Cost-effectiveness & Evaluation Advisory Committee (CEAC)

Northwest Energy Efficiency Alliance

October 28, 2026



CLASSIFICATION LEVEL: PUBLIC

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Agenda

TIME	TOPIC	PRESENTER(S)
9:00AM (10 min)	Welcome/Agenda Review	Jonathan Belais, NEEA Staff
9:10 (10 min)	Annual Reporting Process	Elizabeth Daykin, NEEA Staff
9:20 (5 min)	Local Programs Survey Announcement	Wylie Hampson, NEEA Staff
9:25 (55 min)	Advanced Performance DOAS (Gas) Program Advancement and Key Assumption Update	Aaron Ingle, Wylie Hampson, and Kirstin Moreno, NEEA Staff
10:20 (10 min)	BREAK	
10:30 (5 min)	MRE Update	Meghan Bean, NEEA Staff
10:35 (30 min)	HPWH Baseline Update	Tim Runyan, NEEA Staff
11:05 (25 min)	Manufactured Homes Market Diffusion Evaluation	Anu Teja, NEEA Staff
11:30	Wrap Up	

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Introductions & Ice Breaker

- Name
- Organization
- Question(s) for today
- What's the most useless talent you have?



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LEADERSHIP IN ENERGY EFFICIENCY AWARDS

Help us honor the innovators and collaborators driving energy efficiency across the Northwest and beyond.

NEEA will recognize individuals and teams for their exemplary dedication and performance in the industry.

EVENT: 9-11 a.m. Dec. 4

REGISTRATION: Opens week of Oct. 26

MORE INFO: **neea.org/leadershipawards**

Nominations

Aug 03
Through
Sept 18

Event

Dec 04



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2027 Planned CEAC Dates

QUARTER	DAY	DATE
Q1	Wed	Feb 17
Q2	Thurs	Apr 22
Q3	Wed	Aug 25
Q4	Wed	Oct 27

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Annual Reporting Kickoff:

Overview, Local Programs and Funder Portal

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Annual Reporting Process and Engagement with CEAC

Q4: Today

- Review recent key assumption and data source updates

Q1: Feb/Mar

- Review updates to key assumptions and data sources for savings reporting

Local Program Data Collection

Q2: Apr/May

- Share technical information about Market Transformation savings accounting, reporting, and cost effectiveness
- Share additional updates to key assumptions
- Review energy savings portfolio and progress to Business Cycle goals
- Review key market trends and new findings

Final Annual Report in June

Individual Funder Reports

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Committee Role in Annual Reporting

- Review and advise on key inputs and assumptions
- Shepherd the Local Programs Survey through your organization
- Review your individual funder reports and NEEA's regional market transformation report
- Understand NEEA's savings and cost-effectiveness methods to help answer questions from your organizational colleagues

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NEEA's Annual Local Programs Survey

- NEEA requests locally-claimed units to avoid double counting
- Respondents can either:
  - Fill in excel-based survey template, or;
  - Provide raw data of incentive records

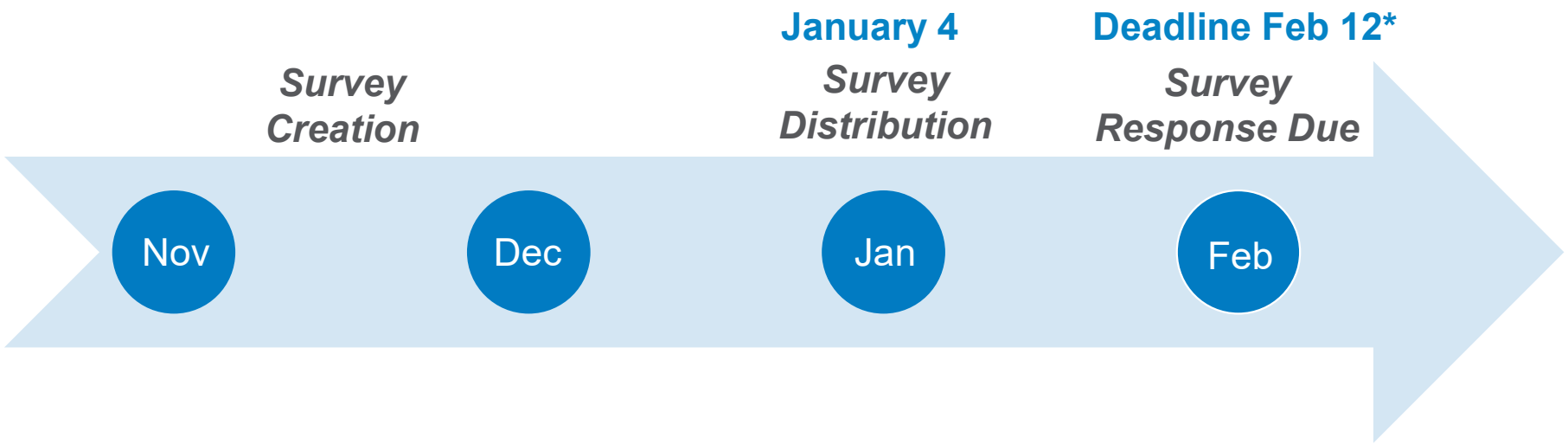
Survey Example:

Product	Channel	Measure Description	2025 Locally Incentivized Units	Comments	Savings Rate Used If available (kWh/Unit)	2025 Incentive Costs (Approx. $ per unit or Total $)
Freezers	Retail	**Any Energy Efficient Freezer (Total)**				
		ENERGY STAR v5 (Total)				
		Compact (<=13.5 Cubic Feet) (CEE Tier 1)				
		Standard (CEE Tier 1)				
Manufactured Homes	Homes	**Northwest Energy Efficient Manufactured Home (NEEM 1.1)**				
		Northwest Energy Efficient Manufactured Home (NEEM Plus)				

Send questions/requests to Chris Clark (cclark@neea.org)

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Local Programs Survey Timeline



*Critical timing for NEEA to meet funder reporting commitments starting early March

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NEEA's Annual Local Programs Survey

- Currently ensuring our contact list is up to date and accurate
- If there are staffing updates on your end that we should be aware of, please let us know!
- For any questions, updates, or other concerns please email Chris Clark (cclark@neea.org)

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Funder Portal on NEEA SharePoint

Funder Portal *NEEA SharePoint*	**Energy Savings Report** *Updated Q1/Q2, upon request*
	• Annual Savings Report • Customized Workbook
	Guidelines and Data Sources *Updated in April*
	• Estimation Approaches & Data Sources • NEEA Guidelines
	Methodologies *Updated in April*
	• Methodology Documentation

- Global reference material available
- Secure organization-specific section to house and share custom reporting documents

If you need an account or need technical support, please contact Chris Clark (CClark@neea.org)

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Advanced Performance DOAS Program Gas Expansion

