CalMTA

11/20/24

Market Transformation Advisory Board (MTAB) Meeting

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

Agenda Day 1: Nov. 20

Time	Agenda Item	Presenter
12:00 p.m.	**1. Welcome, Agenda, & Introductions**	Stacey Hobart
12:10 p.m.	**2. COI Declarations & 10/25 Draft MTAB Notes**	Stacey Hobart
12:15 p.m.	**3. An MT Portfolio for California**	Lynette Curthoys
12:25 p.m.	**4. Summary of Room Heat Pump MTI**	Elaine Miller
12:55 p.m.	**5. Room Heat Pumps: Total System Benefits & CE**	Karen Horkitz, Matthew Wisnefske & Priya Sathe
1:45 p.m.	*Break (15 min)*	
1:55 p.m.	**6. Room Heat Pumps: Budget, Risks, & Discussion**	Jeff Mitchell & Elaine Miller
3:50 p.m.	**7. Stage 2 Scoring & Prioritization of RFI Submissions**	Rick Dunn & Jennifer Barnes
5:20 p.m.	**8. Public Comment** (meeting guest can share publicly during this time)	
5:30 p.m.	Adjourn	

Safety minute

AED & First Aid Kit near Smart Energy Experience room

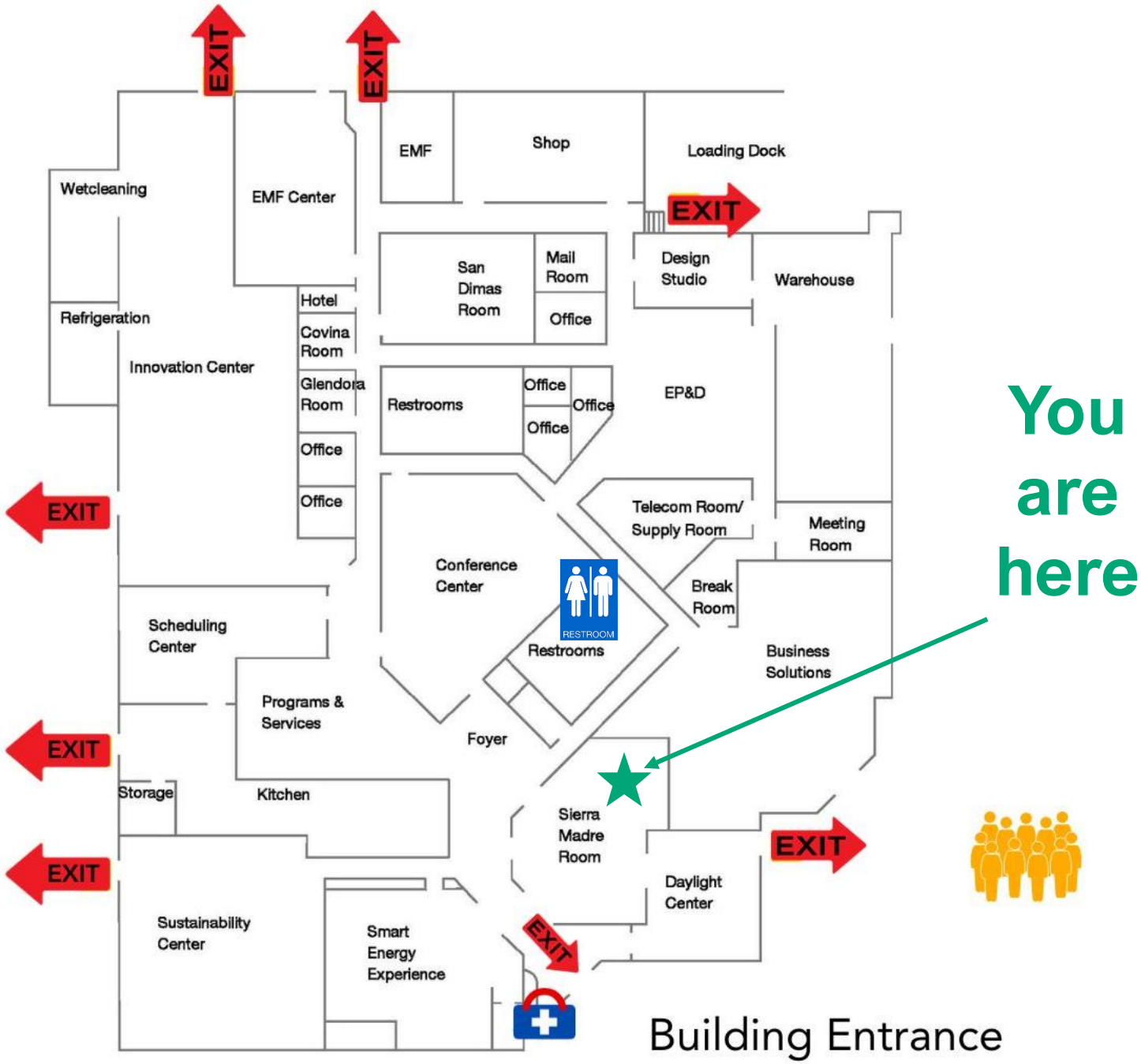
EXIT

Exits on all sides of the building

Evacuation Gathering Destination

RESTROOM

Restrooms



2
COI Declarations & MTAB Meeting Notes

Stacey Hobart
Principal of Engagement & Communications

MTAB declaration of COI

MTAB Eligibility

- Cannot receive funding from CalMTA or be in pursuit of funding

Recusal Requirements

- Can't bid on RFP/RFQ if giving input after Phase I
- Those with competitive interest can recuse from discussion, but must leave MTAB if responding to RFP
- Agree not to influence remaining MTAB
- Interpretation, if needed, done by CPUC staff

MTAB Charter with Conflict of Interest

Transparency

- Public meetings & process where COI concerns can be raised by the public

CalMTA COI policies

- CalMTA has robust COI policies to ensure decision-making is transparent, impartial, and unbiased
- RI employees and subcontractors, who function in decision-making roles, are firewalled from work with California utilities or other covered entities and sign COI certifications
- CalMTA seeks CPUC approval when draw on specialized expertise from subject matter experts who also support work with covered entities

Draft MTAB meeting notes:

10/25

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3
An MT Portfolio for California

Lynette Curthoys
Vice President, Market Transformation

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Thank you MTAB & CalMTA Team for the hard work & collaboration that launched CalMTA & delivered two draft MTI Plans in less than 24 months!

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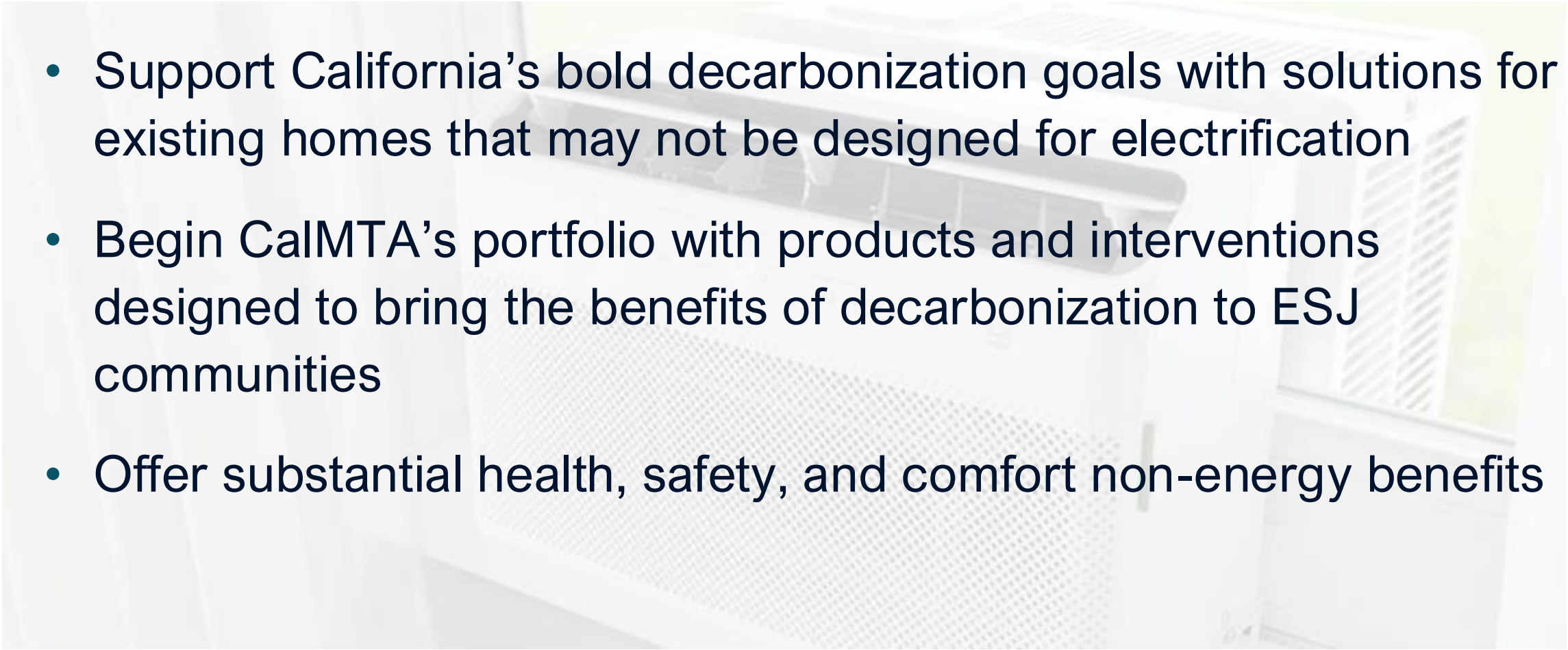
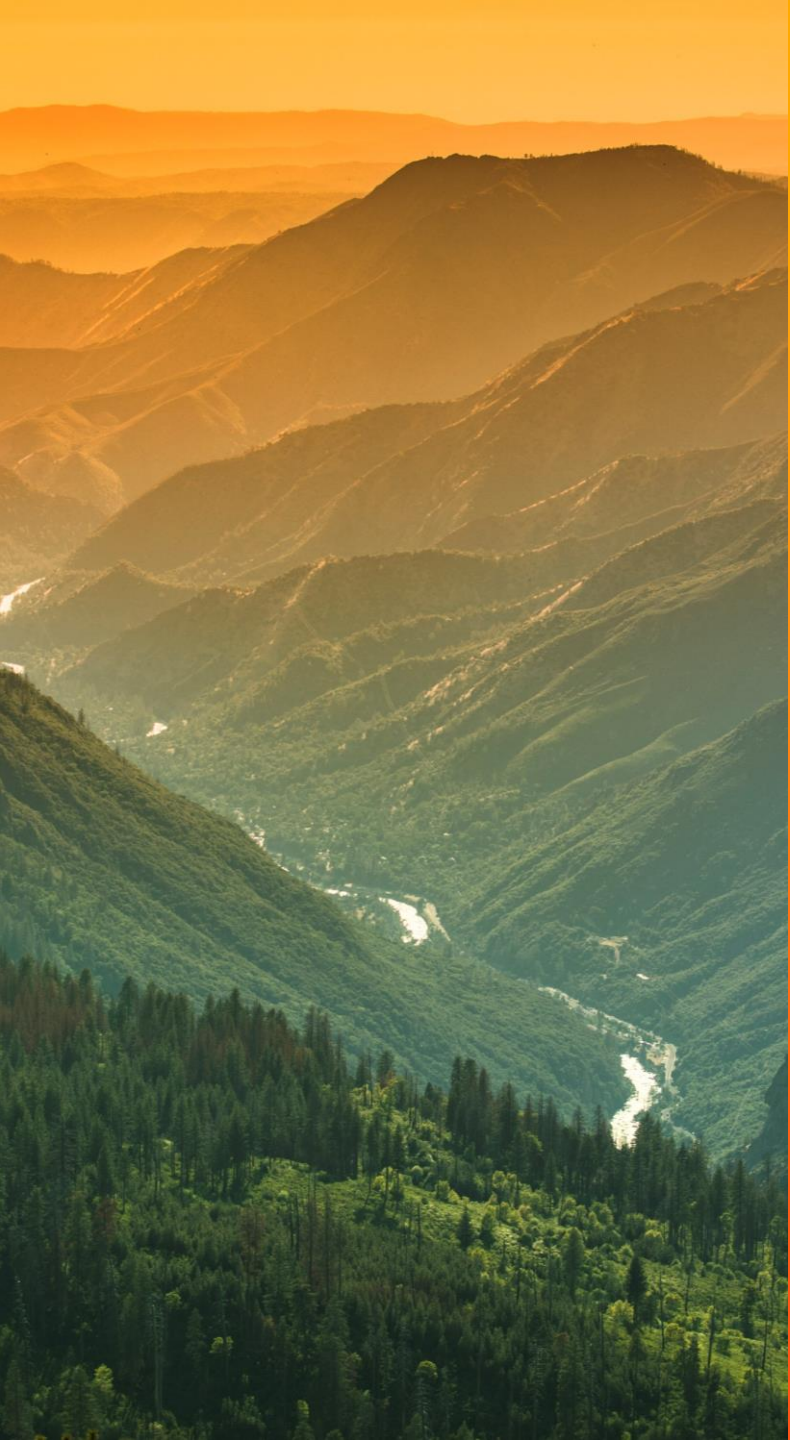
Room Heat Pumps + Induction Cooking



- Support California's bold decarbonization goals with solutions for existing homes that may not be designed for electrification
- Begin CalMTA's portfolio with products and interventions designed to bring the benefits of decarbonization to ESJ communities
- Offer substantial health, safety, and comfort non-energy benefits

Room Heat Pumps + Induction Cooking

- Share common points of leverage with retailers, programs, and electrification policies
- Take on barriers to large-scale residential decarbonization not easily addressed in the traditional EE portfolio
- Collaborate with entrepreneurial California companies to accelerate innovation and bring California-suitable products to market sooner

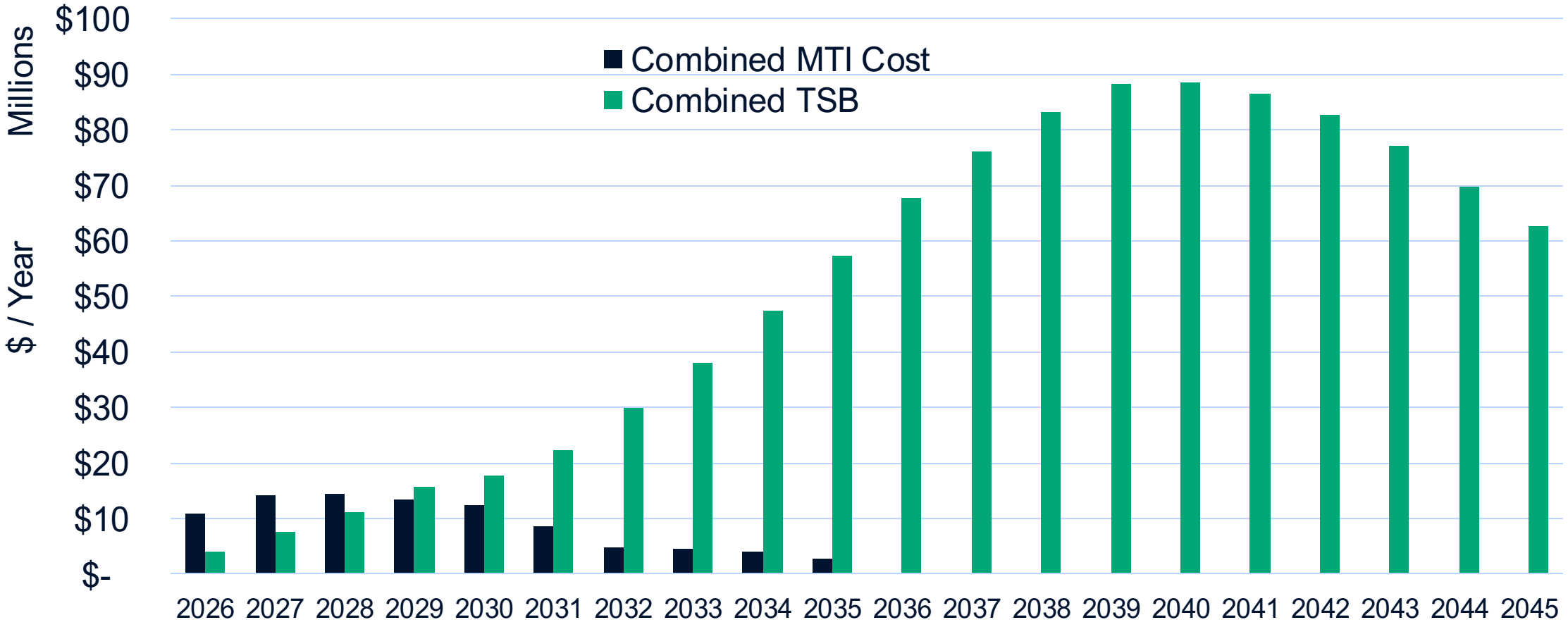


Room Heat Pumps + Induction Cooking

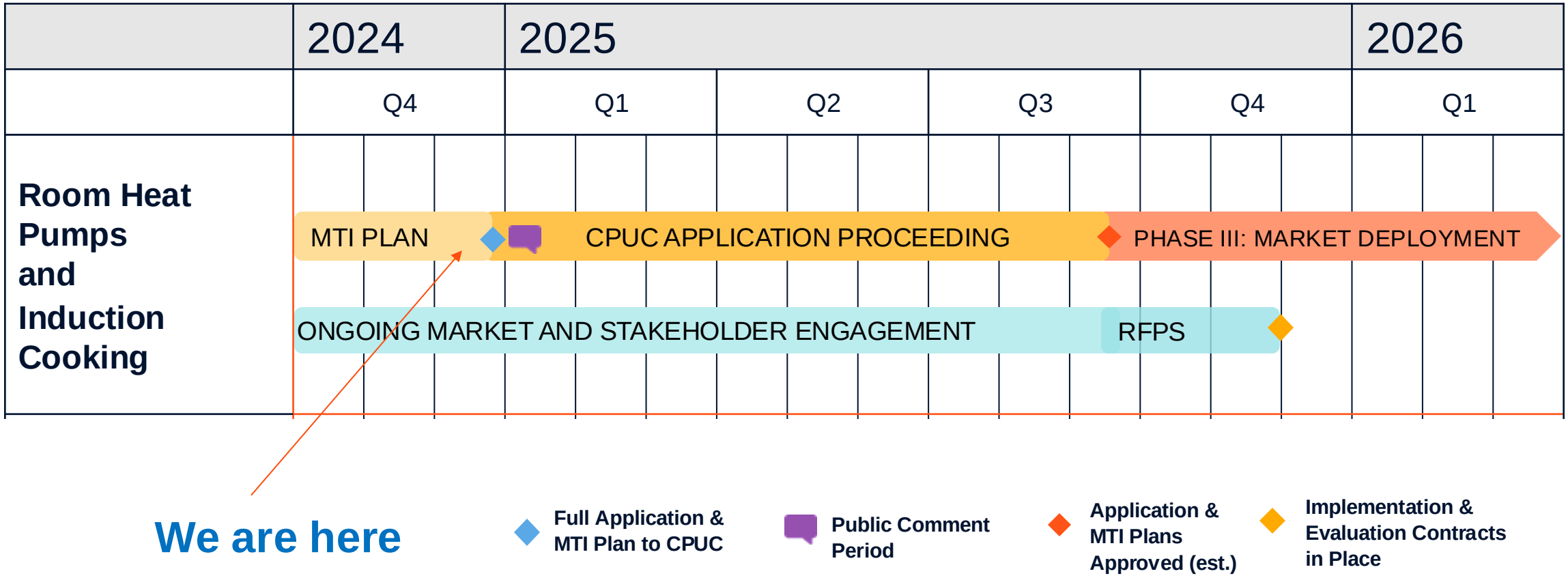
- Deliver substantial benefits over their 20-year life cycle
  - Over $1.35B in statewide benefits to California
  - Over $1.08B in benefits within the service area of the funding IOUs
- Are a cost-effective foundation for a future MT portfolio
  - 1.74 TRC
  - 10.79 PAC
  - 4.26/4.25 Base/High SCT

