Cost Effectiveness and Evaluation Advisory Committee Meeting

DATE: March 6, 2023
TIME: 10:00 - 3:30PM
LOCATION: Microsoft Teams meeting
Join on your computer, mobile app or room device
Click here to join the meeting
Meeting ID: 279 741 961 025
Passcode: 3nJecX
Download Teams | Join on the web
Or call in (audio only)
+1 971-323-0535,,222696706# United States, Portland
Phone Conference ID: 222 696 706#
Find a local number | Reset PIN

AGENDA:

TIME	TOPIC	PRESENTER(S)	Electric/ Gas/Both	Link or Page #
10:00AM (15 min)	**Welcome/Agenda Review** 1. Agenda check 2. Announcements 3. Annual reporting timeline	Jonathan Belais, NEEA Staff		
10:15 (15 min)	**MRE Update** Amy Webb will provide a brief overview and answer any questions regarding the upcoming market research and evaluation activities outlined in the quarterly newsletter. Objective: Committee awareness of market research and evaluation activities	Amy Webb, NEEA Staff	Both	Link
10:30 (40 min)	**Market Progress Evaluation Report Recap** Highlights from recently published MPERs including: • Manufactured Homes • Codes Objective: Inform committee members and answer questions.	Anu Teja, Meghan Bean; NEEA Staff	Both	2
11:10 (10 min)	**Break**			
11:20 (40 min)	**Key Input and Assumption Updates** NEEA staff will present key input and assumption updates and answer questions from committee members:	Ryan Brown, Evan Hatteberg, Aaron Ingle, NEEA Staff	Both	5, 7

Northwest Energy Efficiency Alliance
700 NE Multnomah Street, Suite 1300, Portland, OR 97232
503.688.5400 | Fax 503.688.5447
neea.org | info@neea.org

TIME	TOPIC	PRESENTER(S)	Electric/ Gas/Both	Link or Page #
	• Avoided carbon emissions values update for natural gas cost-effectiveness • Efficient Rooftop Units Inputs and Calculation Updates Objective: Inform committee members, gather feedback, and questions regarding updated assumptions.			
12:00PM (60 min)	**LUNCH**			
1:00 (75 min)	**NEEA Codes and Standards Introduction** NEEA staff will provide an overview of the work that NEEA does to influence state energy codes and compare to its work to influence federal standards. Objective: Informational. Will provide context for CEAC engagement in state-based code assessment discussed at Q4 2023 meeting.	Susan Hermenet, Mark Rehley: NEEA Staff	Both	
2:15 (10 min)	**BREAK**			
2:25 (60 min)	**NEEA's Current Evaluation Approach** NEEA staff will provide current state of evaluation approaches used to evaluate state energy codes, federal appliance standards work, and other federal standards work, including rationale, cadence and estimated costs. Objective: Informational. Will provide context for CEAC engagement in state-based code assessment discussed in Q4 2023 meeting.	Meghan Bean, Susan Hermenet; NEEA Staff	Both	
3:25 (5 min)	**Wrap up**		Both	

Memorandum – *Agenda item*

February 13, 2024

TO: Cost-effectiveness and Evaluation Advisory Committee (CEAC)

FROM: Amy Webb, Sr. Manager, Market Research and Evaluation

SUBJECT: Overview of the Purpose and Scope of NEEA's Transition Market Progress Evaluation Reports (T-MPERs)

Context:

NEEA is an alliance of utilities that pools resources and shares risks to transform the market for energy efficiency to the benefit of consumers in the Northwest. We do this through energy efficiency market transformation (MT) programs.

To assess the effectiveness of MT programs, we field annual Market Progress Evaluation Reports, or MPERs. MPERs are the annual "theory-based" evaluations NEEA uses to assess a program's influence on the market and its success at achieving the market transformation outcomes identified in the program logic model[1]. MPERs do this primarily by tracking market progress indicators (MPIs) that provide evidence that the program is (or is not) influencing the market consistent with the logic model. To prepare for the Q4 2023 Cost-Effectiveness and Evaluation Advisory Committee (CEAC) meeting, I drafted a memo that described in greater detail the scope of a typical MPER. You can find that memo on page 3 of the CEAC packet linked here.

In our Q1 2024 CEAC meeting, NEEA's Market Research and Evaluation group will debrief the committee on the most recent "Transition" MPER, or T-MPER. T-MPERs are a small subset of MPERs that have an expanded scope intended to provide evidence that the MT program is (or is not) ready for transition to the Long-Term Monitoring and Tracking (LTMT) stage of NEEA's program life cycle. This is one of the key inputs that NEEA provides on behalf of the alliance to support the decision about whether the program has sufficiently removed the market barriers so that market transformation can reasonably be expected to continue to diffuse in the region without the continued direct intervention of the NEEA MT program. If the decision is affirmative, then the program can transition to LTMT, at which point NEEA significantly scales back its investment in the market. The primary activities then become continued collection of sales data and annual LTMT studies to track ongoing diffusion in the market. In addition to tracking diffusion, NEEA's LTMT studies help to confirm that the market barriers the program was designed to overcome are not recurring and to identify any emergent barriers which might thwart diffusion.

Like all MPERs, a T-MPER includes the tracking of a program's MPIs. Three other research activities are designed to document evidence of program readiness for transition to LTMT. Those activities are:

- To provide a detailed narrative of the program's history.
- To propose a high-level and realistic LTMT evaluation plan.
- To propose diffusion indicators that could feasibly be tracked annually in LTMT. Diffusion indicators are a subset of the MPIs that assess the diffusion of the energy efficient product or practice across the region.

[1] Each MT program uses a logic model to describe the market barriers the program must overcome, the various activities the program will implement to overcome the barriers, and the outcomes (short, medium and long term) the program expects to see in the market if their interventions are successful. Logic models form the basis for the evaluation approach.

In the upcoming Q1 CEAC meeting, NEEA's Market Research and Evaluation Scientist, Anu Teja, will deliver an overview of the objectives, methods, and key findings from recent Manufactured Homes T-MPER.

Our Ask of You:

Please come to the March 6th CEAC meeting with any questions or feedback you have related to NEEA Transition MPERs.

Contact Amy Webb (awebb@neea.org) if you'd like to connect before the November 30th CEAC meeting.