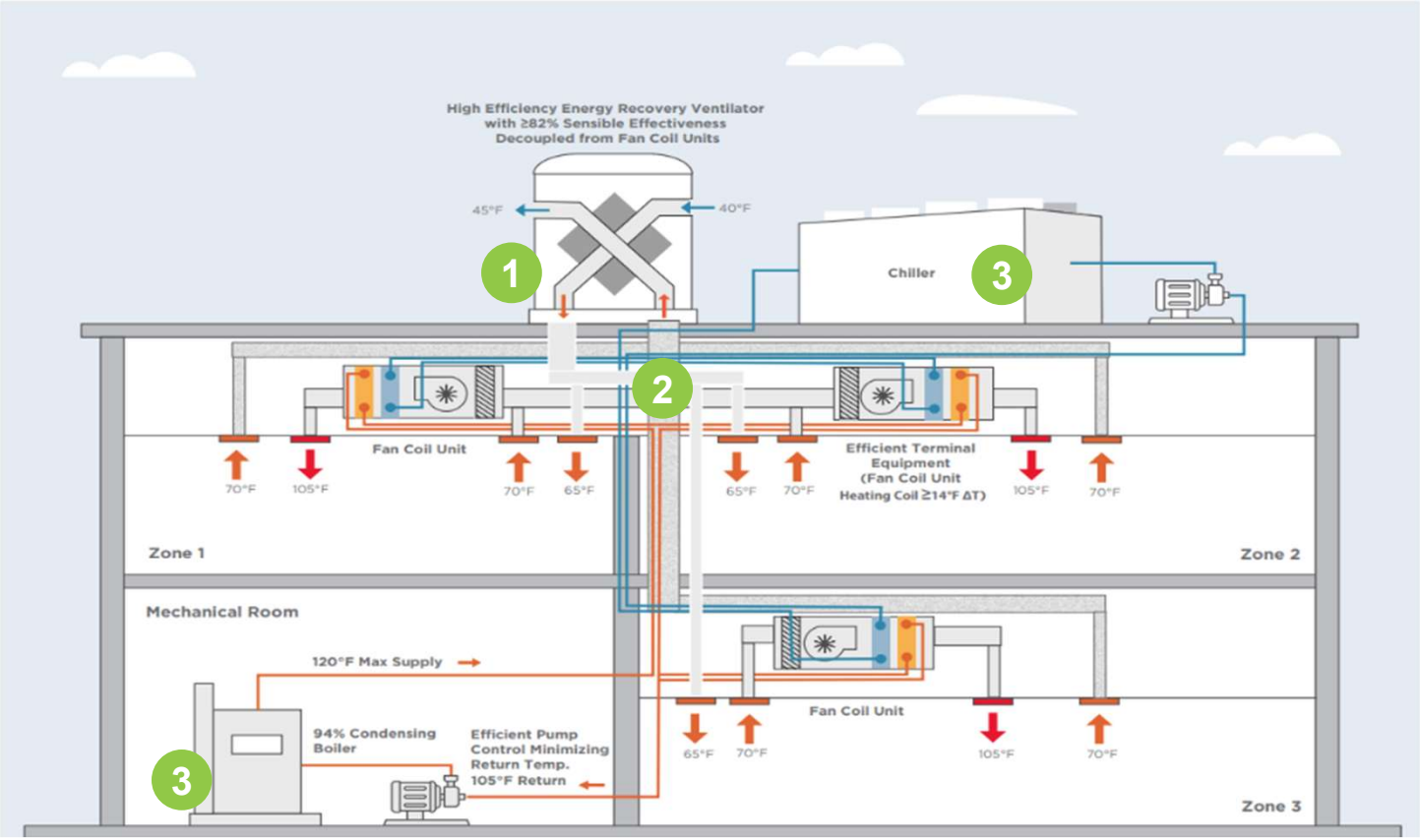
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Advanced Performance DOAS Gas Expansion Overview

- Advanced Performance Dedicated Outdoor Air System (AP DOAS)
- Expands the Advanced Performance DOAS program beyond electric heating systems and into gas heating systems
- **Definition:** Advanced Performance DOAS (Gas) includes:
  - Decoupled DOAS ventilation with a high efficiency Energy/Heat Recovery Ventilator (ERV/HRV) (≥82% efficiency)
  - High-efficiency heating from a natural gas condensing boiler
  - Central space conditioning via hydronic piping with fan coil unit terminal equipment
    - Design specifies lower return water temperatures for increased savings
  - Efficient pumps
- Typically utilized in medium to large sized buildings

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AP DOAS (gas) system



Technology:

1. DOAS w/ high eff. E/HRV
2. Decoupled ventilation
3. Properly-designed condensing gas boiler + electric chiller

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Market Transformation Theory



Opportunity

Pair high efficiency heat recovery ventilators with high efficiency heating and cooling equipment while following design principles to realize deep commercial HVAC energy savings and improved IAQ



Barriers

- System complexity and resistance to change

- Limited familiarity with for key decision makers



Interventions

- Educate and provide technical support to designers/specifiers

- Market system approach and benefits

- Provide evidence to influence national model codes



Impact

For Advanced Performance DOAS to become standard practice in the region and ultimately adopted into energy code

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Gas Baseline and Key Assumptions Review for Advanced Performance DOAS

- Third party reviewer: Cadmus
- Aug-Oct 2026 (to be published Nov 2026)
- Review Scope:
  - Natural Market Baseline
  - Estimation Approach/Tracking
  - Key Assumptions: Market Size, Incremental Cost, Measure Life
- Approach/Methodology: Analyze NEEA materials (descriptive memos, market adoption tracking slide deck, workbooks), incremental cost data, secondary data sources, market research

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Third-Party Findings and Recommendations

Cadmus found NEEA's key assumptions and approach to estimating a natural market baseline to be generally reasonable.

Cadmus identified several opportunities to strengthen the analysis, and NEEA incorporated these recommendations into the final assumptions:

Key Assumption	Recommendation	NEEA Response
Market Size	Cadmus suggested the historical average new construction rates proposed for the market size forecast were optimistic relative to current conditions	NEEA adjusted near-term new construction forecast to match lower rates as reflected in Dodge Construction Network's new construction forecast
Incremental First Cost	Cadmus suggested a modified calculation for estimating incremental first costs from the acquired source data	NEEA modified the calculation per the recommendation
Natural Market Baseline	Cadmus found that the natural market baseline is reasonable. Cadmus suggests strengthening the rationale for the timing and degree of natural market adoption growth in the absence of NEEA and partner activities, given the barriers present in the market	NEEA added rationale to support the natural market baseline analysis as recommended, with no changes to the natural market baseline forecast
Measure Life and Incremental O&M cost	Cadmus indicated that the 20-year measure life is reasonable given the consideration of potential repair and replacement costs as part of incremental O&M, and recommends NEEA further support the expectation in the market that regular maintenance of system components such as ERVs/HRVs is necessary to maintain savings over the system life	NEEA specifies that Advanced Performance DOAS (gas) savings will require continued maintenance and upkeep of system. NEEA is developing additional market education activities related to ERV/HRV maintenance
Measurement Methodology	Cadmus suggests exploring additional data sources and continuing to pursue market extrapolation	NEEA is actively pursuing these improvements

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Expectations

- What we are asking of CEAC:
  - Are these assumptions and analyses clear, reasonable, and appropriate?
- This is not a vote on program advancement

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Key Assumption: Savings Rates

- Savings rates modeled by A2 Efficiency in 2026
- AP DOAS (gas) modeled across scenarios consisting of differing:
  - Building types
  - Climate zones
  - Vintage (new vs. existing)
  - Base efficiency system configurations
- Gas savings range from **0.09 to 0.12** therms per sq foot per year across scenarios
  - For cost effective building types
- Some very small added electric load
- Not part of Cadmus' third-party review

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Washington State Savings Rates

- Advanced Performance DOAS (gas) is expected to be a viable option for complying with Washington State Energy Code fossil fuel pathway
- Unlikely to exceed WSEC efficiency code minimum
  - Minimal above-code gas savings from AP DOAS (gas) in Washington
- Washington excluded from market size and incremental cost analyses due to minimal above code savings
- NEEA will still report savings from AP DOAS (gas) in WA, they just won't be program savings for the AP DOAS program

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Mid-Efficiency AP DOAS (gas)

- NEEA also plans to track nearly-compliant AP DOAS (gas) configurations in the market
  - Identical to fully-compliant AP DOAS (gas) configuration, but with 60-81% efficient ERV/HRV
- Part of overall market transformation towards full efficiency AP DOAS

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Key Assumption: Market Size

- Viable conditioned commercial building space in NEEA's gas region where Advanced Performance DOAS (gas) is expected to deliver above-code, cost effective savings
- **1.1 million square feet per year**
  - Resulting in a 20-year forecast of **100,000–1,000,000** co-created therms
- Market size focus on:
  - Oregon & Idaho gas service territories
  - Large Offices and Secondary Schools
  - Commercial buildings where gas boilers are typical (applicability)
  - New construction & major renovation projects

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Market Size - Data Used

- Commercial Building Stock Assessment (CBSA) data was utilized for:
  - Building stock estimates (Virtual Catalog 2025)
  - AP DOAS (gas) applicability estimates (CBSA 2019)
- Dodge new construction starts and forecast used for:
  - New construction rate estimates
  - Major renovation rate estimates - along with CBSA 2019 and data from BPA's 2022 Commercial HVAC Permit study

