



September 8, 2026

MEMORANDUM

TO: Market Transformation Advisory Board (MTAB)

FROM: Jeff Mitchell, CalMTA
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SUBJECT: 2026 Phase I Update and RFI Advancement Candidates

This memo summarizes CalMTA's recommendations regarding the Market Transformation (MT) ideas that were scored in Phase I in 2025-2026, including two MT ideas that merit further consideration through the development of an Advancement Plan. This memo describes the Phase I: Concept Development activities conducted to date, the feedback provided by the Market Transformation Advisory Board (MTAB), and CalMTA's response to this feedback. CalMTA appreciates MTAB's input and expertise, which have been instrumental in shaping our evaluation of MT ideas during the Phase I process.

Phase I: Concept Development

Phase I: Concept Development includes two stages of scoring and evaluating MT ideas and concludes with the development of Advancement Plans for promising MT ideas that merit further development. The final deliverable of Phase I, an Advancement Plan, identifies knowledge gaps and the research needed to fill those gaps in order to determine whether the MTI should advance to Phase II: Program Development. Approval of the Advancement Plan by the CPUC, following review and comment by MTAB and the public, is the stage gate that allows CalMTA to advance an idea from Phase I to Phase II.

2025 - 2026 RFI and Stage 1 Scoring

In 2025, CalMTA transitioned from discrete RFI submission events to an open RFI submission process. Since permanently opening the web-based submission portal, CalMTA received 10 newly submitted ideas. After conducting a threshold review and combining similar ideas, CalMTA advanced three of the ideas to Stage 1 scoring. No ideas advanced to Stage 2 scoring. Ideas may be reconsidered for advancement in the future. See Table 1 for the list of ideas, scores, and disposition.

Table 1 lists the 10 submitted ideas and their disposition.

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

Table 1. Disposition of Submitted Ideas

Newly Submitted Idea	Disposition	Combined IDEA / Stage 1 Score
IDEA-0226: Solar Streetlighting with Battery Backup	Combined	IDEA-0218 Hybrid Products for Sustainable Outdoor Lighting
IDEA-0227: Self-Funding Clean Energy Plan (SFCEP)	Combined	IDEA-0157 Batch 2: Commercial Replacement and Attachment Window Solutions (CRAWS)
IDEA-0229: Condenser Coil Enclosure Redesign	Combined	IDEA-0101 Condenser Coil Cleaning of Commercial Refrigeration Units
IDEA-0231: Heat Pump	Combined	IDEA-0025 Industrial Process Heat Pump
IDEA-0232: See the Waste, Fix the Waste: SMB Energy Awareness + Implementation (MCV-SMB)	Combined	IDEA-0185 Combining Monitoring-Based Commissioning with DR to Maximize Grid Benefits
IDEA-0233: Ground Source Heat Pump (GSHP)	Scored in Stage 1	Score: 6.09
IDEA-0234: Updated EndoTherm/Hydronic Additives Idea	Combined	IDEA-0100 EndoTherm & EndoCool
IDEA-0235: Energy-Saving Retrofit Controllers for Existing HVAC System	Combined	IDEA-0024 VFDs on All Pumps and Fans > 10 HP
IDEA-0236: Compressor Cycle Reduction Initiative (CCRI)	Scored in Stage 1	Score: 6.00
IDEA-0250: Smart Magnetic Immersed Induction Residential Water Heater (IWH) + VPP	Scored in Stage 1	Score: 6.36

Stage 1 Scoring Results

Newly Submitted Ideas

Ground Source Heat Pump received a Stage 1 score of 6.09. It did not advance to Stage 2 scoring, based on a modest Total System Benefit (TSB) and low MT alignment. GSHPs are ideally suited to climates with more extreme high and low temperatures, where moderate and stable ground temperatures provide greater benefit for operating efficiency. The physical installation, requiring significant ground area, limits adoption in retrofit markets.

Compressor Cycle Reduction Initiative received a Stage 1 score of 6.00. It did not advance to Stage 2 scoring, based on low TSB, energy savings, emissions reduction, and grid flexibility.