Memorandum – *Agenda item*

March 6, 2024

TO: Cost-effectiveness and Evaluation Advisory Committee (CEAC)

FROM: Evan Hatteberg, Market Analyst

SUBJECT: Emission Benefits in Natural Gas Program Cost Effectiveness Analysis

At the March 6th CEAC meeting NEEA Staff will inform and seek feedback from the committee on NEEA's approach to estimate the avoided greenhouse gases (GHG) of natural gas programs in cost effectiveness modeling.

Background

CEAC previously approved NEEA's operational guidelines for gas cost effectiveness analysis at the February 28th, 2023 meeting. Per the operational guidelines cost effectiveness modeling should include "the benefit associated with the avoiding the societal impacts of additional greenhouse gas emissions."[2] The Regional Technical Forum version of ProCost does not estimate the avoided GHG of natural gas savings, so NEEA has developed a methodology to estimate the CO_2 equivalent of natural gas savings. NEEA uses the avoided social cost of carbon from the 2021 power plan to monetize avoided emissions. These newly quantified benefits will be incorporated into NEEA's analysis of its natural gas portfolio. Interested parties can access copies of NEEA's operational guidelines for cost effectiveness on the Portal on neea.org. After logging in to the portal these documents can be found in the "Savings Reports" section under "References." These documents can also be provided directly to stakeholders upon request.

Green House Gas Emissions of Natural Gas

NEEA is proposing the following calculation using data from the EIA "Natural Gas Frequently Asked Questions", EPA "GHG Inventory", the 2021 Power Plan "Upstream Methane Analysis", and the IPCC "Sixth Assessment Report" to estimate the GHG from both Natural Gas combustion and upstream methane losses from the Natural Gas system. Upstream methane losses are converted to their 100-year CO_2 equivalent, and added to the CO_2 combustion values to create an overall CO_2 equivalent value per Therm.

The avoided carbon emissions per natural gas therm saved are calculated using the composition of natural gas and the system assumptions from the 2021 power plan. The EPA estimates the CO_2 per Therm burned to be 11.7 pounds.[3] See Equation 1 for the calculation of CO_2 equivalent of fugitive Methane (CH_4) per therm. The 11.7 pounds per therm burned

[2] NEEA (2023). "Operational Guidelines for Estimating Natural Gas Cost-Effectiveness". Page 7.
[3] EPA (2023). "Greenhouse Gas Equivalencies Calculator". Last Updated July 21st, 2023. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

is added to the 1.65 pounds CO_2 equivalent per therm from upstream methane losses for a combined CO_2 equivalent estimate per therm of 13.34 pounds. Provided the committee is in agreement, NEEA will use these additional benefits for the cost effectiveness analysis of the Natural Gas Portfolio in April 2024.

Equation 1: Per Therm Fugitive Methane Carbon Dioxide Equivalence Calculation

$$1\ Therm\ of\ Natural\ Gas = 96.33\ scf\ Natural\ Gas^{4}$$

$$96.33\ scf\ Natural\ Gas * 93.4\%\ CH_4\ ^{5} = \ 89.97\ scf\ CH_4$$

$$89.97\ scf\ CH_4 = 4.03\ lbs.CH_4$$

$$4.03\ lbs\ CH_4 * 1.37\%\ \ Loss\ Rate^{6} = \ 0.055\ lbs.CH_4$$

$$0.055\ lbs.CH_4 * 29.8\ (100\ Year\ Global\ Warming\ Potential\ (GWP)\ of\ CH_4)^{7} =$$

$$1.65\ lbs.CO_2 Equivalent\ (CO_2e)\ per\ Therm$$

Contact Evan Hatteberg, ehatteberg@neea.org, with additional questions.

[4] EIA (2023). "Frequently Asked Questions (Natural Gas)". Last Updated October 11th. 2023. https://www.eia.gov/tools/faqs/faq.php?id=45&t=8
[5] EPA (2023). "Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory". Annex 3.6, Table 3.6-11. Published April 2023. https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2021-ghg
[6] NW Power and Conservation Council (2020). "Upstream Methane & The 2021 Power Plan". Published June 8th, 2020. https://nwcouncil.app.box.com/s/94w5ii097x0uoc871yoxtl76ehslc9p1/file/723052841733
[7] IPCC (2021). "Sixth Assessment Report, Climate Change 2021: The Physical Science Basis". Page 1017, Table 7.15. Published August 9th, 2021. https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf

Memorandum – *Agenda item*

March 6, 2024

TO: Cost-effectiveness and Evaluation Advisory Committee

FROM: Ryan Brown, Manager, Planning and Analysis

SUBJECT: Q1 2024 Key Inputs and Assumptions Update

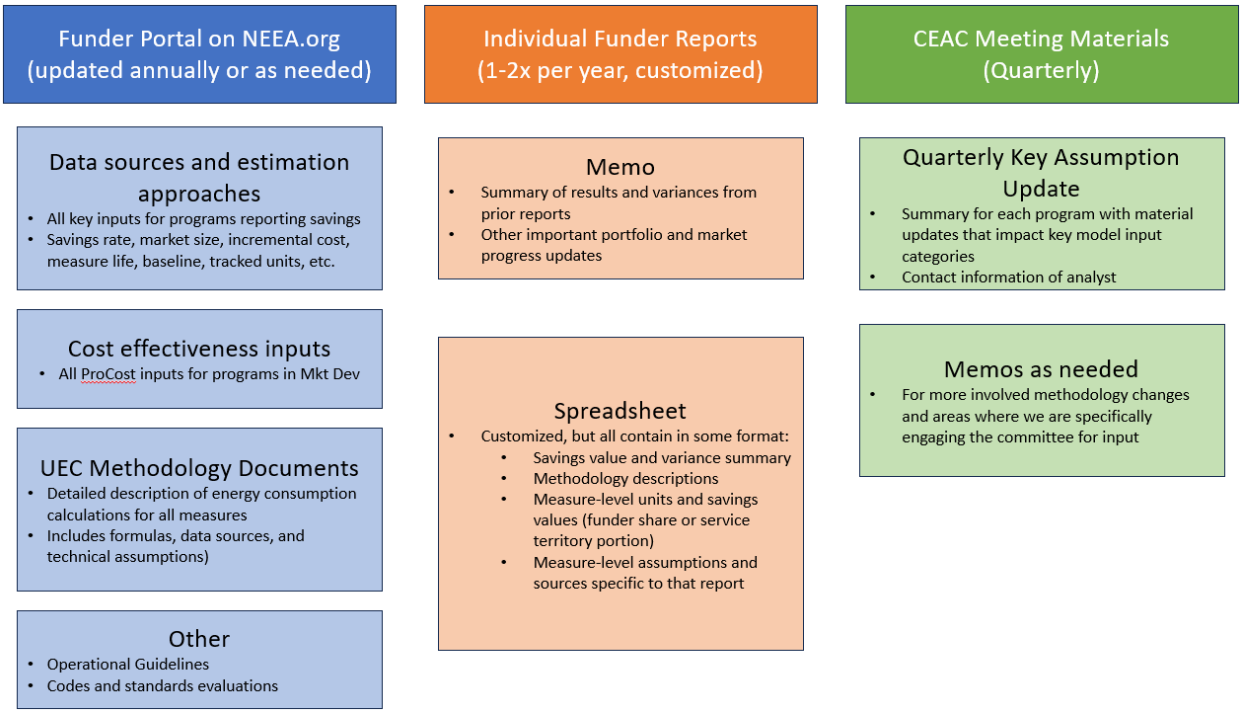
Context:

