Residential Heat Pump Water Heating Market Transformation Initiative

Appendix F: Evaluation Plan - DRAFT

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List of Abbreviations

Abbreviation	Definition
AHRI	Air-conditioning, Heating, and Refrigeration Institute
AWHI	Advanced Water Heating Initiative
BMA	Baseline market adoption
CalMTA	California Market Transformation Administrator
CBO	Community-Based Organizations
CEDARS	California Energy Data and Reporting System
CPUC	California Public Utilities Commission
DAC	Disadvantaged Community
EIA	Energy Information Administration
ESJ	Environmental and social justice
ESRPP	ENERGY STAR Retail Products Platform
GWP	Global warming potential
HP	Heat pump
HPWH	Heat pump water heating
HPWHs	Heat pump water heaters
MOU	Memorandum of Understanding
MPI	Market Progress Indicator
MTI	Market Transformation Initiative
PA	Program Administrator
PTLM	Program theory and logic model
QPL	Qualified products list
RASS	Residential Appliance Saturation Survey
RECS	Residential Energy Consumption Survey
SME	Subject matter expert
TBE	Theory-based evaluation
TMA	Total market adoption
UES	Unit energy savings

1 Introduction

The evaluation approach to the Residential Heat Pump Water Heating (HPWH) Market Transformation Initiative (MTI) will follow the guidelines outlined in the CalMTA Market Transformation Initiative Evaluation Framework for assessing MTI performance and market progress. As indicated in the logic model, an envisioned long-term market outcome of the HPWH MTI is that the majority of residential water heaters newly installed in California each year are heat pump water heaters (HPWHs).[1] Another envisioned long-term outcome is that the MTI supports California's goal of installing six million heat pumps in California buildings by 2030.[2]

Evaluation is essential to the development and successful management of market transformation programs. California Public Utilities Commission (CPUC) Decision 19-12-021 (the Decision), which authorized funding for and the creation of a statewide California Market Transformation Administrator (CalMTA), includes guidance regarding evaluation of MTIs and the overall market transformation portfolio. It calls for setting clear savings goals and other MTI metrics at the time the CPUC initially approves the MTIs to ensure a high level of accountability and ongoing evaluation to reduce program performance risk.

CalMTA and the CPUC's Energy Division will oversee implementation of rigorous and strategically focused evaluation, measurement, and verification practices that will enable CalMTA management and stakeholders to gauge the performance of the MTIs, verify incremental impacts, and improve the design and success of future MTIs. The Decision calls for "real-time" market evaluation, which will provide MTI program managers and implementers with continual feedback, enabling them to pivot strategies as needed to maximize the value delivered to California ratepayers. Tracking of proximate and longer-term market progress indicators (MPIs) that are tightly aligned with the MTI's market transformation theory will reduce MTI performance risk and support timely decisions regarding ongoing investment, or termination of investment, in MTIs.

This document describes CalMTA's preliminary plan for third-party evaluation of the HPWH MTI, including MPIs that demonstrate movement toward long-term outcomes, data sources and approaches to evaluate MPIs, milestones, equity, MTI causality, and the approach for validating incremental impacts and cost-effectiveness. In accordance with the MTI Evaluation Framework, CalMTA developed this preliminary evaluation plan with input from the Evaluation Advisory Group, a group of three independent evaluation experts; the CPUC CalMTA project manager; and the CalMTA market research and evaluation lead.

[1] For more detail on the HPWH MTI logic model and MTI plan, please refer to Appendix A: Logic Model and the HPWH MTI Plan.

[2] To learn more about the six million heat pump goal, please visit https://heatpumppartnership.org/.

An independent third-party evaluator, selected via a competitive bidding process after the MTI advances to Phase III: Market Deployment, will develop final evaluation plans. CalMTA expects that the third-party evaluator may recommend refinements to the approach and metrics described in this document. CalMTA expects the competitive bid for the HPWH MTI to occur in the second half of 2027, and the third-party evaluator will complete market progress evaluations on an annual basis.

1.1 Overview

The approach described in this preliminary evaluation plan employs theory-based evaluation (TBE), which is widely accepted as a best practice for market transformation program evaluation. TBE relies on the MTI having a program theory that clearly identifies the specific market outcomes associated with the MTI strategic market interventions, along with their approximate timing. TBE also assesses causality between the strategic interventions and observed outcomes.

In addition to the proposed MPIs, this preliminary evaluation plan identifies data sources and evaluation approaches that the third-party evaluator can use to assess market progress, MTI causality, and CalMTA's estimates of MTI incremental impacts and cost-effectiveness. This plan focuses on third-party evaluation activities over the first four years of Phase III (that is, through CalMTA's initial funding period that ends in 2031). It does not describe ad hoc market research studies, which CalMTA and/or the third-party evaluator will conduct to inform "real-time" strategy decisions.