Smart Magnetic Immersed Induction Residential Water Heater (IWH) + VPP received a Stage 1 score of 6.36. It did not advance to Stage 2 scoring, based on low energy savings relative to Heat Pump Water Heaters (HPWHs), which is one of CalMTA's current MTIs. The estimated uniform energy factor (UEF) for IWH is 0.98. Typical UEF for a HPWH ranges from 2.0 to 4.0. Additionally, further research is needed to understand and document the technology's ability to comply with the Energy Policy and Conservation Act's pending 2029 National Appliance Energy Conservation Act (NAECA) 4 standards for residential water heater UEF in the Small (20-35 gal) Electric Water Heater category.

Previously Submitted Ideas

In addition to these ideas, CalMTA continued evaluating three ideas submitted in previous RFIs: **Industrial Heat Pumps (HP)**, **Low Carbon Calcined Clay Cement (LC3)**, and **High Performance Windows**.

- IHP and LC3 had been scored in Stage 1 previously. They were prepared for MTAB review and discussed during a January 2026 MTAB meeting. MTAB advised that additional research, described below, be performed for LC3 before determining suitability for advancement to Stage 2 scoring.
- High Performance Windows had been scored in Stage 1 and 2 previously. This idea was reviewed with MTAB but not recommended for advancement to Phase II; at the time, other ideas scored higher and aligned better with portfolio needs. In addition, the initial Stage 2 score resulted in a low TRC estimate.

Both IHP and High Performance Windows advanced to Stage 2 scoring, the results of which are described in Stage 2 Score Results, below.

The LC3 threshold research recommend by MTAB was conducted between January and August 2026. The threshold questions and the findings from CalMTA's research are summarized in Table 2.

Table 2. LC3 Threshold Questions and Research Findings

Threshold Question	Findings
Fuel use: If most available data is from 2019, is CalMTA confident that cement plants are	Conversations with ACEEE and the California-Nevada Cement Association (CNCA) confirmed that the primary fuel sources are still diesel, coal, tires, and alternative fuels (biomass, pistachio

Threshold Question	Findings
still burning coal, tires, and other fossil fuels?	shells, rice hulls). Only one plant was identified as using natural gas.
Application fit: Is LC3 compatible with most OPC applications?	Conversations with ACEEE and CNCA confirmed that LC3 and other blended cements work in OPC applications. While some properties differ (e.g., curing times), LC3 is capable of matching OPC specifications.
Ratepayer funding: Producers are not utility customers; only one uses natural gas. Can CalMTA use ratepayer funds for LC3 MTI?	The CPUC is evaluating whether energy efficiency ratepayer funds should support switching from non-regulated fuels to regulated utility fuels, including how such projects would be funded, categorized, and credited within the EE portfolio framework. The issue remains under review, per the consolidated application proceeding for the 2028-2031 energy efficiency business plans (A.26-03-009, et al.). It is unclear whether industrial process fuels used in cement manufacturing are intended to fall within the scope of the proceeding.
Policy/regulatory drivers: Is California policy for cement decarb and/or cap-and-invest going to drive adoption of LC3?	Unlikely to succeed on its own within targeted timelines. California Air Resources Board (CARB) published their Draft Net-Zero Greenhouse Gas (GHG) Emissions Strategy for the California Cement Sector (Draft SB 596 Cement Strategy) in March 2025. The draft strategy identifies opportunities (levers) and barriers, including cap-and-invest. Per conversations with CARB, 596 is simply the strategy, and CARB lacks the authority to do all of the things described in 596. Interventions are needed on the supply and demand side. SB 596 itself would not transform the market; CARB would need implementation partners. Interest was expressed in understanding how CalMTA would be able to partner on implementation.

Upon conclusion of the research, and based largely on the uncertainty relating to the use of ratepayer funding for switching from non-regulated to regulated fuels, CalMTA decided not to present LC3 as an advancement candidate. CalMTA has shared the LC3 research findings with the CARB to help inform development of their comprehensive strategy, under Senate Bill 596, to drive the state's cement sector toward net-zero greenhouse gas emissions by 2045.

Stage 2 Scoring Results

CalMTA advanced IHP and High Performance Windows to Stage 2 scoring, during which time we updated earlier Stage 1 scores based on new information and proceeded to estimate TSB, Total Resource Cost (TRC), and Participant Avoided Costs (PAC).

- The IHP score was updated for GHG Impacts, Commercialization Readiness, ESJ Impacts, NEIs, and MT Leverage Points.
- The High Performance Windows score was updated for MT Leverage Points.