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Key Assumption: Measure Life

- **Measure life of 20 years**
- Based on equipment useful life of major components
  - ERV/HRV
  - Condensing Boiler
- Assumes
  - Most components of the system can be repaired or replaced without needing to replace the whole system
  - Routine maintenance

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Key Assumption: Incremental O&M Cost

- Incremental Operations and Maintenance costs (O&M) are costs above base system O&M, including repairs and replacement
  - Piping, ductwork, grilles, VAV boxes, fan coil units, controls, and cooling equipment are assumed to be equivalent for base & efficient systems
- Main contributing factors to incremental O&M costs:
  - ERV/HRV maintenance, filter replacement, and repair/replacement
  - Replacement costs for efficient pumps compared to base efficiency pumps

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Key Assumption: Incremental First Cost

- NEEA contracted 2 studies for project cost estimates
  - Provided cost estimates for base efficiency and AP DOAS (gas) projects
- Estimates assume 2-pipe fan coil units for terminal equipment
- Average cost estimates:
  - Large Office: **$0.70** per square foot
  - Secondary School: **-$0.70** per square foot
    - Negative incremental costs primarily attributed to reduced heating and cooling loads from ERV/HRV, which allows for smaller heating and cooling equipment sizes

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Key Assumption: Natural Market Baseline

- The Natural Market Baseline determines the market condition prior to NEEA's intervention and forecasts natural market adoption absent NEEA's influence

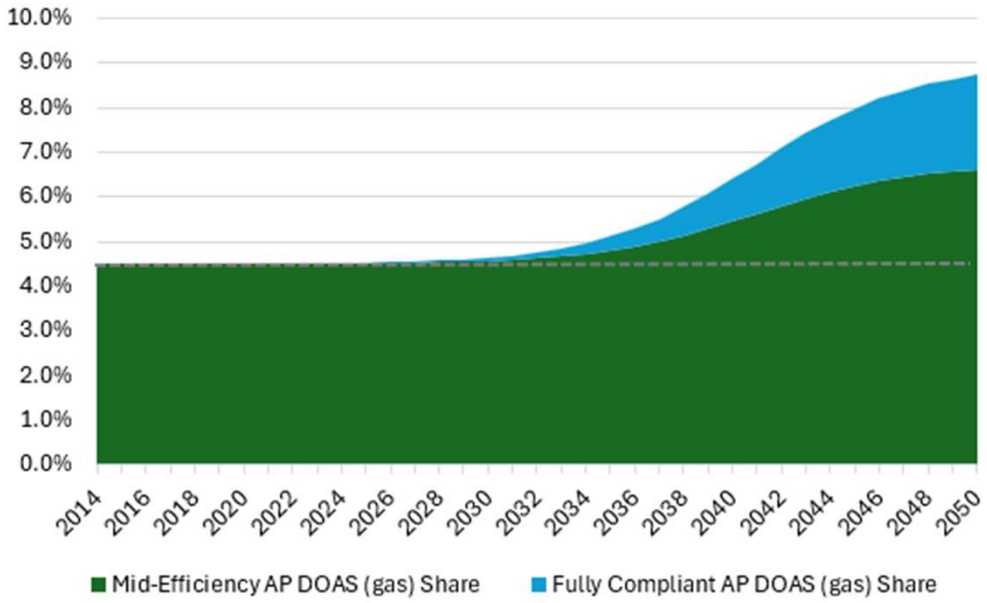
- Baseline start year matches Advanced Performance DOAS (electric) year of 2014
  - Shared barriers and market actors
  - NEEA activity in electric market assumed to have affected market for AP DOAS (gas)
- Initial baseline market condition
  - Mid-efficiency Advanced Performance DOAS (gas) 4.5% existing market share
  - Source: Analysis of data from BPA's 2022 Commercial HVAC Permit Study

- Natural drivers for adoption:
  - Indoor Air Quality
  - Operating-cost concerns
  - State code impetus to efficiency
  - Building performance standards
  - Evolving energy codes
  - New refrigerant regulations

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Key Assumption: Natural Market Baseline Cont.

- Natural market baseline estimated to nearly double in market penetration absent NEEA's intervention by 2050
  - Half of that is estimated to come from mid-efficiency AP DOAS (gas) and half from fully efficient AP DOAS (gas)



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Market Tracking Methodology

- Builds upon Advanced Performance DOAS (electric) tracking
- Current approach identifies and assigns savings rates to compliant projects leveraging a range of data sources:
  - Construction and code compliance databases
  - Permit records
  - Compliant equipment sales data
  - Incentivized projects (NEEA and regional utilities)
- Above code savings in WA are still possible, although unlikely
- NEEA plans to develop statistical extrapolation approach to estimate regional savings

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Benefit Cost Ratio Results

- Large Office: 2.0
- Secondary School: 3.4
- Advanced Performance DOAS (gas) program BCR: 3.1
  - Regional perspective, gas measure (ProCost)
  - Mid-efficiency AP DOAS (gas) has slightly higher BCRs

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Funding Allocation

- Advanced Performance DOAS to be co-funded by electric and natural gas portfolios
- Allocation methodology presented to CEAC Q3 2026
  - Based on relative value of 20-year energy savings benefiting electric and natural gas funders.
- Inputs: gas and electric technical achievable potential over 20 years; savings shapes; economic value of avoided costs; discount rates
- **Calculated funding mix: 90% Electric / 10% Gas**

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Next Steps

- Advanced Performance DOAS (gas) packet was sent out to Natural Gas Advisory Committee (NGAC) on Oct. 22
- Final report for 3rd party review published November 2026
- NEEA will finalize program advancement documentation
  - Based on feedback from CEAC and NGAC
- NGAC Vote December 9, 2026

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Questions?

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Market Research & Evaluation Update

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Looking Ahead to 2027

- 8 Market Progress Evaluation Reports (MPERs)
  1. Advanced Heat Pumps #2
  2. Advanced Performance Dedicated Outdoor Air Systems (AP DOAS) #2
  3. Advanced Performance Rooftop Units (AP RTU) #2
  4. Codes #7
  5. Efficient Fans #1
  6. Extended Motor Products (XMP): Pumps #3
  7. Luminaire Level Lighting Controls (LLLC) #4
  8. Retail Products Portfolio (RPP) #4
- 12 Baseline and Assumption Reviews
- 12 Market Characterizations/market research studies

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Want to Know More?

- Presentations to CEAC
  - Baseline & Assumption Reviews
  - MPER findings
  - Diffusion Evaluation findings
  - Relevant Market Characterization & market research findings
- 2027 Operations Plan Appendix D
- Quarterly Market Research & Evaluation Newsletters
- Reports available on neea.org

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Key Inputs and Assumptions Update

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Input Development and Review Process



Develop Inputs

NEEA staff develop 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 Key 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 Key Assumptions

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

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Q3 Key Inputs Updates

In the meeting packet:

- XMP



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Heat Pump Water Heater Key Assumptions Updates

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Heat Pump Water Heater Program Background

Long established program at NEEA, since 2012, overcoming many challenges along the way

- **Continued Areas of Program Focus:**
  - Ensuring that supply chain continues to recommend heat pump water heater over standard electric resistance tanks
  - Encouraging introduction of new products that address challenging installation configurations
  - Working with supply chain to support adoption of Heat Pump Water Heaters (HPWH) in emergency replacement situations