1.2 Evaluation objectives

The third-party evaluator will employ a TBE approach to assess observed market outcomes in relation to what is anticipated in the HPWH MTI Plan. It will use the MTI program theory as the point of reference, assessing market progress against the theorized short-, medium-, and long-term outcomes and corresponding MPIs and the extent to which the market interventions caused the outcomes theorized in the logic model. The evaluator will conduct ongoing market monitoring via secondary data analysis and primary research to collect a preponderance of evidence across multiple metrics that will enable them to evaluate market progress and causality and, importantly, to provide ongoing market insights that provide real-time information to inform MTI strategy and improve performance. The evaluation will address the following high-level objectives:

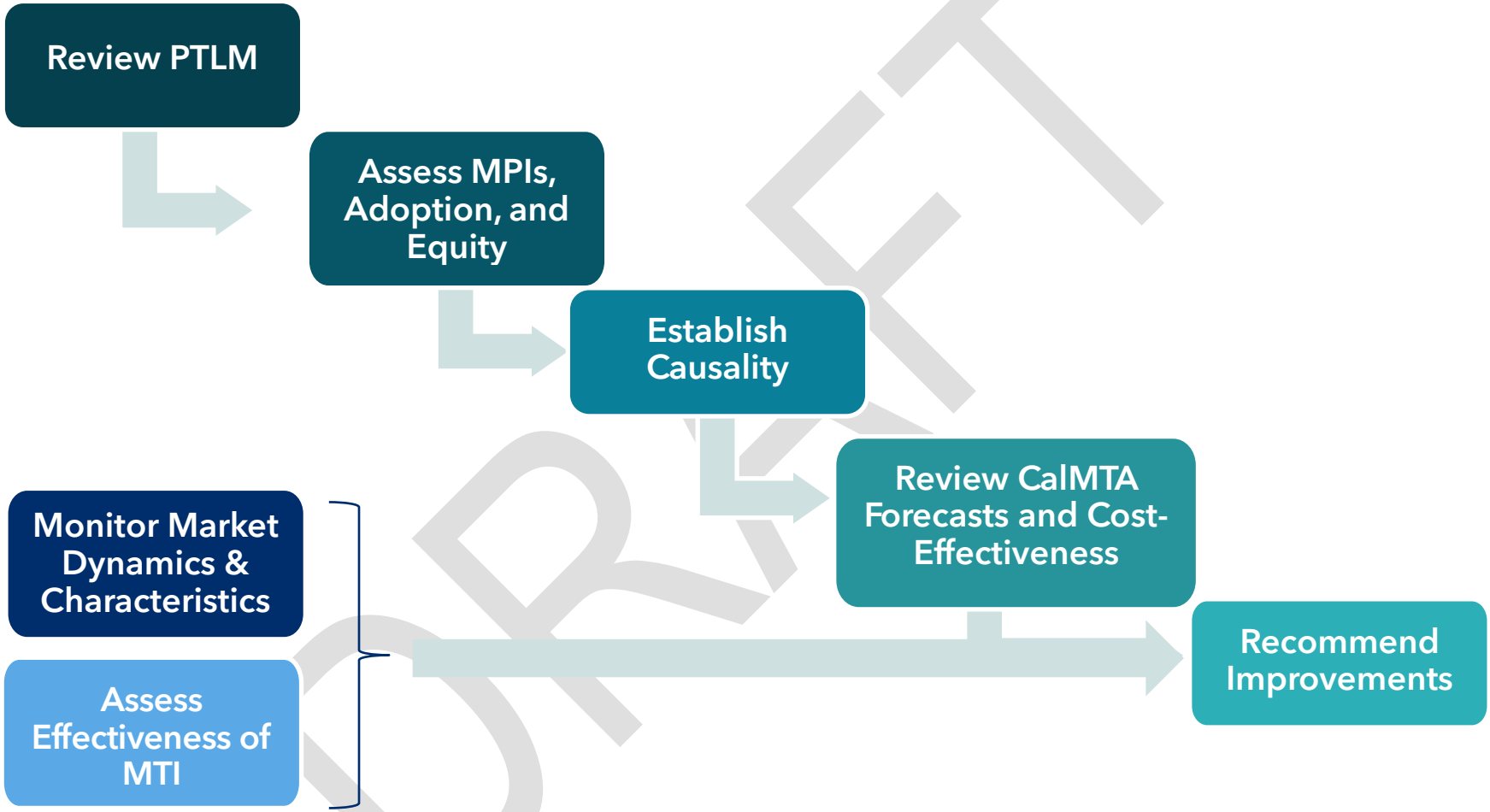
- Monitor market dynamics and characteristics; assess market developments
- Review and assess the MTI program theory and logic model (PTLM)
- Measure market progress and equity, per the MPIs
- Assess equity outcomes described in the MTI Plan and equity research questions described in this evaluation plan