Table 2. Scoring Results

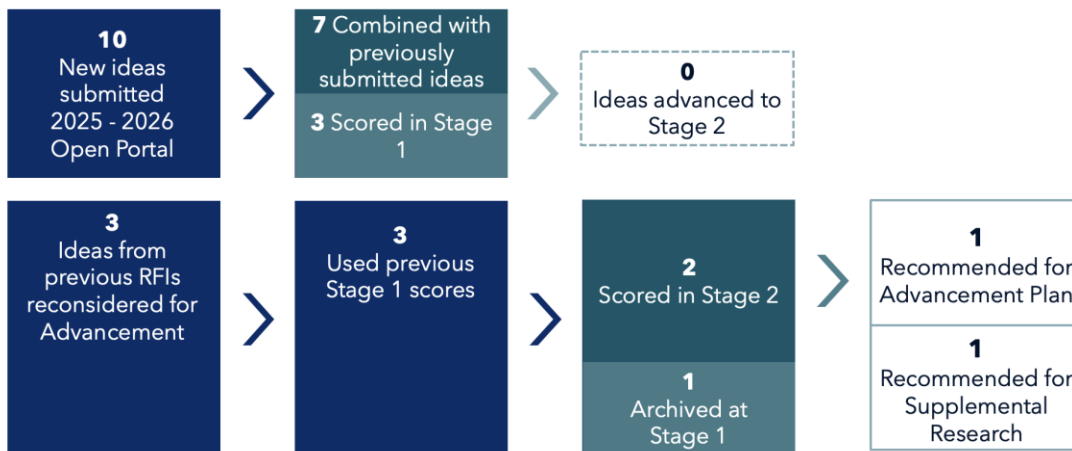
	Stage 1	Stage 2	TSB	TRC	PAC
0025 Industrial Heat Pump	5.54	6.99	\$329M	2.7	8.1
0010 High Performance Windows	7.51	7.89	\$206M	0.74	5.7

Recommendations

IHP is being recommended for Advancement Plan development.

High Performance Windows would benefit from additional research to fill several knowledge gaps and better inform the TSB and TRC estimates and potential for advancement.

Figure 1. Disposition of Ideas in the 2025-2026 RFI



Advancement Plan Development

As a result of Stage 2 scoring and prior discussions with MTAB, CalMTA recommends developing an Advancement Plan for IHP. This MTI aims to accelerate adoption of Industrial Conventional Heat Pumps (CHP) and High Temperature Heat Pumps (HTHP), create a foundation for

subsequent adoption of Steam Generating Heat Pumps (SGHP), support IHP implementation at scale in both new and retrofit applications, and drive scale in domestic IHP manufacturing to reduce first costs.

IHP merits development of an Advancement Plan based on high TSB – driven by high energy savings and high emissions reduction – and a beneficial TRC. Substantial market leverage opportunities and beachhead markets have been identified to facilitate a beneficial ramp rate. The technology is commercially available with broad adoption in foreign markets. This MT idea would also broaden the portfolio’s reach into industrial markets.

The Advancement Plan is the last Phase I deliverable and describes the proposed research and activities that CalMTA would conduct to develop a Phase II MTI Plan if approved for advancement to Phase II.

Industrial Heat Pump Idea

The following sections describe elements of the IHP MT idea that will be further scoped in the Advancement Plan.

Name
Industrial Heat Pump
Sector
Industrial
Portfolio Priorities
☒ Equity ☒ WE&T ☐ Energy Savings ☐ Grid Benefits ☒ GHG Reductions
Product Definition
Industrial heat pumps are based on the same principals as residential heat pumps, relying on compressors and refrigerants to transfer heat from a source to a supply, rather than generating heat via combustion. However, industrial heat pumps can operate at much higher temperatures and have far greater heating capacity, making them suitable for industrial heating applications. Heat sources can be air, water, geothermal, waste heat from an industrial process, or recycled wastewater. The heat is delivered to a range of industrial applications, including sanitization, pasteurization, drying, cleaning equipment, and general high-temperature process water, which can be used for many other purposes. There are several categories of industrial heat pumps. This MTI will focus on Conventional Heat Pumps (CHPs), which have an upper supply temperature of 80°C, and High Temperature Heat Pumps (HTHPs), which have an upper supply temperature range up to 100°C.

Steam Generating Heat Pumps (SGHPs) have supply temperatures of 100°C to 200°C and are also included in this MTI's product definition. However, SGHPs have lower technology readiness and may require additional research to update adoption modeling and forecasting.

