



Cost-effectiveness & Evaluation Advisory Committee Meeting

Northwest Energy Efficiency Alliance

April 27, 2023

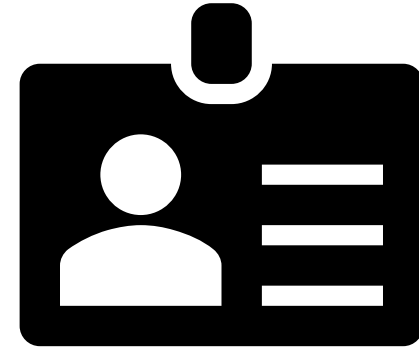
CLASSIFICATION LEVEL: PUBLIC












Introductions

- Name
- Organization
- Question(s) for today?



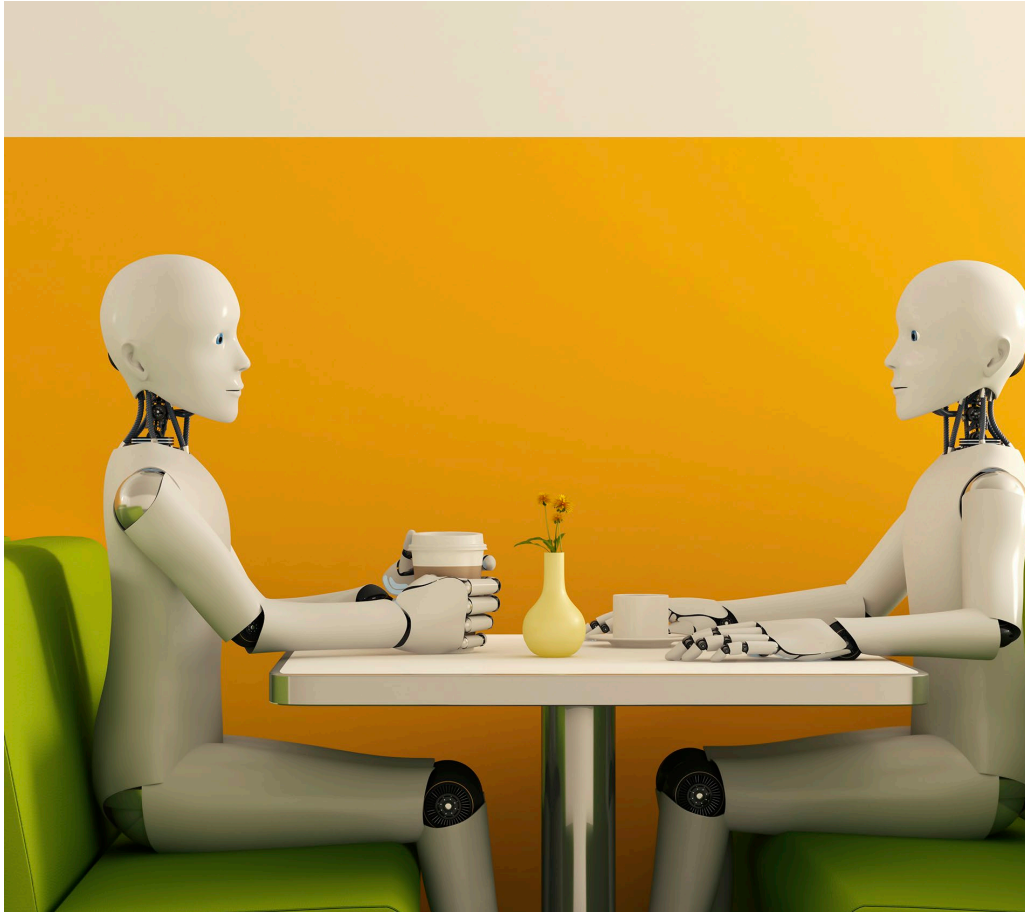


Agenda

10:00am	Welcome/Agenda Review
10:15	MRE Update  
10:30	Dual Fuel Portfolio Overview  
12:00PM	LUNCH
1:00	Key Assumption updates 
2:30	BREAK
2:40	Market Updates  
3:40	Wrap Up



Quick Poll: In-person attendance option for Q3?



If the option were made available in Q3, what is the likelihood you would be able and interested in joining a Q3 CEAC meeting in-person?

- 1 (no chance)
- 2
- 3
- 4



Why are we here again?

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.

MRE Update

Objectives

- ❑ Committee awareness of market research and evaluation activities

2023 Q1

Market Research & Evaluation Quarterly Newsletter

WHAT'S NEW:



Hello everyone!

The Market Research and Evaluation (MRE) team is pleased to bring you this quarter's MRE newsletter. The team is looking ahead to a second quarter of lots of reports! More than half of the twenty-three studies that are currently underway anticipate final reports to post in the next three months. These reports become key assets to the Market Transformation programs they serve, as well as to the region. NEEA's evaluation reports, such as Market Progress Evaluation and Market Characterization reports, not only assess and document progress toward expected market outcomes, but they also provide market insights to help refine the program and improve its effectiveness at transforming the market.

A few of the evaluation projects you will see described in the newsletter do not have an explicit program adaptive management use case. Examples include baseline reviews, cost-benefit model reviews, and key assumptions reviews. MRE is not tracking progress toward outcomes in these studies, and the team is not using the results to refine the program. Instead, the results of these evaluations help to refine the modeled savings for the program. They validate the model assumptions (or, as the case may be, reject them or suggest improvements) and they help to refine the accuracy of the estimated costs and benefits associated with the program's market influence. Thank you for taking some time to read over the newsletter. Please reach out with any questions or suggestions. Until next time, I hope you have a wonderful spring!

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

TABLE OF CONTENTS

At a Glance	2
Integrated Systems	4
Products	11
Codes, Standards, New Construction	17
Long-term Monitoring	21
Contact	22

PUBLISH DATE: March 15, 2023

At a Glance

MARKET RESEARCH & EVALUATION PROJECTS

Integrated Systems



Efficient Rooftop Units: *Market Progress Evaluation Report #1*



PLANNING*



FIELDING*

REPORTING*

High-Performance HVAC: *Market Progress Evaluation Report #1*



High-Performance Windows: *Naturally Occurring Baseline Review*



Luminaire Level Lighting Controls: *Incremental Cost Study*



Luminaire Level Lighting Controls: *Key Assumptions Review*



Luminaire Level Lighting Controls: *Market Progress Evaluation Report #2*



Natural Gas Portfolio and Strategy: *Dual-Fuel and Gas Heat Pump Market Research*



Variable Speed Heat Pumps: *Baseline and Key Assumptions Review*



Products



Efficient Fans: *Fan System Market Characterization*



Motor-Driven Products: *Commercial Adjustable Speed Drive Market Penetration Research*



Heat Pump Water Heaters: *Benefit/Cost Model Review*



Heat Pump Water Heaters: *Market Research: Challenging Installation Scenarios*



Heat Pump Water Heaters: *Market Progress Evaluation Report #7*



Heat Pump Water Heaters: *Installer Focus Groups*



Retail Product Portfolio: *Refrigerator Baseline Update*



Retail Product Portfolio: *Market Progress Evaluation Report #2*



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



Standards: *Commercial Kitchen Equipment and High CRI Lamp Oregon and Washington State Standards Evaluation*



Residential Codes: *Idaho and Montana Residential Code Evaluations*



Residential Codes: *Washington Residential Code Evaluation*



Commercial and Residential Codes: *Market Progress Evaluation Report #2*



Commercial Codes: *Idaho Commercial New Construction Code Evaluation*



Commercial Codes: *Montana Commercial New Construction Code Evaluation*

Long-term Monitoring & Tracking



Ductless Heat Pump Long-Term Monitoring and Tracking, Year 2

DUAL FUEL (Electric & Natural Gas) PROJECTS:



NATURAL GAS PROJECTS:



PLANNING* FIELDING* REPORTING*



*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

Dual Fuel Portfolio Overview

Objectives

- ❑ Inform and address committee questions regarding NEEA's 2022 annual reporting on savings and other key metrics
- ❑ Share emergent themes, management focus areas and outlook for the electric and natural gas market transformation portfolios



Annual Reporting Process – wrapping up in Q2

Q4 2022

- ▶ Review recent key assumption updates

Q1 2023

- ▶ *Open Webinar* on Market Transformation Savings and Benefit-Cost Accounting and Reporting
- ▶ Review updates to key assumptions for annual savings reporting

Q2 2023

- ▶ Publish final set of updates to key assumptions for annual savings reporting
- ▶ Review resulting Energy Savings estimates for the NEEA portfolio
- ▶ Review cost effectiveness assessment, peak savings and avoided carbon emissions
- ▶ Share key market trends and new findings



Executive Summary

	2022 Reported vs Ops Plan target	Cycle 6 forecast vs BP target
Electric	Above target	Above target
Gas	Below target	Below target

- Electric portfolio in strong position
 - Cycle forecast is largely unchanged at the portfolio level
 - Majority of savings potential from current portfolio still ahead of us
 - Efficiency trends have stayed relatively strong despite supply chain and inflationary pressures
- Natural Gas portfolio below business plan forecast
 - Advanced Efficient Rooftop Units into Market Development!
 - Majority of savings in portfolio coming from new construction
 - Additional savings streams expected in the future



Electric Savings Portfolio Update



Electric Market Transformation Portfolio

Active Investments: Status as of Dec. 2022

Scanning/ Concept Development	Program Development	Market Development	Codes & Standards
	Variable Capacity Heat Pump Extended Motor Products / Fans High Performance Windows	Heat Pump Water Heater Luminaire Level Lighting Control Retail Product Portfolio Manufactured Home Extended Motor Products / Pumps High Performance HVAC	New Construction: Residential & Commercial Codes Products: Residential & Non-Residential Standards

Active Investments:

Programs generating first year savings and NEEA is currently investing in the market in the current cycle, 2020-2024

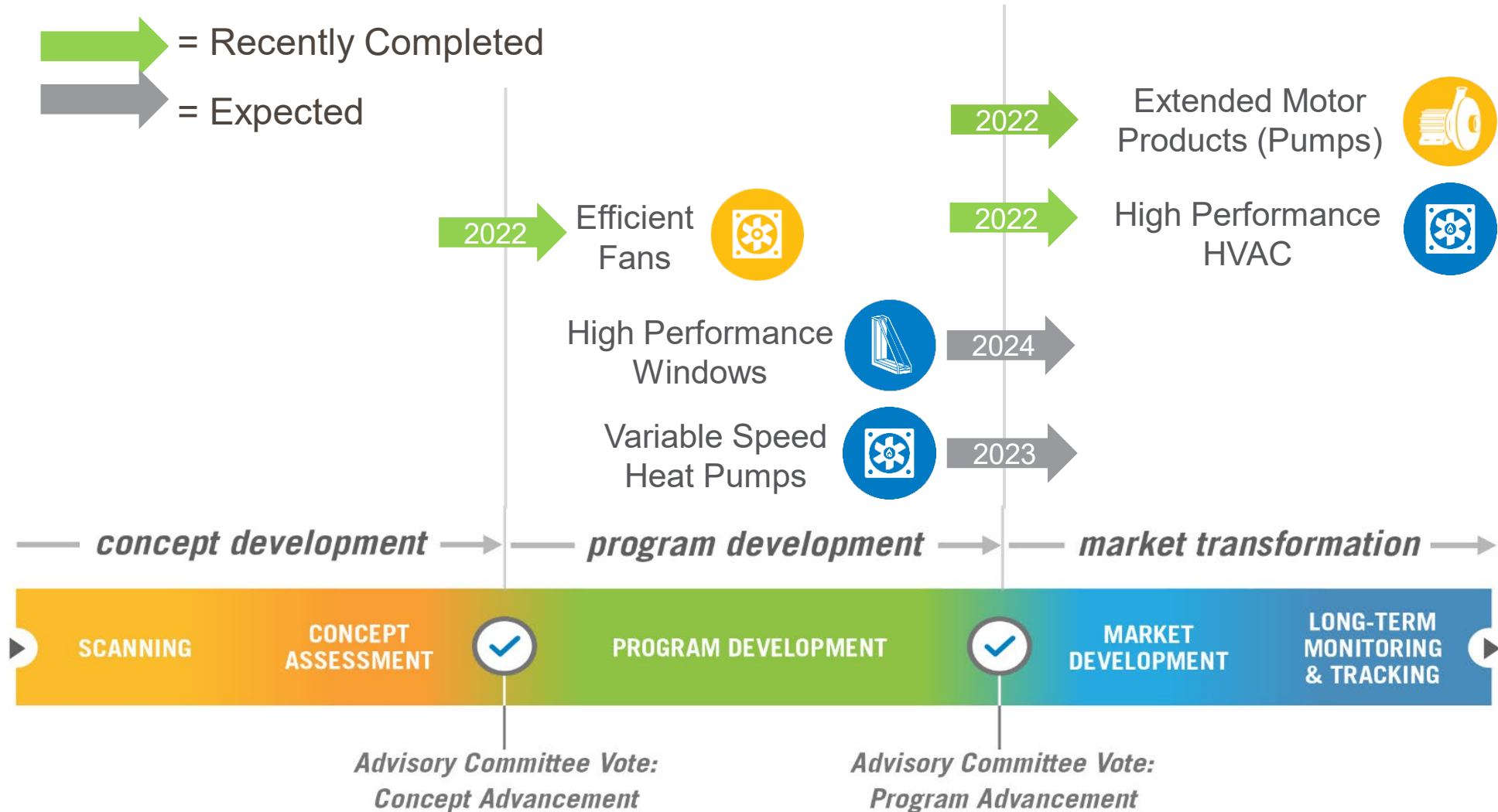
Level of Program Maturity



Programs reporting energy savings in 2022 are in bold



Recently Completed and Next Expected Milestones: Electric





Electric Market Transformation Portfolio

Previous Investments (electric only): Status as of Dec. 2022

Long-term Monitoring and Tracking	Codes and Standards
<ul style="list-style-type: none">Reduced Wattage Lamp ReplacementDuctless Heat PumpsEfficient HomesStrategic Energy Management	<ul style="list-style-type: none">New Construction: Residential & Commercial CodesProducts: Residential & Non-Residential Standards