- Assess MTI causality per the logic model, using a preponderance of evidence-based approach and follow established market transformation evaluation best practices
- Identify gaps in implementation and opportunities to adjust MTI strategy and tactics to improve MTI effectiveness
- Assess ancillary benefits and costs
- Review CalMTA's baseline market adoption (BMA) and total market adoption (TMA) forecasts, unit energy savings (UES), incremental net MTI impacts and co-created MTI impacts,[3] and cost-effectiveness inputs and assumptions

Figure 1 shows the evaluation approach for the first year. First, the evaluator will review the PTLM, identify gaps in the interventions and logic, and assess whether the PTLM accurately captures the implemented MTI interventions and outputs. During this step, the evaluator will also determine the data needed to assess causality based on the MTI's theory of market transformation. Next, the evaluator will conduct primary and secondary research to measure actual units of adoption and other MPIs and equity indicators. Third, the evaluator will synthesize the evidence gathered through multiple lines of research to establish causality. Then, the evaluator will review CalMTA's models for calculating incremental impacts and cost-effectiveness and make recommendations for improvement, including whether and how resources should be reallocated. Finally, the evaluator will provide recommendations to the team for improving the effectiveness of the MTI.

[3] Co-created impacts are the total impacts resulting from an MTI's interventions, including those resulting from collaborations with resource acquisition programs.

Figure 1. Evaluation process



1.3 Market progress indicators and milestones

During Phase II: Program Development, CalMTA team members drafted indicators and milestones for the MTI:

- The **HPWH MTI strategy manager** created a program theory of market transformation and a logic model informed by product and market characterization research.
- The **HPWH MTI evaluation lead** collaborated with the team and evaluation advisors to develop a set of MPIs against which market progress and MTI performance can be assessed, along with data sources that can be used to track progress against those MPIs.

Table 1 outlines the MPIs derived from the PTLM interventions (depicted and described in detail in Appendix A: Logic Model) and outcomes, along with associated milestones. The table also includes MPIs and associated milestones for several outputs because the timely completion of those outputs is critical to the MTI's success. Equity-focused MPIs are denoted with an "EQ" to highlight their relevance to the environmental and social justice (ESJ) goals of the MTI (see EQ5, EQ6, EQ11, EQ15 and EQ19 in the MPI column). The "Focus" column identifies the MTI's focus associated with each MPI (e.g., a market actor group, HPWH units).[4] CalMTA also created a comprehensive evaluability map (see Table 6 in Section 5) that includes the MPIs and milestones shown in Table 1, along with the associated data sources the evaluator will use to assess the MPIs, milestones, and causality. This evaluation plan pertains only to the residential market; references to HPWH products or programs only target the residential sector.

Table 1. HPWH MTI PTLM outcomes, MPIs, and milestones[5]

Strategic Intervention	PTLM Outcome (or Output)	Timing	Focus	Market Progress Indicator (MPI)	Program Milestone/Trend[a]
Influence Product Development and Match Technology to Housing Stock • Use research tools to assess California's housing segments • Match housing segments with existing equipment types and identify gaps • Support split-system technology development and adoption • Leverage existing training efforts to help installers	OUTPUTS: Product and program support roadmaps	Short (1-2 yrs)	H	1 - Status of HPWH product and program support roadmaps	**Roadmaps developed and ready for use by EOY 2028**
	Manufacturers and programs partner with CalMTA on Scale-Up Plans[6]	Short (1-2 yrs)	M	2 - Number of manufacturers partnering with CalMTA on Scale-Up Plans	**Two or more manufacturers sign memorandums of understanding (MOUs) with CalMTA by EOY 2028**
		Short (1-2 yrs)	P	3 - Number of programs partnering with CalMTA on Scale-Up Plans	**Two or more programs sign partnership agreements with CalMTA to provide ongoing support (funding, other) in specified submarket(s) by EOY 2028**
	Energy efficiency partner organizations/programs include greater diversity of HPWH product tiers/program offerings to meet market demand	Med (3-5 yrs)	P	4 - Number of energy efficiency partner organizations/programs that support integrated and split HPWHs, 120V and 240V HPWHs, and other HPWH solutions	**Ten or more energy efficiency partner organizations/programs support integrated and split HPWHs, 120v and 240v HPWHs and other HPWH solutions in their product offerings by mid-2032**
		Med (3-5 yrs)	M, P, I[7]	5 - Supply chain partners support/participate in trainings and use tools/resources to match HPWH technologies to California housing stock[8]	**At least 50% of installers report using tools/resources to match HPWH technologies to their customers' homes by mid-2032**
		Med (3-5 yrs)	M, P, I[9]	EQ5 - Supply chain partners working in ESJ communities support/participate in trainings and use tools/resources to match HPWH technologies to California housing stock	**At least 50% of installers working in ESJ communities report using tools/resources to match HPWH technologies to their customers' homes by mid-2032**

