basis, billing data analysis was ultimately removed from the study scope

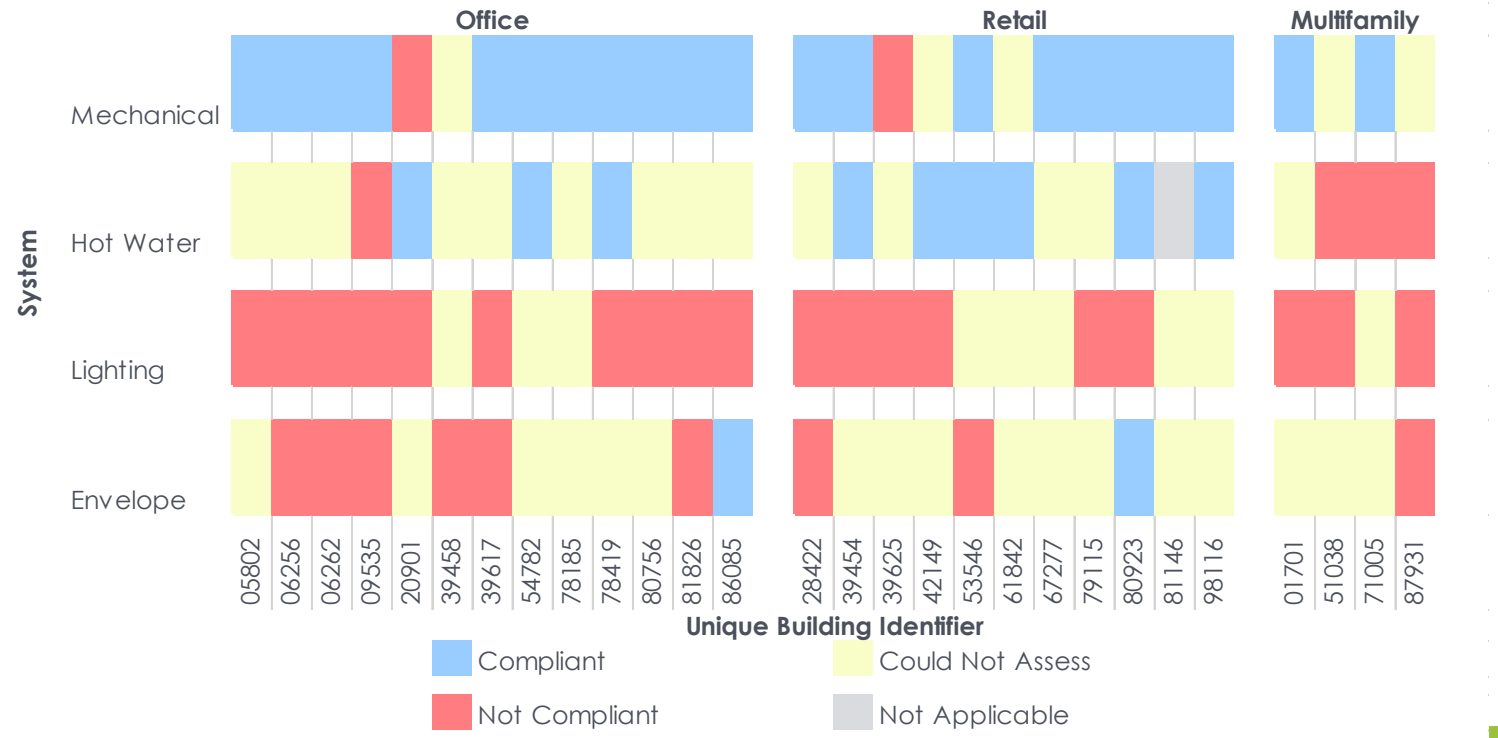
Code Compliance Analysis

- Binary Compliance
  - Focus on key code requirements for each building system, using prescriptive code to determine if requirement was met. Weighted to population
  - If any one requirement was not met, the system was flagged as noncompliant
  - Very strict test, but allows for comparison with other studies
- Weighted Compliance
  - Uses a percentage of compliance level instead of a pass/fail determination, calculated as share of compliant floor area or share of compliant systems
  - More representative view of building's compliance, reduces bias toward zero if a single requirement is not met
  - Can provide a qualitative indication of lost energy savings

Key Findings

Overall Compliance

- None of the 28 sampled buildings were assessed as fully code-compliant
- 22 of 28 buildings were definitively determined to be out of compliance
- Several systems were difficult to assess consistently via plan review