Room Heat Pumps + Induction Cooking

Require near-term investment to realize large-scale long-term benefits



Market deployment timeline



Next Steps for MTAB members

1. Reviewed much of the MTI plans through the Idea to Initiative education campaign
2. Will have opportunities today to hear Part 3 on market forecasts and cost-effectiveness, ask questions, and discuss
3. MTAB members may provide feedback via a form that will be consolidated and appended to the plans as Appendix I
4. Public may comment during the application proceeding

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Summary of Room Heat Pump MTI

Elaine Miller, Senior Strategy Manager

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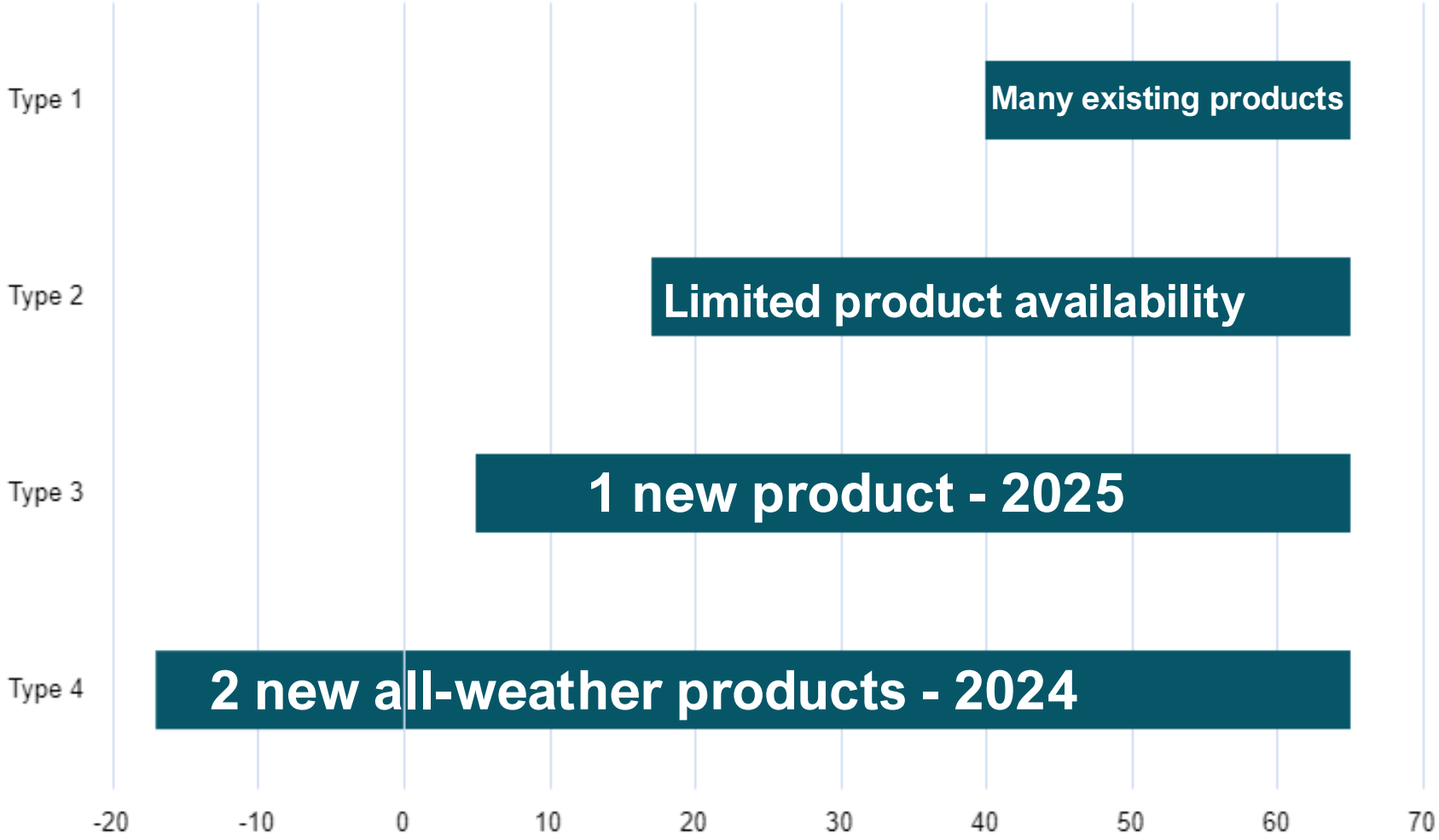
Room heat pumps: Where we are today

Room heat pump (RHP) technology

- Includes window, portable (dual hose), and through-the-wall form factors
- Variable speed
- Output at 8k -14k BtU/h for 400-1,000 ft^2
- 120V plug-in
- Installs without certified HVAC technician or electrician, thus cheaper than alternative HP solutions

RHP types for California winters



	Price	Form factor
Type 1	$	Mostly portable
Type 2	$	Window ?
Type 3	$	Window
Type 4	$$$	Only saddle

RHP Applications

Supplemental heating or cooling for part of a single-family home

- Reduce usage of central systems and eliminate other plugin devices

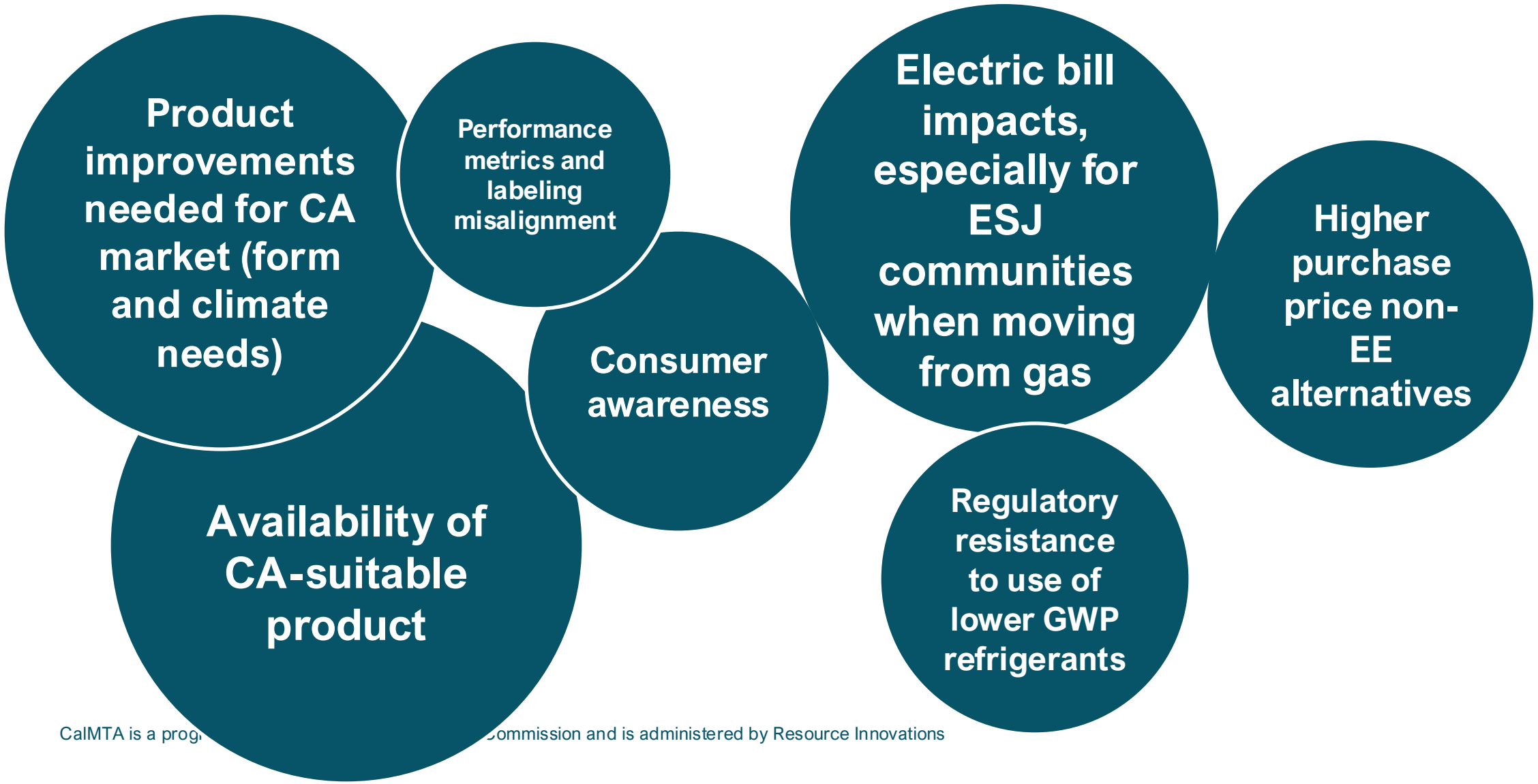
Multifamily heating and cooling

- Fully replace need of inefficient HVAC, especially those with inefficient electric systems

RHP market summary

Target market	Existing single- and multifamily housing
Who makes the product?	There are currently several large firms and small startups producing the product
Who buys the product?	Homeowners, residents, property managers or building owners, and Program Administrators (PAs)
Who uses the product?	Residential consumers who use window and room heaters and air conditioners, homeowners who want a partial solution and renters
How is product sold?	Directly through retailer or manufacturer websites
Who influences purchase decision?	Retailers, property managers are influenced by their perspective of consumer preferences for appliance types and fuel types

RHP Barriers



Opportunities, product features & leverage

Public health and climate resilience benefits, overall push for heat pumps

New ENERGY STAR label for heating and cooling modes, new CEE spec and IRA funding

New market entrants and national partners generating manufacturer momentum

No skilled labor needed for installation and work with 120V outlets

ESRPP program and data collection

Provide both efficient heating and cooling yearlong

RHP: Theory of market change

Interventions	Outcomes
Manufacturer engagement, demand aggregation, policy engagement (refrigerants, electrification rates, E*)	→ Availability of products for CA → More consistent labeling → Support for policy changes
Demand stimulation, program inclusion, awareness building, retail availability, product differentiation	→ Awareness grows → Market share grows → Incremental cost to purchase and operate declines
E* adoption, air filtration capability, lower GWP, DR	→ Availability of products for CA grows → More consistent labeling → Market share grows

Interventions: MTI primary market role

- **I1:** Tech Challenge with manufacturers and aggregated MF guaranteed purchase
- **I2:** Engage national collaborative on future ENERGY STAR specifications, possible federal test procedures, and further demand aggregation
- **I3:** Gather and share usage and bill impact data
- **I9:** Build market awareness of product benefits
- **I6:** Deploy midstream stocking incentives that motivate retailers to target ESJ communities with affordable RHPs

Interventions: MTI supportive market role

- **I5:** Support inclusion and bundling of RHPs with California programs
- **I7:** Support CA policy and standards setting bodies in use of lower GWP refrigerants through manufacturer engagement, lab testing and data sharing
- **I8:** Support advancement of electrification-enabling rate structures to mitigate bill impacts of moving from gas to electric heating

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Room Heat Pumps: Total System Benefits & Cost-Effectiveness

Karen Horkitz
Lead, Market Research and Evaluation

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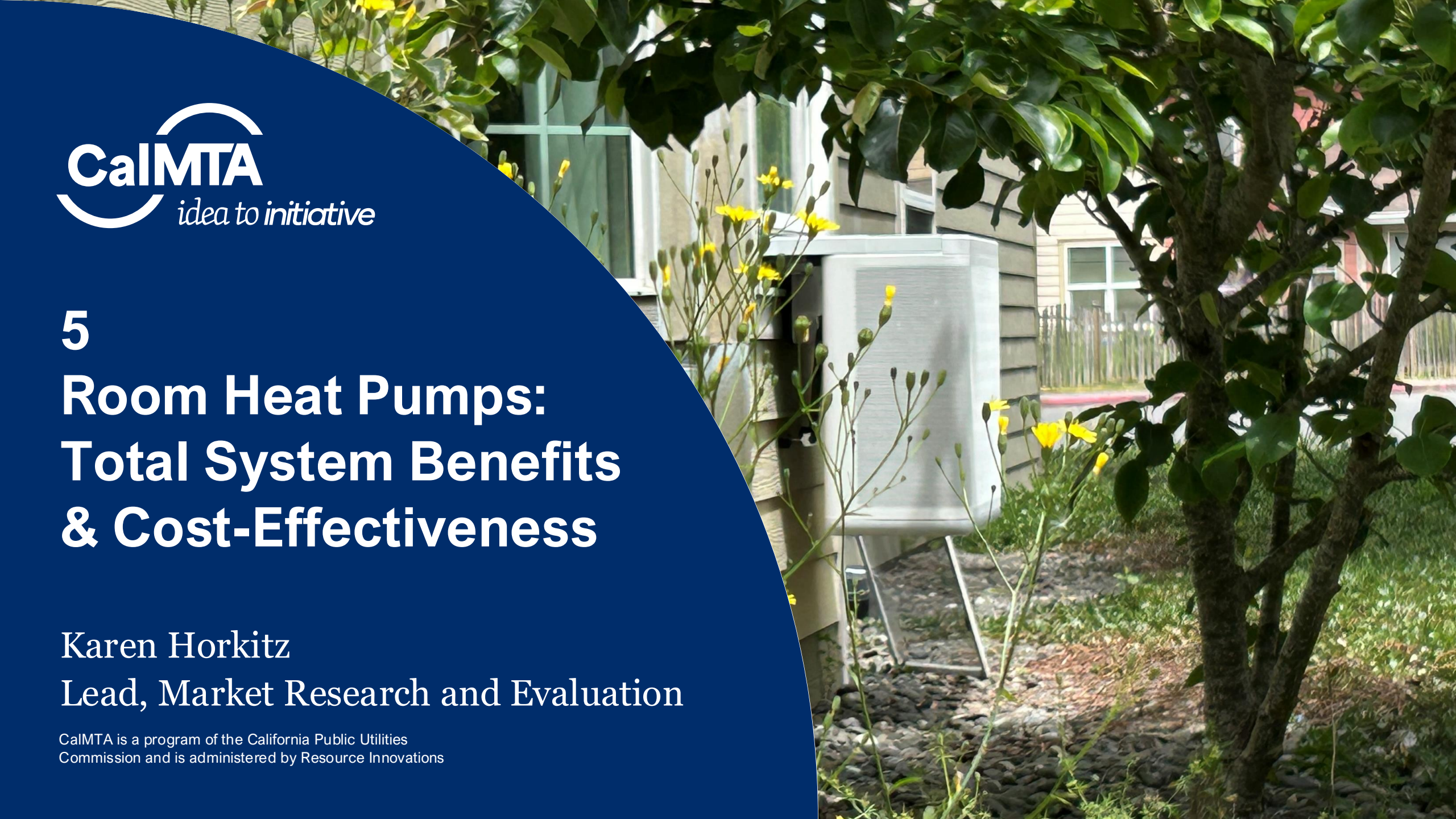


What we'll cover

Room Heat Pumps MTI

- TSB and cost-effectiveness overview
- Modeling overview
- Market adoption forecast
- Cost-effectiveness modeling
- Evaluation

TSB and cost-effectiveness 2024-2045

Test	TSB - Energy	TSB - Grid	TSB - GHG	TSB - Total
TRC	$ 160M	$ 30M	$ 331M	**$ 521M**
SCT	$ 344M	$ 68M	$ 1,005M	**$ 1,417M**