[4] Focus abbreviations: H=HPWH MTI; P=other HPWH programs; M=manufacturers; D=distributors; R=retailers; I=installers. U=HPWH units.
[5] All dates associated with milestones in this table assume implementation of the HPWH MTI begins in the second half of 2027.
[6] A Scale-Up Plan is a customized plan for each MTI-identified submarket that outlines strategies, key partners, and coordination approaches for building market scale.
[7] Manufacturers and partner organizations/programs may offer trainings and tools with which CalMTA coordinates; installers are the intended target market for the trainings and tools.
[8] This MPI covers multiple metrics: supply chain partners supporting/providing trainings and tools, and supply chain partners using the trainings and tools. CalMTA combined the metrics in this table for simplicity.
[9] Manufacturers and partner organizations/programs may offer trainings and tools with which CalMTA coordinates; installers are the intended target market for the trainings and tools.

Strategic Intervention	PTLM Outcome (or Output)	Timing	Focus	Market Progress Indicator (MPI)	Program Milestone/Trend[a]
confidently select the right equipment • Collaborate with manufacturers and energy efficiency programs to develop a product roadmap with pathways for lower global warming potential (GWP) refrigerant options and solutions for equipment gaps	Greater diversity in products with alternative form factors installed in California homes to meet needs of California housing stock	Med (3-5 yrs)	I	6 - Percentage of installers who report they have suitable HPWH solutions for their customers' homes	**50% of installers report they have suitable HPWH solutions for most of their customers' homes by mid-2032**
		Med (3-5 yrs)	I	EQ6 - Percentage of installers working in ESJ communities who report they have suitable HPWH solutions for their customers' homes	**50% of installers working in ESJ communities report they have suitable HPWH solutions for most of their customers' homes by mid-2032**
	HPWHs newly installed in California utilize lower GWP refrigerants and include load shift capabilities	Long (6-10+ yrs)	M	7 - Number of manufacturers selling HPWHs that use lower GWP refrigerants to the California market	TREND: Increasing number of manufacturers (including historically dominant firms) selling HPWHs with lower GWP refrigerants in California in response to regulatory requirements and market forces
		Long (6-10+ yrs)	U	8 - Percentage of annual HPWHs installations in California that meet Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1430 load shift requirements	TREND: Increasing percentage of HPWHs installed annually that meet AHRI 1430 load shift requirements
Aggregate Statewide Buying Power to Attract Market Partners & Build Momentum in Scalable Submarkets • Coordinate with existing energy efficiency/ESJ programs on outreach, training, marketing, and incentives, using collective buying power to reduce equipment and installations costs and drive additional sales • In near term prioritize easy-to-install markets (e.g., electric, solar, propane, new const., retail) to build installer confidence, strengthen business case, and drive sales • Partner with manufacturers to	Increased HPWH installations in early MTI-identified submarkets	Short (1-2 yrs)	U	9 - Increased sales of HPWHs in early MTI-identified submarkets	**15% increase in HPWH sales in two MTI-identified submarkets by EOY 2029**
	Increased installer confidence and acceptance of HPWH technology	Short (1-2 yrs) Med (3-5 yrs)	I	10 - Percentage of installers who feel confident recommending and installing HPWHs in their customers' homes	**35% of installers working in early MTI-identified submarkets feel confident recommending and installing HPWHs in their customers' homes by EOY 2029** **50% of installers feel confident recommending and installing HPWHs in their customers' homes by mid-2032**
	Total installed cost decreases for MTI-identified submarkets	Short (1-2 yrs)	I, M, D, R	11 - Total installed cost of HPWHs in MTI-identified submarkets	**Average of 15% decrease in installed HPWH costs in MTI-identified submarkets by EOY 2029**
		Short (1-2 yrs)	I, M, D, R	EQ11 - Total installed cost of HPWHs in ESJ communities within MTI-identified submarkets	**Average of 15% decrease in installed HPWH costs in ESJ communities within MTI-identified submarkets by EOY 2029**
	Retail channel sees an increase in HPWH sales and is competitive with distributor channel	Med (3-5 yrs)	D, R	12 - Price parity across retail and distributor channels throughout California	**Average HPWH retail price within 10% of average distributor price by mid-2032**
		Med (3-5 yrs)	R, U	13 - Percentage of HPWHs sold through the retail channel	TREND: Increasing percentage of HPWH sold through the retail channel
	Increased California program consistency strengthens market and supply chain business case	Med (3-5 yrs)	U	14 - Number of HPWHs shipped to California annually	TREND: Increasing number of HPWHs shipped to California annually

