CalMTA

Program Strategy Pilot

Portable/Window Heat Pump Self-Installation Practices

February 2024

CalMTA is a program of the California Public Utilities Commission (CPUC)

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Note: *CalMTA is pursuing some limited studies to test MT idea-specific assumptions and strategies and gain greater insights about potential market barriers to adoption of a technology or practice. CalMTA's proposed "Strategy Pilots" are unlike the energy efficiency pilots as defined in D.09-09-047, which are intended to be longer in duration, have significantly greater budgets, and inform IOU statewide programs. Instead, our "Strategy Pilots" seek to address a limited set of questions that are included in our Advancement Plan over a shorter duration. Our strategy testing efforts include the relevant information that is required of CalMTA's "Strategy Pilot" per D.19-12-021 but do not include all the information required of or follow the same process for getting approval of energy efficiency "pilots" as is outlined in D.09-09-047.*

Background

Portable/window heat pumps are an emerging energy-efficient heating, ventilation, and air conditioning (HVAC) technology that provides efficient heating and cooling and fills a gap for renters and owners in multifamily and smaller spaces. By eliminating the need for expert installation or electrical panel upgrades, portable/window heat pumps can significantly improve comfort, remove reliance on inefficient units, and create space-heating flexibility for single-family and multifamily homes.

Commercially available portable/window heat pumps fall into four different configurations:

- **Portable products that are ducted to a window** from manufacturers like Frigidaire and Midea. They offer features CalMTA seeks to make more prevalent, such as the use of low-global-warming-potential (GWP) refrigerants and dual ducting, and are less expensive than other product types.
- **Units that fit into a double-hung window** from manufacturers like Gradient and Midea. These configurations can be self-installed with their outdoor and indoor components "saddled" over a windowsill. While offering desirable features, such as cool/cold climate capabilities, these are premium, expensive products.
- **Conventional window unit configurations** (includes two forms) currently have limited heat pump options but are common in room air conditioners. These units are placed in the frame of the window and held in place with manufacturer provided brackets. These units can be found in standard and U-shaped configurations.

CalMTA has identified several opportunities and barriers that warrant further research into how consumers interact with and utilize this technology. This work will initially focus on two primary assumed benefits that are part of the consumer value proposition of this technology: 1) its purported "self-installation" potential, and 2) relative portability of systems for tenants who own them. The Strategy Pilot proposed by CalMTA and described in this document seeks to verify these claims, particularly for environmental and social justice (ESJ) communities that face unique barriers to adoption. The Strategy Pilot findings will inform the potential development of strategic interventions to be included in CalMTA's Portable/Window Heat Pump Market Transformation Initiative (MTI), with the intent of addressing barriers to adoption for the target market of renters and ESJ communities.

CalMTA identified the need for additional testing related to self-installation, behavioral changes, and the overall consumer value proposition of portable/window heat pumps after releasing the draft Advancement Plan for this MT idea. As a result, the program Strategy Pilot described herein is not included in that Advancement Plan but will be critical to understanding the viability of CalMTA's proposed MT idea.

Strategy Pilot Objectives

As proposed by CalMTA, the Program Strategy Pilot on Portable/Window Heat Pump Self-Installation Practices targets the following objectives:

1) **Verify opportunity of portable/window heat pump self-installation.** Manufacturers of both portable and window heat pumps claim that the products can be quickly self-installed by customers in multifamily units and homes. Manufacturers use terms like "upgrade your HVAC effortlessly" or "DIY heat pumps" to describe this feature. Yet feedback from several pilots currently running in California indicates that these products can be heavy, bulky, and "tricky" to self-install, especially for some consumers.

   Other potential challenges include that even 110V products like these portable/window heat pumps may need to be the only device plugged into a circuit to prevent overloading, as well as differences in installation practices between plug-in models that use hoses to connect with outside air and those that saddle the window frame. In addition, the "saddled" products can only be installed in specific window types. This Strategy Pilot objective is to inform the following possible MT interventions:

   a. **Manufacturer engagement:** CalMTA will share study findings with portable/window heat pump manufacturers that could influence possible product enhancements, including improvements to prescribed installation instructions.
   b. **Awareness- and acceptance-building:** Clarifying the self-installation process or additional installation needs may inform manufacturer messaging and help CalMTA better define the target market sub-segment for this technology.
   c. **Leverage of existing programs:** Results will provide California programs that target weatherization, climate resilience, and decarbonization with a better understanding of installation practices and the support needed to help consumers properly install the product.
   d. **Contractor/installer engagement:** Despite the potential for self-installation, some customer segments (e.g., the elderly or those with less technical experience) will likely still require contractor support. The findings will help identify the type of support needed and the types of consumers who would benefit from this support.