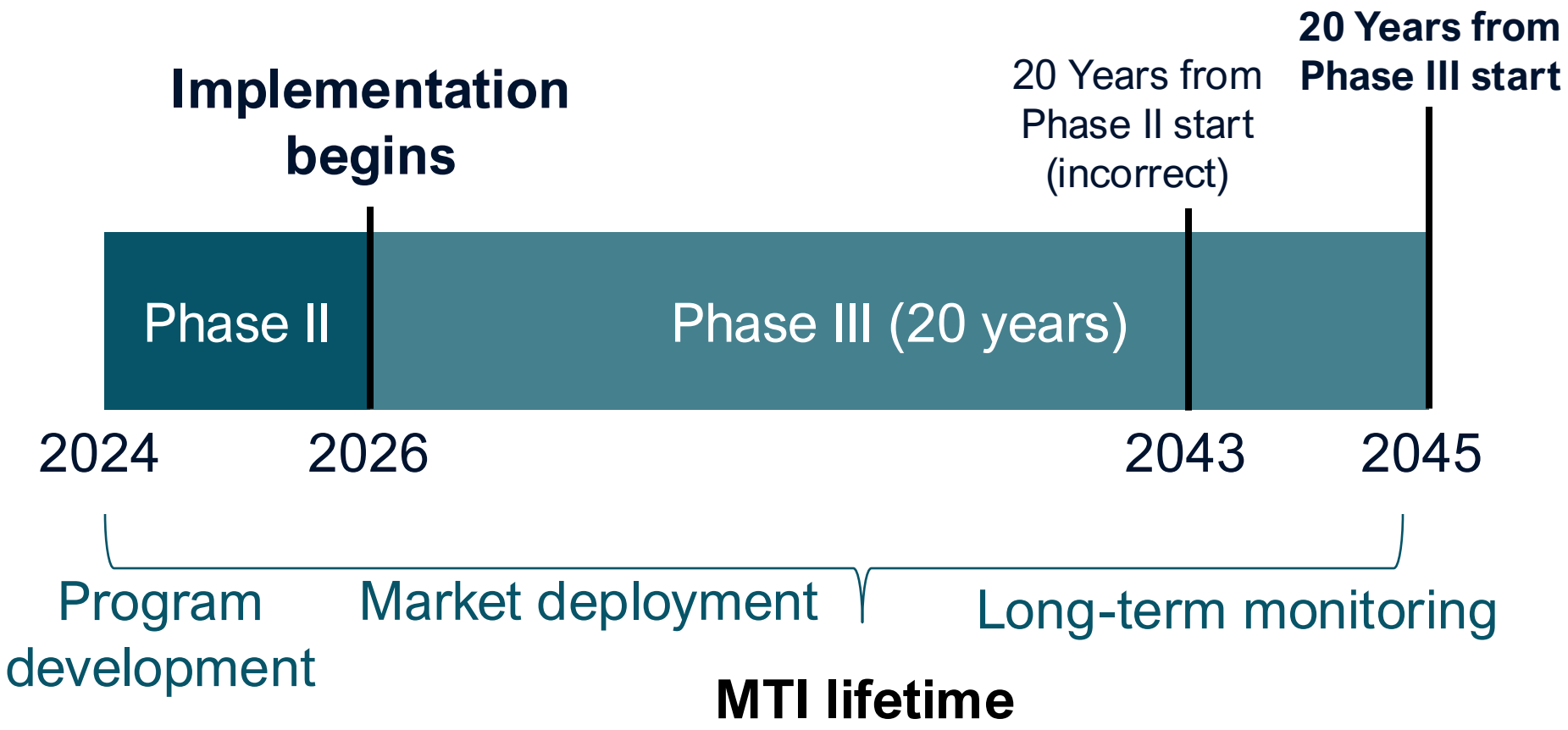
	TRC Ratio	PAC Ratio	SCT Ratio
With Negative IMCs	330.15	8.29	(30.24)
With Negative IMCs set to Zero	5.46	8.29	11.2

Cost-effectiveness calculations: Resource Acquisition vs. MT programs

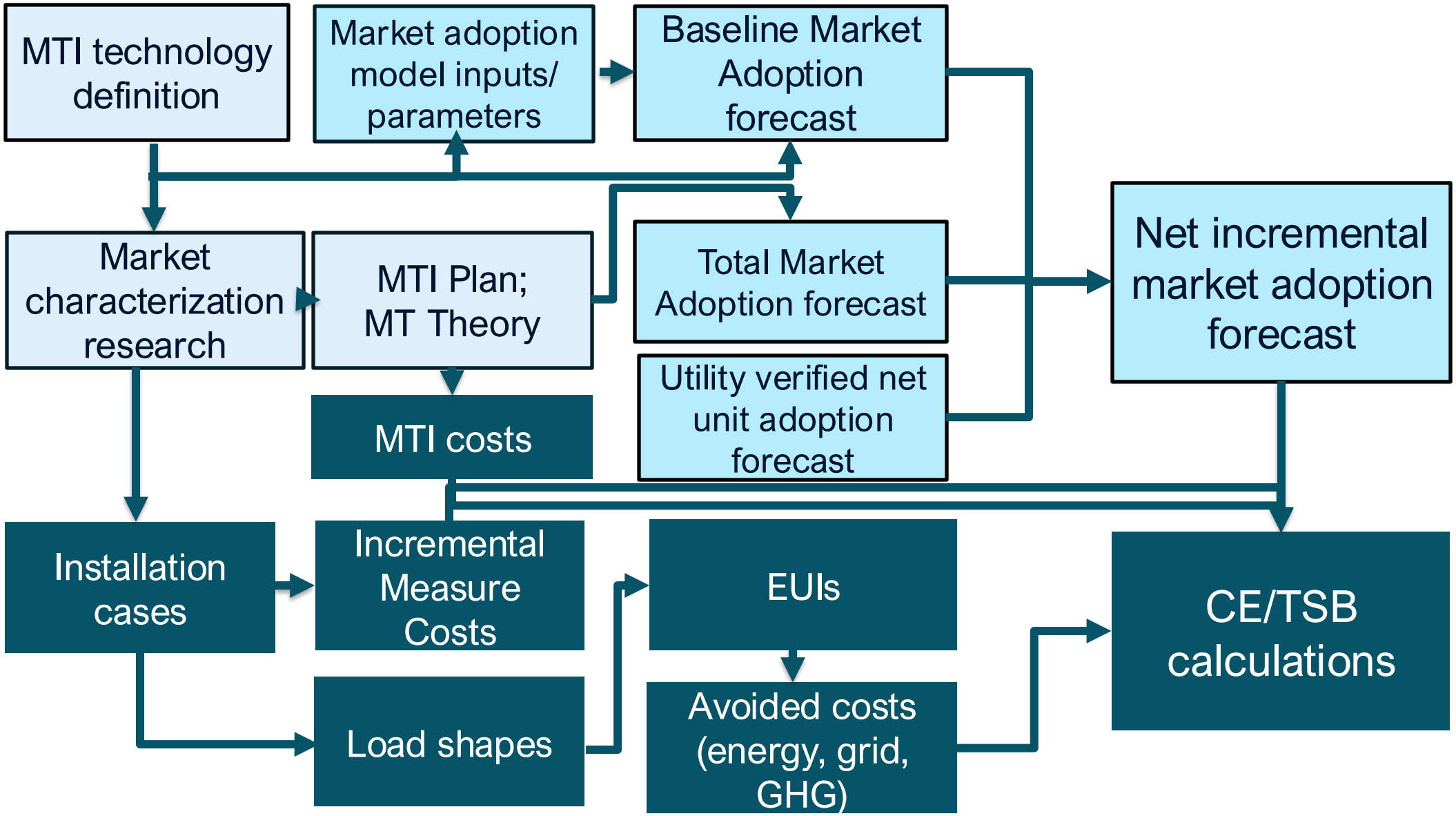
Cost-effectiveness calculation elements	CA standard practice manual approach for RA programs	Approach for MTIs
Codes & standards savings	Excluded	Included for MTIs that are proposed to lead to a new code or standard
Timeframe of forecasted costs and benefits	Program funding period	**MTI Lifetime**[a]
Net-to-gross methodology	Net impacts = (Total units * unit energy impacts [UEI]) * NTG ratio [NTG Ratio = 1 – FR ratio + SO ratio + ME ratio]	Net incremental MTI impacts = [(TMA units – BMA units) * UEI] – utility verified impacts
Incremental costs	Typically remain static	Typically decline over time

[a] CalMTA will forecast impacts 20 years from the date of inception for the MTI and include costs from the start of Phase II

MTI life cycle and lifetime



Forecasting approach



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Market Adoption Forecast

Gouri Shankar Mishra
Senior Associate, Cadmus

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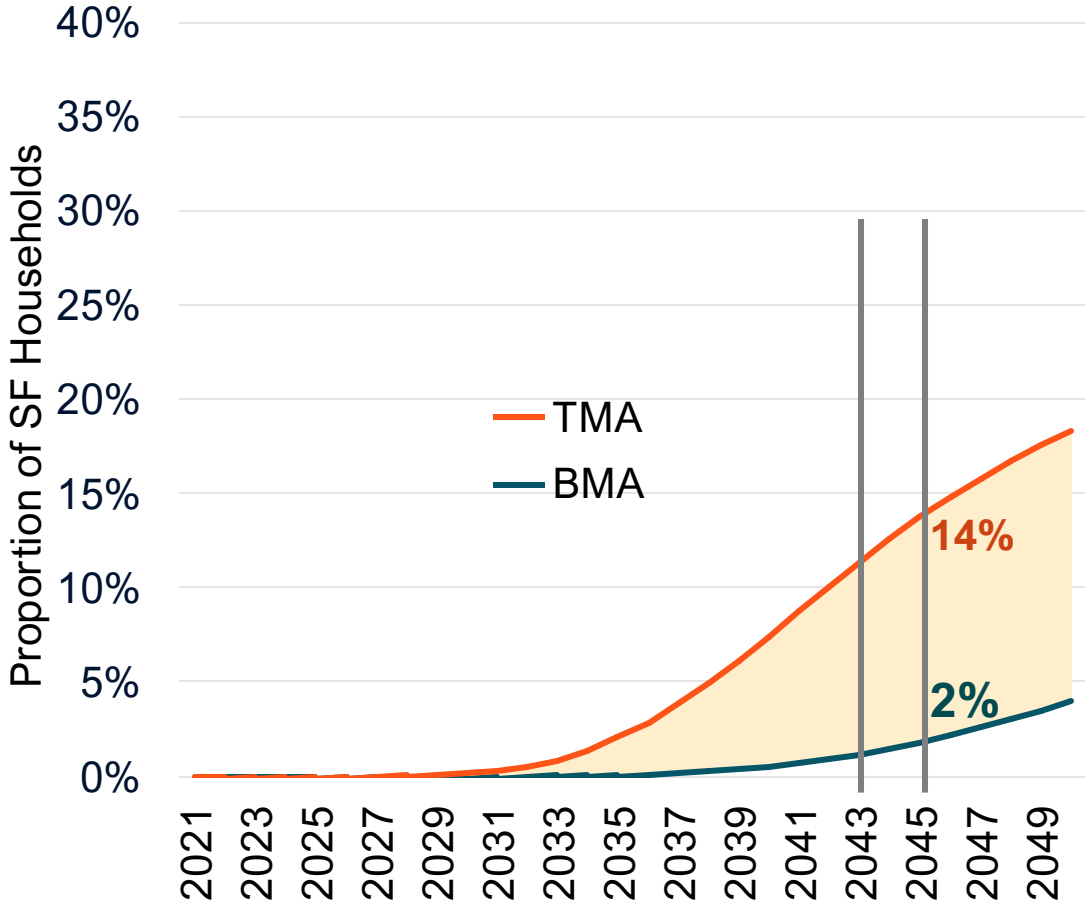
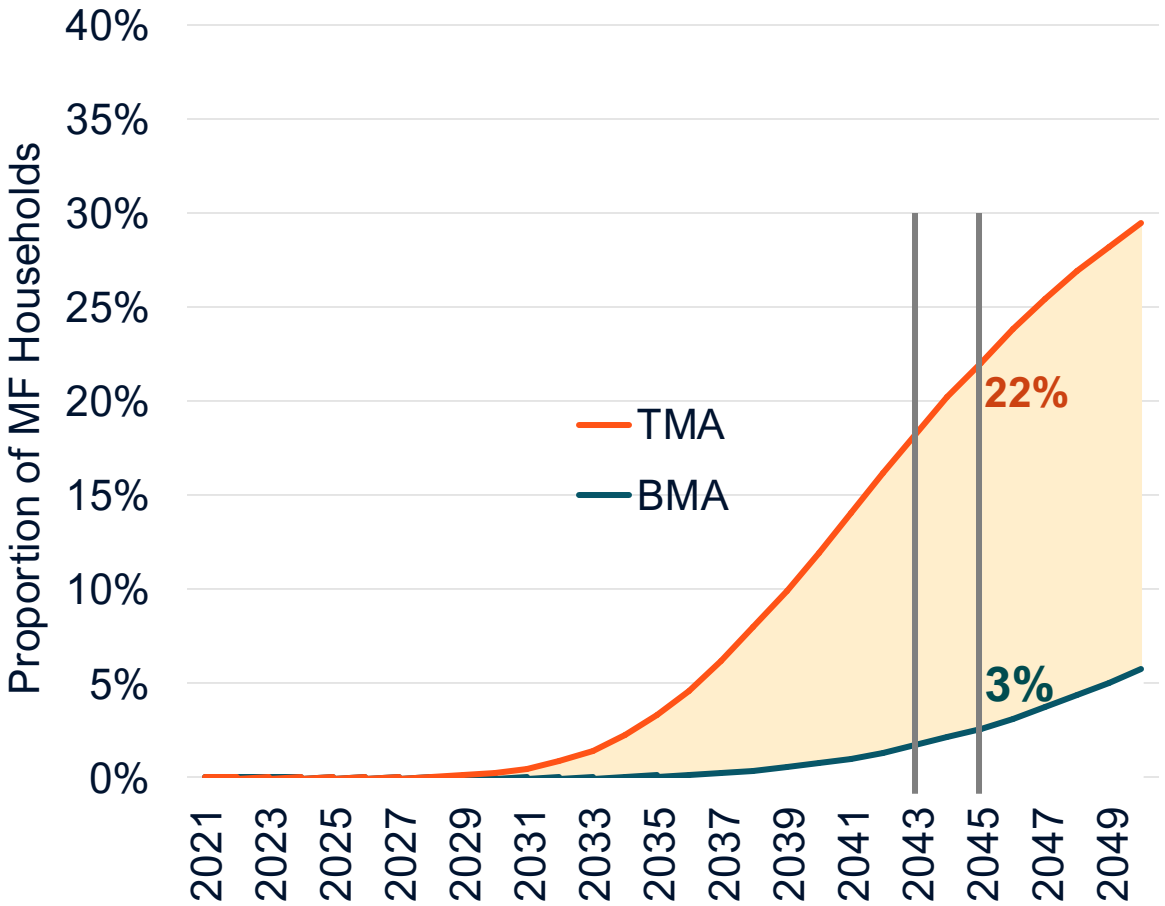
Baseline Market Adoption (BMA)	Expected “naturally occurring” market adoption. Considers current and expected market, regulatory and technological trends. Counterfactual adoption in absence of the MTI
Total Market Adoption (TMA)	Actual market uptake Includes the additional adoption forecasted to result from strategic interventions described in this MTI plan.
Resource Acquisition (RA) Verified Units	Estimated verified adoption associated with RA program claims reported in CEDARS
Net Incremental Adoption	TMA - BMA - RA Verified Units

Estimated adoption

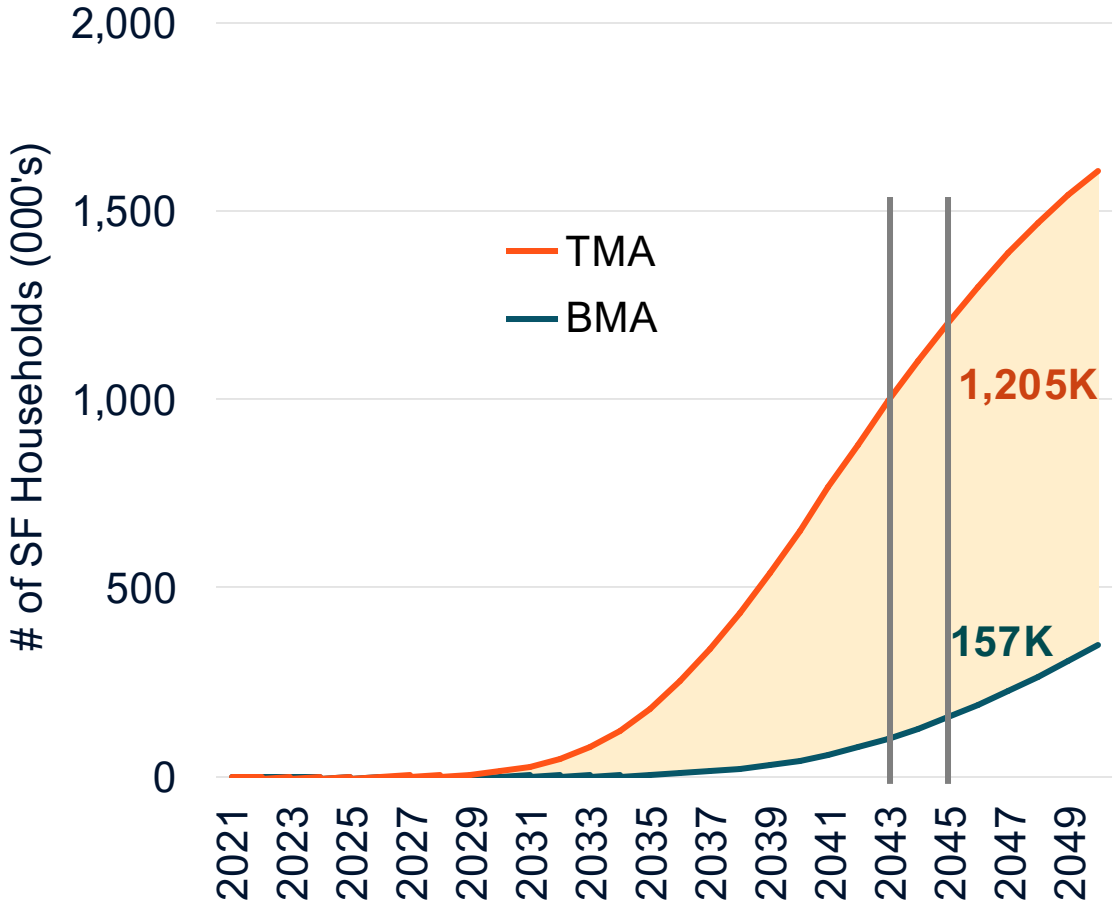
Proportion of existing households estimated to adopt room HP