Strategic Intervention	PTLM Outcome (or Output)	Timing	Focus	Market Progress Indicator (MPI)	Program Milestone/Trend[a]
decrease cost and engage supply chain leaders to champion HPWH adoption • Apply lessons learned and market experience to enable market actors to confidently expand into additional submarkets	HPWHs reach a technology adoption tipping point in existing residential homes	Med (3-5 yrs) Long (6-10+ yrs)	U	15 - Percentage of water heaters installed annually in existing residential homes that are HPWHs (market share)	**32% of all water heaters installed annually in existing homes are HPWHs by mid-2032[10]** • **11% of water heaters installed annually in existing homes as replacements for gas water heaters are HPWHs by mid-2032** **35% of all water heaters installed annually in existing homes are HPWHs by mid-2037** • **16% of water heaters installed annually in existing homes as replacements for gas water heaters are HPWHs by mid-2037**
		Med (3-5 yrs) Long (6-10+ yrs)	U	EQ15 - Percentage of water heaters installed annually in existing residential homes in ESJ communities that are HPWHs	**32% of all water heaters installed annually in existing homes in ESJ communities are HPWHs by mid-2032** • **11% of water heaters installed annually in existing homes in ESJ communities as replacements for gas water heaters are HPWHs by mid-2032** **35% of all water heaters installed annually in existing homes in ESJ communities are HPWHs by mid-2037** • **16% of water heaters installed annually in existing homes in ESJ communities as replacements for gas water heaters are HPWHs by mid-2037**
Develop, Support, and Coordinate Statewide Operational Infrastructure • Develop/support a coordinated, statewide system for water heater sales and data collection with supply chain and program partners • Share anonymized data with market and energy efficiency partners to inform	California program partners align on a shared definition of qualified HPWH products, creating consistency for market partners and end customers	Short (1-2 yrs)	P	16 - Percentage of active California programs aligned on CalMTA-identified definition of qualified HPWH products	**At least 50% of active programs in California aligned on qualified HPWH product definition by mid-2029**
	Installer market partners and programs utilize shared messaging and research to educate and accelerate HPWH adoption	Short (1-2 yrs)	P	17 - Percentage of active California programs using shared messaging about HPWH benefits	**At least 50% of active programs in California use shared messaging about HPWH benefits by mid-2029**
	OUTPUT: Statewide Market Intelligence Hub[11]	Short (1-2 yrs)	H	18 - Status of Market Intelligence Hub	**Market Intelligence Hub developed, tested, and ready for use by mid-2029**

[10] Market share milestones include HPWHs forecasted to be adopted as a result of the Bay Area Air Quality Management District's water heater regulations that will take effect in January 2027 as well as HPWHs forecasted to be adopted as a result of the federal standard that will become effective in May 2029. CalMTA modeled HPWHs forecasted to be adopted as a result of California Air Resources Board proposed regulations as a separate sensitivity analysis. See Appendix B for more information about market share forecasts.

[11] The Statewide Market Intelligence Hub is a data platform that CalMTA will design and maintain to capture, analyze, and report on California residential HPWH sales data with market partners and programs.

Strategic Intervention	PTLM Outcome (or Output)	Timing	Focus	Market Progress Indicator (MPI)	Program Milestone/Trend[a]
resource allocation and program design • Collaborate with programs to create consistent, accessible marketing tools and messaging • Align supply chain messaging to ensure a consistent customer experience • Coordinate with energy efficiency programs to align on and conduct research	Market and program partners leverage and participate in Market Intelligence Hub creating quid pro quo data relationships	Medium (3-5 yrs)	M, D, R, P	19 - Percentage of manufacturers, medium and regional retailers, and program partners, that contribute to the Market Intelligence Hub [12]	**Majority of manufacturers, medium and regional retailers, and program partners contribute data to the Market Intelligence Hub by mid-2032**
		Medium (3-5 yrs)	D, R, P	EQ19 - Percentage of program partners working in ESJ communities that contribute to Market Intelligence Hub and use data from the hub	**Majority program partners working in ESJ communities contribute data to the Market Intelligence Hub by mid-2032**
	Data are leveraged by California programs and market actors and create additional value streams[13] to support funding of California's Heat Pump goals	Med (3-5 yrs)	M, R, P	20 - Market actors and programs demonstrate they value the Market Intelligence Hub by using it	**Two or more market actors or programs demonstrate they value the Market Intelligence Hub by requesting or agreeing to use it by mid-2032**

Notes:

*[a]CalMTA uses milestones to specify expected performance, which is also reflected in its TSB and cost-effectiveness forecasts; **milestones are designated using bold type**. Expected trends are included in this table to guide real-time evaluation and adaptive management efforts. Trends represent directional trends that are consistent with the PTLM and would be consistent with market progress; they are designated using the word TREND at the beginning.*

[12] This MPI covers three separate metrics since there are three sets of market actors—manufacturers, retailers, and program partners. CalMTA combined the metrics in this table for simplicity.