Previous Investments

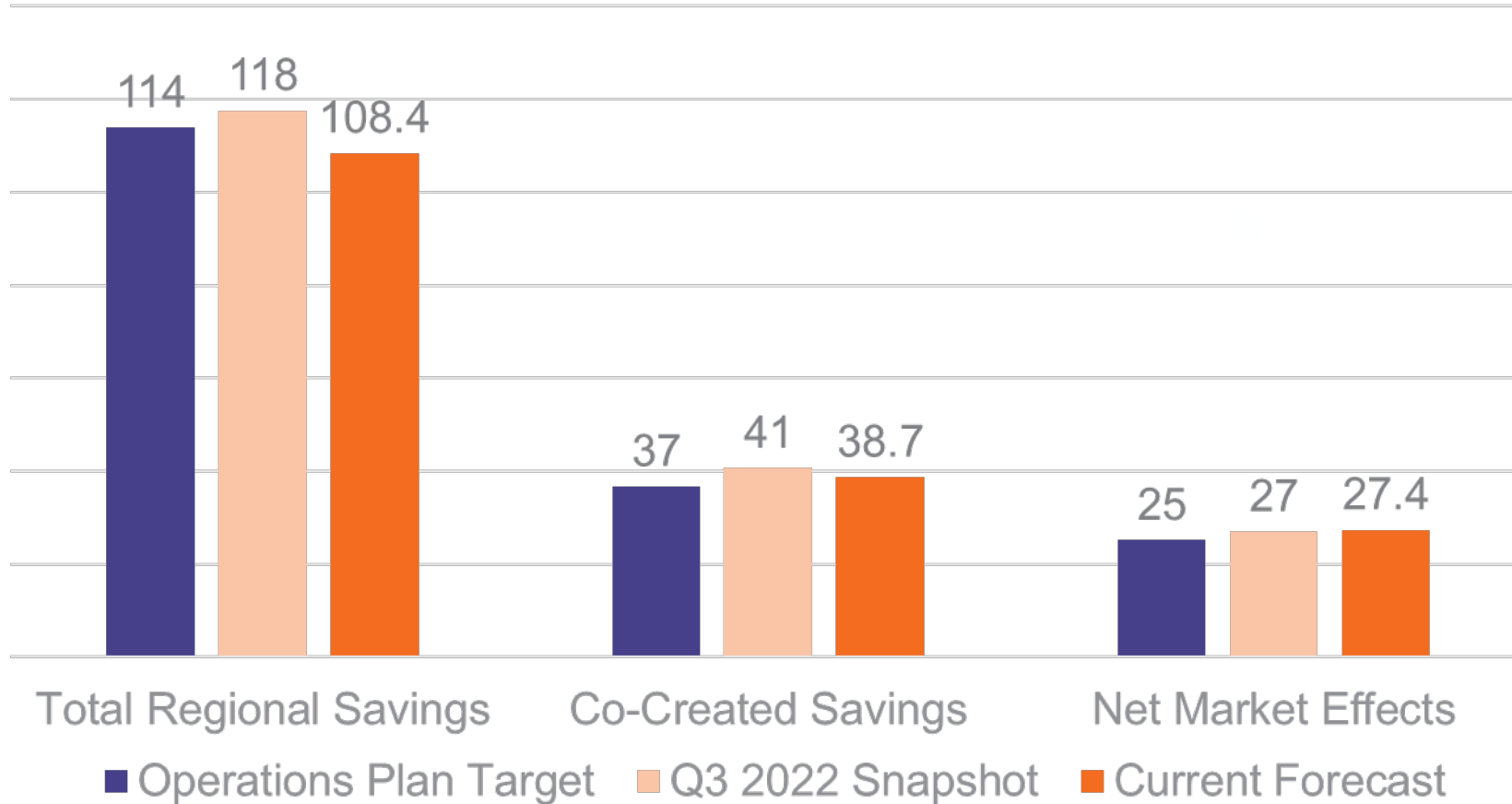
Regional investment has concluded

First year savings above baseline still occurring in market.



Electric Portfolio generated 38.7 aMW of Co-Created Savings in 2022

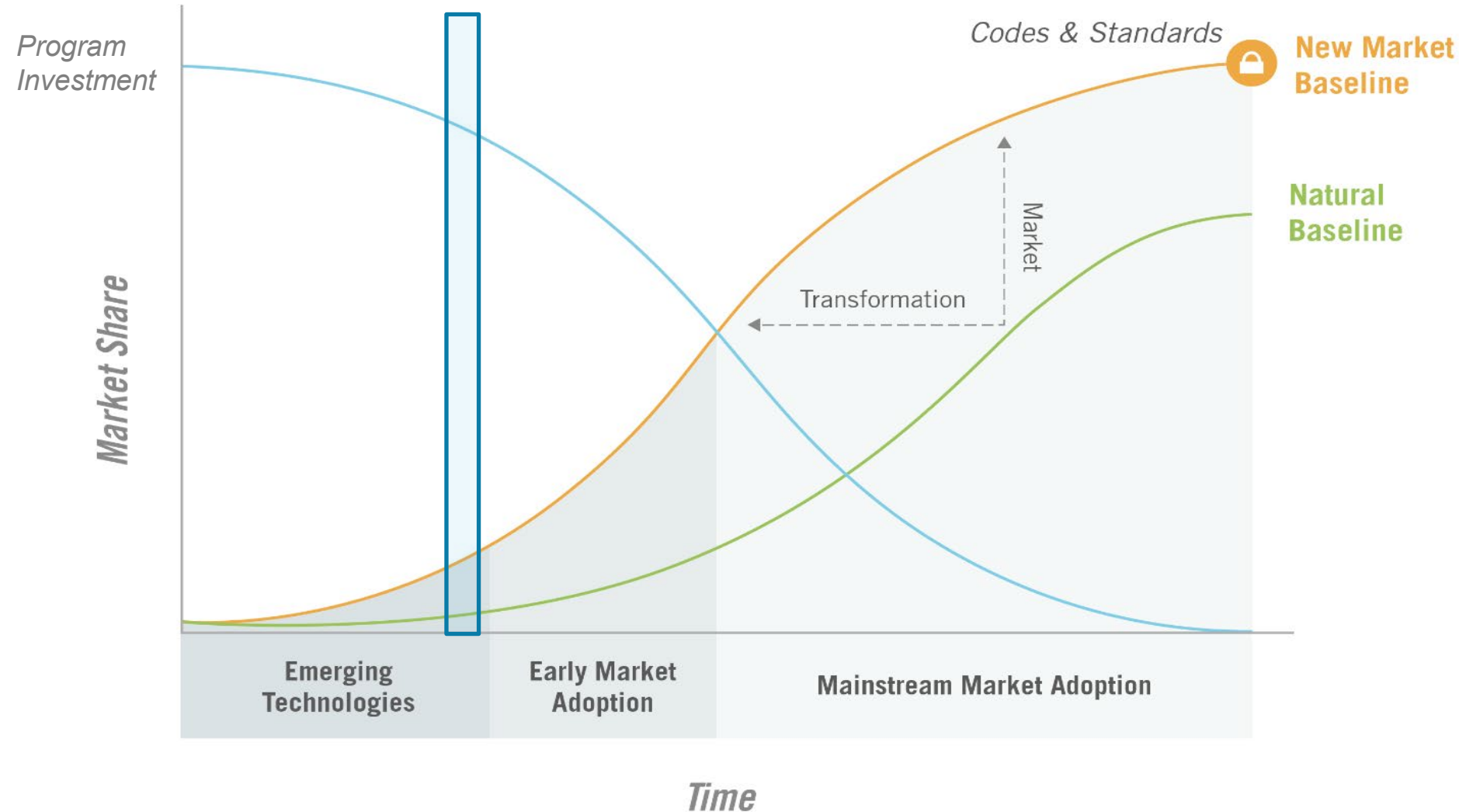
2022 Energy Savings (aMW)



Some evidence in 2022 of supply chain and inflation pressures impacting adoption



Annual Savings is a slice of results of a 20-year market transformation lifecycle

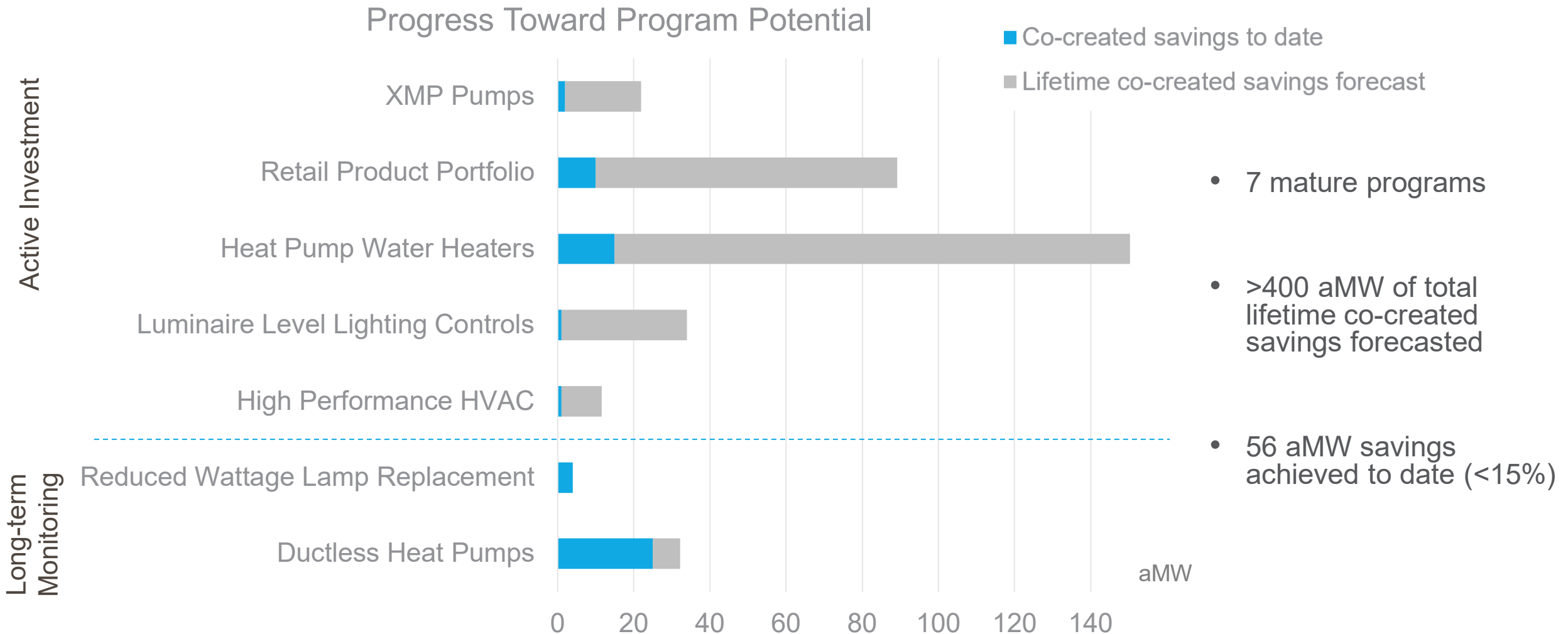


Creating sustainable, long-term conditions through transformative mechanisms:

- Product Specifications
- Improved Test Procedures
- Code
- Standards
- Supply chain commitments
- Market infrastructure and capabilities