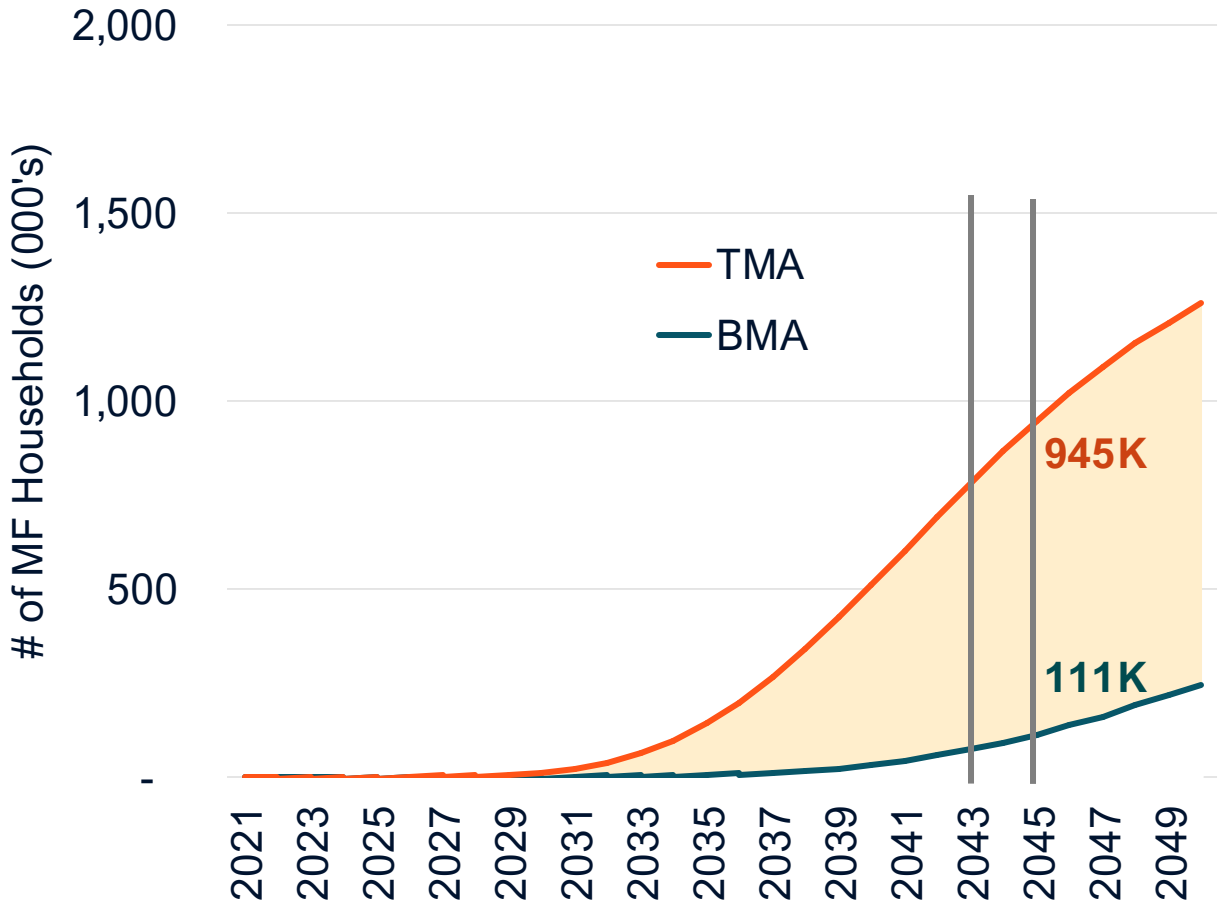




Estimated adoption

Cumulative # of households estimated to adopt room HP





Market adoption forecast

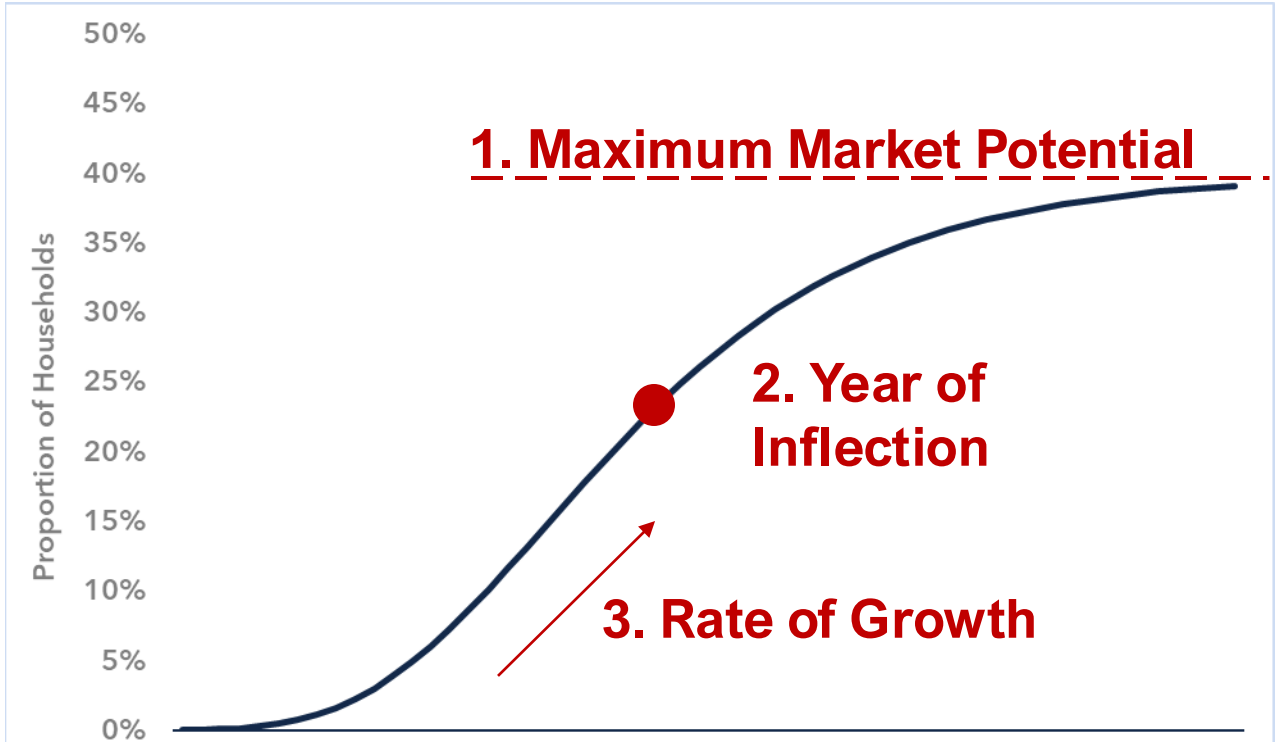
Net incremental adoption = TMA – BMA – verified RA units

	Units of RHP (thousands)							
	TMA	BMA	RA program verified		Net incremental		Non-IOU	Net - incremental net of non-IOU
Single-family	1,838	242	196		1,400		372	1,028
Multifamily	1,207	144	129		934		251	683
Total	3,045	386	386		2,334		623	1,711

Forecast Period: 2024-2045

Adoption estimation: Methods

Diffusion forecast using a s-curve model



Parameter for S-Curve

1. *Ultimate* level of adoption (long term, may be beyond the forecast period).

2. Year with *highest rate of* adoption. Adoption rate decreases after this point.

3. Steepness of the s-curve; *speed of adoption*.

Adoption estimation: Methods

Estimating model parameters in the baseline (BMA) and in presence of the MTI (TMA)

Inputs for BMA

- → Market research
- → Literature review
- → Expert judgement

Inputs for TMA

- → MTI Plan: Interventions and Milestones

Estimation of S-Curve parameters:
Maximum market potential

Step 1: Segment population

1. Household type: MF or SF
2. Current HVAC system
3. Urban or rural?
4. Own or rent?

Step 2: Estimate potential for each segment

What proportion of households in each segment will eventually adopt RHP?

Estimation of S-Curve parameters:
Maximum market potential

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Example: Urban dwelling owners

Table: Estimated potential - Urban HHs Owners

Primary Equipment Type for Heating and/or Cooling	# of households in 2022	
	Multifamily	Single-family
1. Electric Resistance Heating (Zonal)	81	261
2. Electric Central Furnace (Ducted)	14	181
3. Gas, oil or wood stoves (Zonal)	-	378
4. Central HP and/or Mini splits	28	183
5. Central Gas Furnace without any cooling and not counted above in #1 to #4	33	1,049
6. Central Gas Furnace AND Central Cooling and not counted in #1 to #5	73	3,489
7. Window/Wall/Portable AC and not counted above in #1 to #6	15	224
8. No heating or cooling	27	200
9. Central cooling without any heating and not counted above in #1 to #8	46	115
10. Other households	-	86
Total	**316**	**6,166**

Estimation of S-Curve parameters: Maximum market potential

Key assumptions in the baseline (BMA)

High potential among HHs with inefficient zonal system

Table: Primary Equipment Type for Heating and/or Cooling disaggregated by HH type for Urban HHs Owners

	Number of HHs (000s)	
	Multifamily	Single Family
1. Electric Resistance Heating (Zonal)	81	261
2. Electric Central Furnace (Ducted)	14	181
3. Gas, oil or wood stoves (Zonal)	-	378
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9. Central cooling without any heating and not counted above in #1 to #8	46	115
10. Other households	-	86
Grand Total	**316**	

Low potential among SF HHs with central systems

MF units prefer RHP over mini-splits

Key assumptions in the presence of the MTI (TMA)

- Overall higher potential relative to baseline
- Higher potential in rental units

Estimation of S-Curve parameters:
Maximum market potential

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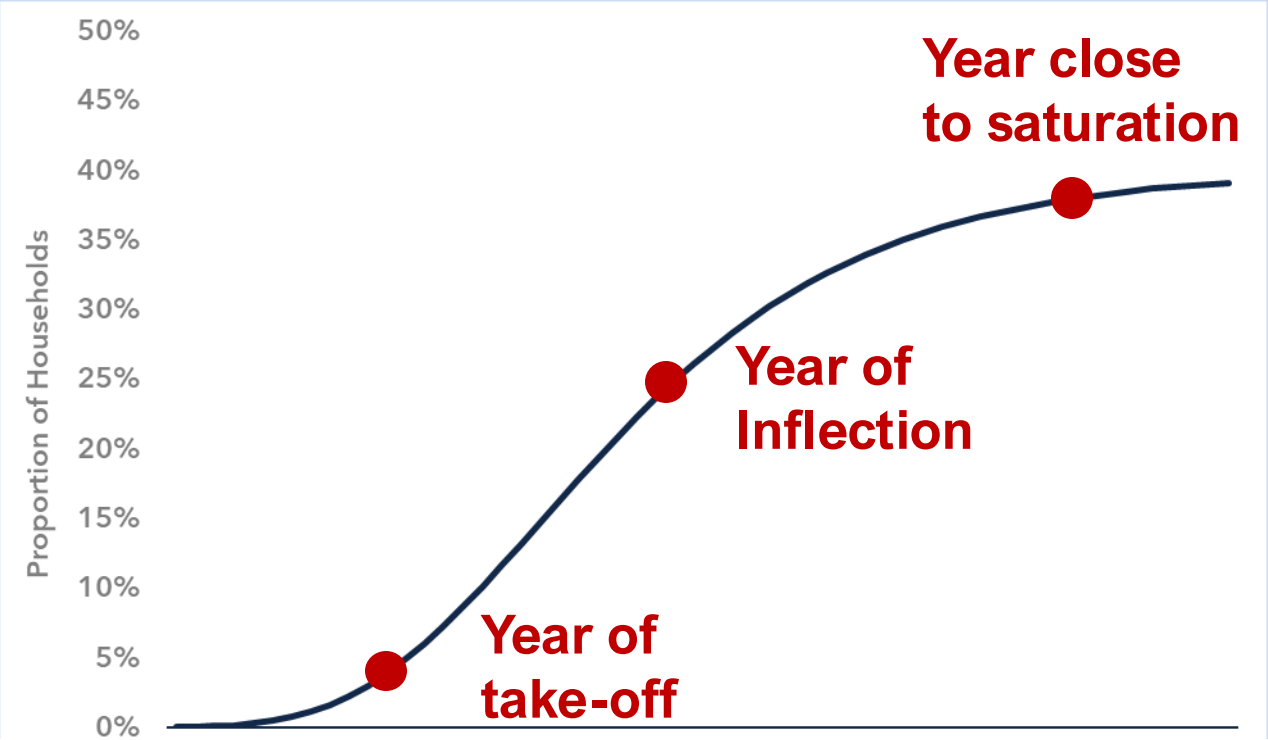
Estimated potential – proportion of existing households

	SF	MF
Baseline (BMA)	13%	19%
In presence of the MTI (TMA)	24%	38%

Note: The numbers in the table represent maximum market potential and not estimated market adoption.

Estimation of S-Curve parameters:
Year of Inflection

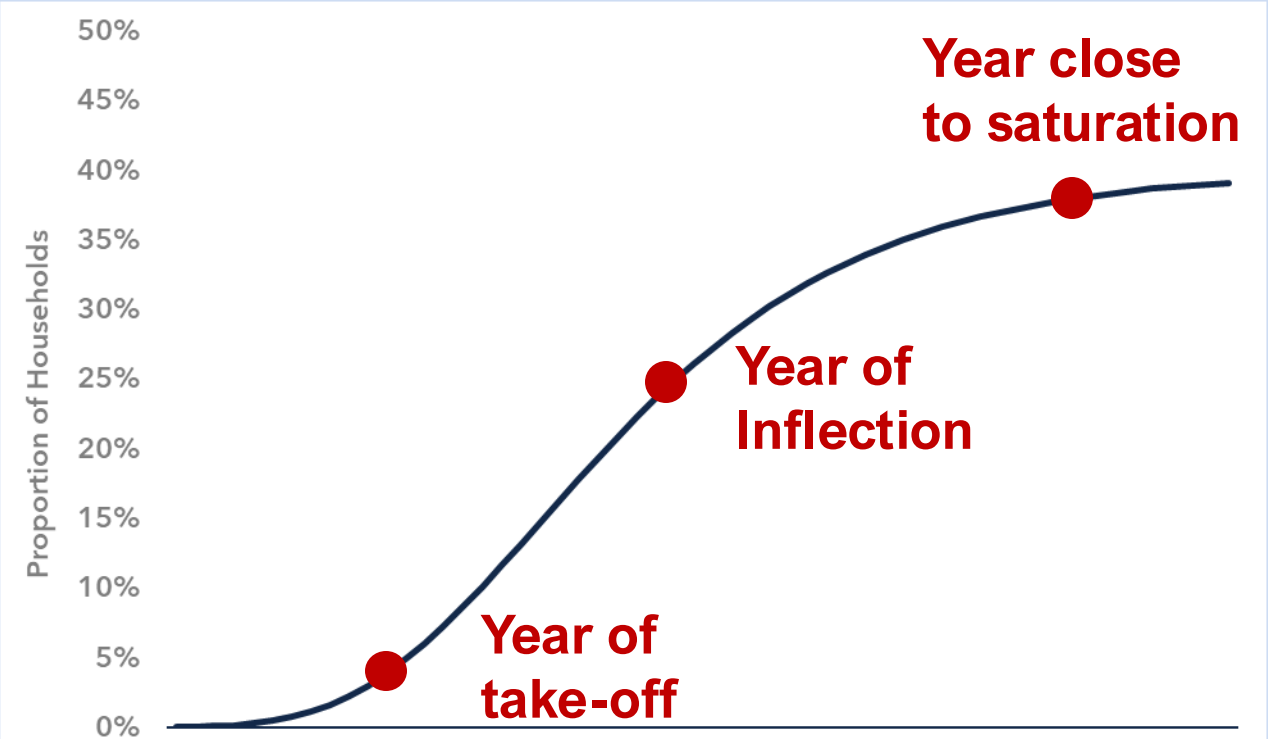
Difficult to estimate Year of Inflection



- Difficult to estimate Year of Inflection
- Instead estimate
  - Year of take-off
  - Year of saturation

Estimation of S-Curve parameters:
Year of Inflection

Assumption: Inflection is mid-point of take-off and saturation



Year of take-off

	Assumption	Source
BMA	2037	Market Research
TMA	2029	MTI Plan Milestones

Saturation

	Assumption	Source
BMA	2067	SMEs / Delphi
TMA	2053	MTI Interventions; CalMTA assumptions

Year of Inflection

Mid-point of take-off and saturation

Estimation of S-Curve parameters:
Rate of growth

Steepness of the s-curve

	Assumed values	Source
BMA	0.1	Inputs from Delphi Panel and literature review
TMA	25% higher	Based on planned interventions in the MTI plan; literature review

Adoption Forecast:
Estimate # of units adopted

	Units of RHP (thousands)							
	TMA	BMA	RA program verified		Net incremental		Non-IOU	Net - incremental net of non-IOU
Single-family	1,838	242	196		1,400		372	**1,028**
Multifamily	1,207	144	129		934		251	**683**
Total	3,045	386	386		2,334		623	**1,711**

Forecast Period: 2024-2045

Break (15 min)
We will be back soon.