Preliminary Market Transformation Theory

Industry ranks as California's second-most polluting sector, contributing 20% of its overall climate emissions. Industrial process heat is responsible for approximately 50% of industrial facilities' energy consumption. California is home to the largest number of industrial gas-fired boilers in the country, and less than 5% of their process heating energy comes from electricity.

Lawrence Berkeley National Laboratory (LBNL) and CalNEXT estimate that the total potential IHP heating capacity in California is 1,051 MW for HTHPs and 1,069 MW for SGHPs. Electrifying just low-temperature heat applications for only the largest emitting facilities within California could eliminate over 5.5 million metric tons of CO₂, equivalent to the annual emissions of 1.28 million cars.

The decarbonization opportunity for California is large, yet IHPs have experienced very low adoption in California and the United States in general. Multiple barriers must be overcome to accelerate and amplify IHP adoption in California, including the following:

- Low market awareness among market actors such as system designers, engineers, and end users about the technical feasibility and application requirements for individual industrial processes
- Bespoke industrial applications that limit adoption of "off-the-shelf" technology
- Lack of domestic production and service, with manufacturing concentrated in the European Union (EU) and Japan
- Insufficient workforce to support application design, validation, and process optimization
- More complex designs than those of simple gas boilers, including compressors and sophisticated controls, that increase the demand for maintenance workforce
- Significantly increased operational costs, under most current rate structures, from the substitution of electric fuel for gas fuel
- Domestic policies that limit refrigerants commonly used internationally, leading to more complicated product portfolios, lower volumes, and U.S.-specific designs, all of which drive up manufacturing costs. Uncertain refrigeration policy creates manufacturing risk by potentially shortening the product life cycle and forcing expensive redesigns of low-volume product lines.

Driving adoption in California depends upon creating a value proposition and driving demand; stimulating supply by increasing manufacturer engagement; reducing supply-side regulatory risks by informing refrigerant policy; and leveraging industry investment for public projects that demonstrate application validity, build market confidence, and bring down early adopter costs.

Creating a Value Proposition and Driving Demand

This MTI will identify beachhead market sectors and applications where business cases are strongest. Examples include food and beverage processing, dairy production, chemical and pharmaceutical production, and automotive. Focusing on applications where waste heat is plentiful and/or simultaneous heating and cooling occur will benefit the business case, as will focusing on the conversion of electric boilers to IHPs.

Stimulating Supply by Increasing Manufacturer Engagement

This MTI will identify IHP-ready, base-load applications common to beachhead markets, allowing manufacturers to align production with narrower, high-value market segments. Higher volumes within fewer applications (rather than lower volumes across many applications) will simplify product configurations and shorten lead times.

Reducing Supply-Side Regulatory Risks by Informing Refrigerant Policy

CalMTA will work with the American Council for an Energy-Efficient Economy (ACEEE), IHP manufacturers, refrigerant producers, and California policy stakeholders to identify optimal pathways to stable refrigerant policy, reducing manufacturing risk and product complexity.

Demonstrating Application Validity to the Public

Public demonstration projects are a key intervention that will help overcome technical and awareness barriers. CalMTA will work with the California Energy Commission's (CEC's) Industrial Decarbonization and Improvement of Grid Operations (INDIGO) program and Food Production Investment Program (FPIP), the Department of Energy (DOE), and other stakeholders to influence grant funding, collaborate on public demonstration projects, and develop case studies. We will focus on applications and opportunities that can be socialized publicly, overcoming awareness barriers related to proprietary applications.

CalMTA does not envision fully funding demonstration projects, given the high cost of equipment, but will leverage the activity of other organizations and contribute funding as needed to achieve research objectives. Demonstration projects will bring down capital costs for early adopters and support a performance database that will build market confidence.

Possible Leverage Points

The following list describes aggregation nodes in the market, several of which are non-ratepayer funded, that CalMTA can leverage to accelerate market adoption and/or amplify MTI influence.