Programs are just beginning to tap into the potential

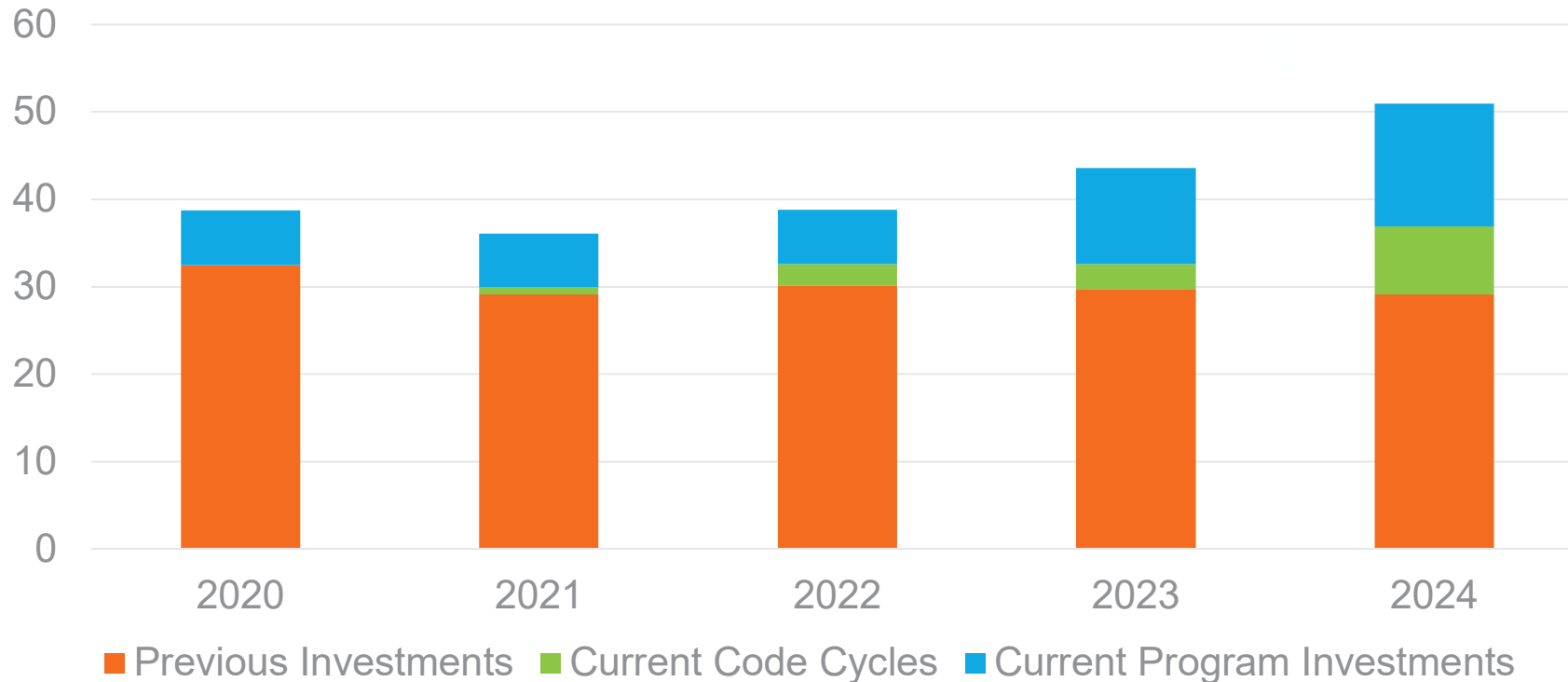




Long term view of market transformation toward sustainable market conditions

~160 aMW of energy savings in this 5-year cycle

Total Energy Savings Portfolio
Co-Created Savings Forecsat (aMW)



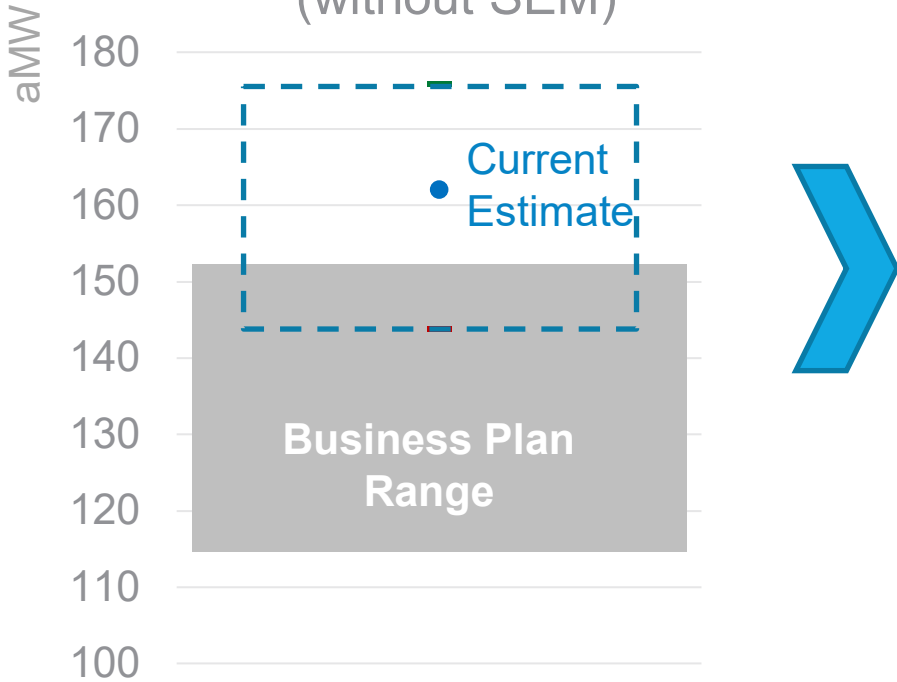
MT Influence is multi-year development and spans:

- Specification, QPL development
- Manufacturer product lines & commitments
- Distributor & Retailer practices
- Consumer choices

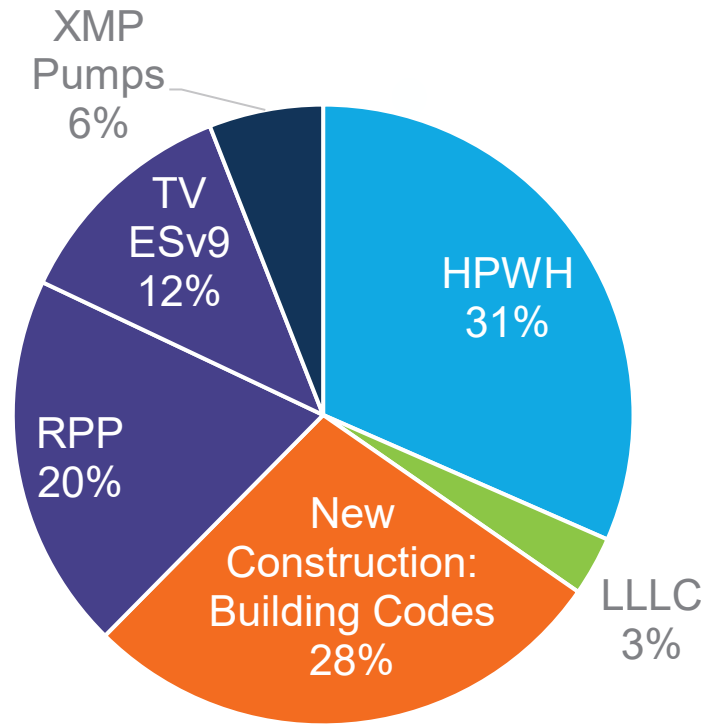


Full Cycle Co-Created Energy Savings forecast at/above Business Plan expectations

2020-2024 TOTAL Co-Created Savings from All Investments (without SEM)



57 aMW CO-CREATED SAVINGS FROM ACTIVE INVESTMENTS 2020-2024



BP range: 40-62 aMW

Strong continuity of Strategic Energy Management (SEM) (+27 aMW cycle-to-date)

XMP Pumps and TVs added portfolio diversity, & increased savings potential for C6

Watching economic effects, but likely to stay above expected savings range through this cycle



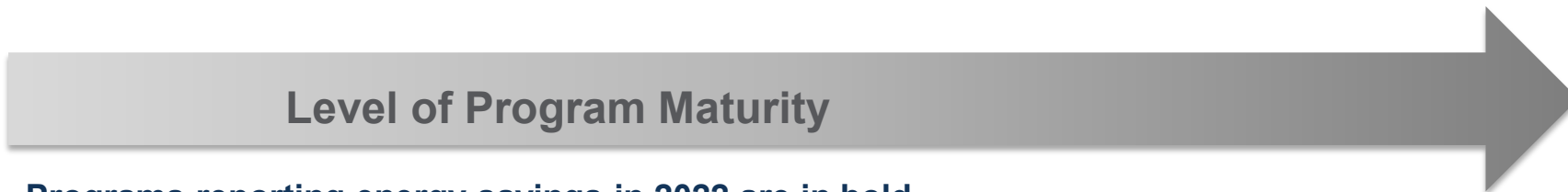
Gas Savings Portfolio Update



Regional Market Transformation Portfolio

Gas Investments

Scanning/ Concept Development	Program Development	Market Development	Codes & Standards
Efficient Gas Water Heaters	High Performance Windows – dual fuel	Efficient Rooftop Units – natural gas	Residential & Commercial Codes – dual fuel
Additional Emerging Market and Technology Opportunities			Residential & Non-Residential Standards – dual fuel

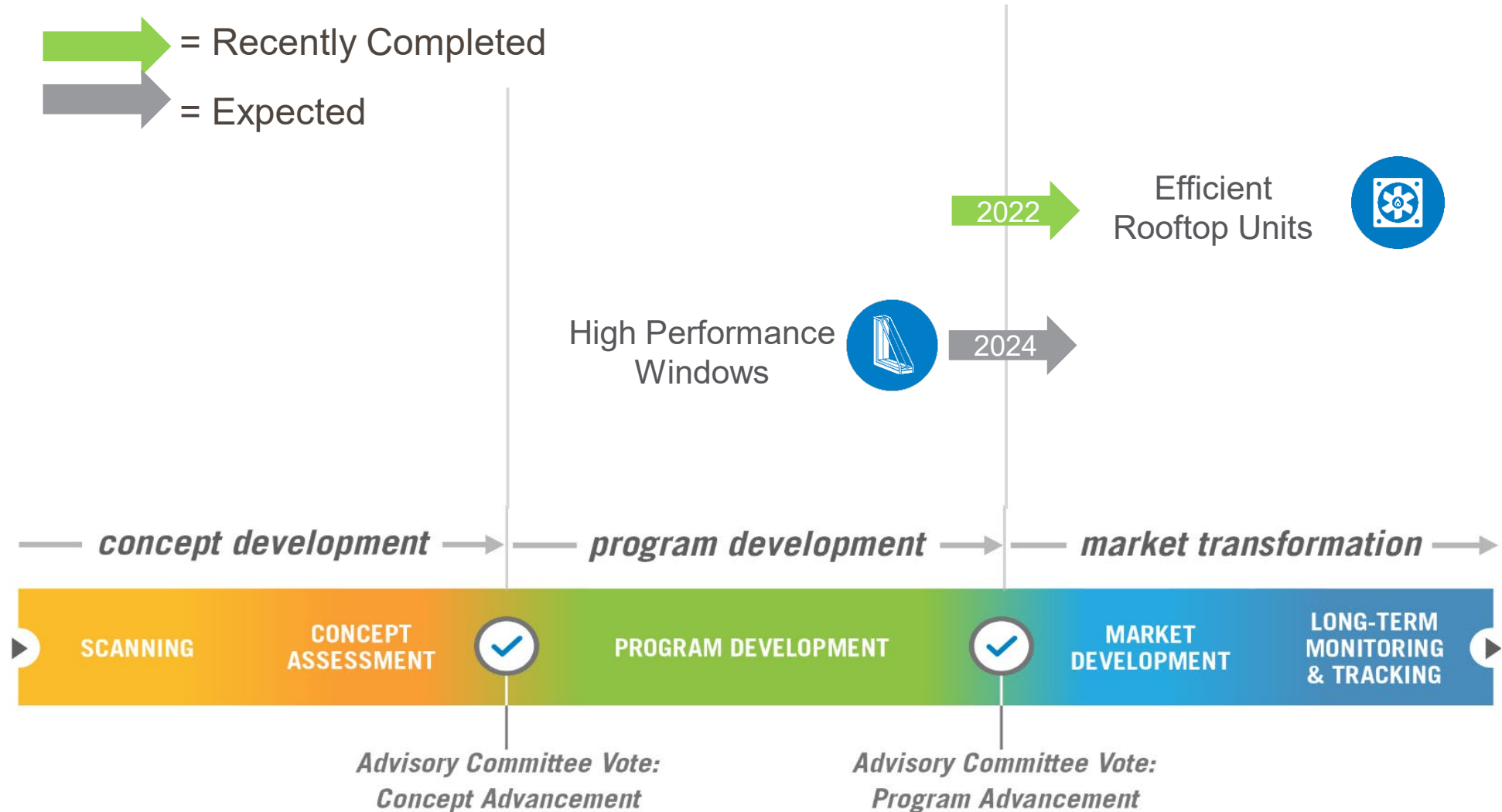


Programs reporting energy savings in 2022 are in bold

Gas portfolio still largely in early maturity



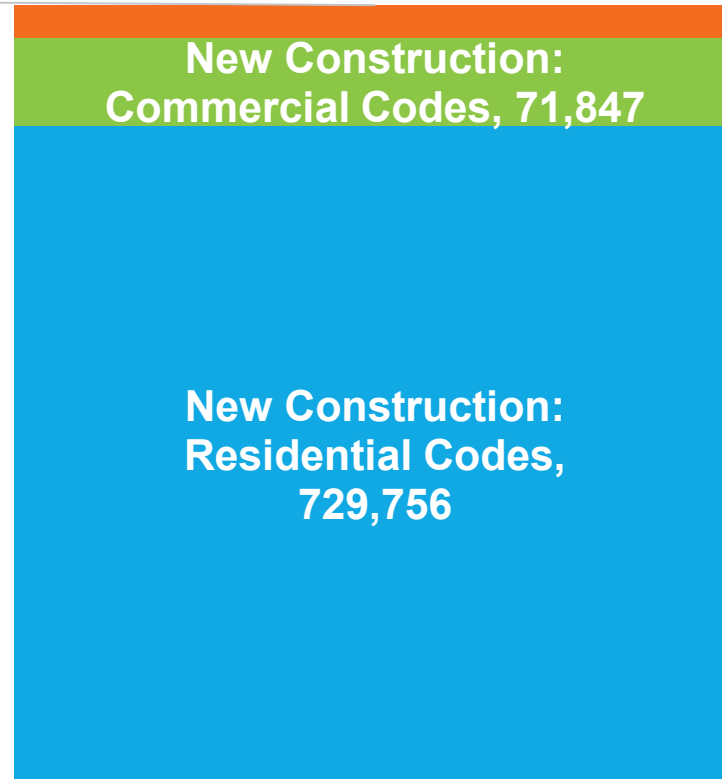
Recently Completed and Next Expected Milestones: Natural Gas