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Cost-Effectiveness Modeling

Matt Wisnefske
Senior Associate, Cadmus

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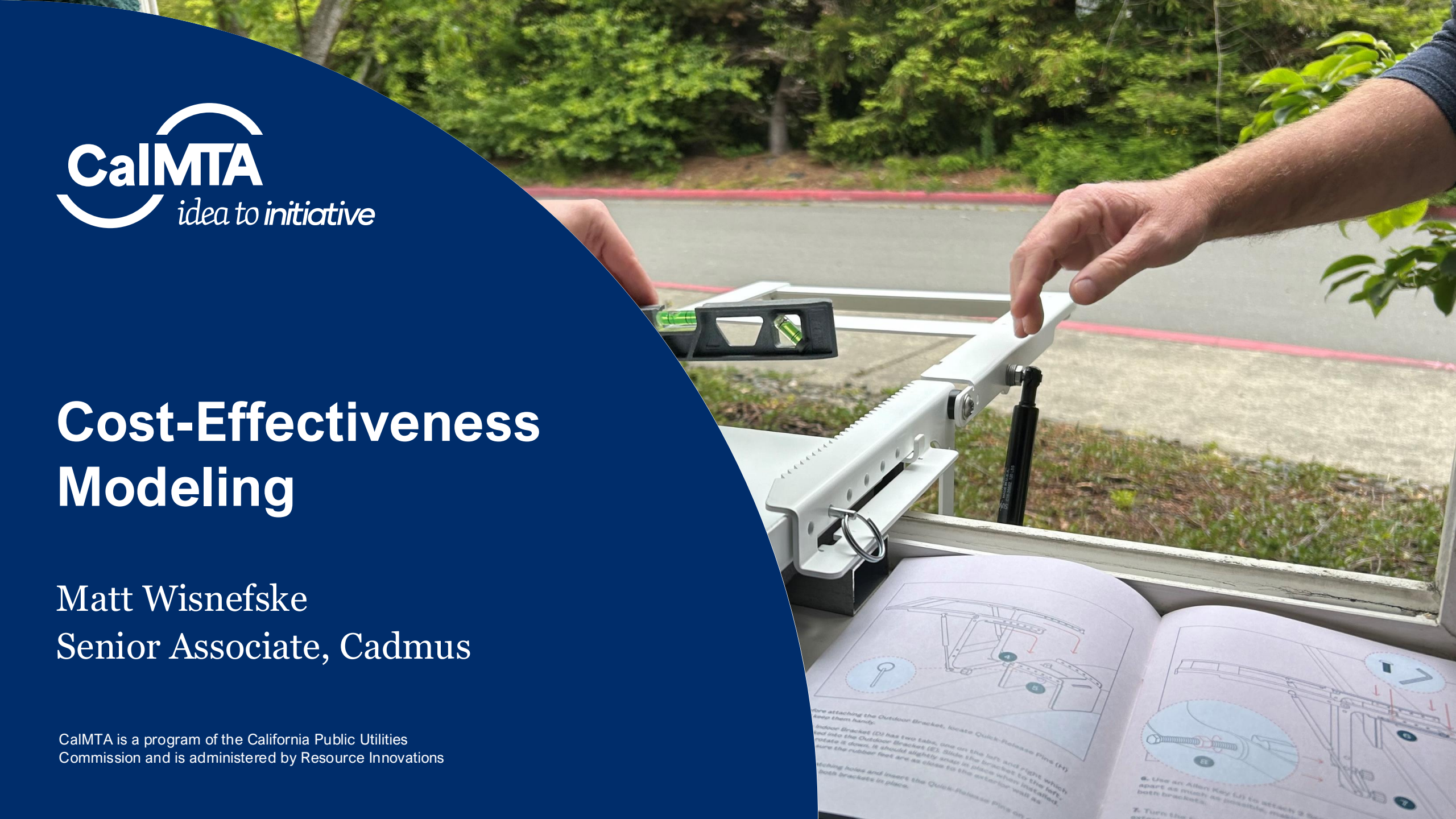
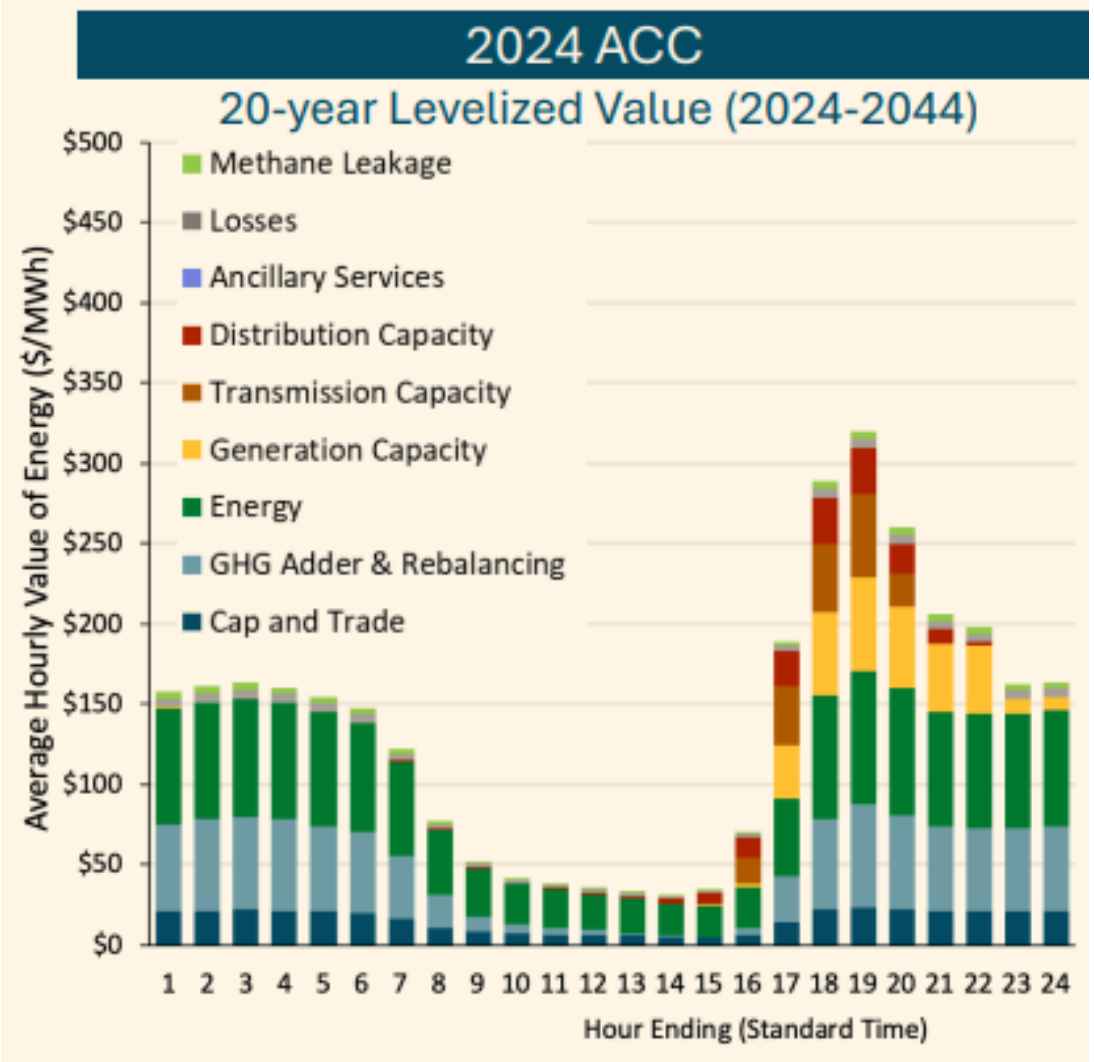


Total System Benefit

- Adopted by the CPUC in 2024
- Composed of life cycle energy, capacity, and greenhouse gas benefits
- Designed to measure the total value to the electric and natural gas systems



Cost-effectiveness tests

Total Resource Cost Test

- Energy system perspective
- Includes initiative costs and incremental measure costs

Program Administrator Cost Test

- MTI administrator perspective
- Includes initiative costs and incentive costs

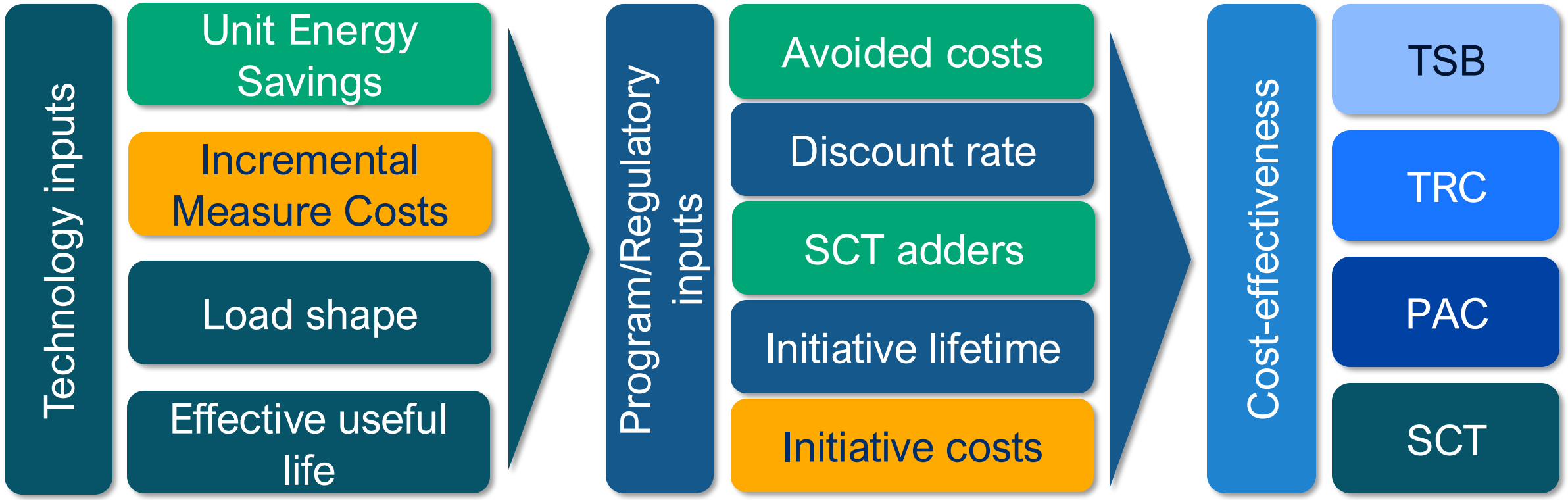
Societal Cost Test

- California-as-a-whole perspective
- Includes initiative costs and incremental measure costs
- Includes more GHG value and lower discount rate

Replacement scenarios

Segment	Counterfactual equipment	Efficient equipment	Decision type	First-year IMC
MF / SF	Room AC + electric resistance heat	Window Heat Pump	Replacement	$245
MF / SF	Room AC + gas wall furnace	Window Heat Pump	Replacement	($598)
MF / SF	Portable AC + electric resistance heat	Portable Heat Pump	Replacement	($180)
MF / SF	Portable AC + gas wall furnace	Portable Heat Pump	Replacement	($1,023)
Single-family	Room AC + electric resistance heat	Window Heat Pump	Displacement	$481
Single-family	Portable AC + electric resistance heat	Portable Heat Pump	Displacement	$56
MF / SF	No cooling + central gas furnace	Window Heat Pump	No cooling	$890
MF / SF	No cooling + central gas furnace	Portable Heat Pump	No cooling	$586

Cost-effectiveness methodology - inputs and assumptions



Technology definition inputs

Unit Energy Savings

- Savings determined by energy modeling using DOE data
- Both in terms of Electricity (kWh) and Natural Gas (Therms)
- Can be negative if there is fuel substitution (through electrification)

Incremental Measure Costs

- Determined by California retailer price data collected in 2024
- Can be negative if a Room Heat Pump is less costly than two other technologies combined (such as a Room AC and a Gas Wall Furnace)

Load shape

- Probability that a technology is in use in every hour of the year (8,760)
- Based on DEER database using multiple California Residential HVAC profiles

Effective useful life

- Number of years a technology is expected to be used after installation before failure or replacement
- Room Heat Pumps get 9 years per California eTRM values

Room Heat Pump MTI Plan

Program/Regulatory inputs

Avoided costs

- Value of reduced energy consumption in every hour of the year (8,760)
- Composed of Energy, Grid, and Greenhouse Gas avoided costs

Discount rate

- Used to discount future costs and benefits to 2024 values
- 7.3% for TRC and PAC, 3% for SCT

SCT adders

- Additional benefits based on Social Cost of Carbon (both high and base cases)
- Additional methane leakage benefit

MTI lifetime

- Number of years that the initiative will run in California
- Phase III runs from 2026 through 2045

Initiative costs

- Costs incurred by California MTA when running the initiative
- Includes administration, research and evaluation, marketing, and incentives
- Costs are largely front loaded in the first few years of the initiative

TSB and cost-effectiveness 2024-2045

Test	TSB – Energy	TSB – Grid	TSB – GHG	TSB – Total
TRC	$ 160M	$ 30M	$ 331M	$ 521M
SCT	$ 344M	$ 68M	$ 1,005M	$ 1,417M

	TRC Ratio	PAC Ratio	SCT Ratio
With Negative IMCs	330.15	8.29	(30.24)
With Negative IMCs set to Zero	5.46	8.29	11.2

Cost-effectiveness “schedule”

Forecasting metric	2030	2035	2045
TSB	$ 5M	$ 79M	$ 521M
TRC ratio (adjusted)	0.13	1.21	5.46
PAC ratio	0.12	1.28	8.29
Estimated incremental investment	$ 36.4M*	$ 21.5M	$ 1.2M
Approximate breakeven year for TRC: 2034			

*Phase III 2026-2030 investment

TSB and Cost-Effectiveness:

Statewide impacts included

Forecasting Metric	Net Incremental Impacts (IOU territory only)	Net Incremental Impacts (statewide)
TSB	$ 521M	**$ 640M**
TRC Ratio	330.15	**(36.25)**
TRC Ratio (adjusted)	5.46	**5.90**
PAC Ratio	8.29	**10.18**

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MTI Evaluation Plan

Karen Horkitz
Lead, Market Research and Evaluation

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Evaluation approach overview

Unambiguous MTI progress and impact goals & metrics established at time of adoption, with data collection plan that substantiates MTI evaluability

Theory-based evaluation (TBE) Clear program theory, logic models, & associated market progress indicators as foundation to establish market influence, progress, & causal impact of MTI interventions

Data-driven, transparent analysis methods to estimate market diffusion, cost-effectiveness, & incremental impact

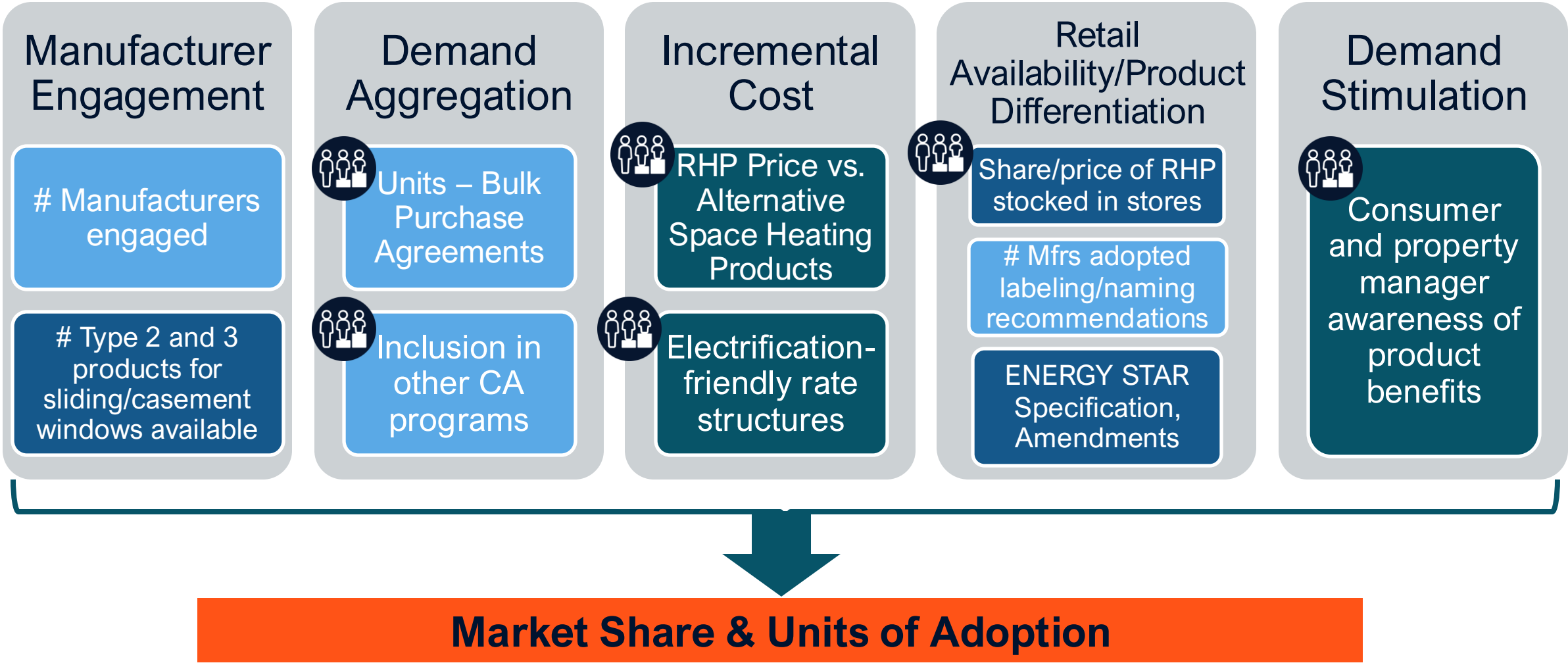
Use of widely accepted best practices to develop & refine baseline market adoption forecast

Agreed upon methodology to determine MTI incremental impact that supports California's policy goals, statewide collaboration, & decisions about future MT investments