- The INDIGO program, established by Assembly Bill 209, funds financial incentives for industry projects that demonstrate significant benefits to the electrical grid, reduce greenhouse gas emissions, achieve California's clean energy goals, and exceed compliance requirements. Project awards range from \$4 million to \$10 million.
- FPIP provides grants to help food processors accelerate the adoption of advanced energy and decarbonization technologies to support electrical grid reliability and reduce greenhouse gas emissions. Since 2022, FPIP has received \$150.2 million in funding.
- The IHP Alliance is a collaborative initiative of ACEEE, the National Electrical Manufacturers Association (NEMA), and the Renewable Thermal Collaborative (RTC). The Alliance aims to

drive large-scale deployment of IHPs in the United States by 2030, leading to significant industrial thermal emission reductions and IHP cost decreases. The IHP Alliance seeks to enable the deployment of up to 625 TBTUs/year of IHP capacity, reduce low-temperature industrial thermal emissions by approximately 10% from 2018 levels, and achieve leveled cost of heat parity between IHPs and natural gas on average across the U.S. by 2030. They assist stakeholders interested in implementing IHPs by offering guidance, resources, and support.

- The High Temperature Heat Pump (HTHP) Symposium is a collaboration of the Danish Technological Institute (DTI), SINTEF Energy Research, and Technical University of Denmark (DTU). Their goals include technical innovations to achieve lower costs and increased energy efficiency while maintaining technical feasibility and stable operation. The Symposium's experience in the EU, where IHP adoption far exceeds adoption in the U.S., can provide valuable lessons learned, best practices, and application data that will aid market transformation in California.
- Electric Power Research Institute (EPRI) is collaborating with Southern Company to develop an IHP Test Site in Atlanta, Georgia. The site will serve as both a testing platform and a demonstration site and will help overcome technical barriers. It will also serve as a showcase location, where utilities and industrial customers can observe the technology operating under real-world conditions, which will help reduce market and awareness barriers.
- California's Cap-and-Invest Program, administered by CARB, is a carbon-pricing system that sets a declining limit on greenhouse gas emissions by utilities and industrial customers and requires major polluters to buy permits for every metric ton of carbon they release. This program can provide financial incentive to industrial facilities to invest in clean energy upgrades. Additionally, industrial users subject to Cap-and-Invest are eligible for incentives from the \$4 billion Manufacturing Decarbonization Incentive Fund, which provides financial backing and compliance support for on-site clean energy upgrades and emissions reductions.
- California SB 943 is a proposed law designed to help factories and industrial facilities switch from natural gas to clean electricity by reforming electricity transmission rates and lowering surcharges.
- ACEEE is active in advocating for and identifying pathways to consistent refrigeration policy and industrial electrification rate design.

CalMTA's Role

IHPs are a well-established technology in international markets, most notably the EU and Japan. CalMTA's role in this MTI will be to develop interventions to overcome domestic and California-specific barriers:

- Identify and segment beachhead markets and corresponding applications that are most IHP-ready.

- Coordinate with international, domestic, and state stakeholders to conduct demonstration projects in beachhead markets, ensuring that projects can be used to develop and publicly disseminate case studies. CalMTA's role is not to fund these projects but to influence the distribution of existing industrial research grants to projects relevant to beachhead markets.
- Engage with domestic and international manufacturers to facilitate supply chain development, reduce lead times, and identify cost-reduction opportunities. This will be facilitated by identifying California applications across industries that can utilize a common IHP design.
- Engage with market actors, including engineering firms, system designers, and end users, to create awareness of IHP-ready applications, define system settings to achieve optimal IHP performance, and use outputs of demonstration projects to develop an applications database that can be shared publicly.
- Engage with ACEEE, IHP manufacturers, refrigerant producers, and policy stakeholders to identify optimal pathways to stable refrigerant policy, reducing manufacturing risk and product complexity.

2025 Priorities for Phase II

Perform market characterization to identify and confirm barriers and leverage points.

Engage with markets and manufacturers to identify beachhead markets, target applications, and performance specifications.

Implement streamlined pilot project(s) to explore inputs into value proposition and business case.

Develop preliminary baseline and market adoption curves.

Recommended for Additional Research

High Performance Windows

The High Performance Window idea, submitted to CalMTA during RFI-1 in 2023, scored well in Stage 1 and Stage 2. MTAB feedback was positive, but questions about TRC led CalMTA to archive High Performance Windows at Stage 2 and monitor the market for new developments.

The High Performance Window idea was rescored during RFI-2 in 2024. The score for MT Leverage points was reduced because the Northwest Energy Efficiency Alliance (NEEA) paused its High Performance Window program.