Image from Hot Water Solutions

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RTF Measure Updates

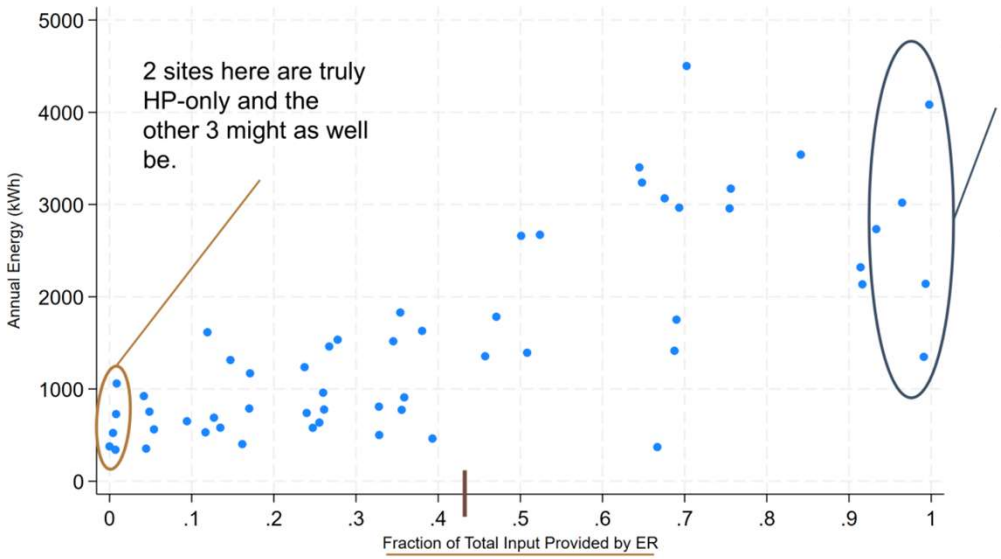
UES and Measure Life Updates

- RTF recently approved a new HPWH measure workbook in August 2026, which included two updates that impact program Key Assumptions
  - UES discounted by 10% to account for results of Home Energy Metering Study (HEMS) data
  - Measure life updated from 13 years to 15 years

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RTF Measure Updates – 10% Electric Resistance Only Mode

- RTF contracted Larson Energy Research (LER) to conduct review of HPWH real world energy consumption in HEMS data
- The RTF implemented a 10% adjustment in UES across all measures to account for observed usage patterns



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HPWH Key Assumptions Review

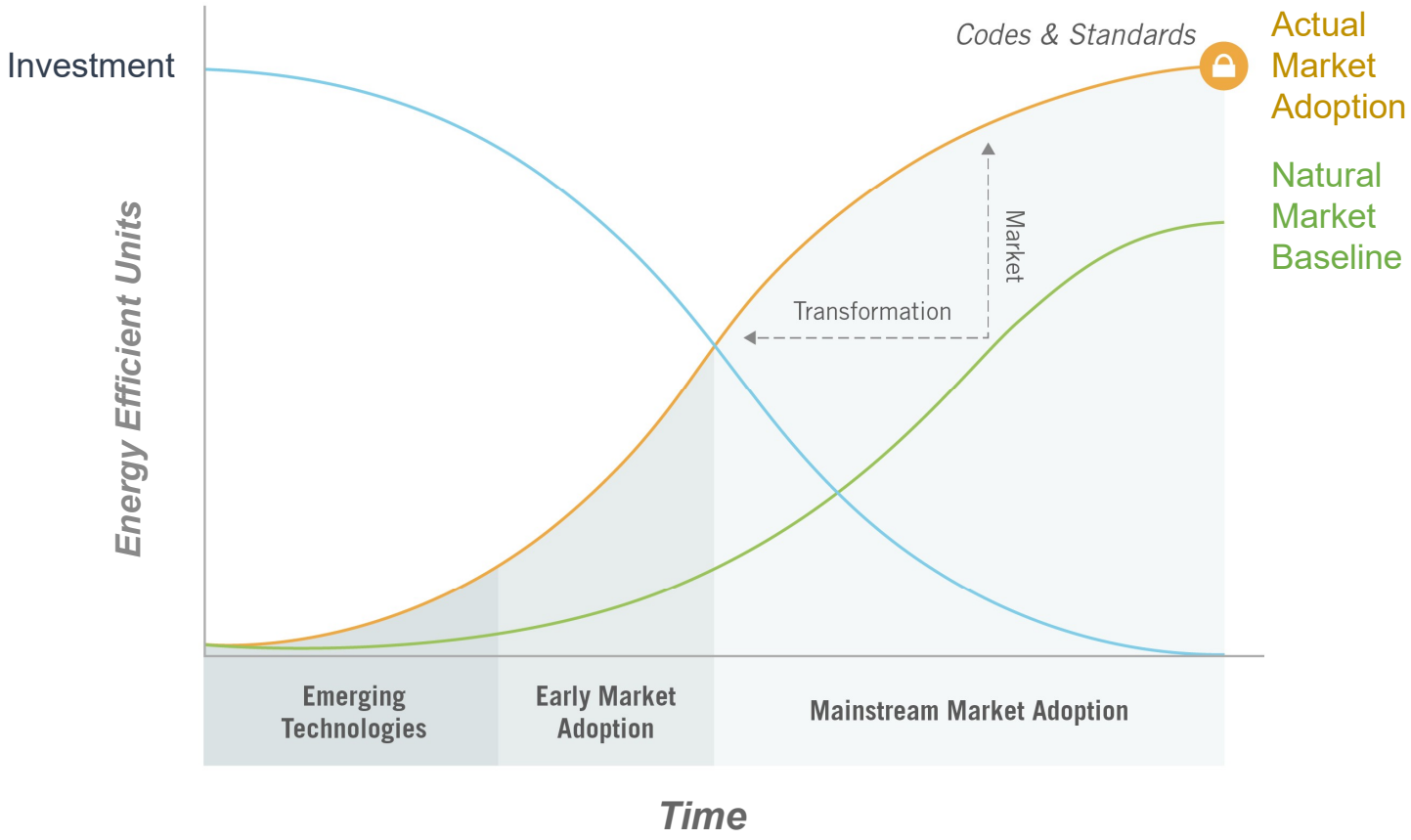
- The latest HPWH Key Assumptions review took place between Q4 2025 to Q2 2026 for the following elements:
  - savings allocation methodology for HPWH New Construction measures
  - annual units' estimation methodology using available RPP data
  - natural market baseline assumptions
- Two evaluation questions related to baseline review:
  - Are the assumptions NEEA has used historically for the NMB still reasonable given current market progress?
  - Should the baseline be updated to reflect the impact of the upcoming federal standard?
- Final report with findings and recommendations was published by the MRE team in Q2 2026