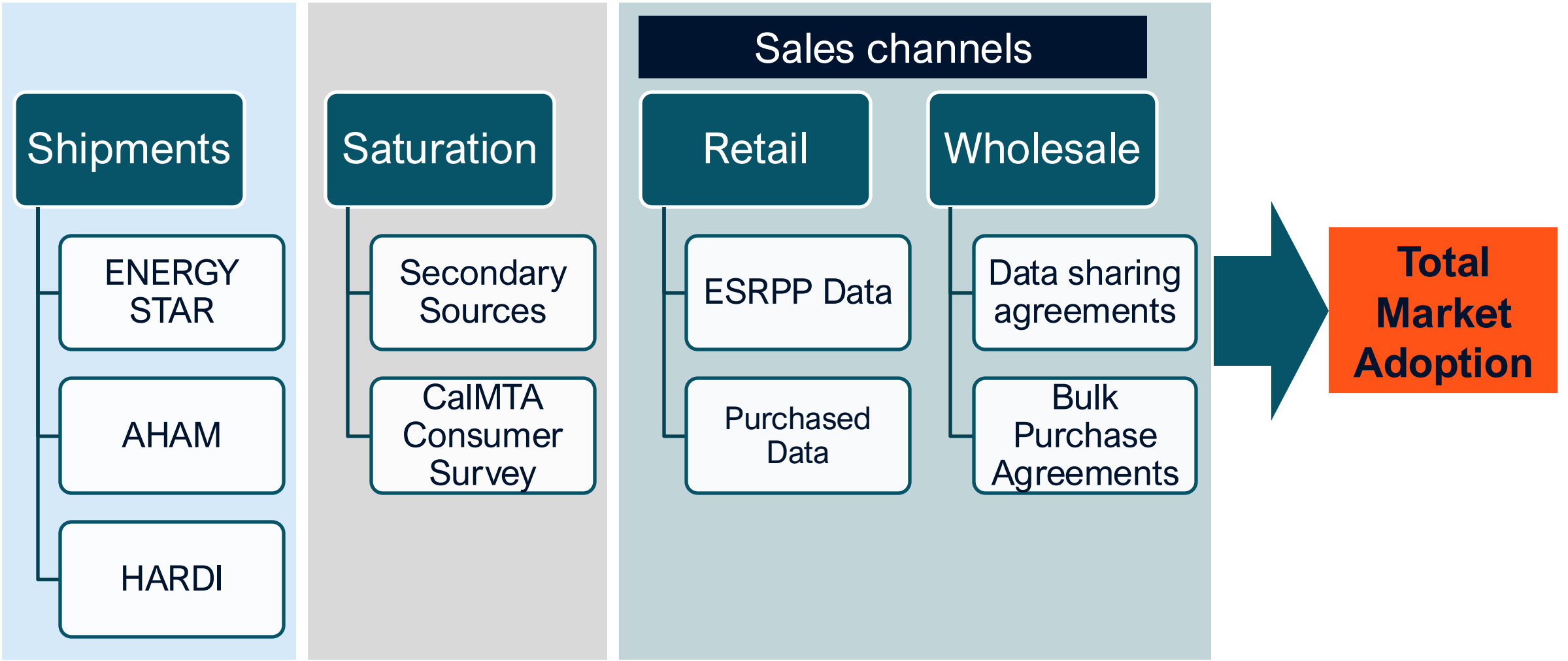
Evaluation objectives

- Monitor market dynamics and characteristics; assess market developments
- Review and assess the MTI logic model and program theory
- Measure market progress and equity, per the MPIs
- Assess MTI causality per the logic model
- Identify opportunities to adjust MTI strategy and tactics, to improve MTI effectiveness
- Review baseline and total market adoption forecasts, TSB and cost-effectiveness model inputs and assumptions
- Assess ancillary benefits and costs

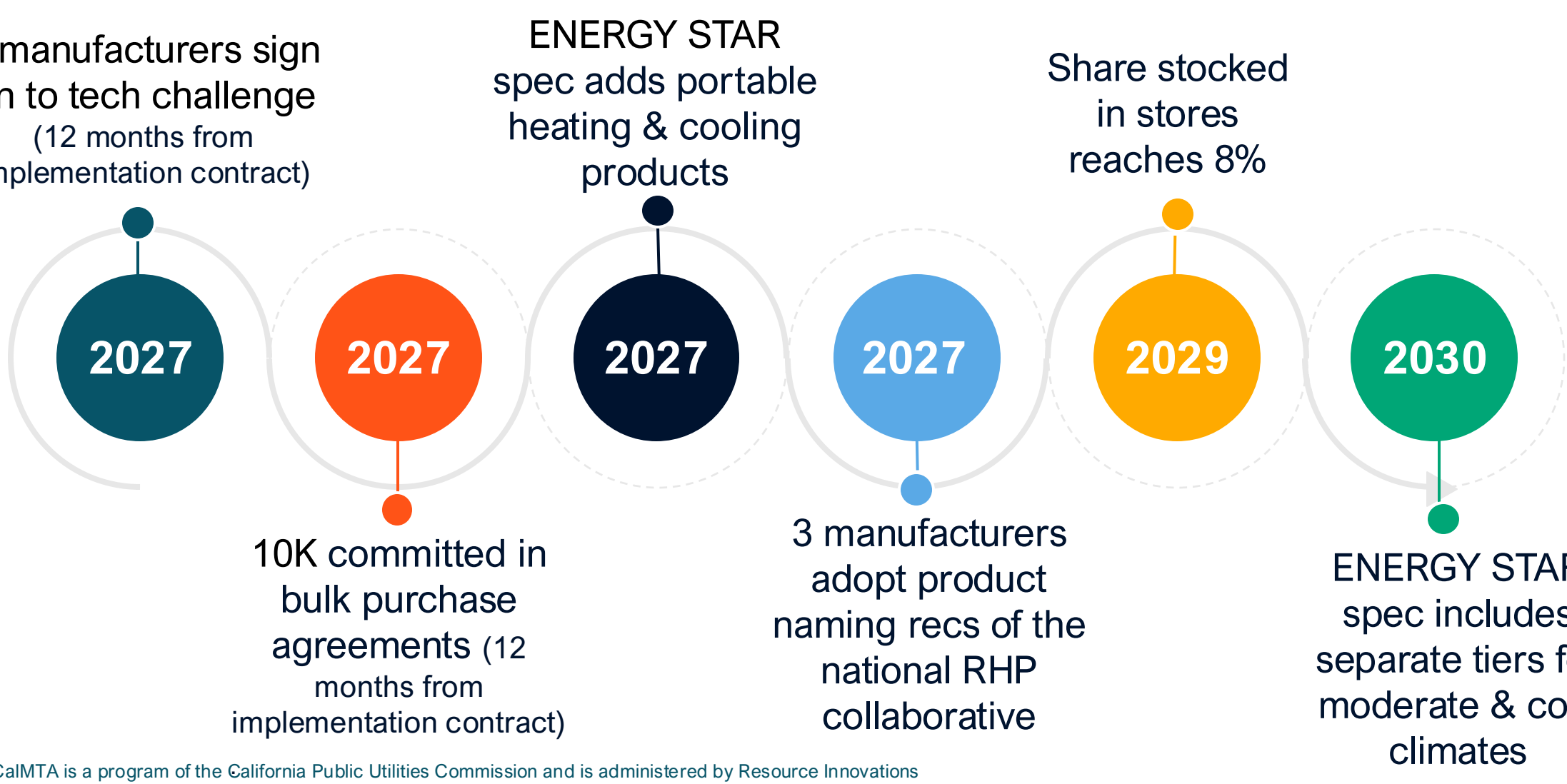
Key Market Progress Indicators



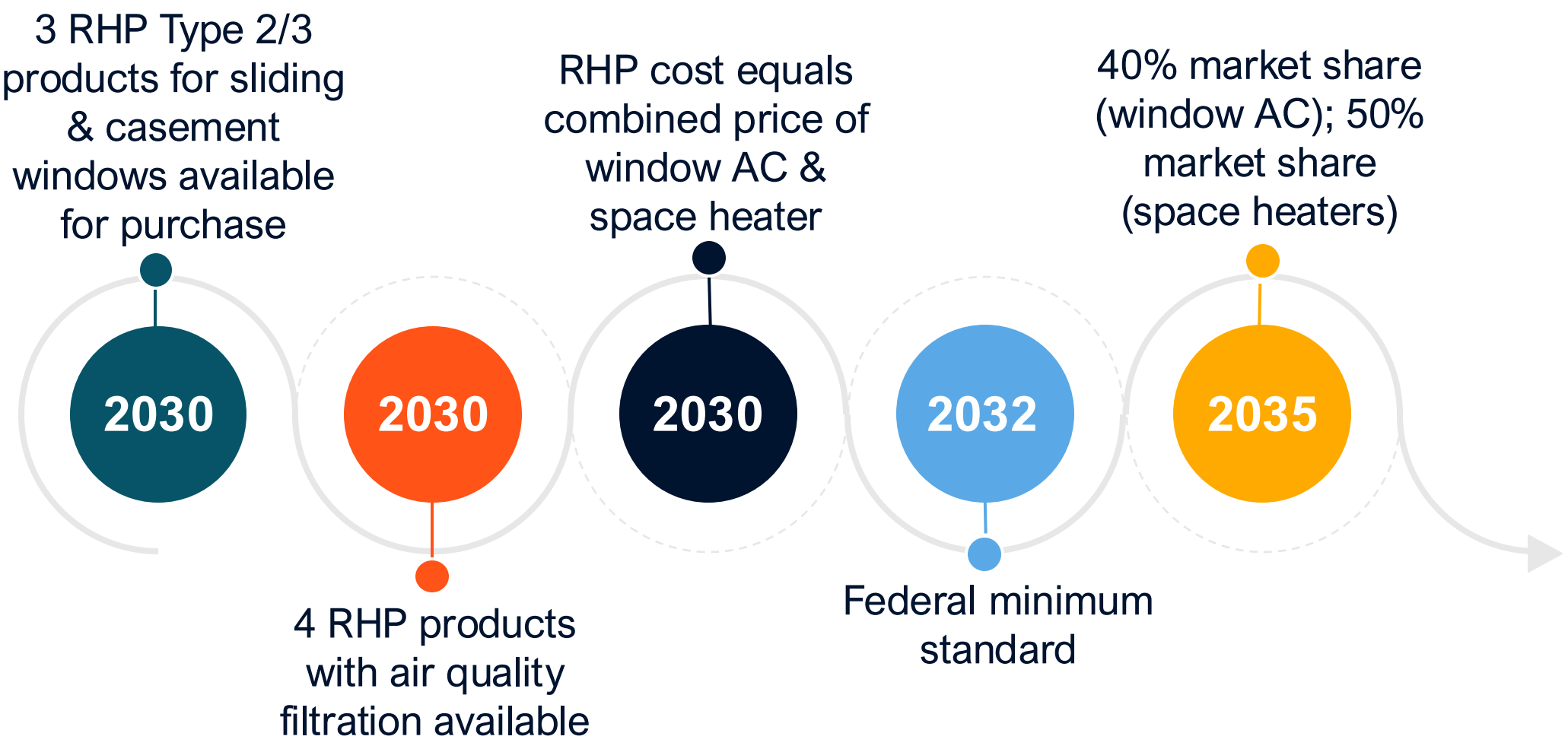
Estimating units of adoption



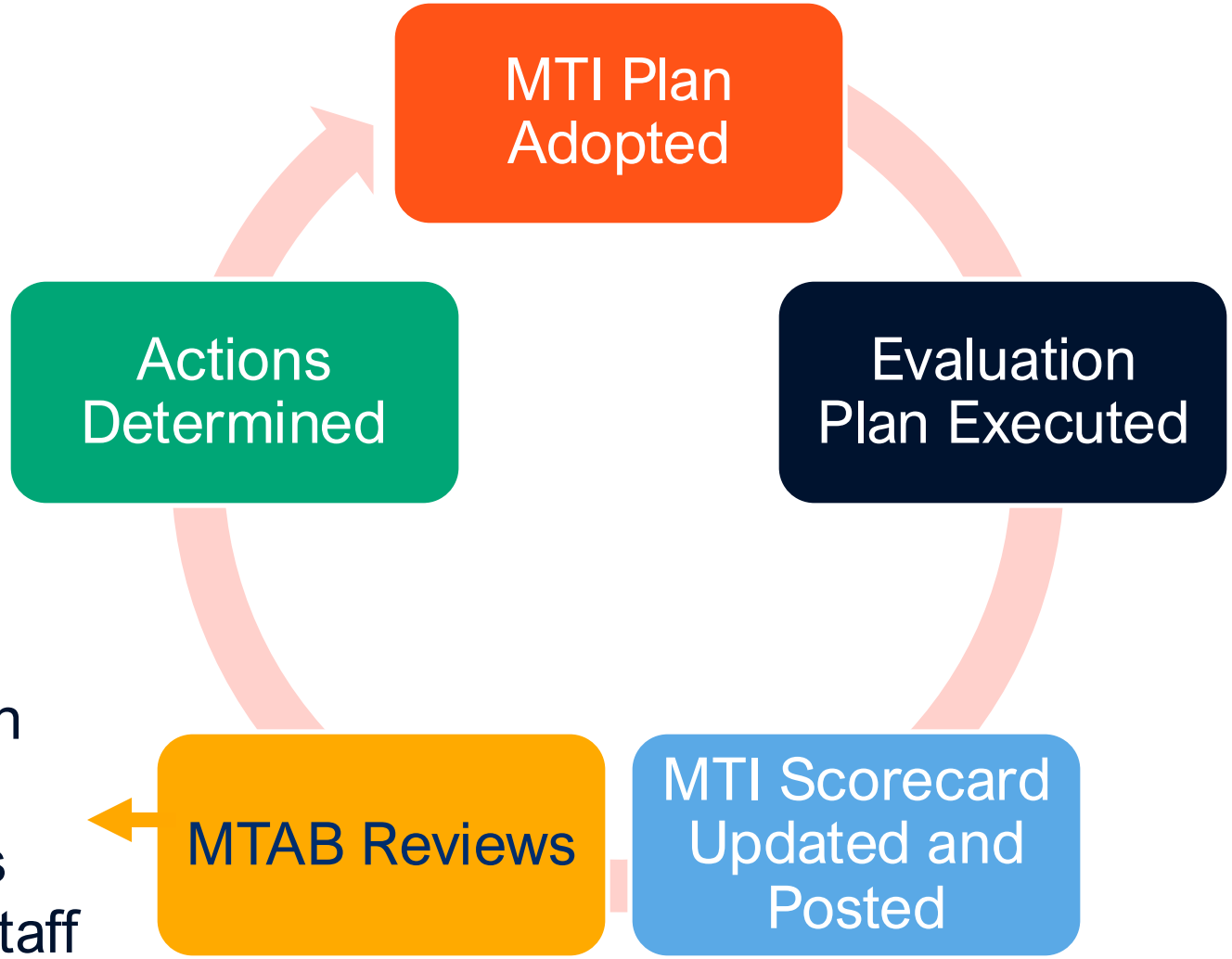
RHP milestones



RHP milestones (cont.)



Monitoring, reporting, and review process



At least annually; underperforming MTIs prioritized on agenda with recommendations from evaluators, staff

6
Room Heat Pumps: Budget, Risks & Discussion

Elaine Miller, Senior Strategy Manager
Jeff Mitchell, Principal of MT

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

Phase III budget

Activity	Total Phase III cost estimate
Program Implementation including the following line items: 1. MTI oversight, strategy and management 2. Marketing & Awareness building 3. Policy development and support 4. Supply chain engagement	$29,458,000
Market Research including the following line items: 1. Market research 2. Data collection	$2,850,000
Mid/upstream incentives include those to retailers	$17,750,000
Downstream incentives includes those to consumers	$5,250,000
Program evaluation	$3,820,000
Total	**$59,128,000**

Key risks

- Will we be able to create a large enough demand aggregation signal for manufacturers?
- Will manufacturers produce an affordable product that meets the needs of California windows types and climate?
- Can CalMTA get market to overcome product labeling challenges?
- Inclusion in California programs
- Electrification rates in California

Why this? Why now for California?

- Fills a critical Heat Pump product gap to help California reach 6M HP Challenge
  - 120V capability and electrical infrastructure challenges, especially for MF
  - Affordable HP option for MF and small residential, ESJ communities
- Leverages and builds upon new market entrants and national momentum
- Future product will provide additional benefits
  - Air filtration capability improving IAQ
  - Use of lower GWP refrigerants
  - DR capability
- **Clear role, timing, and MT Theory for CalMTA**

PART 3

Discussion

- Bright spots and possible challenges
- Questions of clarity for CalMTA
- Questions for other MTAB members
- Other feedback

7
Stage 2 Scoring & Prioritization of RFI Submissions

Rick Dunn, Senior Manager of ET
Jennifer Barnes, 2050 Partners

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

Today's objectives

1. Review Stage 2 scores
2. Gather MTAB feedback and input

Scoring process overview

Threshold Review	Stage 1	Stage 2
Does it save energy? Is it commercially available? Is there enough information to be scored?	Scores based on expertise and easily accessible information	Scores based on estimated TSB & cost-effectiveness Stage 1 scores updates as needed

Sept 2024

Today

RFI scoring criteria

Category	Criteria
Total System Benefit (TSB) A single metric that encompasses energy savings, grid benefits and reliability, and GHG impacts (Stage 2)	Energy TSB
	Grid benefits TSB
	GHG impacts TSB
Product readiness An indicator of the supply chain maturity/product availability	Readiness
Participant cost/cost-effectiveness Assesses the overall estimated cost of the MTI against its benefits	Participant cost (Stage 1) PAC & TRC (Stage 2)
ESJ impacts (equity) Assesses whether the MTI will provide beneficial impacts to ESJ communities or leverage existing community resources in its execution	Beneficial impacts to ESJ communities
	Partnership opportunities with ESJ communities
Non-energy impact Captures the benefits or impacts (in addition to energy savings and greenhouse gas emissions reductions) that the MTI will deliver	Non-energy impacts
MT alignment Ensures MTI aligns with key aspects of MT theory; presents a strong MT opportunity	Innovation characteristics
	Leverage points
	Sustained benefits

Top-ranked ideas: Stages 1 & 2

Stage 1	Stage 2
• Multifunction Heat Pumps	• Multifunction Heat Pumps
• Sustainable Outdoor Lighting	
• Very High Efficiency DOAS	
• Thermal Energy Storage as a DER	
• Reflective Insulation for Windows	
• VFD on all pumps & fans >10 HP	• VFD on all pumps & fans >10 HP
• Agricultural Irrigation	
• BPS Acceleration	• BPS Acceleration
• Smart Electric Panels	
• Smart Home	+ Efficient Streetlights
• High Performance Windows	
• Residential Smart-splitting	

Disclaimers

- TSB values were developed for Stage 2 scoring and selection.
- They are directional estimates to be used to rank and compare the relative value of each idea.
- They are preliminary estimates and are not intended to represent a level of achievable TSB.
- These values are statewide estimates and include IOU attribution.