Two of the primary responsibilities and functions of the Cost Effectiveness and Evaluation Advisory Committee (CEAC) as articulated in the CEAC charter[8] are:

1. Review and advise regarding NEEA cost-effectiveness and savings information to inform annual reporting, and
2. Review and advise regarding market transformation cost and savings measurement and estimation methods.

In order to provide committee members' the necessary documentation needed to fulfill these responsibilities NEEA staff maintains a system of documentation that includes materials posted to the Funder portal on neea.org, the content available in Funder Reports themselves, and Meeting Materials provided to accompany each quarterly CEAC meeting

Figure 1: System of Documentation for Key Inputs and Assumptions



[8] In addition to the two responsibilities listed above there are 3 more in the charter:

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.

In order to facilitate a focused review of items that are new or changing over time NEEA staff has prepared a quarterly update report for the committee that highlights those items. For those that are more consequential or nuanced we then also include agenda time to review with the committee in more detail.

In recent months NEEA staff has been considering whether this practice is adequately setting the committee up to truly fulfill the responsibilities listed above and has decided to make some improvements to the process in 2024. Some of the improvements include:

- Improved visibility into the underlying technical assumptions that have material impact on the model inputs of savings rates and costs.
- Improved visibility into the review history for key inputs and assumptions.
- More context for the magnitude and impact of updates on the calculation outputs (savings and cost effectiveness).

These improvements will be incrementally rolled out during 2024. In the interim these meeting materials include this cover memo and the two detailed memos on the updates we are presenting for the committee's review and consideration.

Q1 2024 planned updates for the committee:

- Avoided carbon emissions costs added to the inputs for Natural Gas measures (separate memo and agenda time)
- Efficient Rooftop Units key assumptions updates (separate memo and agenda time)

Our Ask of You:

Come ready to engage with and ask questions on the two updates detailed in the subsequent memos on gas avoided carbon costs and Efficient Rooftop Units.

Contact Ryan Brown (rbrown@neea.org) if you'd like to connect before or after the March 6th CEAC meeting.

Memorandum – *Agenda item*

March 6, 2024

TO: Cost-effectiveness and Evaluation Advisory Committee (CEAC)

FROM: Aaron Ingle, Sr. Market Analyst

SUBJECT: Key Model Input Updates for Efficient Rooftop Units Program

Intro/Background

The Efficient Rooftop Units program aims to transform the commercial HVAC market through improving the efficiency of gas-fired rooftop units (RTUs), by 1) making efficient options available in the competitive replacement market, and 2) with a federal standard that requires at least 20% more efficient RTUs than the 2020 market average. There are two tiers of Efficient RTUs: Tier 1 includes shell measures (2" insulation and low-leakage dampers), and Tier 2 includes Tier 1 measures and either a condensing gas furnace (CGF) or an energy recovery ventilator (ERV). RTUs that do not meet these specifications can qualify as Tier 1 or Tier 2 units based on performance metrics (i.e., thermal efficiency).

Third-Party Review of the Natural Market Baseline and Key Assumptions for the program was completed in Q3 2022, as was presented to the Cost Effectiveness Advisory Committee, also in Q3 2022.[9] The Efficient RTU program entered Market Development in Q4, 2022.

A variety of data and assumptions are being updated at this time to reflect the current best available information acquired by the program, leading to the key input updates detailed below. However, the overall approach utilized for each key assumption has not changed, and therefore the Third-Party Review completed in 2022 remains applicable.

Savings Rates Update

Savings rates for Efficient RTUs are derived from energy modeling conducted by Cadeo Group[10] for a portfolio of building types and heating zones. A weighted unit energy savings (UES) was calculated based on the square footage heated by gas RTUs in each building type and heating zone in the 2019 Commercial Building Stock Assessment (CBSA). To preserve the full target market sample in the CBSA, building types that were not modeled were assigned savings rates associated with the closest building type based on energy use and building usage. Savings rates are calculated relative to a gas RTU meeting federal minimum warm air furnace standards. This method went through Third-Party Review in 2022.

A 1-Floor Medium Office building model has been added to the model portfolio to improve representation of the commercial building stock. Additionally, a correction was made to ERV fan electricity use in all models. Additional updates were made to the heating zone weighting to better match NEEA's gas funding territory. On net, these changes resulted in a small decrease in UESs for the Tier 2 measures (-3% for CGFs, -8% for ERVs). There was no change to the Tier 1 UES.