Image from Hot Water Solutions

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Market Transformation



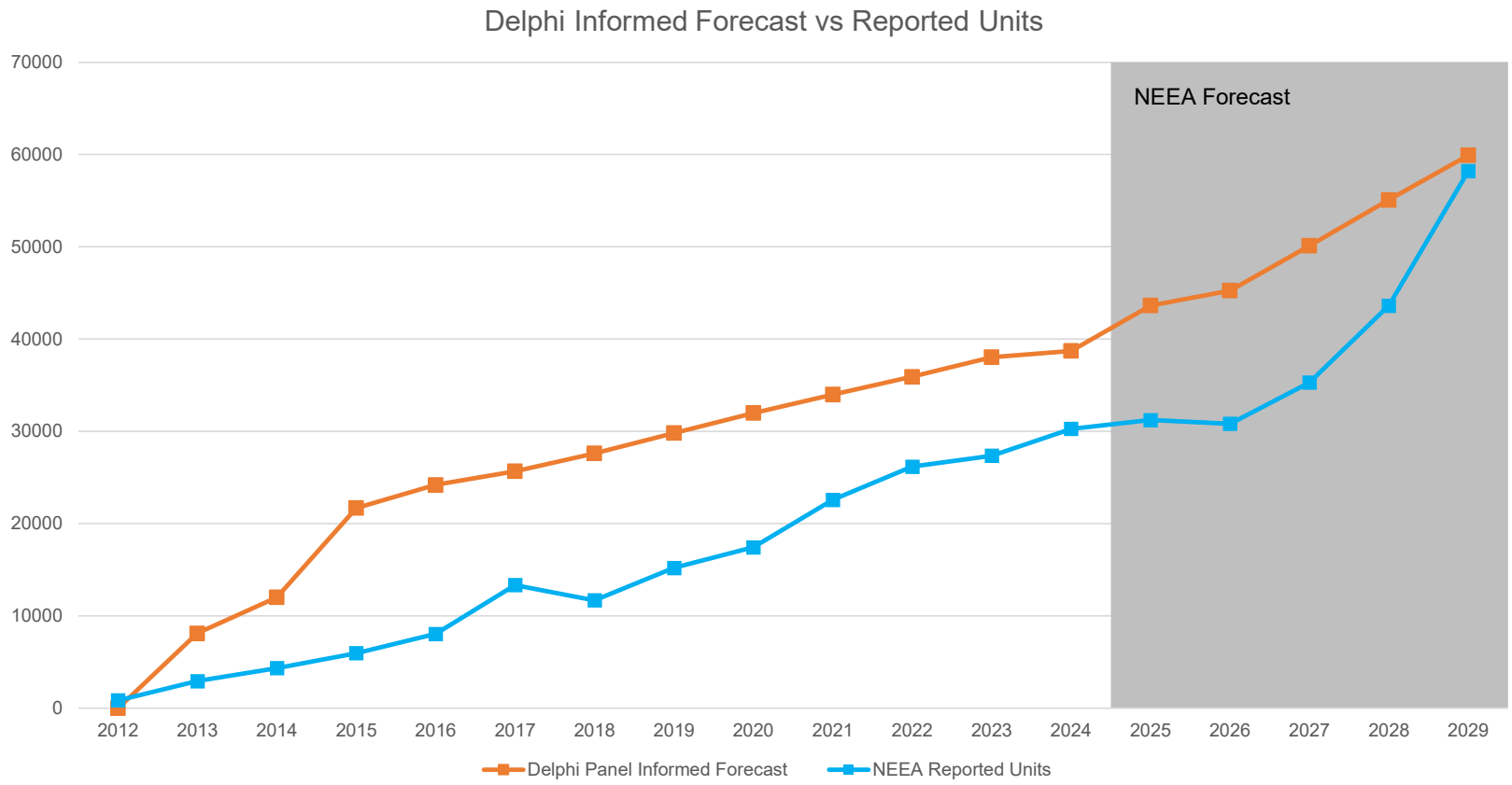
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Natural Market Baseline Review – Summary of Findings

- Previous natural market baseline relied on Delphi panel conducted in 2013
  - Used for both retrofit/replacement and new construction measures
  - The Delphi panel informed forecast assumed a federal standard for HPWHs would be in place by 2024
- LER found that Delphi panel forecasts consistently overestimated the regional market adoption compared with actual adoption reported by NEEA
- In consideration of recurring findings in market progress evaluation reports (MPERs), LER recommended the natural market baseline reflect low adoption rates of HPWHs absent NEEA and its partner's interventions in the market

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Delphi Forecast and Historical Market Units



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Recommended Baseline Updates

- Use an adjusted national HPWH market share for the natural market baseline
  - LER recommended halving the national market share to account for influence of robust incentive programs in certain states
  - Forecast through 2029 (expected federal standard in place) using an exponential fit
- Reevaluate the baseline forecast once the federal standard is in effect

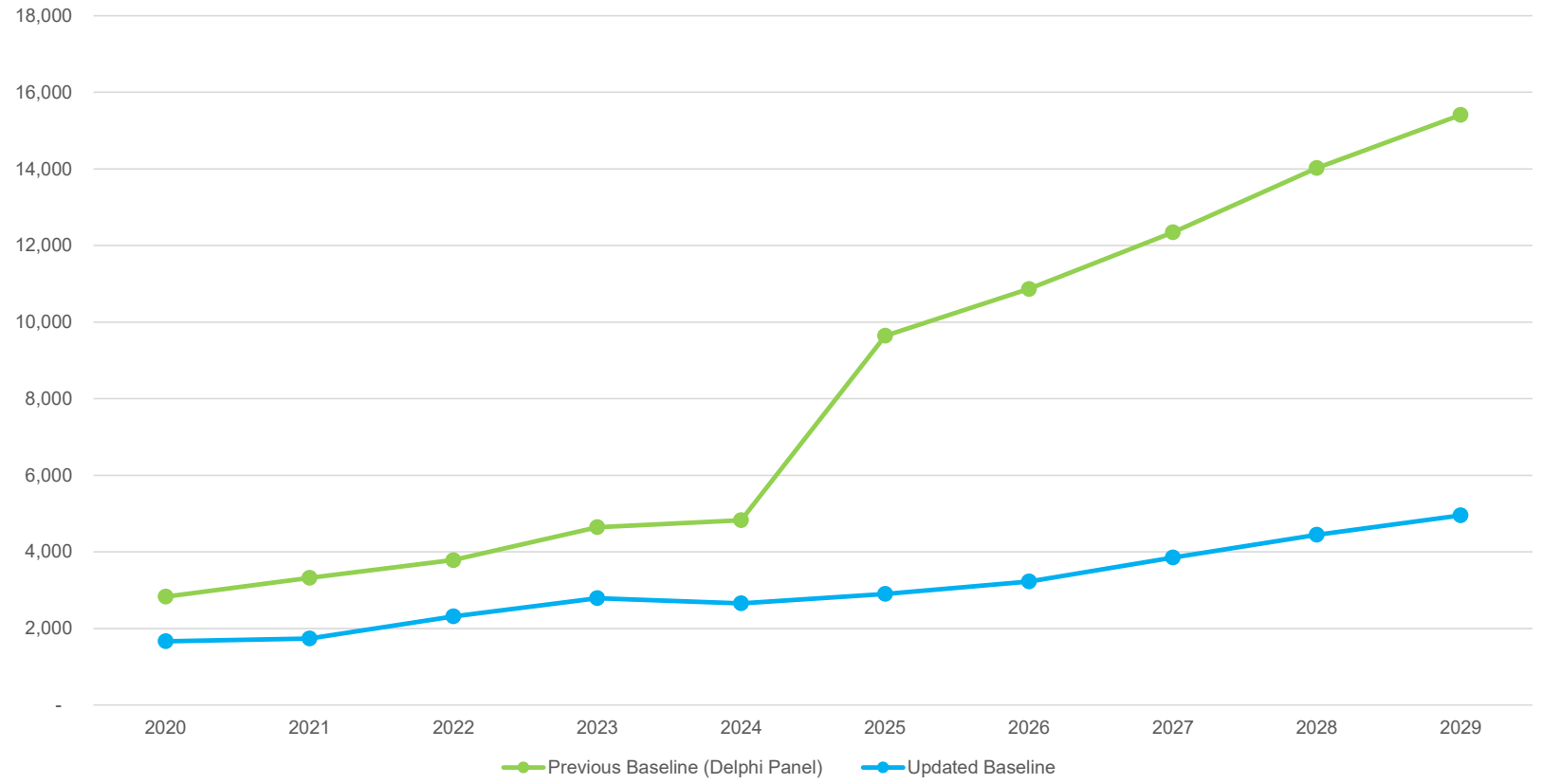
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NEEA Updates

- Based on LER's recommendations, NEEA staff have made the following updates:
  - Updated 2020-2023 baseline estimates using 50% of the estimated HPWH national market share
  - Updated 2024-2029 baseline estimates/forecast using exponential fit of historical data
  - Maintain current baseline assumptions for years 2030+
    - NEEA staff will explore options for updating the baseline assumptions for post-federal standard years