[13] By capturing, analyzing, and reporting on residential HPWH sales within California, the CalMTA's Market Intelligence Hub will create a valuable source of information for supply chain actors, energy efficiency programs, and other stakeholders to help all actors get a regular pulse on the market and support increased HPWH adoption.

1.4 Data collection and analysis activities

CalMTA identified primary and secondary data collection activities and analysis tasks that will enable the third-party evaluator to evaluate the HPWH MTI. Table 2 lists the evaluation research objectives along with associated data collection and analysis activities, which are described in more detail in the following section. CalMTA looks forward to reviewing proposals that identify additional reliable data sources and detailed descriptions of innovative methods the evaluator recommends that can improve upon the approaches described in this document.

Within six months of the evaluation initiation, the evaluator will identify data gaps and potential options for filling those gaps.

Table 2. Research objectives and evaluation activities

Research objective	HPWH MTI program data and materials review	Secondary data collection & literature review	Sales and program data collection and analysis	Stakeholder, subject matter expert (SME), program partner, and MTI staff interviews	Manuf., distributor, and retailer interviews	Installer surveys	Consumer & building owner/ property manager surveys	CalMTA forecasting & cost-effectiveness model reviews
Assess the theory of market change per the MTI logic model	X	X	X	X	X	X	X	
Monitor market dynamics and characteristics	X	X	X	X	X	X	X	
Track units of adoption	X	X	X	X	X	X	X	
Measure market progress, per MPIs and milestones	X	X	X	X	X	X		
Assess MTI equity	X	X	X	X	X	X	X	
Assess MTI causality	X	X	X	X	X	X		
Assess MTI implementation	X		X	X	X	X	X	X
Assess incremental MTI impact	X		X	X	X	X		X

2 Data sources

CalMTA conducted a market characterization study of the California residential HPWH market in 2024 (published in early 2026).[14] That study characterized the market baseline conditions and values for some of the MPIs listed in Table 1. This evaluation plan includes data collection activities that build on the research conducted in the study.

2.1 MTI program data and materials

CalMTA and its eventual implementation contractor(s) will track and record the team's activities and interventions, including the timing of each action/activity. The evaluator will review this information annually to assess the MPIs and milestones and to assess causality between the MTI's interventions and market outcomes. The information will include:

- MTI program documentation, including implementation and marketing plans, and implementation records, including Salesforce data
- HPWH MTI plan, logic model, and implementation plan documents
- Product roadmap linking existing and future HPWH technologies to housing types with optimal applications
- Program support roadmap
- CalMTA-developed tools (e.g., market segment opportunity assessment tool, messaging and marketing tools)
- CalMTA agreements/contracts/MOUs with supply chain actors and program partners (Scale-Up Plans) and resulting data
- MTI tracking data
- Qualified products list (QPL) maintained by CalMTA, or a QPL maintained by a market partner that CalMTA leverages
- CalMTA's Statewide Market Intelligence Hub
- List of key stakeholders with contact information
- Market adoption and cost-effectiveness models with inputs, assumptions, and calculations

[14] For more information on the market characterization, please refer to Appendix D: Market Characterization.

The evaluator may suggest changes to the MPIs once CalMTA has begun implementing the HPWH MTI and has data for specific submarkets.

2.2 Secondary data and literature review

The HPWH MTI Market Characterization study included an extensive literature review, drawing from various secondary data sources including the Energy Information Administration's (EIA) 2020 Residential Energy Consumption Survey (RECS), the most recent (2019) California Residential Appliance Saturation Survey (RASS), and U.S. Census' American Community Survey.[15] These sources provided insights into baseline appliance saturation levels, consumption, household characteristics, and other insights relevant to single-family, multifamily, and mobile home households in California.

The team also reviewed publicly available technical and market research materials to document the existing HPWH program and policy landscape, identify key barriers and opportunities for HPWHs, and identify recently completed and ongoing studies of the residential water heater market. These include:

- California regulatory filings and dockets
- The California Electronic Technical Resource Manual
- Research and reports hosted by CalNEXT and TECH Clean California
- Key industry websites and reports (e.g., documents available through the California Heat Pump Collaborative and the Advanced Water Heating Initiative (AWHI))
- Information gathered from searches using tools including Google Scholar, Semantic Scholar, Science.Gov, and general internet research on RHP products
- Pricing and product availability from reviews of manufacturer websites and online retailers.

The evaluator will leverage some of the same data sources in conducting an annual literature review to monitor market dynamics and inform residential HPWH MTI market progress evaluations. For example, the evaluator may include these sources in its research:

- **U.S. Census American Community Survey (Source U.S. Census, Accessed Annually)** The evaluator will use this data source to develop and refine survey and interview sample designs to reflect California's population. Using this data will ensure that supply side market actors serving key demographic groups—potentially defined by income level, geographic area, and household type and ownership—are appropriately captured.