[9] Zahlan, J., Kan, C., Zuczek, X., Talan, E., & Michael, R. (2022). Review of Market Share Forecast and Key Assumptions for Efficient Rooftop Units. Report #E22-449 prepared for NEEA by Cadmus Group (2022). https://neea.org/img/documents/Review-of-Baseline-and-Key-Assumptions-for-Efficient-RTUs.pdf

[10] Dimeo, M., Eschenbach, B., Gorrissen, W., Hovey, R., Kora, A., Luker, C., Okam, S., Schultz, I., Widder, S., & Larson, M. (2022). Energy Savings from Efficient Rooftop Units in Heating Dominated Climates. Report #E22-330 prepared for NEEA by Cadeo Group (Portland, OR) and Big Ladder Software (Denver, CO). https://neea.org/resources/energy-savings-from-efficient-rooftop-units-in-heating-dominated-climates

Table 1: Previous and Updated Unit Energy Savings (UESs) for Efficient RTU Tiers

	Savings rate (Therms / square foot)	
Tier	**Previous**	**Updated**
Tier 1	0.016	0.016
Tier 2 CGF	0.055	0.053
Tier 2 ERV	0.119	0.110

Cost Effectiveness Update

Efficient RTU savings rates and incremental costs are estimated relative to a gas RTU meeting federal minimum warm air furnace standards. The itemized cost-estimation approach includes equipment, material, installation, O&M, and construction scalars, adjusted for a standard set of market escalation and inflation assumptions. The RTF's ProCost calculator (v5.08) is used to complete the calculations, together with NEEA's assumptions regarding peak loads and the updated natural gas CO2e benefit - discussed in a separate memo within these Q1 2024 CEAC Meeting Materials.

As the program has progressed, additions, corrections, and updates have been made to modeling results, incremental cost data, savings rates as described above, forecasting, and related calculations. These changes, described in Table 3, have altered the program benefit-cost ratios.

Table 3: Cost-Benefit Analysis Input Updates

Change	**Previous**	**Updated**	**Rationale**
Added an energy model (per above) to the portfolio, affecting input savings rates	3 building models used: -Retail -Strip Mall -Grocery	4 building models used: -Retail -Strip Mall -Grocery -1 Floor Medium Office	Incrementally improves the model portfolio's representation of the building stock
Correction to ERV fan energy use in all models	Various	2% decrease in Tier 2 ERV rooftop unit average total site energy savings	Updated value better reflects expected ERV fan energy use
Updated climate zone weights derived from the RTF Climate workbook (https://nwcouncil.box.com/v/rtfclimteznecalcv3-2) to better reflect NEEA's Gas Funding territory	Weights: HZ1 .80 HZ2 .17 HZ3 .03	Weights: HZ1 .924 HZ2 .074 HZ3 .002	Updated HZ weights more closely reflect NEEA's gas funding territory, which is almost entirely WA and OR (with a bit in Idaho)
Updated the weights that determine the contribution of each Tier to the total program benefit cost ratio. The weights, based on an updated savings forecast, reflect each Tier's % of 20-year forecast co-created savings	Weights: Tier 1 .730 Tier 2 CGF .180 Tier 2 ERV .090	Weights: Tier 1 .499 Tier 2 CGF .044 Tier 2 ERV .458	Total program benefit cost ratio depends on the relative contribution of each Tier to the total program savings. The forecast was updated based on current market knowledge and assumptions.
Updated incremental cost inputs based on additional quotes and updated input data	Various	See Table 5 below.	The most recent incremental cost estimates were utilized, and additional data sources were incorporated into the incremental cost estimation method.
Updated ProCost to include avoided greenhouse gas emissions benefits of natural gas efficiency	Avoided greenhouse gases resulting from gas efficiency not valued	Avoided greenhouse gases resulting from gas efficiency of 13.34 CO2 equivalent lbs/Therm included and valued at the social cost of carbon from the 2021 Power Plan	This follows NEEA's operational guidelines for gas cost effectiveness analysis, as discussed in a separate memo in Q1 2024 CEAC Meeting Materials.

The updated benefit-cost ratio (BCR) for the efficient rooftop units program is estimated to be 1.1, with variation between efficiency tiers, climate zones, and building types. Breakdowns of the BCR by Tier, Heating Zone, and Modeled Building Type are summarized in Table 4. Despite the various input updates, the overall program BCR has shifted only slightly from the previous estimate of 1.0.

The program continues to work towards updated and improved incremental cost estimates for each product configuration – particularly the performance path, where units can qualify as Tier 1 or Tier 2 based on efficient rated performance without meeting prescriptive design criteria. As this category of efficient units becomes more prevalent, NEEA will monitor which equipment is used to meet the specification and revisit the incremental cost estimation. NEEA currently assumes that performance path equipment will have an equivalent cost-effectiveness to prescriptive equipment meeting the same performance criteria. Additionally, there is the potential for significant cost-reduction as the current custom products become more commoditized - as intended within the program strategy. Potential future economies-of-scale driven cost-reductions are however not assumed in the current estimates.

Table 4: Benefit Cost Ratio (BCR) Summary

Total Program BCR: 1.1					
BCR By Tier:		BCR By Heating Zone:		BCR By Modeled Building Type:	
	BCR		BCR		BCR
Tier 1	1.1	**HZ1**	1.1	**Grocery**	1.2
Tier 2 (CGF / ERV)	1.2	**HZ2**	1.5	**Retail**	1.0
		HZ3	1.9	**Strip Mall**	1.5
				1 Floor Medium Office	1.3

Table 5: Incremental Cost Details

Tier	UES (Therms/ton) for 6-10 ton units	Incremental Cost ($/ton) for 6-10 ton units	Annual Incremental O&M ($) for 6-10 ton units	Notes
1	4.8 – 16.8	$86	-	
2 CGF	10.1 – 47.8	$306	$15	
2 ERV	17.2 – 63.0	$236 - $522	$11	Assumes ERV sizing to meet outside air needs by building type

NOTE: All savings and costs are incremental to a federal minimum efficiency gas RTU

2023 Q4 Market Research & Evaluation Quarterly Newsletter

WHAT'S NEW:

Happy greetings, everyone!

NEEA's Market Research and Evaluation (MRE) team is pleased to share with you the latest research and evaluation project news. Enclosed are important details related to current studies, as well as those that will commence in the first quarter of 2024. There will be a host of studies in the field between now and the end of the first quarter. Several programs are in the midst of their first market progress evaluation report (MPER), including the Commercial HVAC programs (High-Performance HVAC and gas Efficient Rooftop Units) and the Extended Motor Products program. These evaluations will bring increased understanding of the market opportunity for these measures, as well as NEEA's progress toward its Market Transformation goals. There are also several state energy code compliance and standard influence evaluations in the field. In addition, lots of studies are wrapping up, so stay tuned for reports to hit your inbox over the next few weeks. 2023 has been an exciting year with many opportunities to connect in-person, share new ideas, and tackle big challenges. It's been an eventful twelve months, and the MRE team looks forward to what the year ahead brings.