Scoring summary: Stages 1 & 2

Idea #	Idea name	Stage 1	Stage 2
0085	Multifunction Heat Pump	8.11	8.11
0193	Building Performance Standard Acceleration	7.30	7.22
0105	Efficient Streetlights	7.21	6.92
0024	VFDs on all pumps and fans >10 HP	7.32	6.82

0085: Multifunction Heat Pumps

Description

Two- or three-way residential heat pump systems that generate hot water for domestic consumption and provide space heating only (two-function) or both space heating and cooling (three-function), within the same system using a single compressor.

Enables

- Energy efficiency; significant GHG reductions over gas systems
- Accelerated multifamily sector electrification
- Could support the transition to ultra-low GWP or natural refrigerants

0085: Multifunction Heat Pumps

Typical residential configuration:

- Single outdoor heat pump serving:
  - Air handler for space conditioning
  - Hot water tank for water heating
- Separate loop of refrigerant lines for air handler and hot water tank

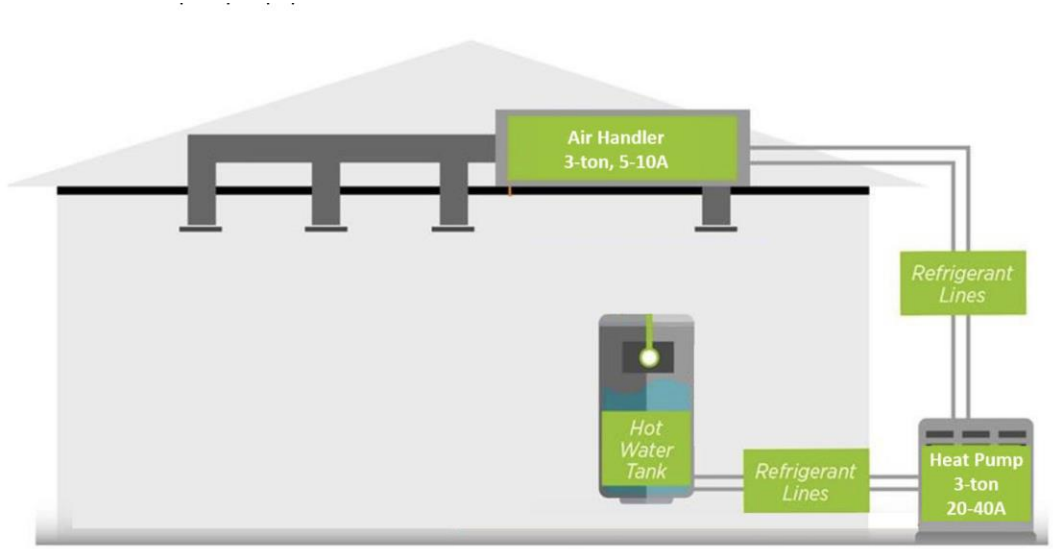


Figure 1: Air-to-Air Multi-Function Heat Pump system diagram showing the outdoor unit and refrigerant lines serving both the air handler and the indoor hot water tank.

Source: Adapted from original image provided by Villara.

0085: Multifunction Heat Pumps

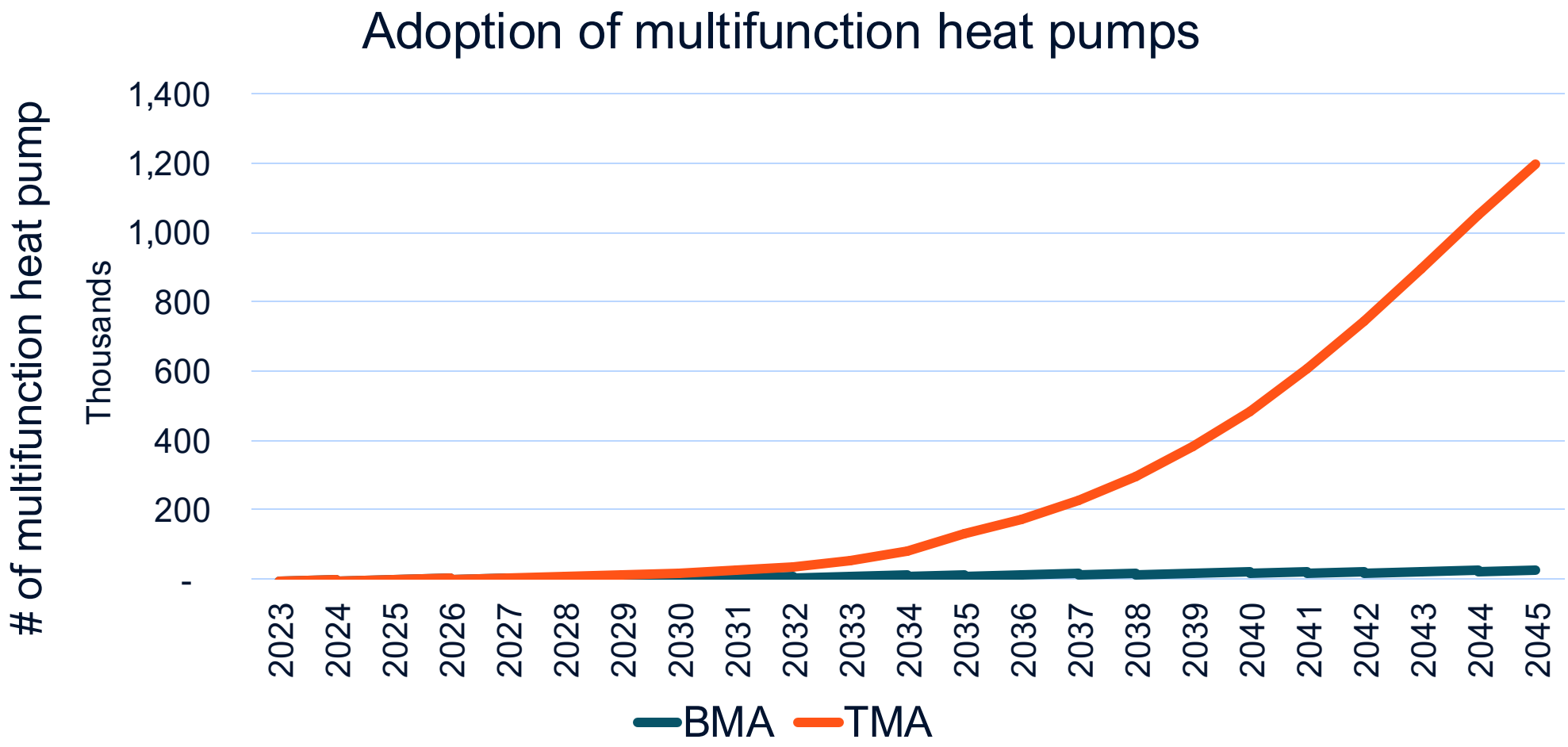
Challenges

- Currently less efficient than competing single-function HP and HPWH technologies
- Identification and optimization of a single refrigerant for combined space conditioning + water heating
- Space cooling (AC) functionality is still emerging technology

Potential MT strategies

- Drive technology advancement for better integration of space cooling and optimization of MF form factors
- Support transition to low-GWP refrigerants
- Leverage reduced need for electric panel upgrades for whole house electrification

0085: Multifunction Heat Pumps



0085: Multifunction Heat Pumps

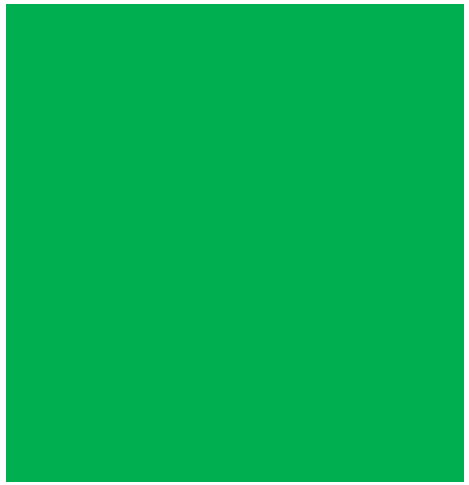
TSB Electric	TSB Grid	TSB GHG	TSB Total
$351M	$618M	$1,199M	$2,354M

Stage 1 Score	Stage 2 Score
8.11	8.11

- **Program budget: $58M**
- **PAC: 60.98**
- **TRC: 1.25**

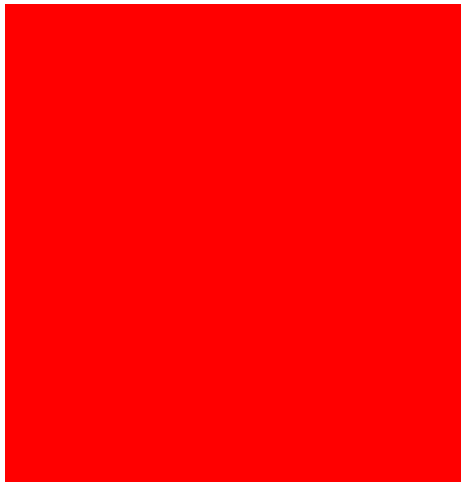
What do you think?

Hold up one of the three color cards to indicate your reaction.



Excited

Neutral or unsure



No way

0193: BPS Acceleration

Description

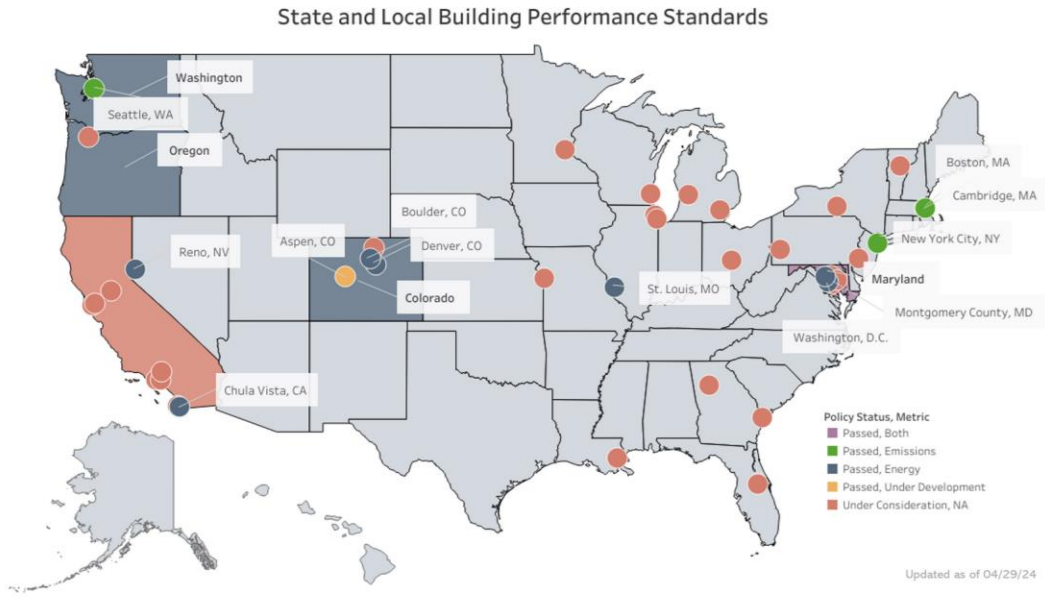
Strategies and tools to facilitate building-owner compliance with policies and laws aimed at reducing energy use intensity (EUI) and GHG emissions of the built environment; most commonly applies to buildings >20,000 ft^2, including commercial, industrial, municipal and multifamily properties.

Enables

- Energy efficiency; GHG reductions
- Leverage point for other market transformation activities

0193: BPS Acceleration

- ~45 states/jurisdictions have implemented or are developing BPS
- CEC oversees CA statewide benchmarking
- BPS implemented in Chula Vista:
  - 2023: ≥ 50,000 ft^2
  - 2026: ≥ 20,000 ft^2
  - Policy metric: EUI
  - Goal: 57% GHG reduction by 2030
- Statewide BPS in Colorado, Maryland, Oregon, and Washington:
  - Goal: 90-100% GHG reduction by 2050



Source: DOE EERE Building Energy Codes Program (Updated 4/29/24)

0193: BPS Acceleration

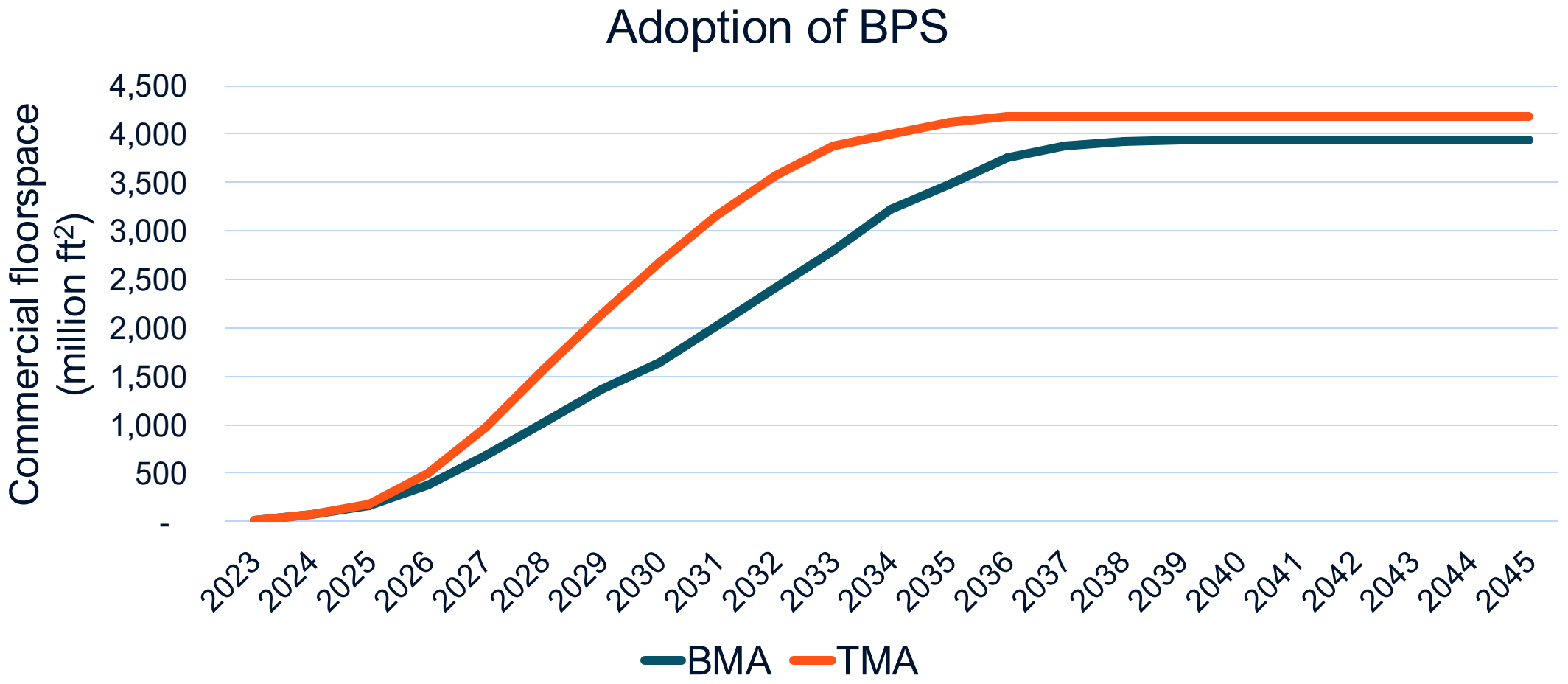
Challenges

- Often requires large financial investment by building owners
- Some owners may opt to pay the fine rather than upgrading infrastructure
- Different jurisdictions will have different building stock, goals and challenges
- Accelerator hubs, to date, have had limited success driving compliance

Potential MT strategies

- Accelerate re-commissioning to rapidly optimize building performance before assessing capital improvements
- Leverage emerging “zero-over-time” strategies to align BPS compliance timeline with existing capital improvement schedules
- Create additional support for buildings in ESJ communities that may be less efficient than other areas

0193: BPS Acceleration



0193: BPS Acceleration

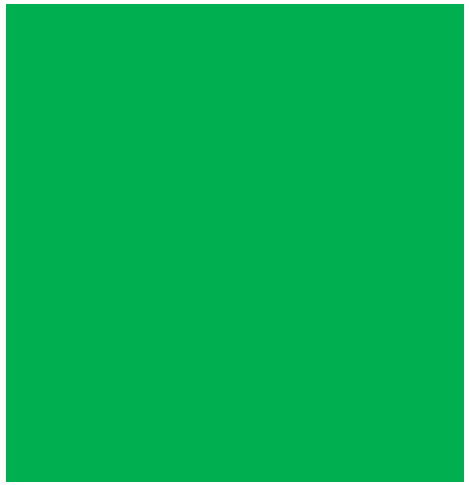
TSB Electric	TSB Grid	TSB GHG	TSB Total
$148M	$223M	$195M	$566M

Stage 1 Score	Stage 2 Score
7.30	7.22

- **Program budget: $54M**
- **PAC: 12.67**
- **TRC: 1.35**

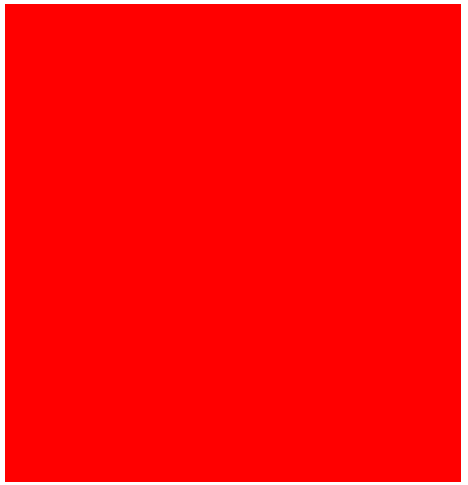
What do you think?