2022 Co-Created Therm Savings

**Products:
State Standards,
25,957**

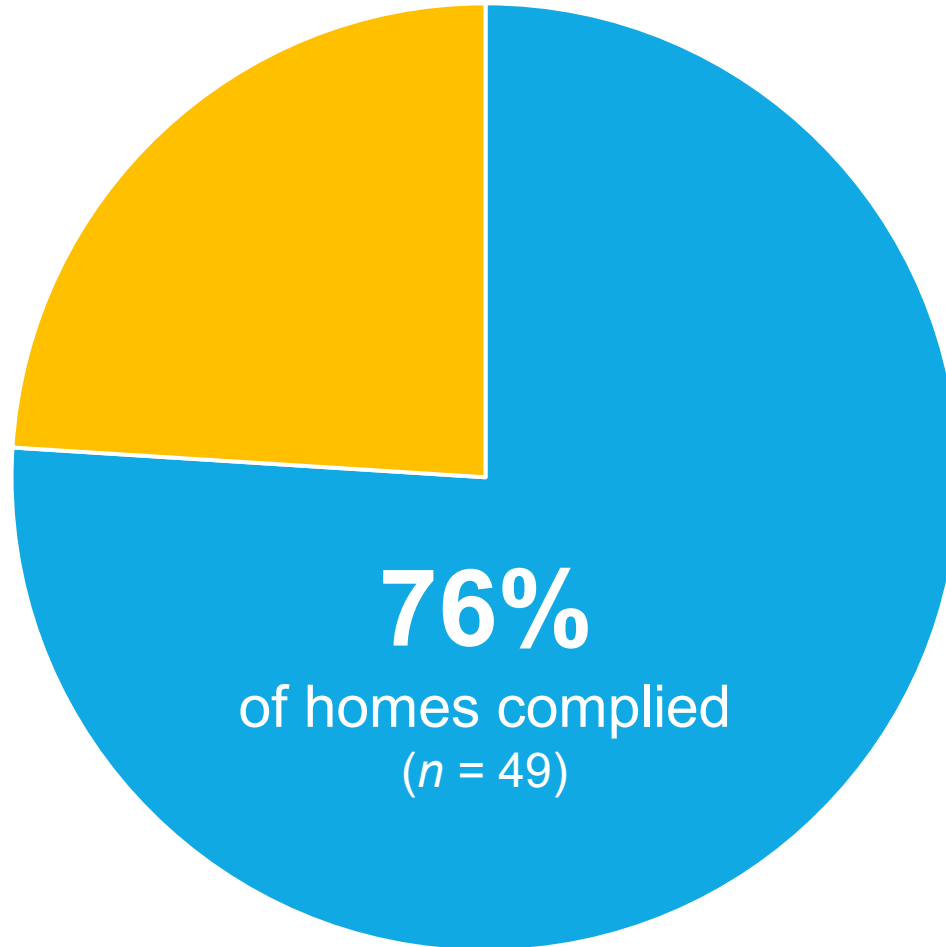


2022 Co-created Savings

Expecting
2022 Savings
from Efficient
Rooftop Units



Washington Residential Code Evaluation Compliance Results





Washington Residential Code Evaluation

Primary Space and Water Heating Fuel Results

■ Electric

■ Gas

Space Heating

WSEC 2015 Evaluation
(n = 178)

20%

80%

WSEC 2018 Evaluation
(n = 56)

82%

18%

Water Heating

WSEC 2015 Evaluation
(n = 114)

37%

63%

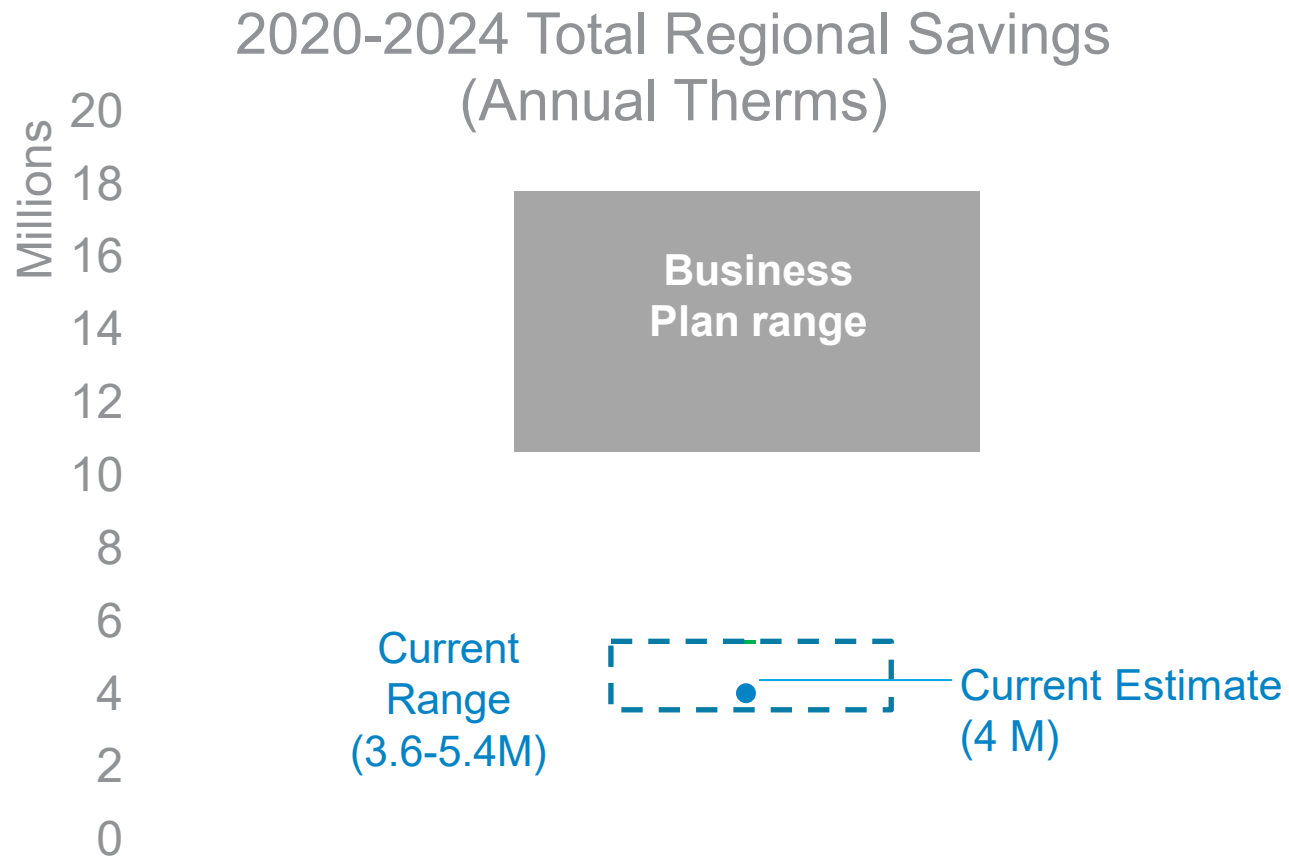
WSEC 2018 Evaluation
(n = 56)

89%

11%



Cycle 6 Expectations Reset for Natural Gas Portfolio



**Avoided
Carbon
Emissions:**

**15,600 –
24,200 tons**



Expectations for Timing of Savings Reporting

Program	Products	Year Expected to Begin Reporting
New Construction: Commercial Code	Specific proposals advanced in WA 2018	2021
	Specific proposals advanced in 2021 OEESC	2021
	Working on future code development in ID	TBD
New Construction: Residential Code	Residential Codes WA 2018	2021
	IECC 2018 with Idaho amendments	2021
	Or. Specialty Code 2023	2024
Efficient Rooftop Units	Efficient Rooftop Units	2022 (Available in Q4)
Products: State and Federal Standards	Commercial Kitchen Equipment (WA)	2021
	Commercial Kitchen Equipment (OR)	2022
	Commercial Boilers (Federal)	2023
High-Performance Windows	Windows	2023/2024
Efficient Gas Water Heater	Gas Heat Pump Water Heaters	TBD

Additional Portfolio Metrics: Electric and Natural Gas

Objectives

- Clarify NEEA's use of Cost-Effectiveness results
- Update the committee on the changes to Cost-Effectiveness inputs and current Portfolio Values



Benefit-Cost Assessment



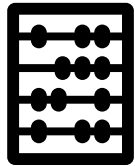


Updating Input Assumptions for the 2021 Power Plan



Changing to ProCost Version 5.x

Updated version of ProCost developed by the RTF for the 2021 Power Plan



Updated Model Inputs

New Discount Rate, and Avoided Costs to align with the 2021 Power Plan



Peak Hours Definition

NEEA Cost-Effectiveness reporting will continue to use the 7th Power Plan Peak Hours definition, but we will run the model with the 2021 Power Plan definition as well for comparison



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

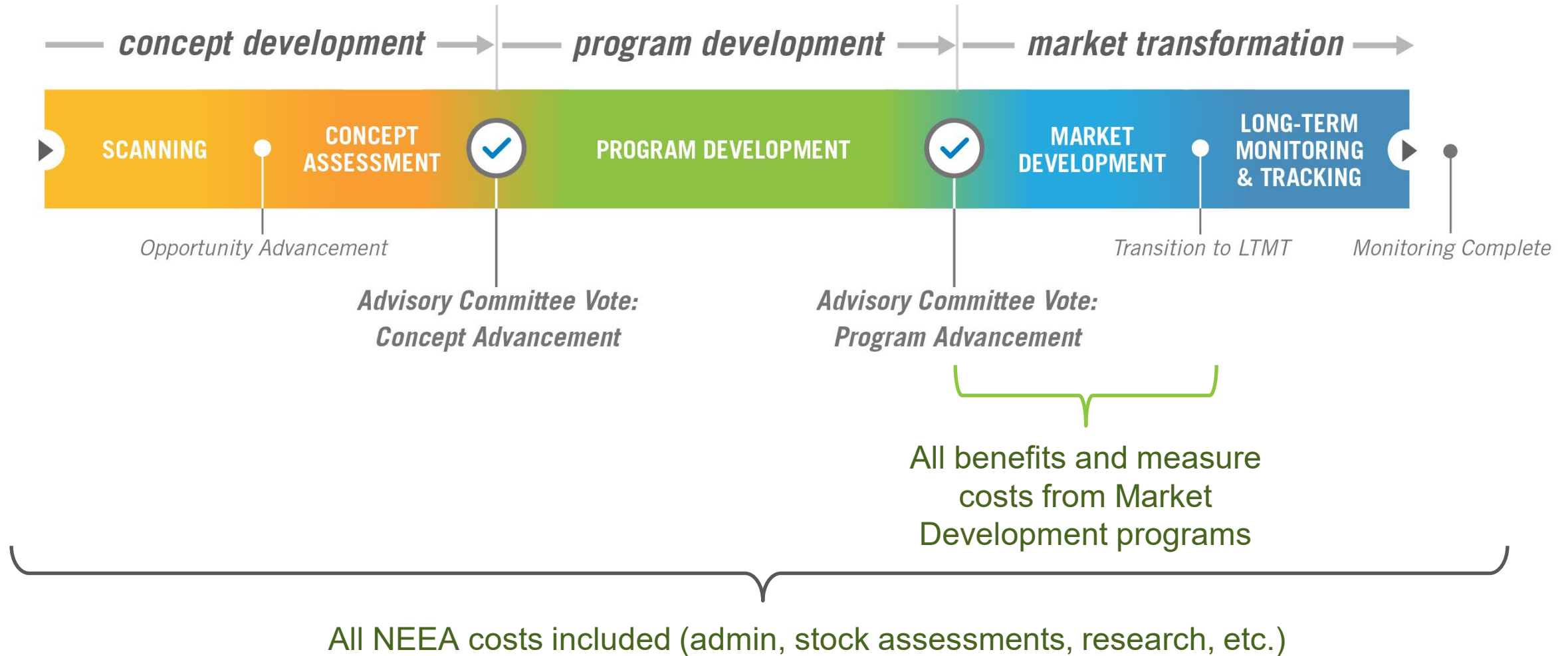


Portfolio level

Aggregate across programs
Market Transformation investment from societal perspective

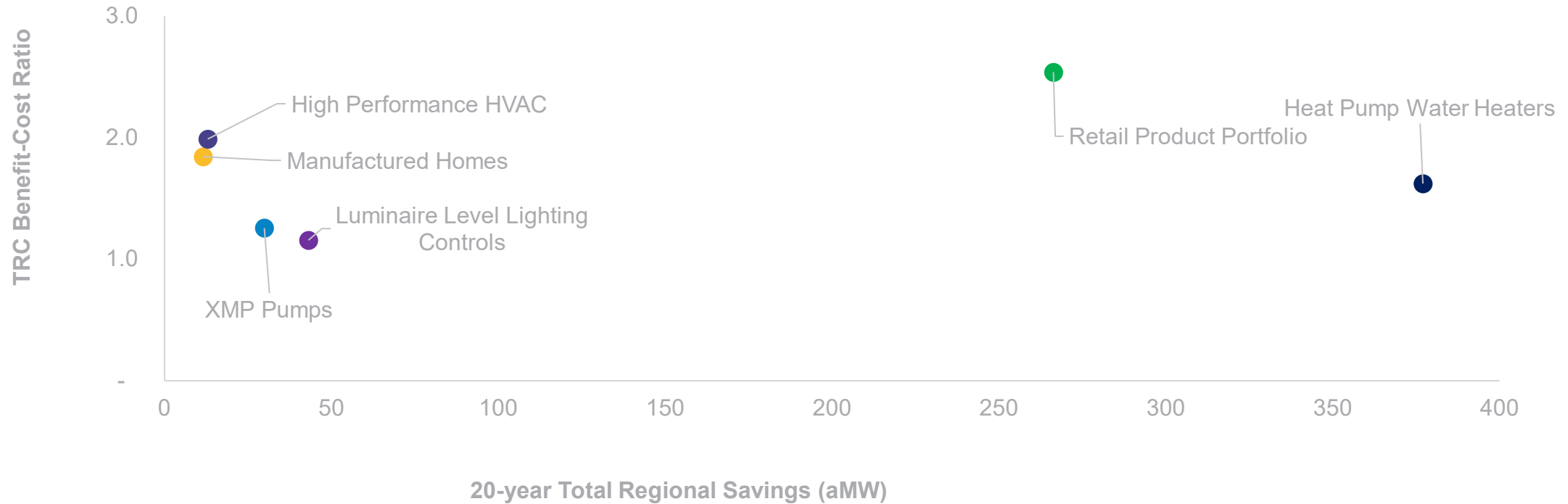


Aggregating Results to the Portfolio





Electric Portfolio **Benefit-Cost Ratio is 1.99**



- *20-year stream of benefits and costs to the region from programs in Market Development*
- *Includes all of NEEA Cycle 6 Budget.*