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

TABLE OF CONTENTS

At a Glance 2

Integrated Systems 4

Products 10

Codes, Standards, New Construction . 15

Contact 23

Questions about this report may be addressed to:

Amy Webb
Sr. Manager, Market Research & Evaluation
awebb@neea.org

PUBLISH DATE: December 14, 2023

At a Glance

MARKET RESEARCH & EVALUATION PROJECTS

	PLANNING*	FIELDING*	REPORTING*
Integrated Systems			
BetterBricks: *Commercial Building Market Research*		✓	
Efficient Rooftop Units: *Market Progress Evaluation Report #1*		✓	
High-Performance HVAC: *Market Progress Evaluation Report #1*		✓	
Luminaire Level Lighting Controls: *Market Sizing*			✓
Luminaire Level Lighting Controls: *Key Assumptions Review*			✓
Luminaire Level Lighting Controls: *Market Progress Evaluation #2*			✓
High-Performance Windows: *Market Influence Study*	✓		
Products			
Extended Motor Products: *Agricultural Pumps Market Research*	✓		
Extended Motor Products: *Market Progress Evaluation Report #1*		✓	
Efficient Fans: *Fan System Market Characterization*			✓
Retail Product Portfolio: *Connected Consumer Products Market Research*	✓		
Retail Product Portfolio: *Retailer and Manufacturer Sustainability Goal Literature Review*			✓
Heat Pump Water Heaters: *Market Progress Evaluation Report #7*			✓
Heat Pump Water Heaters: *Benefit/Cost Model Review*			✓

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

Codes, Standards, New Construction

	PLANNING*	FIELDING*	REPORTING*
Standards: *Non-Weatherized Gas Furnaces and Mobile Home Furnaces Standard Evaluation*		✓	
Standards: *Battery Chargers Standard Evaluation*		✓	
Commercial Codes: *Idaho Commercial New Construction Code Evaluation*		✓	
Commercial Codes: *Montana Commercial New Construction Code Evaluation*		✓	
Residential Codes: *Montana Residential Code Compliance Evaluation*		✓	
Residential Codes: *Oregon Residential Code Compliance Evaluation*		✓	
Residential Codes: *Idaho Residential Code Compliance Evaluation*			✓
Codes: *Market Progress Evaluation Report #2*			✓
Manufactured Homes: *Transition Market Progress Evaluation Report*			✓
Residential New Construction: *Bridger View Housing Development Market Research Project*			✓

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

Commercial Building Market Research | BetterBricks | FIELDING

The research objective for this market research effort is to refine and expand on NEEA's understanding of the building upgrade journey for commercial building decision makers, in order to generate recommendations on how NEEA could support decision makers and their networks. It will also inform NEEA's exploration of interventions and resources for decision makers as they consider making energy efficient upgrades to their buildings. The key research question is: What is the building upgrade journey for commercial building decision makers? NEEA has contracted with ETHNO to address this question through the analysis of secondary materials and by conducting interviews and site visits with commercial building decision makers across the region. Interviews are scheduled to begin in Q4 2023.

This study is expected to be completed in Q1 2024, and a final report is anticipated for Q2 2024.

MRE Scientist: Zdanna King
zking@neea.org
503.688.5439

Market Progress Evaluation Report #1

Efficient Rooftop Units (RTU) | **FIELDING**

As of late 2022, NEEA's Efficient RTU program is actively promoting efficient RTUs for gas heated commercial buildings across the region. This study will be the first evaluation of the program's Market Transformation efforts. The program's overarching objectives for the study are to:

1. Provide timely and actionable formative evaluation findings and recommendations to enable continuous improvement of the program;
2. Assess Market Transformation progress as measured by program Market Progress Indicators; and
3. Qualitatively assess program influence on observed market transfomation.

NEEA contracted with Apex Analytics and NMR Group to conduct the evaluation. NEEA kicked off the Efficient RTU evaluation in June. This quarter, the evaluation team plans to interview and survey commercial HVAC contractors, distributors, and manufacturer representatives. The evaluation will be ongoing through the fall of 2024, with a final report anticipated in Q4 2024.This evaluation study will be conducted in close coordination with the Market Progress Evaluation for the High-Performance HVAC program, which is also being completed by Apex Analytics and NMR Group.

MRE Scientist: Lauren Bates
lbates@neea.org
503.688.5418

Market Progress Evaluation Report #1 | High-Performance HVAC | FIELDING

As of late 2022, NEEA's High Performance HVAC program is actively intervening to transform the market for very high efficiency Dedicated Outside Air Systems (DOAS) for electrically heated commercial buildings across the region. This study will be the first evaluation of the program's Market Transformation efforts. The program's overarching objectives for the study are to:

1. Provide timely and actionable formative evaluation findings and recommendations to enable continuous improvement of the program;
2. Assess Market Transformation progress as measured by program Market Progress Indicators; and
3. Qualitatively assess program influence on observed market transfomation.

NEEA contracted with Apex Analytics and NMR Group to conduct the evaluation. NEEA kicked off the High-Performance HVAC evaluation in July. In Q3 2023, the evaluation team plans to interview and survey commercial HVAC system designers. The evaluation will be ongoing through the fall of 2024, with a final report anticipated in Q4 2024. The study will be completed in close coordination with the Market Progress Evaluation for the Efficient RTUs program, which is also being conducted by Apex Analytics and NMR Group.

MRE Scientist: Lauren Bates
lbates@neea.org
503.688.5418

Market Sizing

Luminaire Level Lighting Controls (LLLC) | **REPORTING**

NEEA's LLLC program is considering adding exterior parking lot lighting to its portfolio. This study's research objective is to attain supported estimates for luminaires in parking lots, current LLLC market penetration, and the potential for market growth in exterior LLLC with NEEA intervention, in order to inform the naturally occurring baseline and projections of energy savings over time. Research questions include: 1) What is the market size for exterior LLLC in parking lots? 2) What is the potential market size for exterior LLLC in parking lots over the next twenty years? Several sub-questions address nuanced assumptions essential for modeling around these two key lines of inquiry. Cadeo will utilize their technical expertise and the selection and review of secondary sources to address the research questions. Research completion and an accompanying final report are anticipated in Q1 2024.