Methodological Findings

- Based on building plan reviews, no sampled building was fully compliant with 2018 IECC using the strict binary compliance methodology
  - NEEA may consider using weighted compliance as the primary metric for future studies, as this takes level of compliance into consideration and provides a more representative view of the state's overall compliance with current energy code
- Montana 2018 IECC was only in effect for 16 months, limiting the number of commercial buildings designed during that time; after assessing received plans and removing all out-of-scope sites, this study included a total of 28 of 65 eligible buildings
  - NEEA may consider focusing future studies on code cycles that last a more typical 3–6 years, allowing a larger population of eligible buildings to be designed and constructed and providing market actors time to properly learn and implement code requirements

Methodological Findings, Continued

- To supplement direct building contacts, plans were also gathered through requests to city or county building departments and public sources, including county websites and the Montana Department of Labor & Industry website
  - Given the degree of success observed, NEEA may prioritize these sources to secure building plans for future code compliance evaluation studies
- While building plans were sufficient to determine compliance with most energy code requirements. Some requirements, such as those related to windows and controls, are not easily determined through building plans
  - NEEA may consider a hybrid approach of building plan reviews and targeted site visits in future studies to address gaps in plan-only system compliance evaluability

What's Next for Commercial Code Compliance Evaluation

Commercial Code Compliance Evaluations

Completed

- Oregon *(2010 / 2014 OEESC)*
- Washington *(2015 WSEC / 2015 SEC)*
- Montana *(2018 IECC with Montana Amendments)*

In Progress (Report Available Late 2025)

- Idaho *(2018 IECC with Idaho Amendments)*

Planned

- Oregon, Kickoff Q1 2026 *(TBD)*
- Washington, Kickoff Q1 2028 *(TBD)*

Montana Residential Code Compliance Evaluation Findings

NEEA Code Compliance Evaluations

- Residential: Conducted at least once per 5-year business cycle per state
- Measure compliance with the most recent code(s)
- Answer other key questions, including but not limited to:
  - Inform savings reporting
  - Gather information about market response to the code
  - Compare results across jurisdiction types of interest

Montana Residential Code

- 2018 IECC with Montana amendments went into effect February 2021
- 2021 IECC with Montana amendments went into effect June 2022

	2018	2021
Fenestration U-factor	+	
Wood-frame wall U-factor	+	
Ceiling R-value		+
High-efficacy lighting	+	+

Research Questions

- What proportion of homes built under 2018 and 2021 IECC with Montana amendments comply with the code?
- What proportion of homes have above-code measures?
- What are the greatest opportunities for energy savings if compliance is increased?
- Does envelop tightness compliance differ across rural and urban areas?
- What proportion of homes have gas versus electric primary space and water heating?

Methods

Data Sources

- Collected data on in-progress new construction homes built under IECC 2021 with Montana amendments
- On-site audits
  - 143 inspections across 8 counties
  - Followed DOE's sampling approach
- Interviews with 5 code officials and 5 home builders
- Permits were not a viable data source

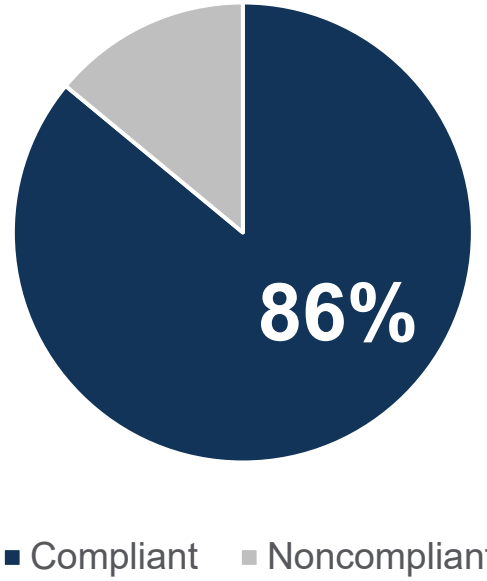
Calculating Compliance

- Compare average energy use intensity (EUI) of observed homes to the EUI of a home that exactly meets code
  - 2018 IECC with Montana amendments baseline
  - 2021 IECC with Montana amendments baseline
- Large-scale Monte Carlo analysis
- Simulate a representative sample of potential measure combinations