2) **Verify the consumer value proposition, including value of self-ownership.** Because the technology is relatively new, CalMTA seeks to better understand the benefits that portable/window heat pumps offer to consumers, especially renters and homeowners in multifamily and small single-family properties. The current value proposition assumes that consumers will value the ability to own and easily move the heat pump unit. As with window air conditioning (AC) units, renters could purchase this product when supplemental heating or cooling is needed during a weather event and take it with them whenever they move. Confirming that target audiences value this feature will inform:

a. **Manufacturer and retailer engagement:** A refined consumer value proposition will help the supply chain refine product messaging and better promote portable/window heat pumps to consumers.
b. **Awareness- and acceptance-building:** Understanding what aspects of the value proposition resonate most with ESJ communities and other market sub-segments will enhance CalMTA's messaging and help better target potential adopters.

3) **Understand the impact of technology usage on consumer behavior.** Use of a portable/window heat pump will inherently affect the way consumers interact with functioning wall heaters, central heaters, and window AC units. It will also impact the household energy bill. The proposed Strategy Pilot will ask participants to document the ways they utilize other heating and cooling equipment in the home and determine overall energy bill impacts, informing:
    a. **Manufacturer engagement:** Findings will help manufacturers identify possible improvements to user manuals and consumer marketing.
    b. **Awareness- and acceptance-building:** Insight into behavioral impacts will refine consumer marketing messaging and tactics.
    c. **Leverage of existing programs:** Results will provide California programs that target weatherization, climate resilience, and decarbonization with a better understanding of consumer usage patterns and installation practices, as well as possible best disposal practices in retiring window AC units that contain refrigerants.

4) **Build manufacturer engagement and CalMTA understanding of technical and supply-chain barriers.** The Strategy Pilot will allow CalMTA to engage manufacturers as partners and gain a deeper understanding of technical and supply-chain barriers that impact adoption, including product specifications, availability, and installation practices. Lessons learned from the study will be shared with manufacturers to improve product specifications, installation manuals, and marketing messages. This information will complement the broader manufacturer engagement research conducted through the planned market characterization and product assessment work.

Program Strategy Pilot Plan

Task 1. Identify community-based organization (CBO) implementation partners

CalMTA will partner with two to three CBOs that are currently working to support heating and cooling upgrades among multifamily and small single-family renters and homeowners in ESJ communities. We will provide 50-60 portable/window heat pump units at no cost for distribution and will compensate participating CBOs for the staff time required to help implement this study.

Task 1 Activities:

- Identify suitable CBO partners based on a scan of active pilots and programs addressing improved heating and cooling technologies in the target market that could be augmented to include portable/window heat pumps
- Develop a partnership plan, including roles and responsibilities of identified CBOs, geographic area served by those CBOs, and which manufacturer product(s) to test
- Identify target buildings and participants for the Strategy Pilot

Task 1 Deliverables:

- Executed contract with identified CBOs
- Catalog of current materials (e.g., specifications, installation manuals, and marketing materials) needed to implement Strategy Pilot
- Partnership plan and roles and responsibilities documentation

Task 2. Engage manufacturers on targeted products

CalMTA will partner with manufacturers offering portable/window heat pumps to ensure product availability for the Strategy Pilot.

Task 2 Activities:

- Depending on the targeted buildings and participants determined in Task 1, engage manufacturers, and identify and negotiate product specifications. CalMTA will test all standard configurations including saddle, U-shaped, standard, and portable products
- When possible, negotiate with manufacturers on bulk pricing and to ensure product availability
- Identify installation instructions and marketing materials
- Acquire products for market test and installation guidance
- Regularly communicate and coordinate with manufacturers on product delivery and lessons learned from installations.