MRE Scientist: Zdanna King
zking@neea.org
503.688.5439

Key Assumptions Review

Luminaire Level Lighting Controls (LLLC) | **REPORTING**

NEEA contracted with the Cadmus Group in late Q3 to conduct a review of key assumptions underlying its benefit-cost model for its LLLC program. The research objective for this study is to revise LLLC modeling assumptions in order to refine co-created energy savings reporting for the LLLC program. Research questions include: 1) Is it appropriate for NEEA to adjust the Regional Technical Forum's (RTF) recently updated Controls Savings Fraction (CSF) for occupancy sensor with daylighting controls to the current RTF mathematical values or below? If so, what values might be more appropriate? 2) Is NEEA's approach to adjusting new construction baseline CSF to reflect the code requirement of various lighting control types in various space types appropriate? 3) Is it appropriate for NEEA to adjust the baseline CSF that it nets out of retrofits? Cadmus will address the research objective utilizing their technical expertise and through the selection and review of secondary sources. Research completion and an accompanying final report are anticipated in Q1 2024.

MRE Scientist: Zdanna King
zking@neea.org
503.688.5439

Market Progress Evaluation Report #2

Luminaire Level Lighting Controls (LLLC) | **REPORTING**

NEEA's LLLC program seeks to accelerate the adoption of LLLC in commercial buildings for new construction, major renovation and retrofit projects. NEEA contracted with Cadmus to conduct a second Market Progress Evaluation for the LLLC program and launched the study in September 2022.

Interviews and surveys were collected from November 2022 through May 2023 with stakeholders, manufacturers, installers, designers, specifiers, and lighting decision makers, in order to address the following questions:

1. How do the program documents clarify and align to convey the program's strategy and planned activities to overcome market barriers and drive market changes that will increase LLLC adoption?
2. To what extent has the program progressed toward achieving its short and mid-term outcomes as tracked through its market progress indicators?
3. What leads decision makers to purchase LLLC (versus other NLC) and what features (including non-energy benefits) do they value leading up to purchase and after the product is installed?

The study found that NEEA's program activities were well-aligned with its intended outcomes. The study found that the market had changed in a few ways including an increase in the number of companies recommending LLLC and including it in their building plans and an increase in the number of installers who believed LLLC were easier to install than other networked controlled lighting options. A final report is available on neea.org.

MRE Scientist: Zdanna King
zking@neea.org
503.688.5439

Market Influence Study

High-Performance Windows (HPW) | **PLANNING**

NEEA is planning an influence study to document HPW program participation within the Partnership for Advancing Window Solutions (PAWS) network that may have influenced the adoption of the ENERGY STAR® 7 specification for windows. A contractor will interview NEEA staff members, other PAWS participants and ENERGY STAR representatives to determine if and how NEEA influenced the new, more energy efficient specification in Q2 2024. These interviews are time sensitive and are usually captured during initial market progress evaluation reports after a program has passed into the market development phase. With NEEA's plans to maintain HPW in the program development phase for this coming year, however, it is important to field a study now in order to capture interviews while program activities have been recently completed.

NEEA plans to complete this study by Q3 2024 with a report available shortly thereafter.

MRE Scientist: Zdanna King
zking@neea.org
503.688.5439

Agricultural Pumps Market Research

Extended Motor Products (XMP) | **PLANNING**

In order to support ongoing program planning and opportunity assessment, NEEA intends to field a research study exploring the dynamics of the agricultural pump market across NEEA's four-state region. Study methods are likely to include secondary research accompanied by primary data collection (e.g., in-depth interviews, electronically administered surveys) to seek input and insight from professionals active in this market. An RFP will be developed and launched in early Q1 2024, with contractor selection and project kickoff scheduled for late Q1 2024.

MRE Scientist: Chris Cardiel
ccardiel@neea.org
503.688.5488

Market Progress Evaluation Report #1

Extended Motor Products (XMP) | **FIELDING**

As of Q2 2022, NEEA's XMP Pumps program is actively engaging with manufacturers' representatives, trade associations, and other market actors to increase adoption of energy-efficient motor-driven products (specifically clean-water pumps and circulators at or below 50 horsepower) across the four-state region. This Market Progress Evaluation Report (MPER) will be the first evaluation of the program's Market Transformation efforts. The program's overarching objectives for the study are to:

1. Review the XMP Market Transformation (MT) Theory, Program Logic Model, and Market Progress Indicators (MPIs) to assess their clarity and alignment in conveying (1) the Program's strategy and planned activities to overcome market barriers and drive market changes that will increase efficient clean-water pump and circulator adoption, and (2) NEEA's proposed approach for evaluating XMP market progress.
2. Conduct the first year of tracking MPIs to lay the groundwork for year-over-year evaluation, and report progress on several near-term outcomes.

Study methodologies are likely to incorporate surveys of XMP Program participants, surveys and/or interviews with additional market actors, and secondary analysis of existing datasets, reports, and other relevant materials. The request for proposals to conduct this evaluation will be released in early Q4 2023, with an award decision and study kick-off targeted for late Q4 2023. The evaluation will be ongoing through Q3 2024, with a final report anticipated in Q4 2024.

MRE Scientist: Chris Cardiel
ccardiel@neea.org
503.688.5488

Fan System Market Characterization | Efficient Fans | REPORTING

NEEA contracted with DNV Energy Insights, Inc., to conduct a Market Characterization study to inform development and planning efforts for the Efficient Fans program, which is in the program development stage of NEEA's Initiative Life Cycle. The program aims to accelerate adoption of efficient fans and fan system products, including motors, drives, and controllers, by working upstream with manufacturers and highlighting efficiency metrics within their selection software. The initial program is in the commercial and industrial sectors.

The objectives for this Market Characterization study include:

1. Profiling and sizing of the regional fan system market
2. Identifying and prioritizing market barriers
3. Documenting market actor motivations and fan system path-to-purchase

A project kick-off was held in February 2023, and data collection with multiple market actor groups (e.g., fan system manufacturers, manufacturers' representatives, distributors, and end users) commenced in Q2 2023 and continued through mid-Q2 2023. The study is expected to conclude with a final report posted to neea.org by the end of Q4 2023.