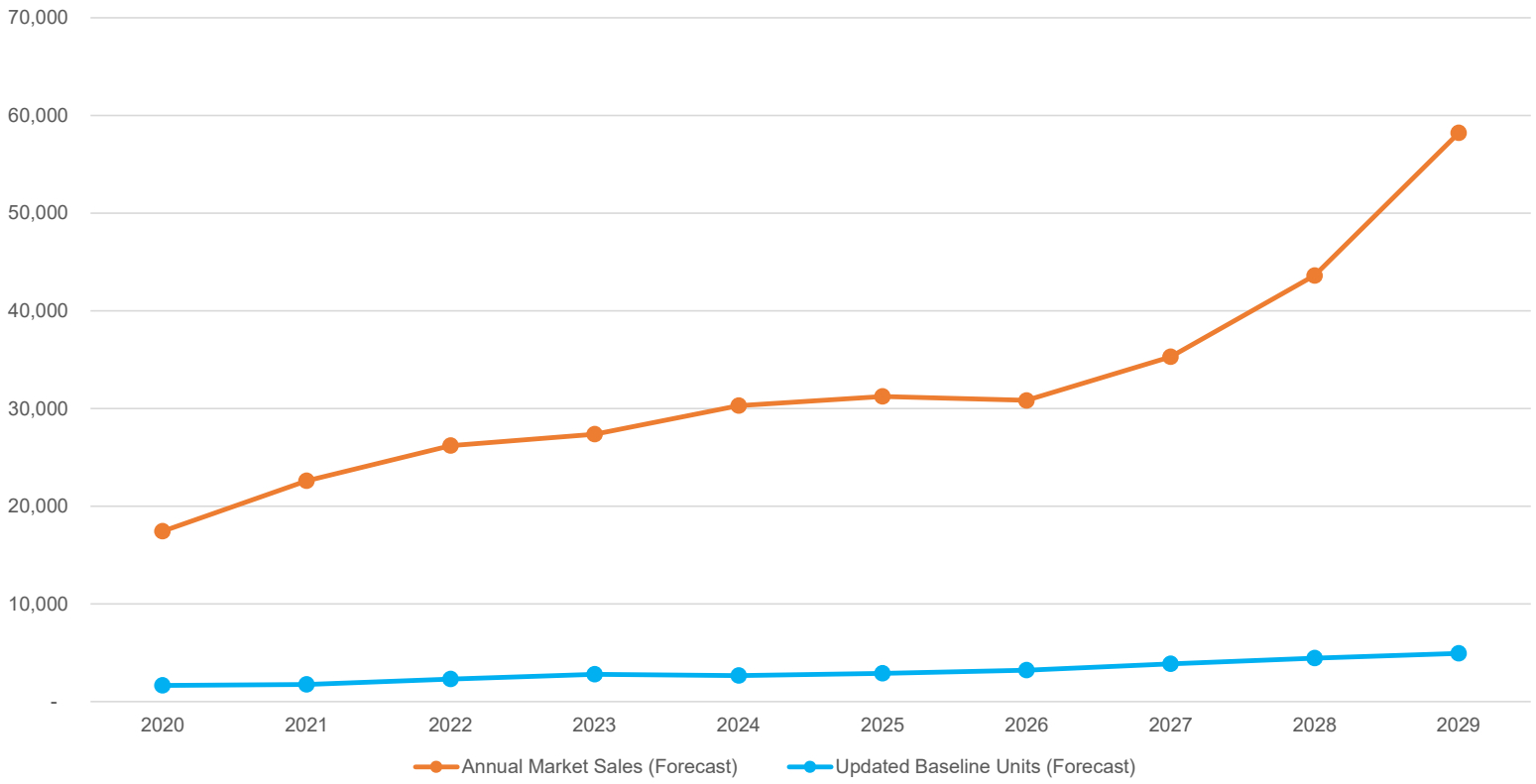
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Baseline Comparison



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Updated Baseline vs Annual Sales



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Impact of Key Assumption Updates

- RTF UES Updates
  - Impact to Power Plan and Market Transformation Savings
- RTF Measure Life Update
  - Impact to Power Plan and Market Transformation Savings
- Natural Market Baseline Update
  - Impact to Market Transformation Savings

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Impact to Business Plan

- RTF UES update
  - Decrease in forecasted savings
- RTF measure life update
  - Increase in near term and historical savings
  - Decrease in long term forecasted savings
- Baseline update
  - Increase in historical and forecasted co-created savings

NEEA Business Plan	Co-Created Savings Δ (aMW)
2020 - 2024	1.0
2025 - 2029	1.5

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Questions?

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Manufactured Homes Diffusion Evaluation
Findings Discussion

October 28, 2026



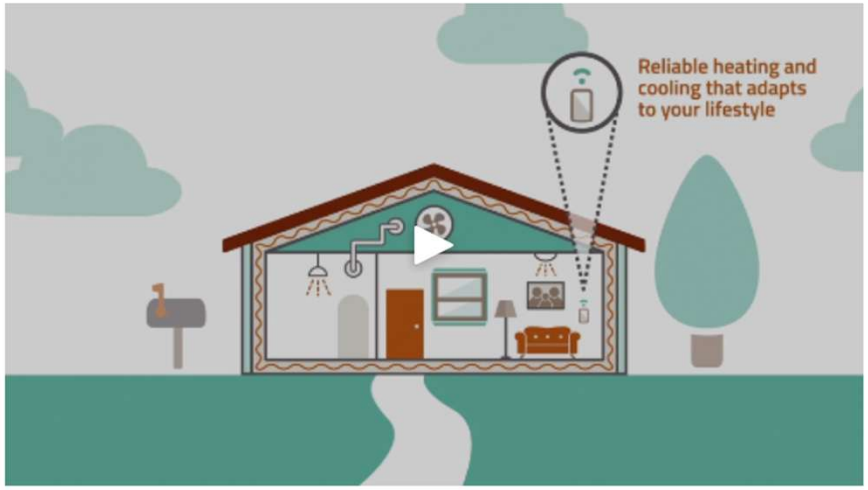
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Market Diffusion Evaluation Background & Context

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What is a NEEM+ Home?

MAKE YOUR MANUFACTURED HOME THE MOST ENERGY EFFICIENT YOU CAN BUY.



WHAT MAKES THESE ENERGY SAVING HOMES DIFFERENT? HERE ARE A FEW OF THEIR INNOVATIVE FEATURES:

- Careful sealing of all connections
- Added floor, ceiling, and wall insulation
- High-performing upgraded windows
- LED bulbs in every fixture
- Ultra-efficient, silent ventilation system
- Flashing and house-wrap
- Smart Thermostat for cooling/heating control

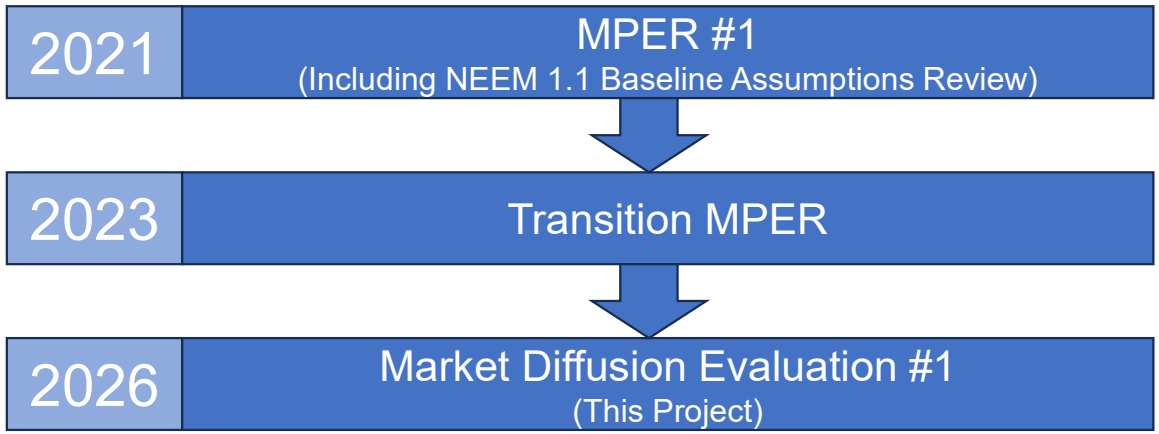
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The Role of a Market Diffusion Evaluation in the Initiative Life Cycle



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Research Background



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Diffusion Evaluation Research Objectives

Assess implications of current regulatory environment for NEEM 1.1 Natural Market Baseline

- How have manufacturers responded to delays in implementation of the federal standard?
- When is a standard likely to take effect?
- How have federal tax credits impacted the market and what lasting effects, if any, are they likely to have?

Evaluate market progress relative to diffusion indicators

- Is there a specification in the market that effectively differentiates energy efficient homes?
- Is an above-code efficiency specification likely to remain viable in the market?