Task 2 Deliverables:

- Non-disclosure agreement (NDA) and MOU with manufacturers of targeted products that includes purchase agreement and negotiated pricing
- Catalog and copies of current materials (e.g., specifications, installation manuals, and marketing materials)
- Acquisition of products used in the study
- Partnership plan and roles and responsibilities documentation

Task 3. Finalize Strategy Pilot scope and plan

CalMTA will work with partner CBOs and manufacturers to finalize agreement on scope, including identification of target buildings/participants, featured products, timelines, and budget. CalMTA will also provide end-to-end project management to ensure study success and value to participants.

Task 3 Activities:

- Host kickoff meeting with all partners
- Work with CBO partners to identify target buildings and customers (may be an expansion to an existing pilot or program)
- Determine target numbers of households for each suitable product (i.e., plug-in and saddle-style models), with a goal of installing at least 50-60 products in households, pending CBO input
- Develop journey map for target customers to capture product acceptance, installation practices, and both product usage and overall household energy use
- Engage property managers/owners to better understand any landlord barriers to the installation and use of window/portable heat pumps
- Assess and anticipate the need for technicians to be onsite for some installations depending on participant needs
- Develop timelines, budgets, and data gathering plan

Task 3 Deliverables:

- Detailed scope and plan
- Kickoff meeting agenda and action items
- Customer journey map
- Detailed budgets, timelines, and data gathering tools

Task 4. Create Strategy Pilot materials

CalMTA will work with partners to adapt and develop needed outreach and educational materials, customer agreements, and data gathering tools.

Task 4 Activities:

- Create participation verification process, including development of participant screening materials and documentation
- Develop participant application

- Acquire installation manuals and instructions from manufacturers and assess for ease of understanding, specifications of products, etc.
- Acquire and store equipment from manufacturers or local suppliers
- Identify and develop survey instruments to capture participant experience, with materials designed to document the installation process and associated challenges

Task 4 Deliverables:

- Participant screening materials and process documentation
- Application for participants
- Installation manuals from manufacturers
- Survey instruments, including versions in participants' preferred languages
- Instructions for participants to gather data and complete survey instruments, also available in additional languages as needed

Task 5. Implement Strategy Pilot

CalMTA will conduct the study with partner CBOs and manufacturers over a 6–8-month period.

Task 5 Activities:

- Recruit participants on a rolling basis (CBO-led)
- Schedule no-cost delivery and observation for installation of portable/window heat pumps
- Educate participants on project expectations and provide tools to document lessons learned on installation
- Track and monitor disposal of retired AC units and document findings to ensure proper disposal of refrigerants
- Deploy tools to track whether participants who move during this period take the product with them

Task 5 Deliverables:

- Project tracking
- Documentation (including photos) of participant location, products delivered, and installation
- Documentation tracking use of portable/window heat pumps and supplemental heating and cooling equipment
- Documentation tracking disposal of older AC units after installation of the portable/window heat pump

- Documentation tracking participant behavior related to the portable/window heat pump during and after a move

Task 6. Conduct Strategy Pilot assessment

CalMTA will evaluate outcomes of the Strategy Pilot against stated objectives and share information and lessons learned with stakeholders.

Task 6 Activities

- Assess whether the Strategy Pilot was deployed successfully and in alignment with its intended design for maximum learnings. Metrics will be finalized prior to the start of implementation. Table 1 identifies preliminary performance metrics identified by CalMTA.

Table 1. Preliminary Performance Metrics

Strategy Pilot Tasks	Preliminary Performance Metrics
Task 1. Identify CBO implementation partners	Successful engagement of CBOs operating in at least two main regions of the state
Task 2. Engage manufacturers on targeted products	Successful acquisition of test products (conventional, U-shaped, ducted and saddle-style products)
Task 3. Finalize Strategy Pilot scope and plan	Target participants identified with CBOs are primarily renters and single-family homeowners in ESJ communities
Task 4. Create Strategy Pilot materials	n/a
Task 5. Implement Strategy Pilot	• Installations involve a balanced split of window/portable heat pump products • Installations are observed by the project team in at least 50% of participating homes • At least 75% of participants return data collection/ongoing monitoring forms • Participants are satisfied with their experience with CBO partner interactions, as measured by survey