MRE Scientist: Chris Cardiel
ccardiel@neea.org
503.688.5488

Connected Consumer Products Market Research

Retail Product Portfolio (RPP) | **PLANNING**

NEEA will engage a contractor to conduct market research to assess consumers' use and attitudes toward purchasing connected consumer products. The RPP team will begin scoping this research in Q4 2023 with the goal of kicking off the project in Q1 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Retailer and Manufacturer Sustainability Goal Literature Review

Retail Product Portfolio (RPP) | **REPORTING**

NEEA has engaged with Apex Analytics to conduct a literature review of television and white good retailer and manufacturer sustainability goals. Apex will review publicly available information on organizations' sustainability goals as well as academic and popular press articles to meet the following objectives:

- Compile information on regulatory and investor motivations that are driving organizations' sustainability efforts
- Compile retailer and manufacturer sustainability goals and provide a summary of retailers/manufacturers sustainability goals, focus areas, and strategies
- Assess which organizations are considered leaders or are investing heavily in sustainability/efficiency and which are investing less
- Provide recommendations for how the ESRPP program could provide value to retailers/manufacturers pursuing sustainability goals

This project will kick off in Q4 2023 and a final report is expected to be available in Q1 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Market Progress Evaluation Report #7

Heat Pump Water Heaters (HPWH) | **REPORTING**

NEEA contracted with NMR Group in early 2023 to conduct the 7th Market Progress Evaluation Report (MPER) for the HPWH program. The key objectives of this effort were to:

1. Ensure the logic model accurately reflects how the current Market Transformation theory for the program is being implemented and assess the market progress indicators (MPIs) for usefulness
2. Estimate 2022 penetration of HPWHs in the region with sales broken out by key attributes
3. Evaluate the program's performance over the course of 2022 in achieving outcomes by measuring against a subset of MPIs tied to the program's highest priority barriers
4. Assess the effectiveness and impact of the "Boring but Efficient" downstream marketing campaign conducted in 2022

In Q2 2023, NMR completed a quantitative survey of general installers in the region, as well as in-depth interviews with a few water heater retail representatives to better measure the program's performance over the past year. Analysis is complete, and a final report is available on neea.org.

MRE Scientist: Anu Teja
ateja@neea.org
503.688.5421

Benefit/Cost Model Review | Heat Pump Water Heaters (HPWH) | REPORTING

In late 2022, NEEA contracted with Larson Energy Research to conduct a review of its 2022 Benefit Cost Model. Key activities included:

- A review of extrapolation methodologies used to estimate manufacturer shipments
- An assessment of NEEA estimates for HPWH market share in single-family new construction
- A review and validation of the modeling assumption underlying the removal of Tier 1 and Tier 2 measures for future years

This work was completed in Q3 2023, and a final report is available on neea.org.

MRE Scientist: Anu Teja
ateja@neea.org
503.688.5421

Non-Weatherized Gas Furnaces and Mobile Home Furnaces Standard Evaluation

Standards | FIELDING

NEEA's Codes and Standards team engaged in efforts to increase the stringency of the standard for non-weatherized gas furnaces and mobile home furnaces. NEEA contracted with Michaels Energy to conduct a qualitative assessment of NEEA's influence on the standards processes and provide a quantitative estimate of the share of savings resulting from the standards that are the result of NEEA and other efficiency organizations' efforts. The project will kick off in September 2023, and Michaels Energy will review NEEA records and publicly available documents and will conduct interviews with key stakeholders from NEEA, Department of Energy and other organizations. A final report is anticipated Q2 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Battery Chargers Standard Evaluation

Standards | FIELDING

NEEA's Codes and Standards team engaged in efforts to increase the stringency of the battery chargers standard. NEEA contracted with Michaels Energy to conduct a qualitative assessment of NEEA's influence on the standards processes and provide a quantitative estimate of the share of savings resulting from the standards that are the result of NEEA and other efficiency organizations' efforts. The project will kick off in September 2023, and Michaels Energy will review NEEA records and publicly available documents and will conduct interviews with key stakeholders from NEEA, Department of Energy and other organizations. A final report is anticipated Q2 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Idaho Commercial New Construction Code Evaluation

Commercial Codes | **FIELDING**

The Idaho Commercial New Construction Code Evaluation study focuses on (a) assessing the path(s) by which and degree to which code compliance is achieved with the amended 2018 International Energy Conservation Code (IECC) in newly constructed buildings, and (b) measuring the energy performance of a subset of these buildings as compared with the average energy performance of buildings constructed under previous code. The results of the study will provide direction to the development and implementation efforts of the NEEA Codes team and will provide other regional code stakeholders guidance in targeting their energy efficiency work in the commercial new construction sector.

NEEA contracted with Opinion Dynamics to undertake this study. The study design and methodology selected for this project focuses on permit data and building plans as the primary sources of construction and compliance information, with virtual or in-person site visits planned for a subsample of participating buildings in order to validate the accuracy of permit data. The project kicked off in mid-Q3 2022, with planning and sample development continuing through Q4 2023. Data collection, including interviews with site contacts, desk review of permit data, and in-person/virtual site visits, are scheduled to commence in Q4 2023 and conclude in Q3 2024. This study includes analysis of billing data; collection of this data is planned to continue through the end of Q3 2024, with analysis and report preparation to follow. A final report is anticipated in Q4 2024.

MRE Scientist: Chris Cardiel
ccardiel@neea.org
503.688.5488

Montana Commercial New Construction Code Evaluation

Commercial Codes | FIELDING

The Montana Commercial New Construction Code Evaluation study focuses on (a) assessing the path(s) by which and degree to which code compliance is achieved with the 2018 IECC in newly constructed buildings, and (b) measuring the energy performance of a subset of these buildings as compared with the average energy performance of buildings constructed under previous code. The results of the study will provide direction to the development and implementation efforts of the NEEA Codes team and will provide other regional code stakeholders guidance in targeting their energy efficiency work in the commercial new construction sector.

NEEA contracted with Michaels Energy to undertake this study. The study design and methodology selected for this project focuses on permit data and building plans as the primary sources of construction and compliance information, supplemented by telephone or virtual interviews with building owners and operators to contextualize and enrich the results of permit and plan analysis. The study also includes virtual or in-person site visits planned for a subsample of participating buildings in order to validate the accuracy of permit data. The project kicked off in mid-Q2 2022, with planning and sample development continuing through Q1 2023. Data collection, including interviews with site contacts and desk review of permit data, commenced in Q2 2023 and is scheduled to conclude in Q3 2023, while in-person/virtual site visits commenced in Q4 2023 and are scheduled to conclude in early Q1 2024. This study includes analysis of billing data; collection of this data is planned to continue through Q1 2024, with analysis and report preparation to follow. A final report is anticipated in Q2 2024.