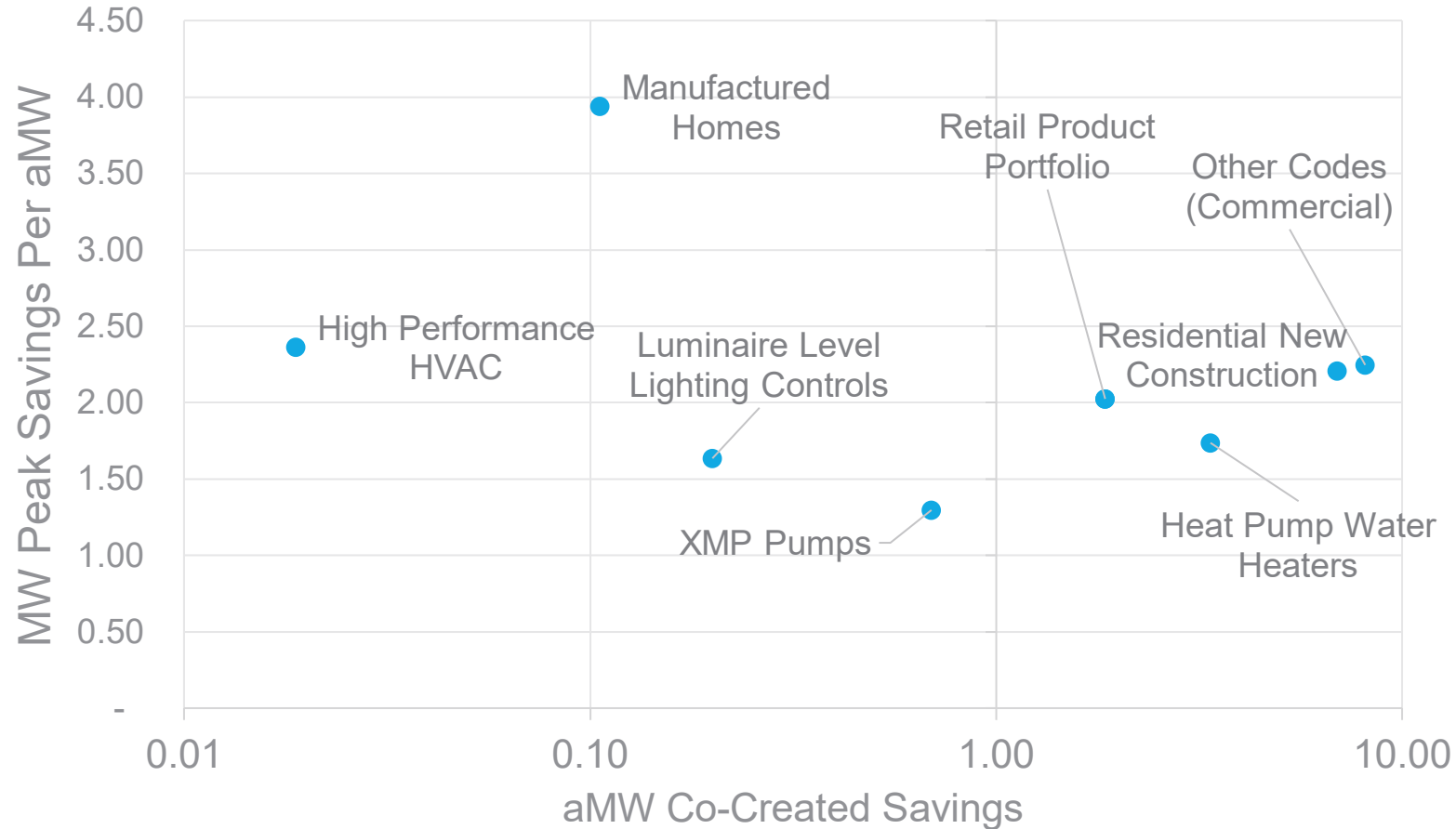


Additional Value Metrics

1. Peak Savings
2. Avoided Carbon Emissions



2022 Co-Created Regional Winter Peak Savings* is 45 MW



Total Peak Savings

- Winter: 45 MW
- Summer: 35 MW

**Showing only the values for Market Development Programs and Codes*



2022 Co-Created *Avoided Carbon Emission is 174,000 Tons* (*\$12 million*)



Greenhouse Gas Emissions from 35,264 passenger vehicles per year



CO2 Emissions from 19,972 homes energy use per year



Carbon Sequestered by 1,051 acres of US forests preserved from conversion to cropland in one year



LUNCH
(return at 1:00PM)

Key Assumptions Updates

Objectives

- Provide visibility to updates made in key assumptions for 2022 reporting of energy savings
- Answer any questions on updates to NEEA's key assumptions



Key Assumption Development and Review process



Develop Key Assumptions

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

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



Validate Key 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](#)



Key Assumption Final Report: Supporting Documentation

More documentation is available at:

<https://neea.org/portal/sign-in>

 Login

 Savings Reports

Reporting Resources

Data Sources and Estimation Approaches +

Key Assumptions Quarterly Reports +

References +

Codes +

Standards +



Q2 2023 Key Assumptions Updates

- XMP Pumps Variable-Load Baseline and Constant-Load to Variable-Load Savings Review
- LLLC Extrapolation Methodology
- ENERGY STAR Most Efficient Bottom-Mount Refrigerator Baseline Revision

XMP Pumps Variable-Load Baseline and Constant-Load to Variable-Load Savings Review

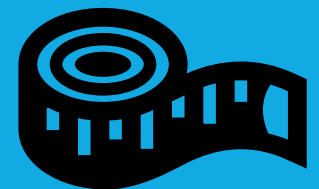
Objectives

- ❑ Update the committee on the Naturally Occurring Baseline market share forecast for Variable-Load Pumps
- ❑ Review the Savings Estimates for Variable-Load Pumps Replacing Constant-Load Pumps



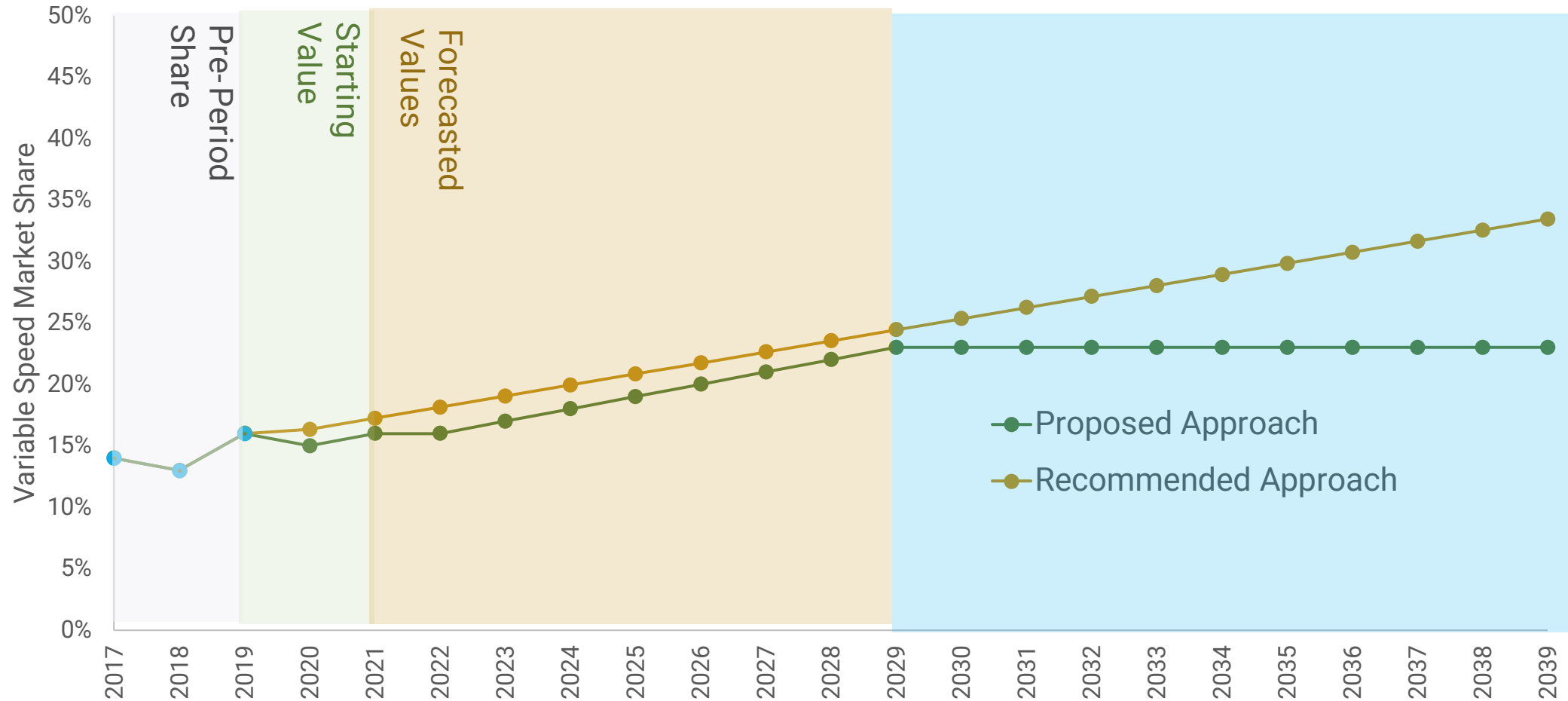
Background

- Independent review of NEEA's naturally-occurring baseline and savings calculation for Variable Load Pumps
- Apex Analytics reviewed documents and sales data
- NEEA Accepted Apex's recommendations





Key Assumptions Baseline; VL Market Share





Variable Load Pump Replacing Constant Load Pump Savings Estimation (Drive Savings)

- NEEA Contracted with Cadeo to develop a savings estimation approach
- Cadeo used analysis of metered data of pumps with Variable Speed Drives (VSD) that the RTF developed
- Resulting savings of 491 kWh per Horsepower



Drive Savings Recommendations and Application

- Apex Recommendations
 - Assess the feasibility of incorporating additional facility level information into NEEA savings estimates
 - Investigate the relationship between pump horsepower and drive savings per horsepower
- NEEA will continue to use the conservative estimate of 491 kWh per Horsepower