- Assess whether the objectives of the Strategy Pilot were successfully met, as documented in Table 2

Table 2. Evaluation Research Objectives

Strategy Pilot Objectives	Evaluation Research Objectives or Metrics
1. Verify opportunity of portable/window heat pump self-installation	• Quantify the number of installations that were do-it-yourself (DIY) vs. assisted • Categorize and describe specific installation issues participants encountered to aid informed recommendations on product improvement or enhanced installation instruction • Segment installation findings by participant characteristics

Strategy Pilot Objectives	Evaluation Research Objectives or Metrics
2. Verify the consumer value proposition, including value of self-ownership	• Assess user satisfaction with the portable heat pump unit and potential for future use of product • Measure the importance of self-ownership through participant surveys • Among consumers who move during the study period, track moves and measure experience regarding uninstalls (moving the unit) and reinstalls

3. Understand the impact of technology usage on consumer behavior	• Characterize the space conditioning baseline equipment among participating households
	• Measure use of portable heat pump by
	  ○ Time of use (hours per day)
	  ○ Room/whole home
	  ○ Function (heating or cooling)[1]
	  ○ Primary or secondary
	  ○ Use of back-up sources
	• Explore and describe participant behavior change in relation to baseline space heating and cooling equipment
	• Examine the impact of the heat pump on electric load and bills

4. Build manufacturer engagement and CalMTA understanding of technical and supply chain barriers	• Among participating manufacturers, characterize product specifications and feasibilities for improvement • Explore and document manufacturer receptivity, along with technical challenges, to product improvements or affordability and supply chain barriers and opportunities • Identify and document the value proposition for manufacturers to engage with CalMTA during the Strategy Pilot and potential future MTI deployment (e.g., customer insights, bulk volume/sales, industry leadership, financial support) • Capture lessons learned from manufacturer engagement that can be applied to future MTI interventions

- Implement evaluation activities before, during, and after the Strategy Pilot to support the evaluation objectives in Table 2 including:
  i. Develop data collection tools and instruments for use during and after the study, in accordance with best practices, to map back to evaluation objectives
  ii. Collaborate with the CalMTA MT strategy manager and program manager and partner CBOs on protocols for observing installations and gathering ongoing participant feedback (e.g., text message surveys)
  iii. Conduct interviews with partner CBOs to gather pilot feedback

[1] Due to the Strategy Pilot implementation timeline, most usage data will be collected during the cooling season. Because of the unique opportunity the study offers for communicating with participants, CalMTA will explore possibilities for extending data collection into the heating season in the future.

- Share findings via a public webinar, inviting key CalMTA stakeholders such as the Market Transformation Advisory Board (MTAB), California Public Utilities Commission (CPUC), utilities, CBOs, etc.

Task 6 Deliverables:

- Finalized key performance metrics
- Data collection instruments
- Findings in PowerPoint presentation and recorded webinar

Timeline

Table 3 provides the estimated timeline to complete each Strategy Pilot task. Month 1 will begin upon confirmation of CPUC acceptance of the plan, which is targeted to happen in February 2024 after a comment period and webinar.

Table 3. Program Strategy Pilot Timeline/Schedule of Activities

Activity	Timeline (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Task 1. Identify CBO implementation partners												
Task 2. Engage manufacturers on targeted products												
Task 3. Finalize Strategy Pilot scope and plan												
Task 4. Create Strategy Pilot materials												
Task 5. Implement Strategy Pilot												
Task 6. Conduct Strategy Pilot assessment												

Initial Cost Estimate

Table 4 summarizes the estimated costs of completing each task as described in this plan.

Table 4. Program Strategy Pilot Initial Cost Estimate Summary

Task/Description	Initial Cost Estimate
Task 1. Identify CBO implementation partners	$15,000
Task 2. Engage manufacturers on targeted products	$10,000
Task 3. Finalize Strategy Pilot scope and plan	$25,000
Task 4. Create Strategy Pilot materials	$50,000

Task 5. Implement Strategy Pilot	$250,000
Task 6. Conduct Strategy Pilot assessment	$100,000
Equipment Purchase (up to 100 units ranging in price from $1,000-$4,000 each)	$200,000
Total	**$650,000**

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.