[15] For the most recent RECS, please refer here https://www.eia.gov/consumption/residential. For the most recent RASS, please refer here https://www.energy.ca.gov/publications/2021/2019-california-residential-appliance-saturation-study-rass. For most recent U.S. Census' American Community Survey, please refer here https://www.census.gov/programs-surveys/acs.html.

- **California RASS**
  The evaluator will use the most recent version of California's comprehensive residential sector study to assess saturation trends for water heating technologies. Because RASS is updated infrequently and will not be useful for observing year-to-year shifts, its use will be limited. Nonetheless, the evaluator should examine this data source, especially after updates, to understand long-term trends. The evaluator will use RASS data to:
  - Analyze patterns of adoption for water heating technologies across housing types (i.e., single-family homes, multifamily units, and mobile homes)
  - Track shifts in consumer preferences over time, offering insights into the market's progression toward different water heating solutions.
- **EIA RECS**
  EIA RECS is national data source that provides data to assess broad market adoption trends for water heating technologies. EIA RECS, like the California RASS, is updated infrequently so is most appropriately used to track longer-term changes in residential water heating solutions. The evaluator may use EIA RECS to corroborate California RASS or other data sources, as well as to compare HPWH adoption in California to adoption elsewhere in the country.
- **CalEnviroScreen**
  This mapping tool uses socioeconomic, environmental, and health information to produce scores for every census tract in California. The evaluator may use this tool to identify consumer survey respondents who meet ESJ criteria.

During the literature and secondary data review, and throughout the course of its work, the evaluator will also strive to identify additional relevant data sources or literature, including new evaluations and market studies. Examples of useful sources of installer contacts include:

- California Contractor's State Licensing Board
- Better Business sites, manufacturer installer lists
- Larger retailer (e.g., Home Depot) installer lists
- Other programs' HPWH or HVAC installer lists

To identify consumers in ESJ communities, useful sources include the U.S. Department of Housing and Urban Development's Open Data Site and Los Angeles County GeoHub/Equity Explorer.

2.3 California sales and program data

The evaluator will analyze sales data from multiple sources each year, as listed below, and determine the scope and market coverage, areas of overlap, and whether there are any remaining gaps in the retail channel data. The evaluator will make recommendations about potential additional data sources, and on how to use the data to determine market adoption of

HPWHs and other relevant MPIs. The evaluator will also analyze Program Administrator (PA) program data to understand program-driven adoption levels.

- **Mid-stream incentive ENERGY STAR® Retail Products Platform (ESRRP) retailer sales data (source: CalMTA ESRPP data, analyzed periodically)**
  Participating ESRPP retailers will provide full category sales data for all electric and gas water heating technologies sold in their California stores. These data will include quarterly sales data, pricing, and market penetration of HPWH technology. The evaluator will work with CalMTA to access these data annually and will have access to CalMTA's analyses including sales and price trends, and summary statistics.
- **Circana or NeilsenIQ data (source: Circana or NeilsenIQ, purchased data)**
  Circana/NeilsenIQ data are based on actual sales for many California retailers but also include forecasted sales for major retailers such as Home Depot, Lowe's, and Best Buy. Since the ESRPP data include actual sales for these same large retailers, the combination of Circana/NeilsenIQ's forecasted data with ESRPP's actual sales data will provide a more complete and accurate representation of the overall market for residential water heating technologies in California. The evaluator will work with CalMTA to specify and potentially purchase these data to fill any gaps in retail sales data obtained through ESRPP. By merging these two datasets, the evaluator will be able to measure the total market for both gas and electric water heating technologies, with a particular focus on HPWHs, across the entire state.
- **PA and California Energy Data and Reporting System (CEDARS) Data**
  The evaluator will assess program participation by compiling program data and CEDARS data to account for market interventions by California PAs. The evaluator will incorporate net-verified program participation data into total market adoption estimates to avoid double-counting. This is discussed further below. The evaluator may also use CEDARS data to identify the incumbent types of water heaters that are being changed out for HPWHs.
- **Other Sources of Sales or Shipment Data**
  The evaluator will work with CalMTA to gather shipment and sales data to assess sales across all channels. This may involve sources such as ENERGY STAR, AHRI (a trade organization), CalMTA-negotiated data sharing agreements with manufacturers and distributors, or bulk purchase agreements. The evaluator will also need to collect data on new construction in California (e.g., from permitting/California Home Energy Efficiency Rating data or timely code evaluation studies) to understand the number of HPWHs going into new homes annually and suggest data sources (and analytical approaches) to ensure HPWH sales from small and mid-size retailers are included in HPWH market share estimates.