LLLC Extrapolation Methodology

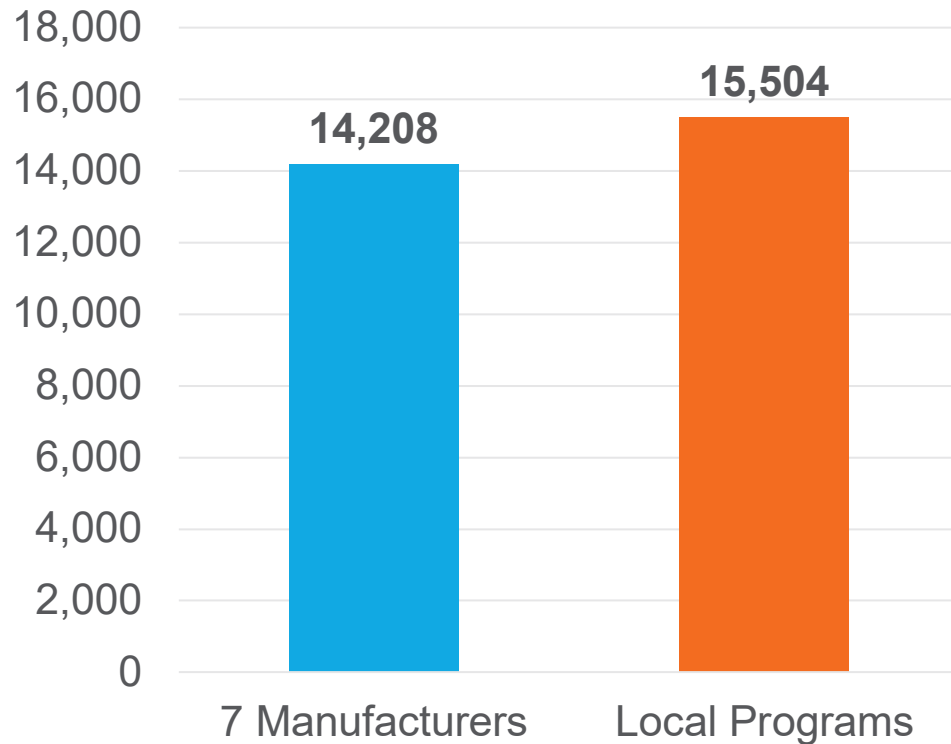
Objectives

- ❑ Inform the Committee how NEEA extrapolates LLLC sales to the region



Observed LLLC Sales to the Region in 2022

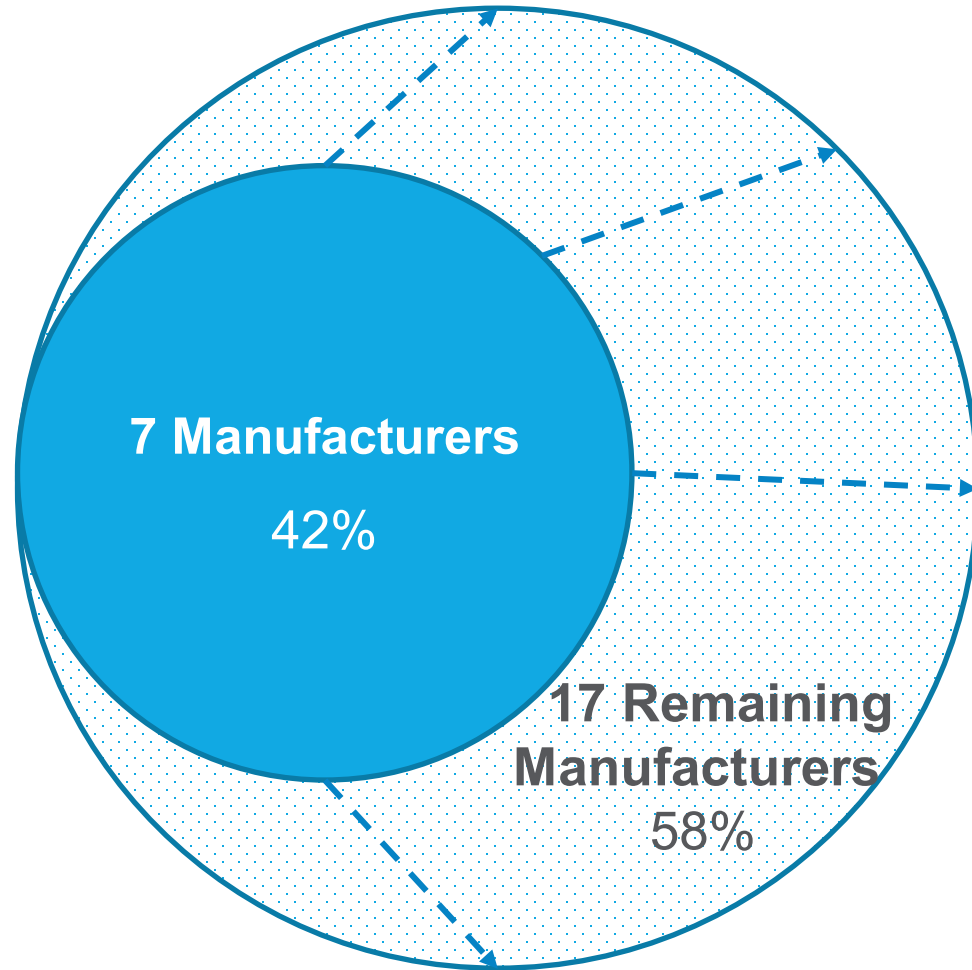
LLLC Sales to the Region: 2022



- 14,208 LLLC units sold to the region by 7 LLLC manufacturers
 - Mix of large and small manufacturers
- 15,504 LLLC units reported by Local Programs



Estimating Total LLLC Sales to the Region



- 24 additional LLLC manufacturers on Design Lights Consortium's Qualifying Products List (DLC QPL)
- Past years' LLLC sales data collected from regional lighting distributors
- Knowledge of the market share of each manufacturer
- Sales observed through the 7 manufacturers is 42% of the market



Total Regional LLLC Sales in 2022





Third Party Review & Recommendation

- Overall, NEEA's extrapolation to be reasonable and supported by quantitative & qualitative sources
- Recommendation to NEEA:
 - Continue to pursue sales data from additional manufacturers
 - Continue to compare the sales against Local Programs data
 - Revisit the total market size periodically
 - Survey lighting installers

ENERGY STAR Most Efficient Bottom-Mount Refrigerator Baseline Revision

Objectives

- ❑ Provide background and inform the committee on the revised Naturally Occurring Baseline market share forecast for ENERGY STAR Most Efficient Refrigerators

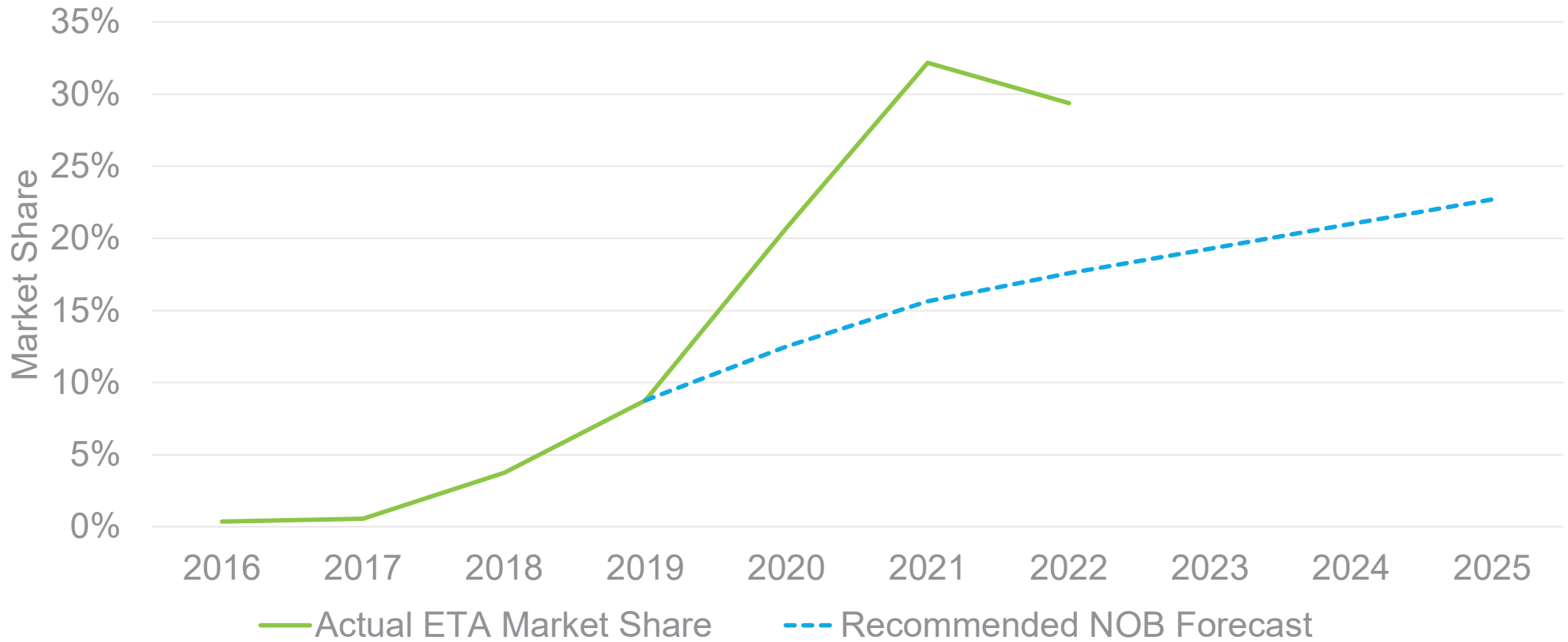


Background

- Original baseline published Q2 2022
- Emerging Technology Award list expanded greatly during 2022
 - Led to increased market share during pre-intervention period
- Contracted Apex to revise their baseline recommendation for bottom-mount refrigerators



Recommended Bottom-mount Baseline Forecast





Conclusion

- Accept Apex's recommended baseline forecast
- Consider further review if actual market share flattens or falls

Market Updates

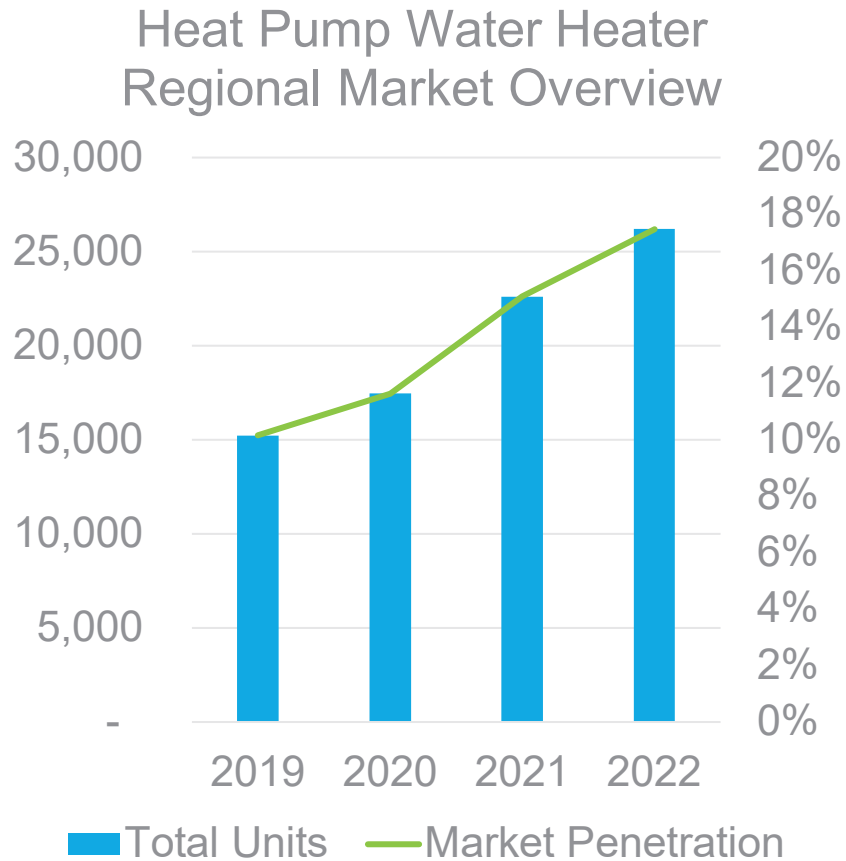
Objectives

- ❑ Inform and contextualize portfolio metrics



HPWHs

Heat Pump Water Heaters



MT Theory: Influence passage of federal standard for Heat Pump Water Heater

Key Takeaways

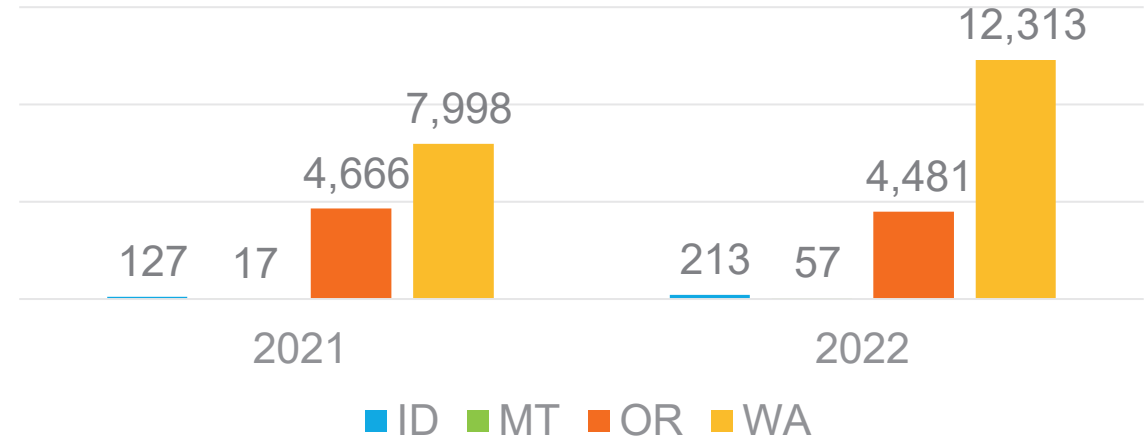
- Continuing regional market growth observed: 16% YOY
 - Regional Market Adoption of HPWH is estimated at 17.4% (15% higher than national average)
- Notable increases in market adoption for both Idaho and Montana
- New Construction continues to be primary driver of regional sales
- Observable decline in sales through retail local programs channels



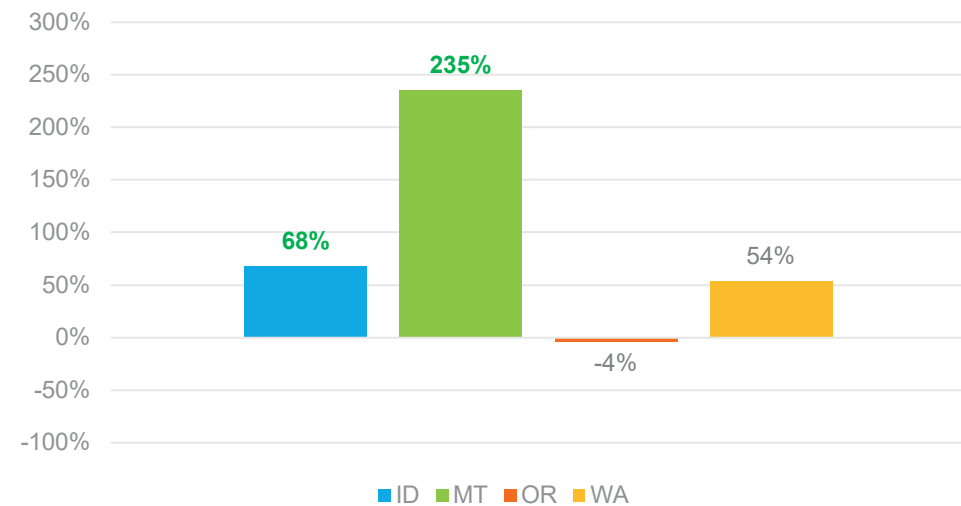
Regional Sales Trends

- Continued growth in sales volume for Washington State
- Significant percentage increase in YOY sales for Idaho and Montana