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Diffusion Evaluation Research Approach

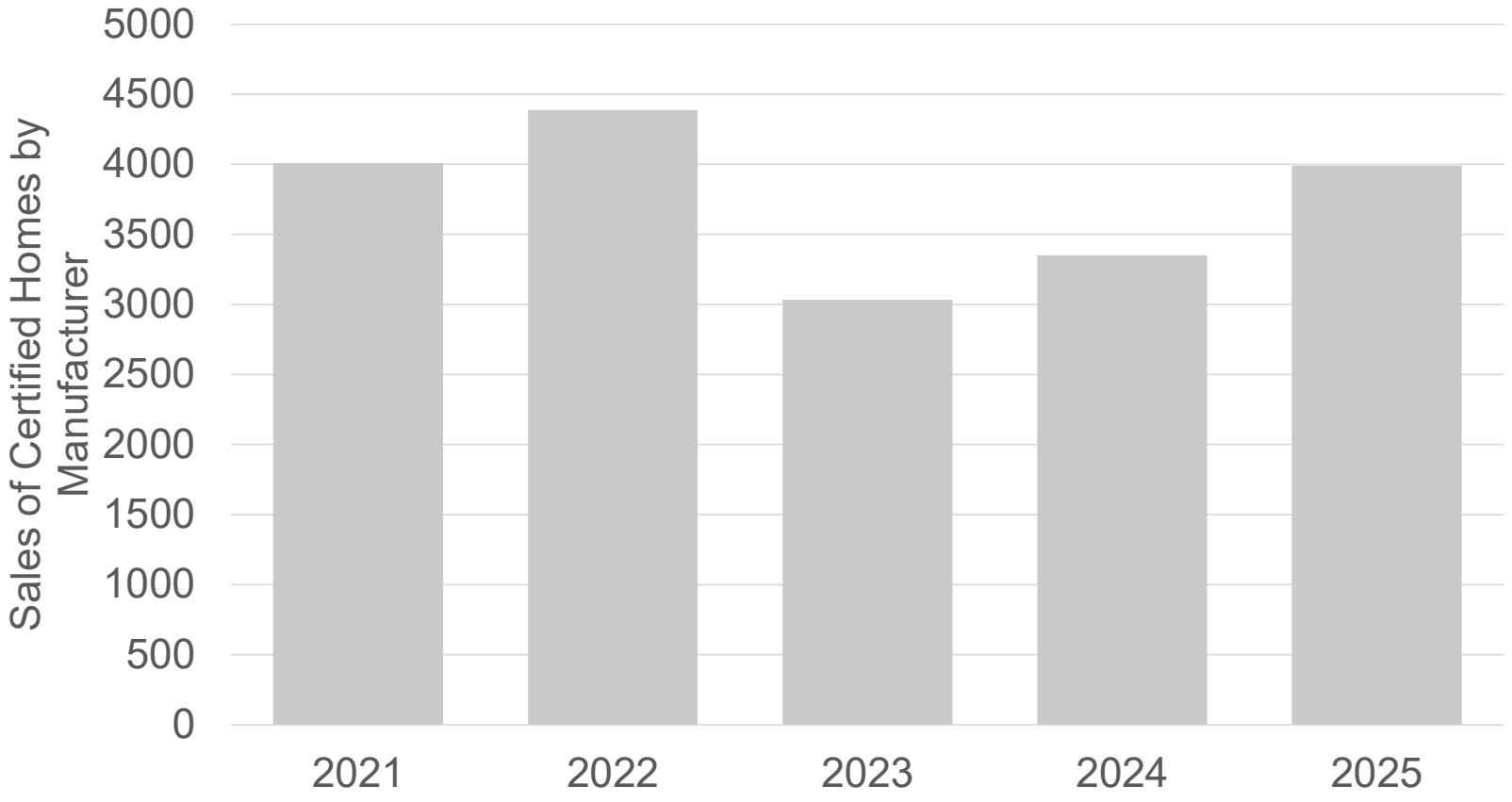
- Secondary Research
  - Regulatory proceedings
  - Press coverage
- Data Analysis
  - Northwest Energy Works data on certified homes 2021-2025
  - Manufactured Housing Survey
- Market Stakeholder Interviews (7 participants)
  - 4 manufacturers
  - ACEEE
  - NASEO
  - Northwest Energy Works

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What has happened in the market over the past few years?

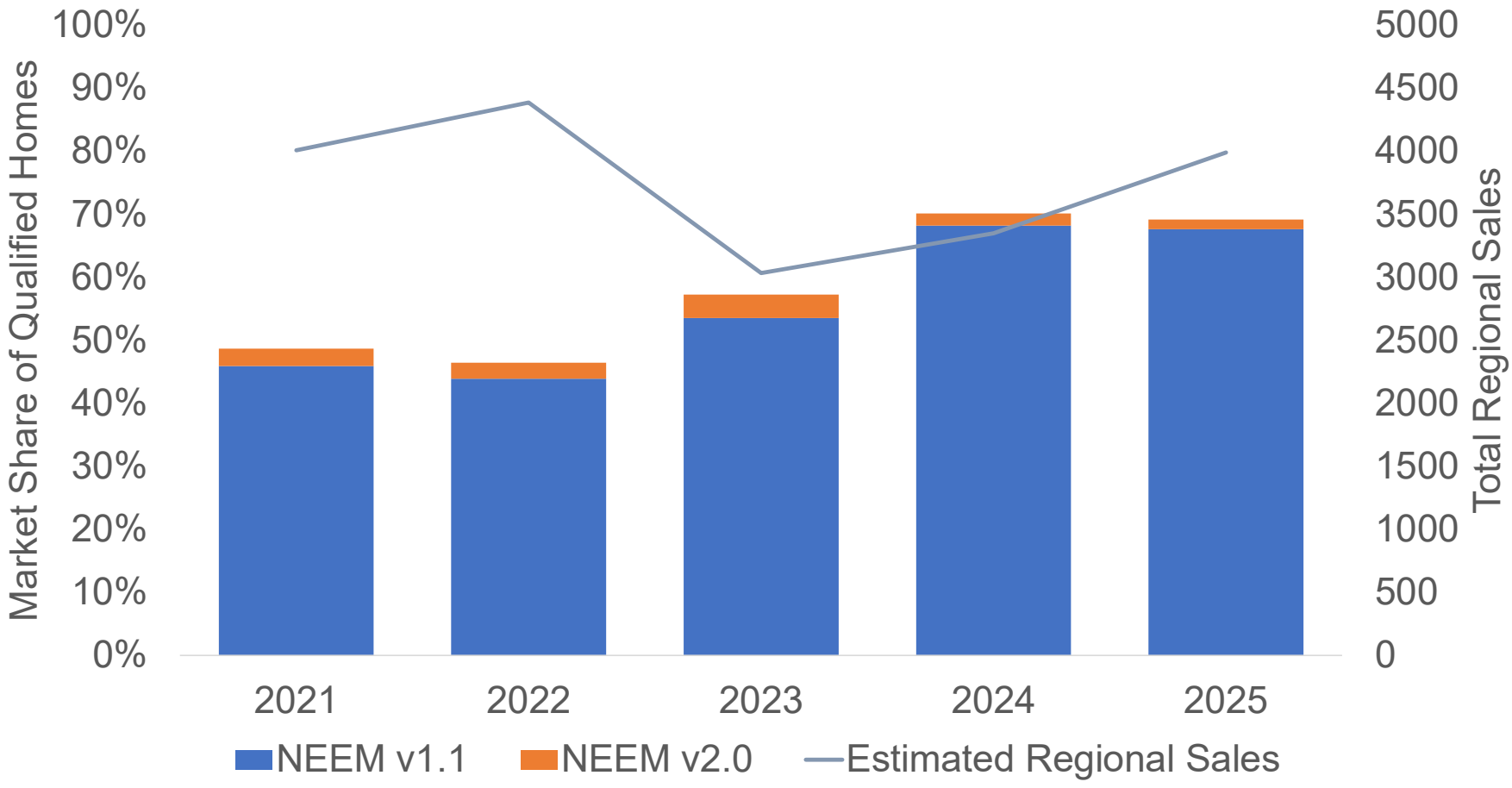
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2023 Sales Dip Appears Unrelated to Federal Standard