Since RFI-2, numerous market changes have occurred:

- The California Electronic Technical Reference Manual (eTRM) High Performance Window measure was approved in May 2026.
- The Minnesota Efficient Technology Accelerator (ETA) launched its High Performance Window program.

- An innovation prize for a low-cost, builder-grade High Performance Window was sponsored by a coalition of partners: Nicor Gas (IL), Xcel Energy (CO), and ETA. Results are pending.
- CalMTA's Commercial Replacement and Attachment Window Solutions (CRAWS) MTI conducted a field study demonstrating that measured savings exceed model predictions.
- CRAWS established an estimated useful life (EUL) of 30 years. High Performance Window programs across the U.S. have EULs ranging from 30 to 46 years, significantly improving TRC.
- To facilitate and improve its rollout of heat pump technologies, New York State's Consolidated Edison shared its plans to launch a single-family and multifamily residential High Performance Window retrofit program – part of an “envelope first” strategy that would present a substantial demand signal for High Performance Window manufacturers.

As part of the 2025-2026 RFI, CalMTA rescored High Performance Windows. The developments described above resulted in an improvement of the Stage 2 score from 7.51 to 7.89. CalMTA proceeded to develop TSB, TRC, and PAC estimates:

TSB: \$206 million

TRC: 0.74 (range of 0.4 – 1.1)

PAC: 5.7

CalMTA used information and data available from California and national sources to develop these estimates. However, additional California-specific knowledge gaps remain. Resolving these will refine and update TSB and TRC and better inform the potential for advancement. Key areas of research:

- Analyze California building stock to understand the single-family vs. multifamily residential opportunities. Update TSB, which is currently based on single-family residences only.
- Perform additional modeling to determine how solar heat gain coefficient (SHGC) specifications and/or California climate-zone-specific performance tiers can impact overall savings and TRC.
- Complete focused field studies to determine actual energy savings, having learned from CRAWS that actual savings can exceed modeled savings.
- Evaluate different baseline scenarios: no action, normal replacement, accelerated replacement. Current estimates use California code as their baseline. However, California has over 5.5 million single-family detached homes built before 1990, most of which retain single-pane or double-pane clear windows. This indicates a potentially significant upside for savings estimates.
- Better understand current installed product costs based on recent market activity and innovation prize outcomes.

CalMTA recommends completing these focused research efforts before recommending a full Advancement Plan for High Performance Windows. The results of this research will inform a more accurate estimate of TSB and TRC and enable CalMTA to determine whether additional Phase II research should be performed to fully develop the High Performance Window idea.

Portfolio Characteristics

Expanding a robust portfolio of ideas remains an important consideration as CalMTA conducts MTI activities in 2027. In addition to selecting individual MTIs, CalMTA needs to consider how the entire portfolio of selected ideas will perform compared to strategic goals. This is not unlike a financial portfolio, where investments with higher risks and rewards are mixed with investments with lower risks and rewards to manage overall risk. After discussions with MTAB during Batch 2 development, CalMTA identified characteristics of the MTI portfolio that will be important to monitor – even though not every MTI will address or perform well against every characteristic. As part of Batch 3 development, MTAB identified TSB and ramp rate as priority characteristics.

Key portfolio characteristics for all idea batches are shown in Table 3, below.

Table 3. MTI Portfolio Characteristics

Idea name	MTI Phase	Sector	Ramp Rate/ Timing	ESJ	WE&T
Industrial Heat Pumps	1	Ind	Long	Med	Med
Building Performance Standard Acceleration	2	Comm	Med	Med	Med
Foodservice Water Heating	2	Comm	Long	Med	Med
Commercial Replacement and Attachment Window Solutions	2	Comm	Long	Med	High
Residential Heat Pump Water Heating	2	Res	Short	Low	High
Commercial Rooftop Units	2	Comm	Med	Med	High
Room Heat Pumps	3	Res	Short	High	Low
Induction Cooking	3	Res	Short	High	Low

About CalMTA

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations. We work to deliver cost-effective energy efficiency and decarbonization benefits to Californians through a unique approach called market transformation. Market transformation is the strategic process of intervening in a market to create lasting change by removing market barriers or exploiting opportunities, accelerating the adoption of identified technologies or practices. CalMTA-developed market transformation initiatives also aim to advance state goals on demand flexibility, workforce development, and equity. Learn more at www.calmta.org.