Distributor Sales Footprint 2022



Distributor Sales Trends

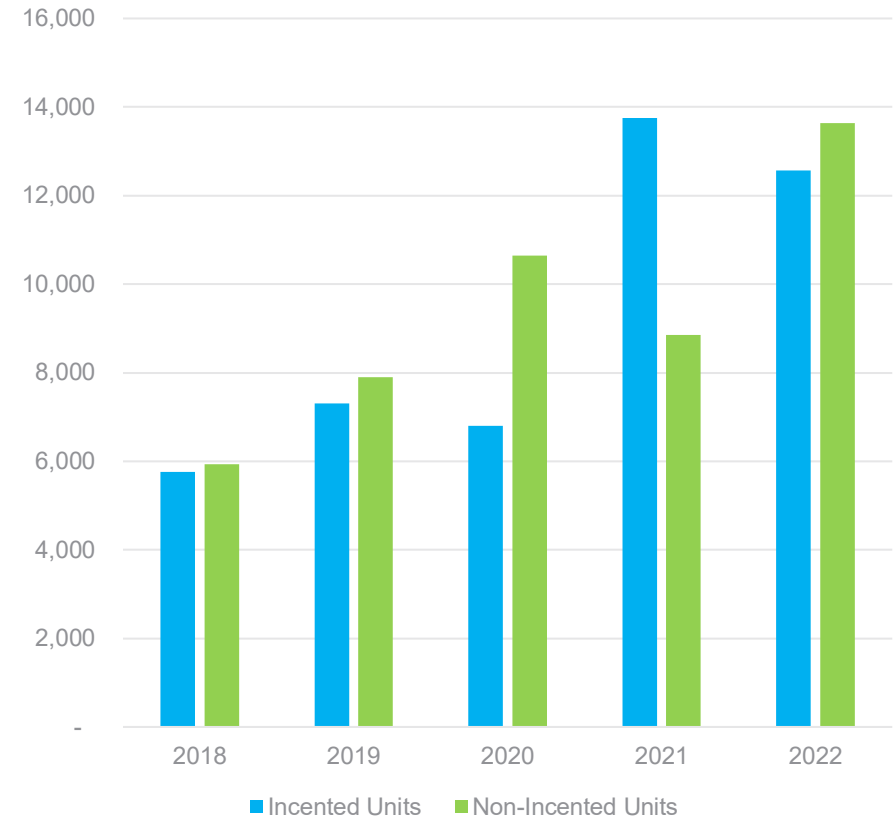




Local Programs Participation

- Local Programs accounted for 46% of regional market units, down from 60% in 2021
 - Decrease largely due to reduced sales through midstream retail programs
 - Are potential shifts in consumer spending habits due to inflation in effect?

HPWH Incented vs. Non-Incented Units

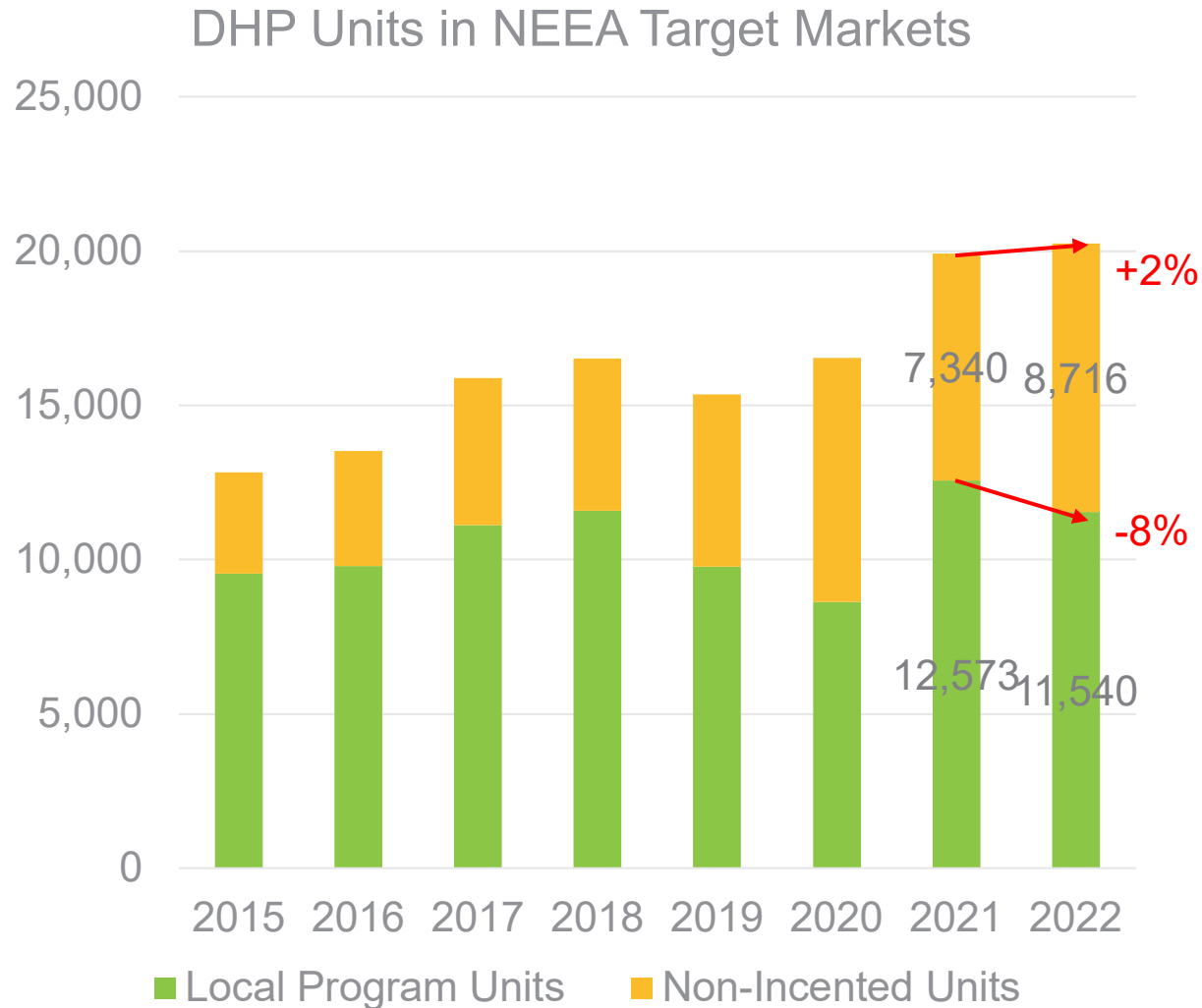




DHP



Ductless Heat Pumps



MT Theory: Accelerate adoption and market acceptance of ductless heat pumps in electrically heated homes.

Key takeaways

- Long-term Monitoring and Tracking Study #2 will be published in Q2
- After all-time high local programs in 2021, saw 8% decline
- Added distributors to the HVAC Supplier Study that significantly increase the regional coverage of DHP sales

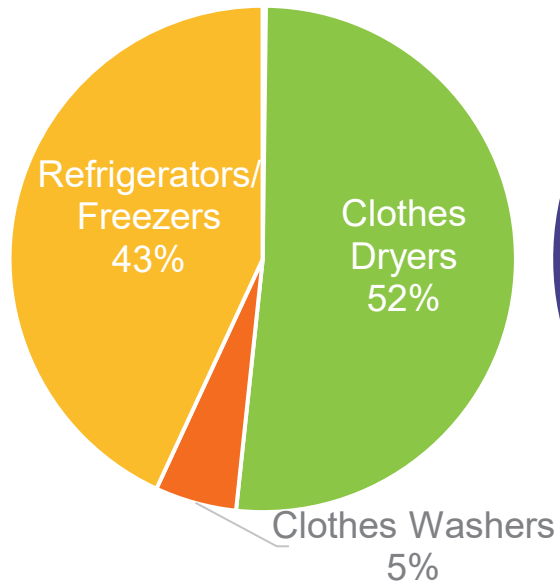
A large, light-orange graphic element consisting of three nested, right-pointing chevrons. The innermost chevron is the smallest, the middle one is larger, and the outermost is the largest, creating a sense of depth and movement towards the right.

RPP

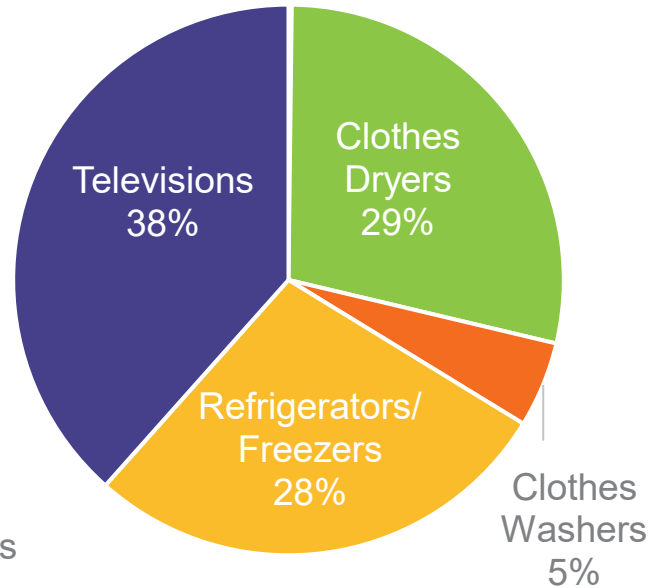


Retail Product Portfolio

2022 Co-Created Savings



2020-2024 Co-Created Savings



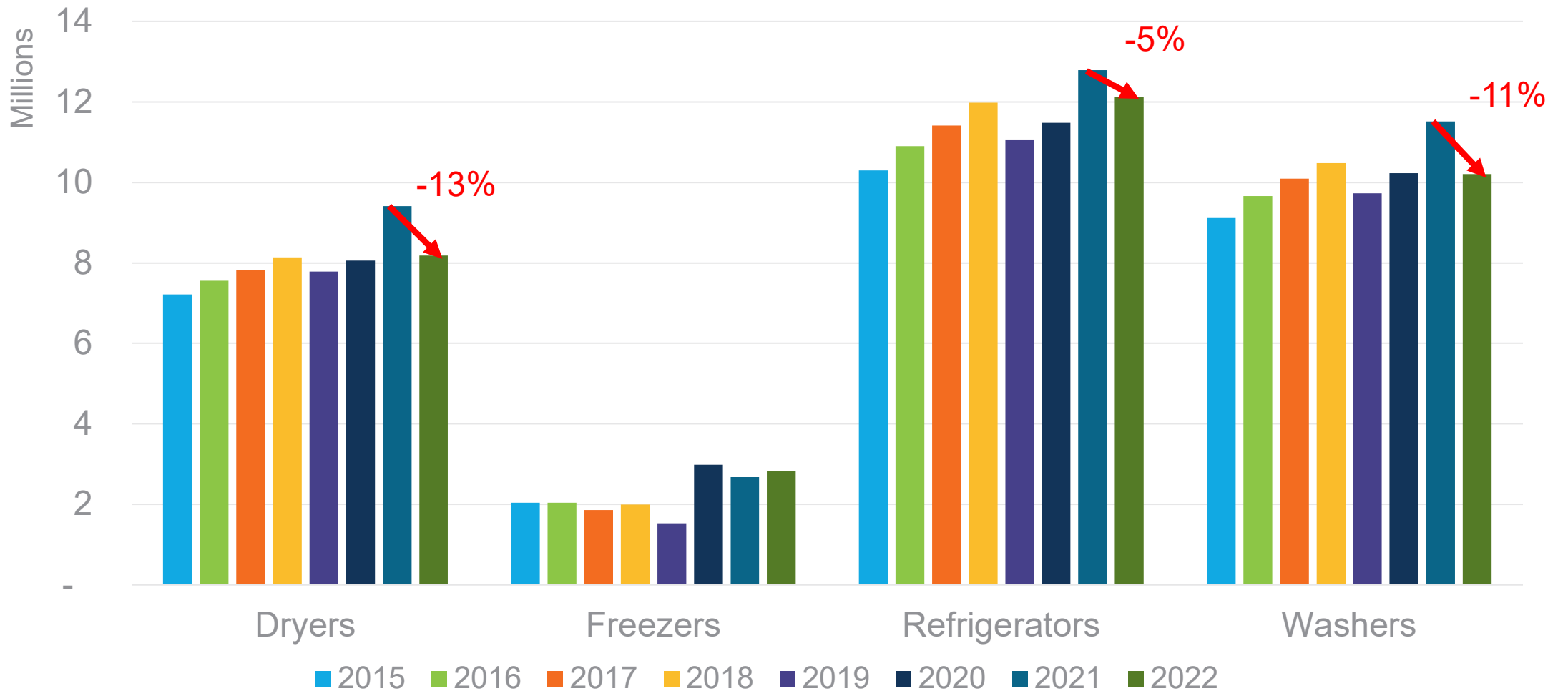
MT Theory: RPP uses mid-stream incentives to influence retail stocking practices and gain access to full category sales data, drives specification advancements and ultimately manufacturing for a portfolio of energy-efficient product sold through the retail channel.