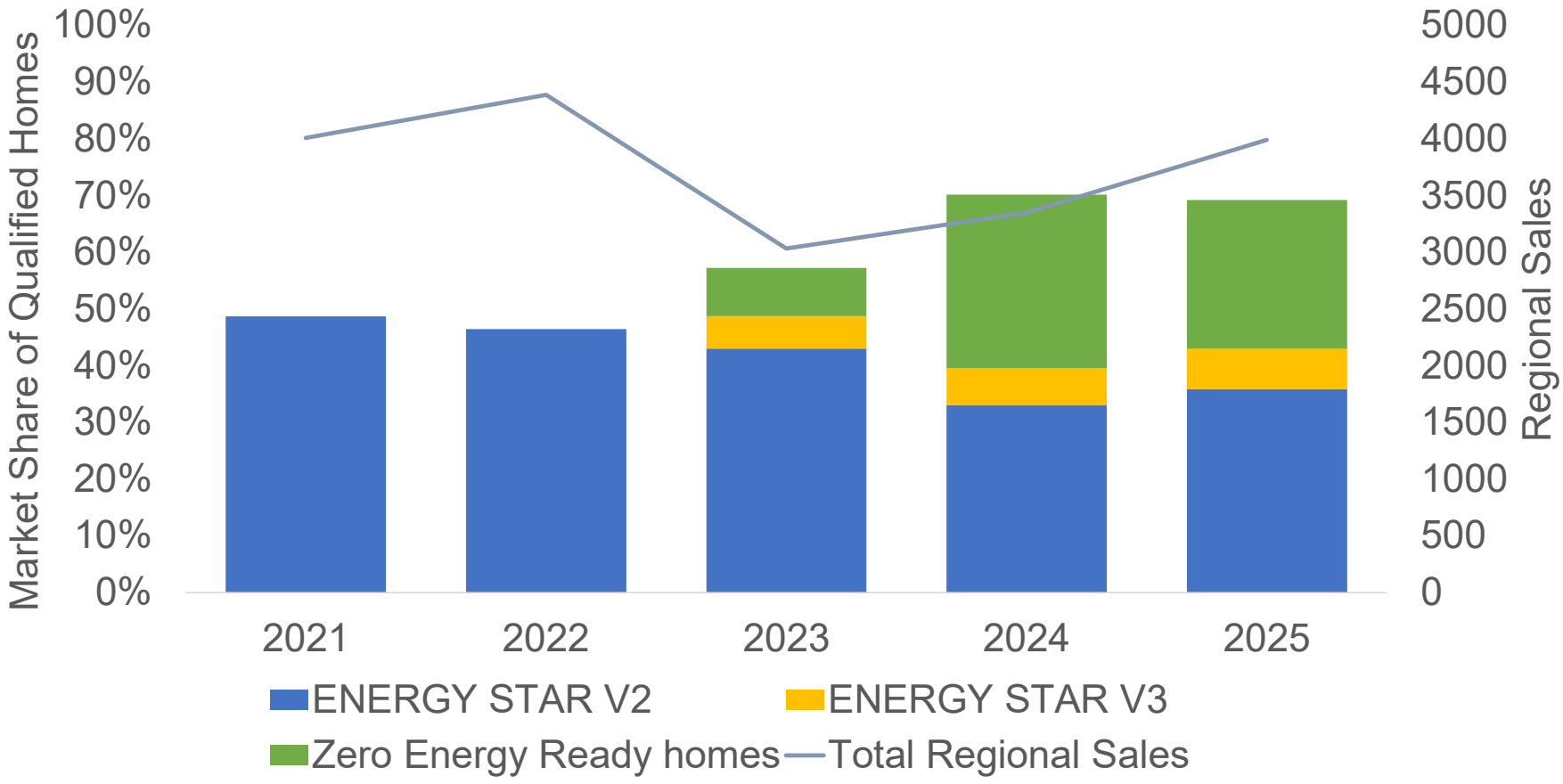
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NEEM Market Share Grew from 2023-2025



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ZERH Homes Drove Growth in Qualified Market Share



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What is likely to happen in the next few years?

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Manufacturers Are Not Likely to Continue Building ZERH as Default Once Tax Credits Expire (06/2026)

- Higher efficiency specs will become an option for home buyers to select, rather than a default.
- ENERGY STAR V3 and ZERH require heat pump installation
  - HP installation must be done once the home is sited
  - Tracking is difficult and costly for manufacturers

"When [tax credits] go away, you have to take a look to see if the price pressures are enough to continue to offer [qualified homes] or is lowering the cost by taking things out the best way to address pricing pressures." –Manufacturer

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Manufacturers Anticipate Price Competition Will Push Toward Lower Efficiency Homes

- Manufacturers are looking to cost cutting to maintain profits once tax credits end.
- Manufacturers anticipate that consumer demand will not support efficient houses at the higher cost.
- Competitive pressures will lead manufacturers to match others' lower-cost offerings.
- The industry markets itself as a provider of low-cost housing.

*"[If competitors] go to a base insulation level to achieve a lower price point, and **consumers react to that lower price point** as opposed to having ENERGY STAR, we will have to answer that."*

"I expect I'm not immune to price pressures at this time. There are other manufacturers that have moved. We haven't moved yet, but it's on our agenda."

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But There Was Disagreement on the Relative Impact of Incremental Efficiency Costs

- Some saw the added cost of efficiency as small relative to the total home cost
  - "If a manufacturer pulls out $1,500 from the base price [of a home] to go to lower [cost] energy [measures], but what the consumer is looking at is a total package of $300,000 and above, is $299,000 going to make a difference?"
- Others saw price as the primary driver of consumer decisions
  - "If you can create demand for an upgrade, that's great. If not, price becomes the dominant buying motive for both the wholesale retail customer and the home buyer. A couple thousand dollars makes a big difference all the way around."

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Multiple Efficiency Specifications Cause Conflict

- Divergence between NEEM and ENERGY STAR
- Manufacturers have limited motivation to pursue ENERGY STAR V3
  - Can continue to certify homes to V2
  - Adoption of the spec would increase infrastructure costs for manufacturers
  - Would require Northwest Energy Works to shift resources
- Regional utility incentives drive relevance of NEEM spec, but RTF cost effectiveness finding (due to increased baseline) could be a barrier
- Two manufacturers plan to continue to offer NEEM+
  - Demand in jurisdictions that require manufactured homes to meet site-built standards
  - One dealer focuses heavily on it

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Conclusions and Recommendations

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The Market Has Not Adapted to the Federal Standard

- Growth in market share of qualified homes is due to the (now expired, as of June 2026) tax credit, not to adjustments in building practices to prepare for a federal standard.
- The tax credit is likely to have limited long-term effects on the market share of qualified homes.
- Market actors and experts do not anticipate a federal standard or updated HUD code will take effect in the near future.

"NEEA should adjust natural market baseline assumptions to account for no new federal standard or HUD code activity until at least 2030, assuming a federal administration more friendly to efficiency regulation would not take office until 2029 and would require at least a year to bring a regulation into effect".

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Meaningful Efficiency Specifications Are Likely to Remain Available, but Market Share Is Not Likely to Grow

Specification	Finding
ENERGY STAR V2	Market share at risk of decline, but qualified homes likely to remain available.
ENERGY STAR V3	High cost for manufacturers to track and no tax credits or other incentives; market share likely to remain low.
ZERH	Market share likely to decline as it becomes an option rather than default for manufacturers that have adopted.
NEEM+	Likely to remain available but as a niche product.

NEEA should collaborate with Northwest Energy Works, the RTF, and BPA to provide analysis support and encourage regional utilities to continue offering incentives for efficient manufactured homes

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Thank You!

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2027 Planned CEAC Dates

QUARTER	DAY	DATE
Q1	Wed	Feb 17
Q2	Thurs	Apr 22
Q3	Wed	Aug 25
Q4	Wed	Oct 27

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Wrap-Up

- Public Comment
- Upcoming Meetings: February 17th, 2027 (tentative)
- Feedback:
  - Overall
  - Agenda
  - Packet materials
  - What went well? What needs work?

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