Key Findings

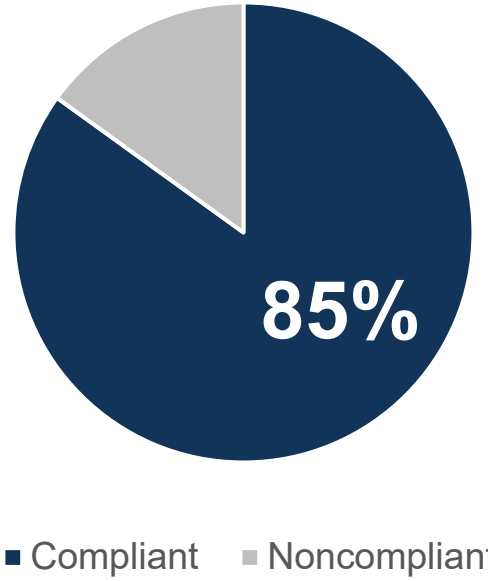
Statewide Compliance

2018 IECC with Montana Amendments



The average home built under the code uses **11%** more energy than a code compliant home.

2021 IECC with Montana Amendments



The average home built under the code uses **12%** more energy than a code compliant home.

Above-Code Measures (50% or Greater)

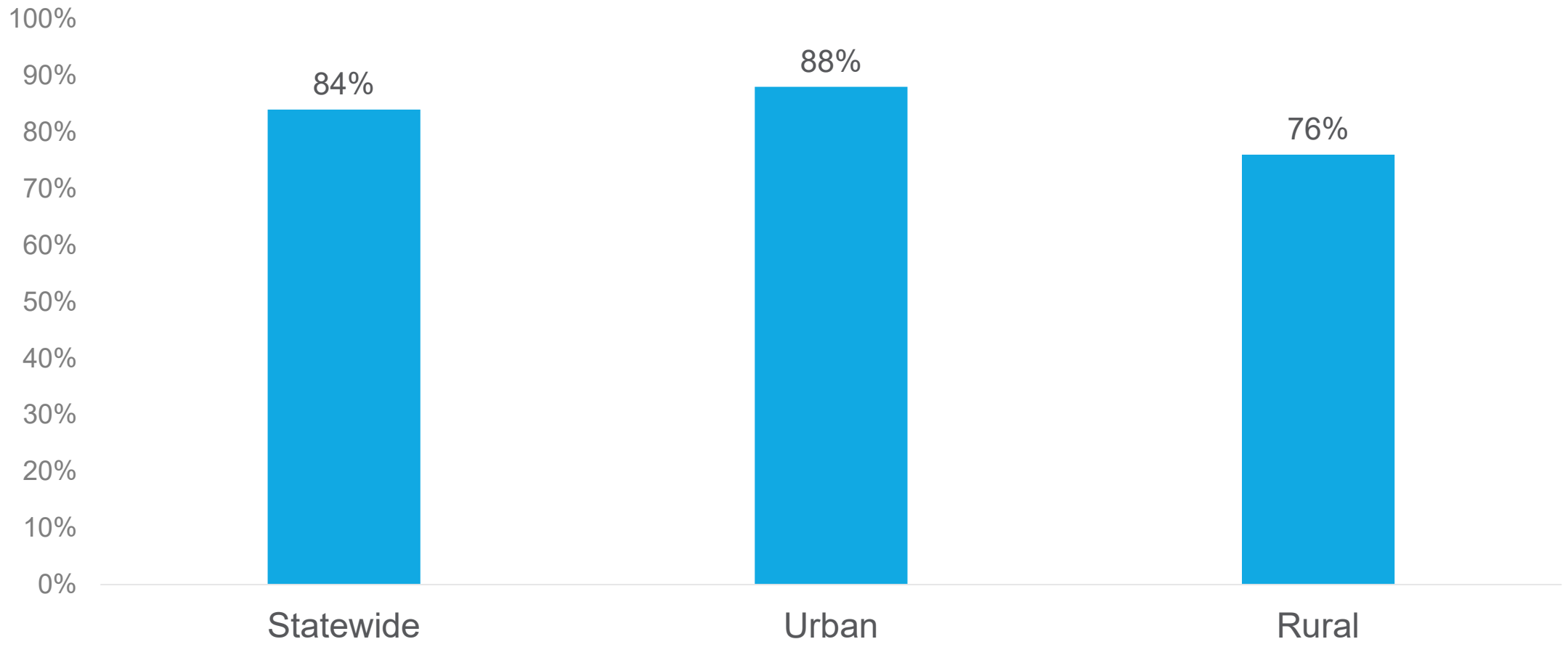
Measure	% Observations
High efficacy lighting (2018)	90%
Envelope tightness (ACH50)	84%
Window U-factor	79%
Adjusted duct tightness	73%
Basement R-value	50%
Basement U-factor	50%

Opportunities to Increase Energy Saving

- Duct leakage and external wall insulation represent over 60% of potential savings