MRE Scientist: Chris Cardiel
ccardiel@neea.org
503.688.5488

Montana Residential Code Evaluation

Residential Codes | **FIELDING**

NEEA contracted with Industrial Economics, Inc. (IEc) to review assumptions underlying its estimation of energy savings resulting from NEEA's and its partners' involvement in the Montana state code processes. Using data collected through permit review, site visits to residential new construction building sites, and interviews with market actors, this research will address the following objectives:

1. Assess statewide compliance with selected code requirements among single-family homes built under IECC 2018 with Montana amendments
2. Develop estimates of statewide energy code compliance and compliance within urban and rural jurisdictions separately using data collected on individual code requirements
3. Provide statewide findings regarding primary space and water heating fuel and above-code elements using data collected on individual code requirements

This work kicked off in Q1 2023, and the final evaluation of Montana's residential energy code is expected in Q4 2023.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Oregon Residential Code Compliance Evaluation

Residential Codes | **FIELDING**

NEEA has solicited bids for a contractor to review assumptions underlying its estimation of energy savings resulting from NEEA's and its partners' involvement in the Oregon state code processes. This evaluation will:

1. Assess statewide compliance among single-family homes built under the 2021 Oregon Residential Specialty Code (ORSC)
2. Provide statewide findings regarding primary space and water heating fuel and above-code elements using data collected on individual code requirements
3. Provide an analysis of builders' choices regarding compliance pathways and efficiency level to which the home is built

The team will select an evaluation contractor and kick off the project in Q4 2023.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Idaho Residential Code Evaluation

Residential Codes | **REPORTING**

NEEA contracted with Industrial Economics, Inc. (IEc) to review assumptions underlying its estimation of energy savings resulting from NEEA's and its partners' involvement in the Idaho state code processes. Using data collected through permit review, site visits to residential new construction building sites, and interviews with market actors, this research will address the following objectives:

1. Assess statewide compliance with selected code requirements among single-family homes built under IECC 2018 with Idaho amendments
2. Develop estimates of statewide energy code compliance and compliance within urban and rural jurisdictions separately using data collected on individual code requirements
3. Provide statewide findings regarding primary space and water heating fuel and above-code elements using data collected on individual code requirements

This work kicked off in Q1 2023, and the final evaluation of Idaho's residential energy code is expected in Q1 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Market Research Progress Evaluation #2

Codes | REPORTING

NEEA contracted with ADM Associates to conduct a Market Progress Evaluation Report (MPER) for its Commercial and Residential Codes efforts. ADM will evaluate the logic and clarity of NEEA's updated codes logic model, make recommendations for improvement, and assess outcomes associated with codes training and education and code influence activities. The project kicked off in October 2022, and NEEA expanded the scope to address an assessment of the Code team's code influence activities in April 2023. A report addressing all research objectives is expected in Q1 2024.

MRE Scientist: Meghan Bean
mbean@neea.org
503.688.5413

Transition Market Progress Evaluation Report

Manufactured Homes | REPORTING

NEEA contracted with Apex Analytics, LLC to conduct a transition market progress evaluation of its Manufactured Homes program. This is a key input informing the alliance's decision to transition the program to the Long-Term Monitoring and Tracking (LTMT) phase of the Initiative Life Cycle (ILC) process, where NEEA significantly scales back its investments in the market. In this current evaluation effort, NEEA strives to confirm that NEEM+ homes will remain viable in the Northwest once NEEA transitions the program to LTMT. Key research objectives are to:

1. Summarize the initiative's work and achievements since its inception in 2016
2. Track key market progress indicators
3. Recommend viable approaches to conduct subsequent LTMT efforts, including proposing an evaluation plan to track any updated Diffusion Indicators

Data collection and analysis began in Q2 2023 and a final report is anticipated in the first half of Q4 2023.

MRE Scientist: Anu Teja
ateja@neea.org
503.688.5421

Bridger View Housing Development Market Research Project

Residential New Construction | **REPORTING**

NEEA contracted with JG Research & Evaluation to conduct a multiple method research study at the Bridger View Housing Development in Bozeman, Montana. Sixty-two homes are planned in three phases of construction. The first phase began in the fall of 2021. The Bridger View homes will include ductless heat pumps, heat pump water heaters, thin triple pane windows, and other energy-efficient technologies and building practices. To support NEEA's existing Market Transformation programs in designing effective intervention strategies for cold climate markets, NEEA is seeking to better understand any challenges or perceptions associated with these products and practices from the perspective of installers and home occupants unique to colder regions. The study includes three objectives:

- Estimate and identify components of any cost deltas to install these measures in a cold climate.
- Document installers' challenges, work around solutions and other experiences installing each measure.
- Understand homeowner/occupants' perceptions of energy-efficient measures in their homes upon move in and during different seasons (including the winter).

The study incorporates qualitative methods, such as field observations of installations, and video-journaling of home occupants over time, as well as quantitative analysis of the multiple factors that may influence cost. The study launched in November 2021 and continued intermittently throughout the duration of construction and for at least one full year of home occupancy. A final report is anticipated in early 2024.

MRE Scientist: Anu Teja
ateja@neea.org
503.688.5421

CONTACT US:

Amy Webb
Sr. Manager, Market Research & Evaluation

awebb@neea.org
503.688.5448

Anu Teja
Sr. MRE Scientist

ateja@neea.org
503.688.5421

Meghan Bean
Sr. MRE Scientist

mbean@neea.org
503.688.5413

Lauren Bates
Sr. MRE Scientist

lbates@neea.org
503.688.5418

Chris Cardiel
Sr. MRE Scientist

ccardiel@neea.org
503.688.5488

Zdanna King
MRE Scientist

zking@neea.org
503.688.5439

TOGETHER *We Are Transforming the Northwest*

AVISTA · Bonneville Power Administration · Cascade Natural Gas Corporation · Chelan County P.U.D. · Clark Public Utilities · EnergyTrust of Oregon · Idaho Power An IDACORP Company · NorthWestern Energy · NW Natural · Pacific Power · Portland General Electric · PSE Puget Sound Energy · Seattle City Light · Snohomish County PUD Public Utility District No. 1 · Tacoma Power Tacoma Public Utilities