Key takeaways:

- 40+ television models now registered as ENERGY STAR v9
- National appliance shipments returned to historical norms after spike in 2021
- Refrigerators with advanced compressors a increasing in market share in recent years
- ENERGY STAR market share for laundry equipment remains around 40%



Retail Products Portfolio: Total Shipments Decreased

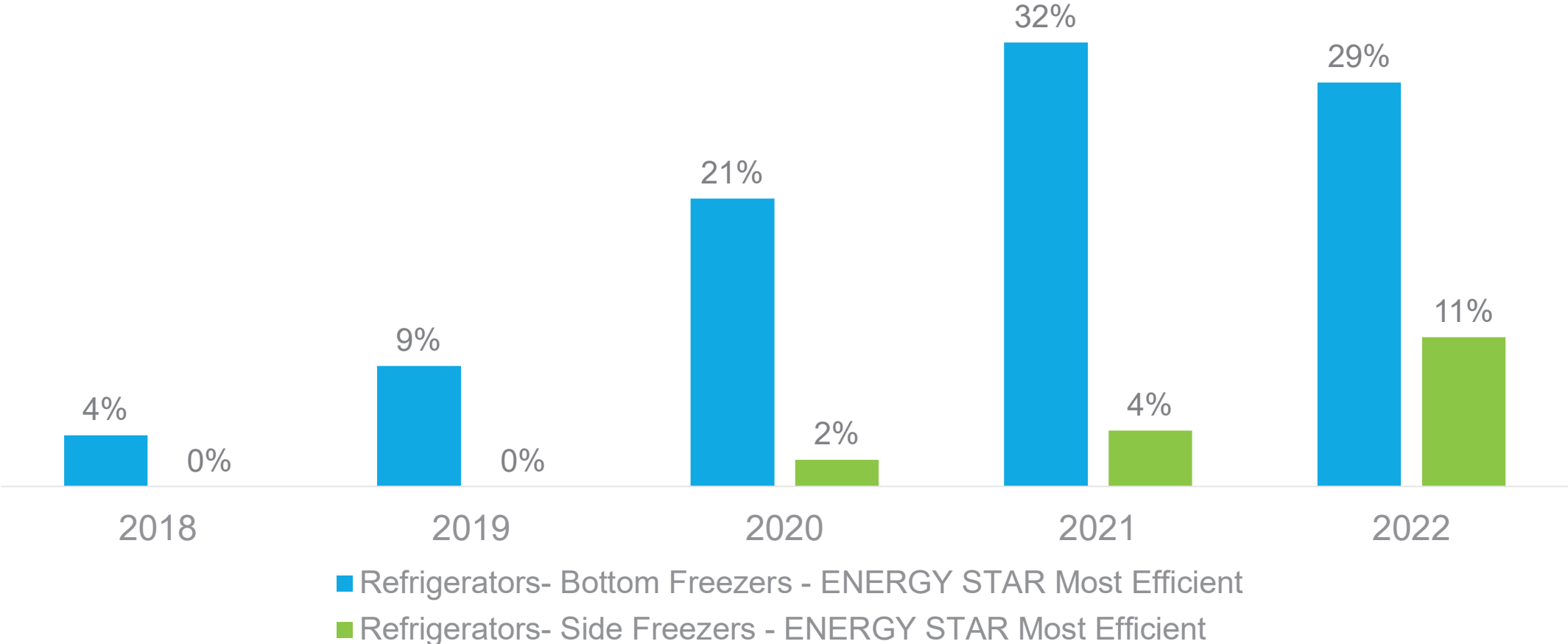




Retail Products Portfolio:

Emerging Tech Award increases ENERGY STAR Most Efficient share

ENERGY STAR Most Efficient Market Share

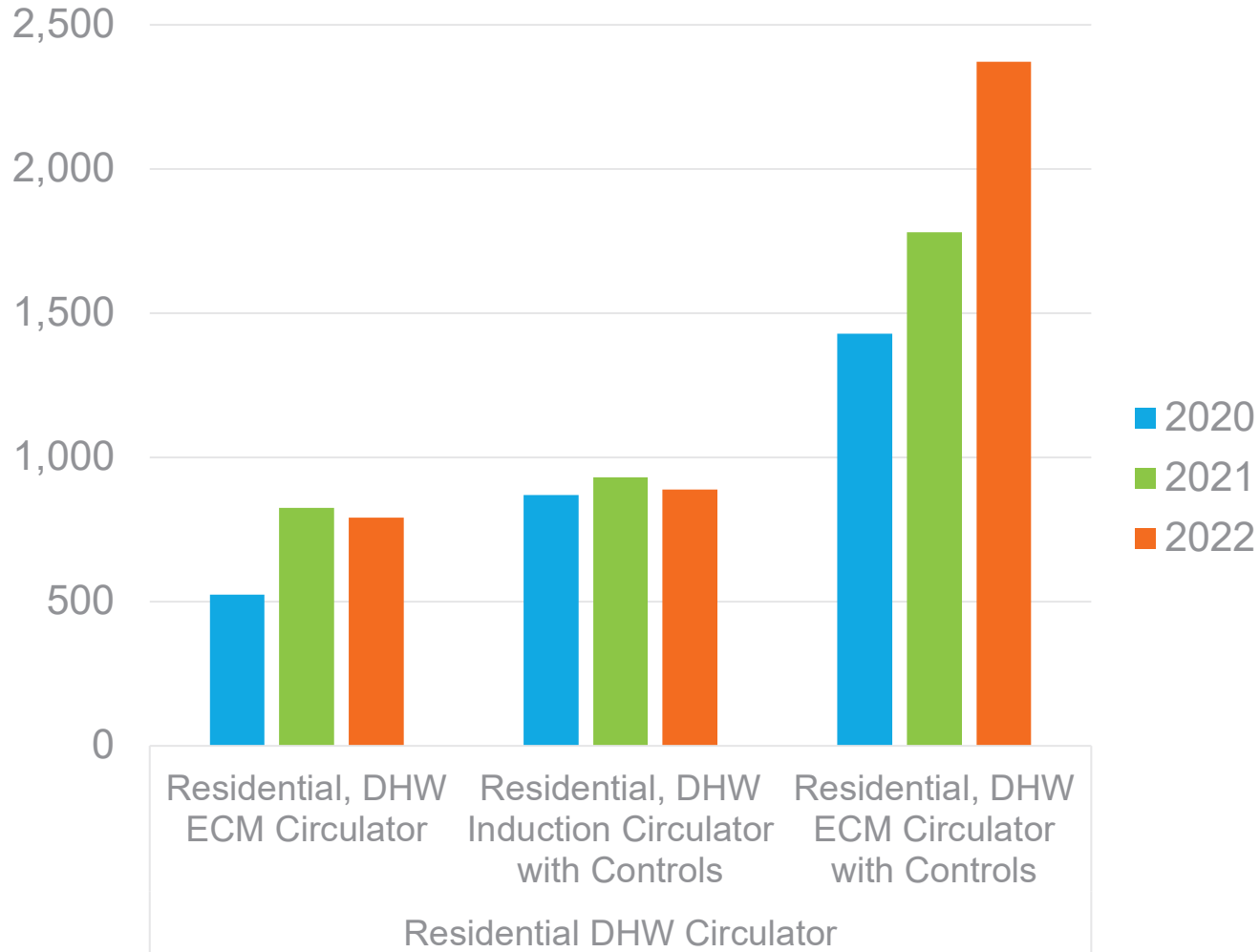


A large, light orange graphic consisting of three nested, right-pointing chevrons. The innermost chevron is the lightest shade, the middle one is a slightly darker shade, and the outermost one is the darkest shade, matching the background. The text 'XMP' is centered within the middle chevron.

XMP



Extended Motor Products (XMP): Ahead of Expectation



MT Theory: Incentivize pump distributors to increase adoption of highly efficient clean water pumps and circulators

Key takeaways

- Good uptake on highest efficiency residential circulators (seen in chart)
- The market for clean water pumps grew overall, but we saw some backsliding on the efficiency mix

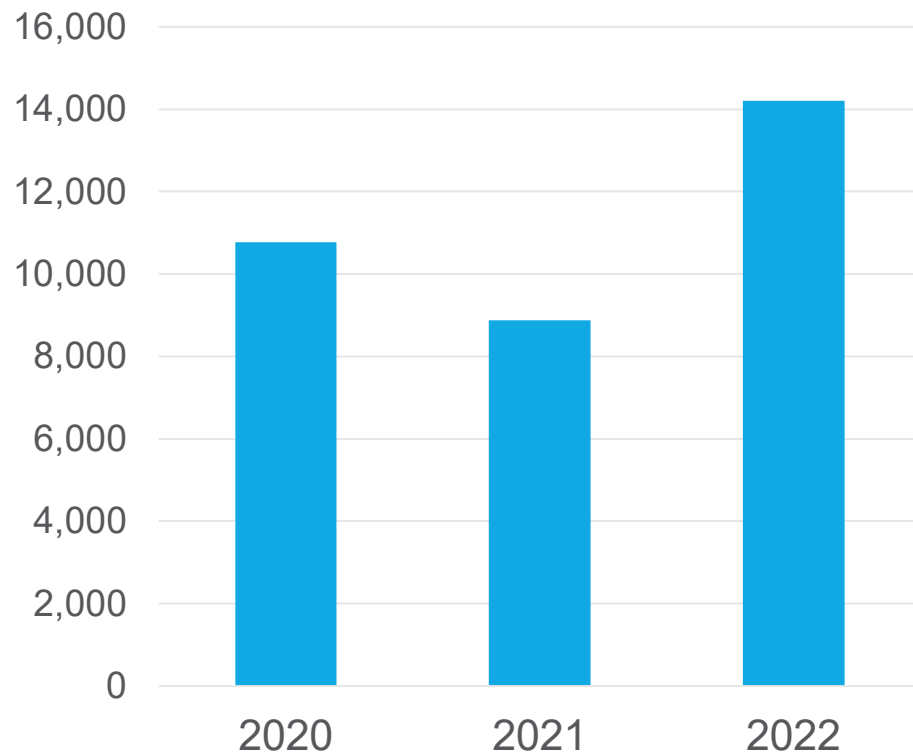


Luminaire Level Lighting Controls



Luminaire Level Lighting Controls (LLLC)

**Regional LLLC Sales Reported
by 7 Manufacturers**



MT Theory: Incorporate specification development, market awareness building, training, utility program support, supply chain interventions, and integration with energy codes to transform the market so that LLLC systems become standard practice for commercial buildings.

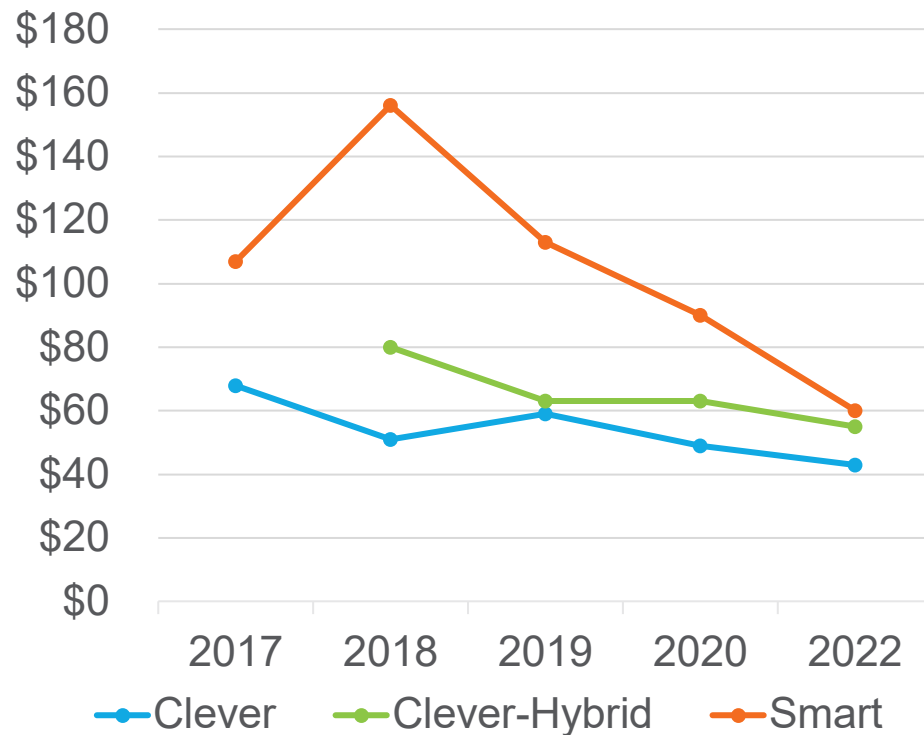
Highlights

- Regional LLLC sales data covers 7 LLLC manufacturers
- Despite challenges, sales grew 60% in 2022
 - Supply chain disruptions
 - Long lead times for wireless products
 - Multiple price increases
- Distributors are seeing greater interest in LLLC



2022 LLLC Incremental Cost Study

Incremental Cost Per LLLC Fixture



- 31-44% decrease in incremental per-fixture costs since 2017
 - Increased competition
 - Economies of scale
- Incremental cost of Clever, Clever-Hybrid, and Smart LLLC systems have converged
 - Ongoing subscription fees going away
 - Free mobile app made programming process more streamlined

A large, faint watermark logo is centered on the page. It consists of a diamond shape with a stylized 'S' or 'Z' pattern inside, rendered in a lighter shade of orange than the background.

Additional Market Updates



Additional Market Updates



Commercial HVAC

- High-Performance HVAC (VHE DOAS)
- Efficient Rooftop Units (ERTUs)



New construction

- Manufactured Homes
- Residential & Commercial



Upcoming Meeting Topics

Q2 – August 24, 2023

**Topic
Requests?**

How was your experience?



Meeting Wrap-up

- Public Comment?
- Upcoming Meetings:
 - August 24, 2023
- Feedback:
 - Overall
 - Agenda
 - Packet Materials
 - What went well?
 - What needs work?