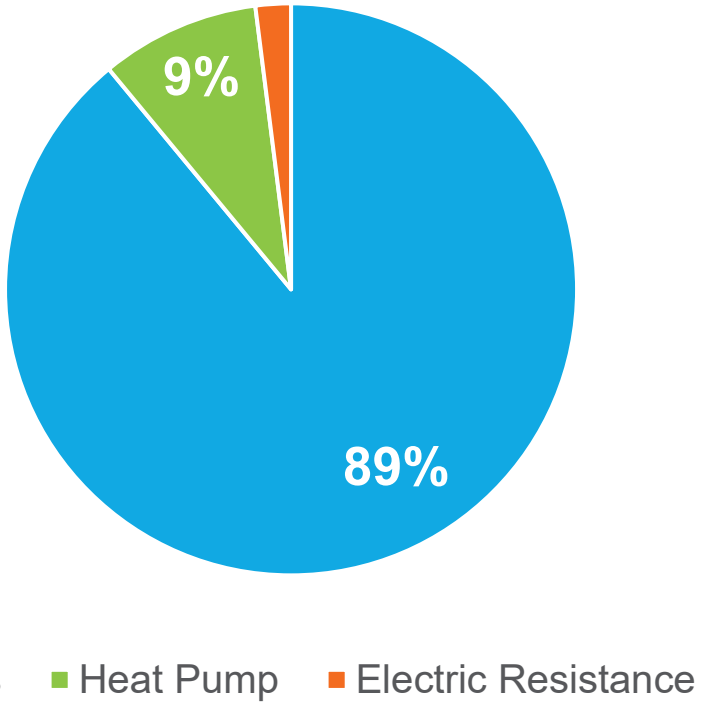
- Findings from site inspections and interviews suggest an opportunity for training around duct leakage, envelope tightness, and insulation installation quality (IIQ)

Urban vs. Rural Envelope Tightness Compliance

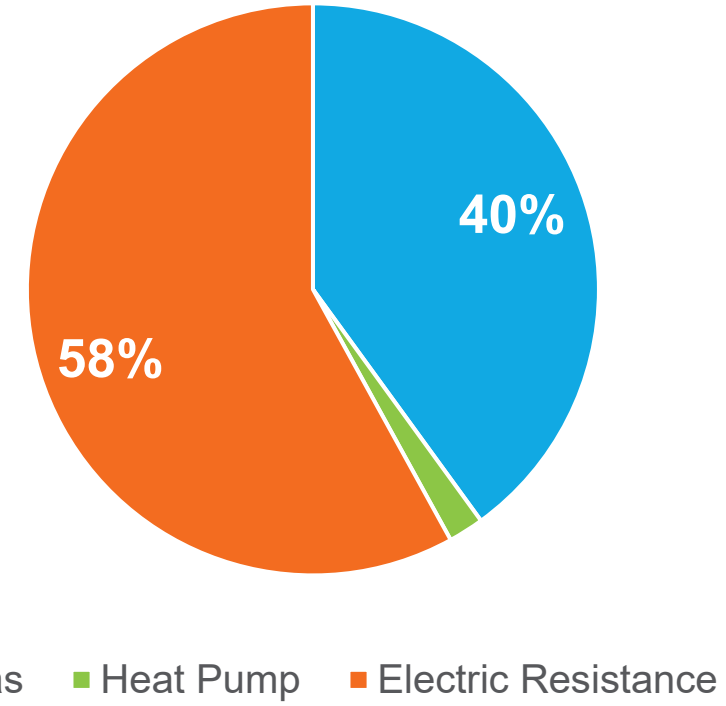


Primary Space and Water Fuel

Space Heating



Water Heating



Questions?

What's Next for Residential Code Compliance Evaluation

Residential Code Compliance Evaluations

In Progress/Recently Completed

- Washington (Washington State Energy Code 2018)
- Idaho (IECC 2018 with Idaho Amendments)
- Montana (IECC 2018 and 2021 with Montana Amendments)
  Report available March 2025
- Oregon (2021 Oregon Residential Specialty Code)
  Report available Q2 2025

Kicking off Late 2025

- Oregon (2023 Oregon Residential Specialty Code)
- Washington (Washington State Energy Code 2021)

Thank You!

Meghan Bean

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Wrap Up

Meeting Wrap-up

- Public Comment?
- Upcoming Meetings:
  - April 30 & May 1, 2025
- Feedback:
  - Overall
  - Agenda
  - Packet Materials
  - What went well?
  - What needs work?