Hold up one of the three color cards to indicate your reaction.



Excited

Neutral or unsure



No way

0105: Efficient Streetlights

Description

Efficient, well-designed streetlighting systems with controls

Enables

- Energy efficiency; GHG reductions
- Grid flexibility
- “Smart City” interaction with other city systems

0105: Efficient Streetlights

Control and dimming strategies

- Often aligned with size and sophistication of jurisdiction
- Simple dimming
- Traffic pattern dimming
- Adaptive or “Smart City” control

0105: Efficient Streetlights

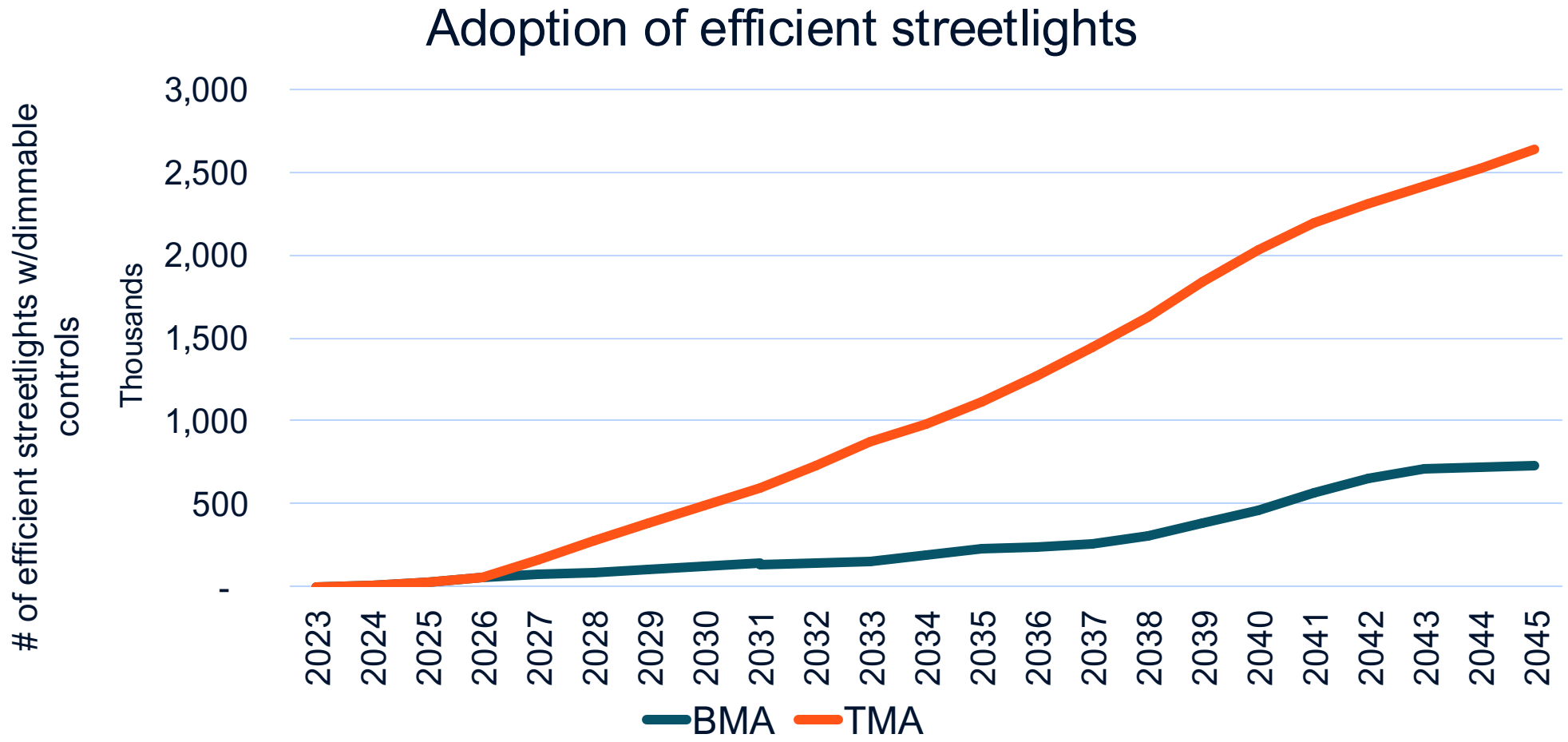
Challenges

- Lack of awareness of efficient options and smart controls
- Limited knowledge of advanced control strategies, capabilities, and design
- Financial barriers associated with retrofits
- Different ownership models

Potential MT strategies

- Smart controls are widely developed and proven
- Drive upgrades through outreach, education, and toolkits
- Develop means for jurisdictions to capture all the financial benefits
- Strategies to support streetlight municipalization

0105: Efficient Streetlights



0105: Efficient Streetlights

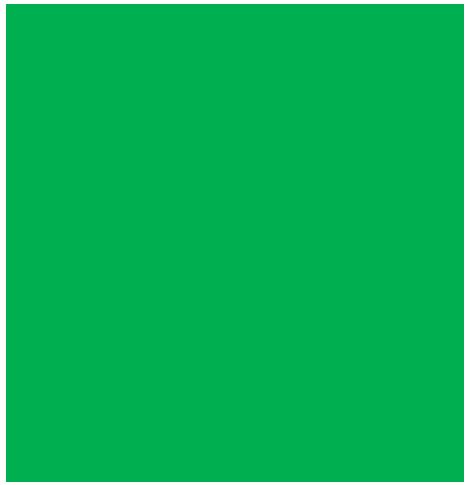
TSB Electric	TSB Grid	TSB GHG	TSB Total
$114M	$46M	$97M	$257M

Stage 1 Score	Stage 2 Score
7.21	6.92

- **Program budget: $9M**
- **PAC: 20.93**
- **TRC: 0.80**

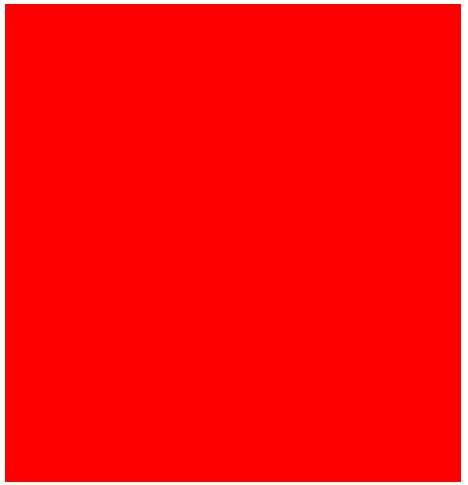
What do you think?

Hold up one of the three color cards to indicate your reaction.



Excited

Neutral or unsure



No way

0024: VFDs on all pumps and fans >10 HP

Description

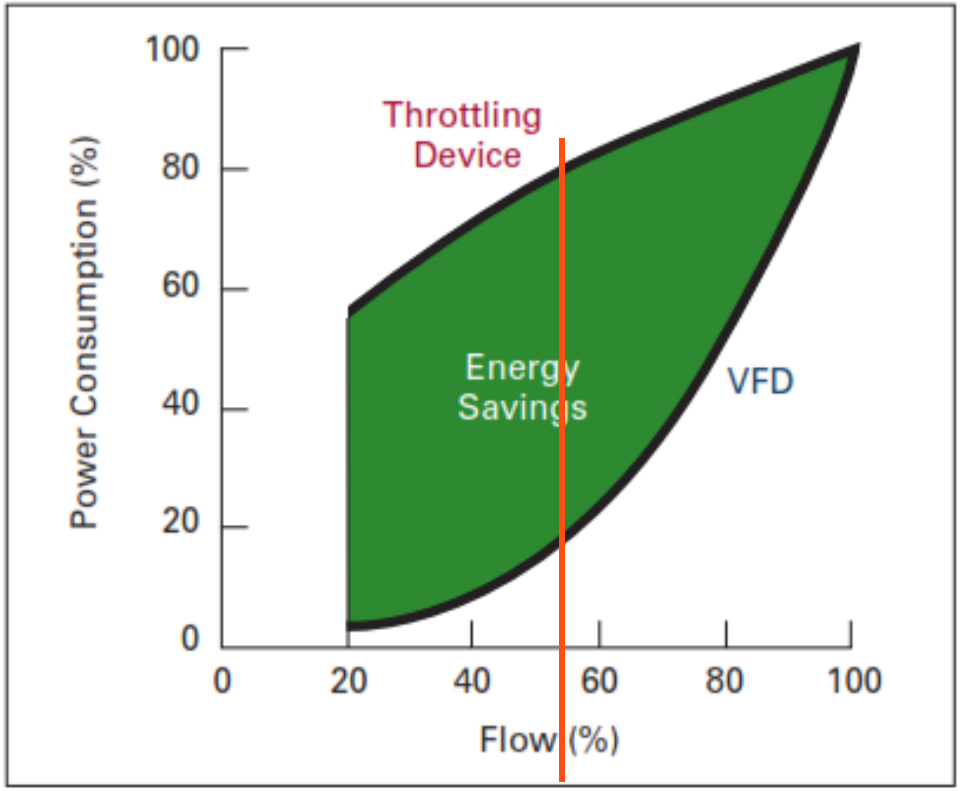
Installation of VFDs on commercial and industrial pumps and fans >10HP, which allow reduced speed and energy consumption during periods of low loads; can be combined with advanced motors for additional efficiency gains

Enables

- Energy efficiency; GHG reductions

0024: VFDs on all pumps and fans >10 HP

- Existing control is typically a throttling valve (for pumps) or outlet damper and inlet guide vanes (for fans); motor runs at full power
- Power to speed relationship with VFDs is cubic
  - Small decrease in speed yields a large decrease in power
  - Average VFD operating point from DOE/LBNL study: ~55% of full load.
    - 20HP pump power reduced from 12 to 3 kW



Average operating point

0024: VFDs on all pumps and fans >10 HP

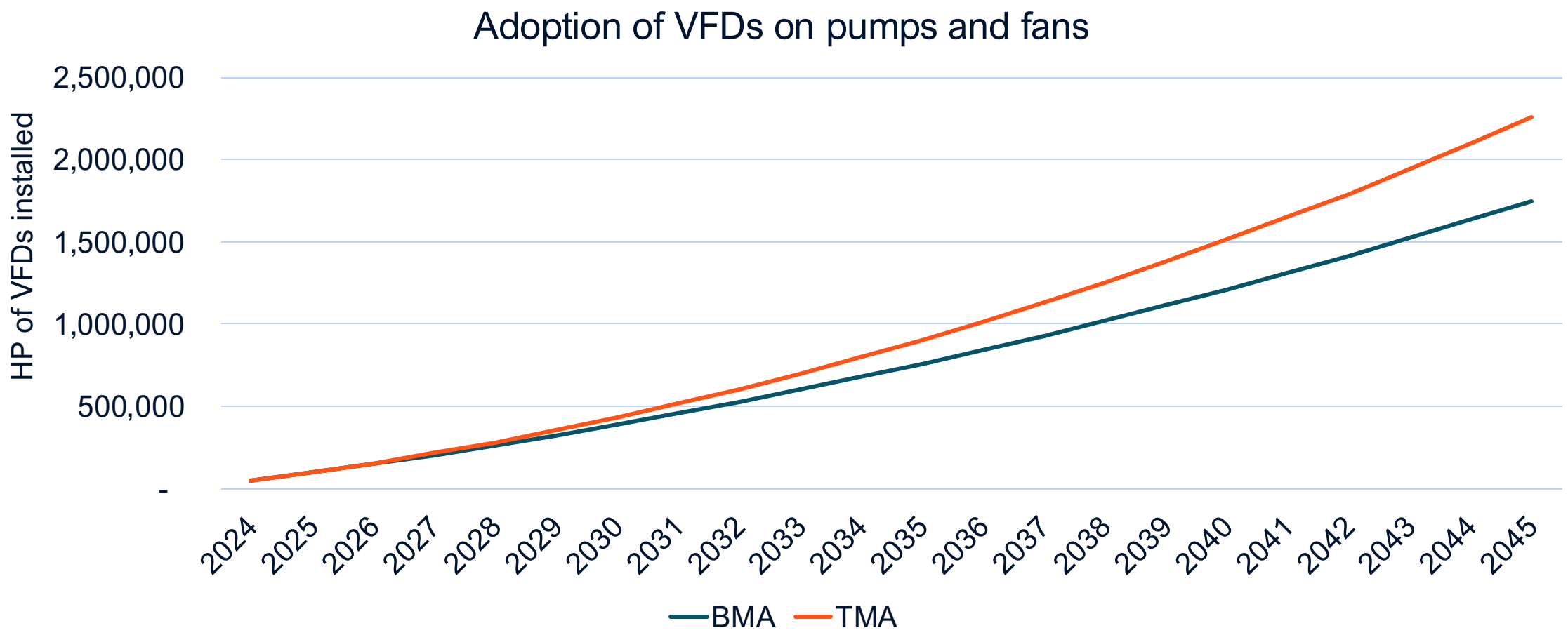
Challenges

- Replacement market has strong like-for-like preference; risk-averse
- Industrial opportunities require advanced process controls
- Energy costs are not easily visible and/or not considered significant cost-control opportunities in many C&I applications
- Slow ramp in other MT programs

Potential MT strategies

- Industry collaborations (e.g., Hydraulic Institute) to educate market about benefits and low risk technologies
- Develop value proposition around reduced unplanned downtime, lower maintenance and increased product life rather than energy savings
- Workforce development to address complexity of installations and reduce installation costs

0024: VFDs on all pumps and fans >10 HP



0024: VFDs on all pumps and fans >10 HP

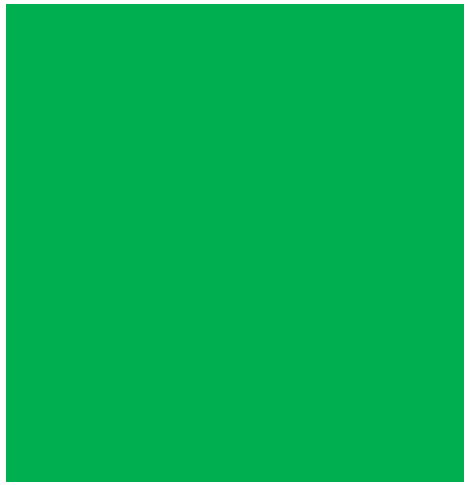
TSB Electric	TSB Grid	TSB GHG	TSB Total
$195M	$83M	$284M	$562M

Stage 1 Score	Stage 2 Score
7.32	6.82

- **Program budget: $35M**
- **PAC: 22.29**
- **TRC: 8.30**

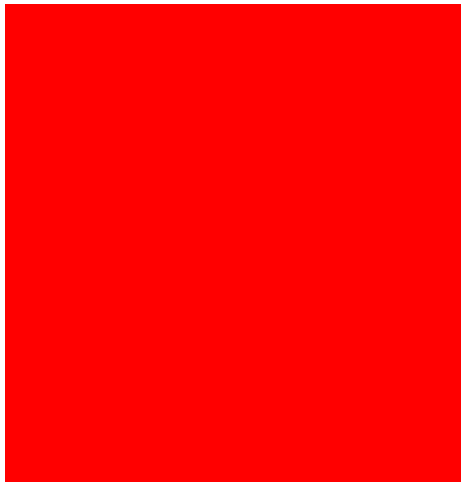
What do you think?

Hold up one of the three color cards to indicate your reaction.



Excited

Neutral or unsure



No way

Estimated TSB, TRC, and PAC

		Preliminary		
Idea #	**Idea name**	**TSB ($M)**	**TRC**	**PAC**
0085	Multifunction Heat Pump	2,354.1	1.25	60.98
0193	BPS Acceleration	566.4	1.35	12.67
0105	Efficient Streetlights	256.8	0.80	20.93
0024	VFDs on all pumps and fans >10 HP	562.4	8.31	22.29

Breakout group: What makes a good MTI?

- The unique value of MT is to over time **identify and overcome structural barriers** that (1) impede adoption of a given technology or practice and (2) can't be adequately addressed through other mechanisms (i.e., incentives)
- **Priorities for advancing ideas to Stage 2:** High TSB and ramp rate

Breakout group: What makes a good MTI?

- Additional considerations in Stage 2 may include:
  - **MT alignment** - must be a good MT opportunity; should have a vision for how the market will respond to interventions and how savings will be locked-in
  - **Equity** - not all ideas have a strong equity component, but this can tip the scales
  - **Incremental value** - where can CalMTA add maximum incremental value to California's efficiency and decarbonization efforts

Batch 3 breakout groups

Step 1: Breakout group discussions

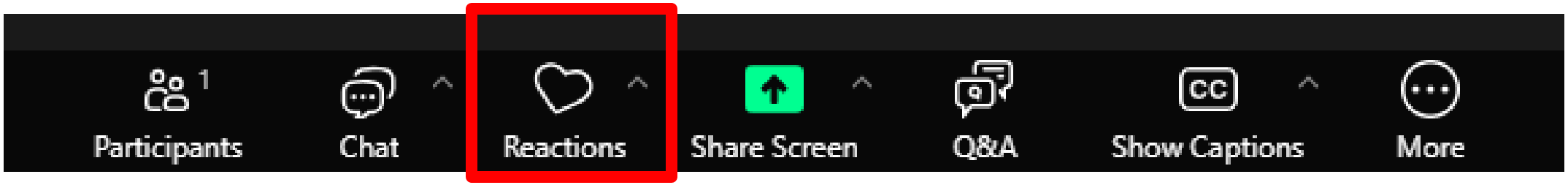
- CalMTA staff will assign MTAB members into three breakout groups
  - Teams should assign one member as the note-taker and one as the spokesperson
- Groups discuss each of the five ideas, identifying the pros, cons, and dealbreakers of including each idea to the CalMTA portfolio

Step 2: Team presentations

- Each spokesperson will present and defend their team's top-three pros, top-three cons, and any dealbreakers

6. Public Comment

Raise your hand using the “Reactions” feature and we will allow you to unmute yourself.



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for the public good

Market transformation is a proven approach that works to remove market barriers so that energy efficient, equitable, and climate-friendly approaches become the new standard practice for all Californians.

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