In addition to using the sales and program data to estimate HPWH adoption rates in existing homes in the general population and in ESJ communities, these data will inform the evaluator's estimates of HPWH unit sales and pricing through the distributor and retail channels, as well as its

annual estimates of the percentage of HPWHs sold in California that include lower GWP refrigerants and that meet AHRI 1430 load shift requirements.[16]

2.4 Primary data collection

The evaluator will develop a sampling and research plan that allows for longitudinal tracking of key metrics to measure progress toward achieving the MTI's milestones. The evaluator will clearly document data sources, the sampling strategy, and the sample frame development process so results can build on previous baseline and evaluation findings. For MPIs for which an established baseline value is not available, the first-year measurement will serve as a baseline for future year comparisons.

2.4.1 MTI staff, stakeholder, SME, and program partner interviews

In addition to interviewing MTI staff, the evaluator will conduct interviews with stakeholders, SMEs, and a census of program partner staff to inform the market characterization of HPWHs each year. The interviewees will include representatives from organizations conducting research and development, organizations involved with standard setting and policy making, PAs and implementers of California programs, and community-based organizations (CBOs) that promote HPWHs—both programs that are and are not partnering with CalMTA.

The interviews will inform an understanding of a variety of key market information, including:

- Changes to pending federal efficiency standards
- Loopholes or workarounds to federal or state standards/codes
- Current program offerings
- Future program changes influenced by CalMTA
- Customer perceptions and barriers to adoption
- Market and technology trends
- Partner programs' messaging
- Qualified product definitions
- Training and educational offerings for installers
- Opportunities for CalMTA to maintain and enhance collaboration with other programs

[16] To learn more about AHRI 1430, please refer to https://www.ahrinet.org/search-standards/ahri-1430-i-p-demand-flexible-electric-storage-water-heaters-addendum-1.

2.4.2 Manufacturer interviews

The evaluator will conduct interviews with both established and emerging manufacturers to assess the causal relationship and impact of HPWH MTI interventions aimed at increasing product availability and innovation.

During the baseline market characterization, CalMTA interviewed representatives from six manufacturers. These interviews were geared toward understanding the HPWH product landscape and covered topics such as:

- Manufacturers' current product offerings
- Plans for future products
- Distribution channels
- Motivations and needs for products
- Perceived barriers and opportunities for products and adoption

During the market deployment phase (Phase III), the third-party evaluator will attempt to reach the same six manufacturers to focus on manufacturer responses to specific MTI interventions and track changes in attitudes, behaviors, training and educational offerings, product offerings, and pricing relative to CalMTA's initial manufacturer interviews. The evaluator will also identify and conduct interviews with additional manufacturers who should be included based on market share, market presence, innovative products, or pricing.

Manufacturer offerings, plans, product pricing, and perspectives may change fairly rapidly during the first few years of the HPWH MTI's implementation due to the MTI's anticipated effect on increasing HPWH demand in California, the new federal water heater efficiency standards slated to take effect in 2029,[17] and other HPWH programs throughout the U.S. To capture manufacturers' evolving viewpoints and information, the evaluator will interview HPWH manufacturers in each year through 2031.

2.4.3 Distributor and retailer interviews

The evaluator will interview distributors and retailers about a variety of topics, including:

- Awareness of the HPWH value proposition
- Stocking practices and rationale for those practices
- Lead times for products that are not stocked
- Perceptions of HPWHs and HPWH programs

[17] Federal Register. (2024). "Energy Conservation Program: Energy Conservation Standards for Consumer Water Heaters." 10 CFR Parts 429 and 430 EERE 2017-BT-STD-0019] RIN 1904-AD91. May 6, 2024.

- Frequency of recommending HPWHs
- HPWH share of residential water heaters sold
- Innovative products
- Wholesale and retail HPWH pricing

These interviews will take place annually to closely track the very dynamic residential water heater market. While CalMTA will provide referrals to distributors who have been contacted by the MTI, the evaluator will review and expand this list to develop a representative set of distributors to interview. The evaluator will also develop a representative list of retailers to interview, ensuring CalMTA gleans insight from a diverse sample of retailers (e.g., both rural and urban, as well as large, medium, and smaller retailers).

2.4.4 Water heater installer surveys

During the first year, and in alternate years following that, the evaluator will survey contractors who install (non-central) residential water heaters about topics including:

- Installer awareness of HPWHs
- General perceptions of HPWHs and HPWH programs
- HPWH training receive
- Confidence and comfort installing HPWHs
- Confidence in and acceptance of HPWH technology
- Perceived availability of HPWH products they believe are a good match for their customers
- Frequency of HPWH recommendation and installation
- Percent of homes for which they do not have a suitable HPWH solution
- Reasons for not recommending HPWHs
- Equipment and labor installations costs
- Experience with incentive and financing programs
- Prevalence of customers switching from gas or propane water heaters to HPWHs

The evaluator will compare these survey findings to findings from the baseline market characterization research and other evaluations. The evaluator will also recommend additional survey topics to explore that enhance earlier evaluation findings and address changing market conditions.

CalMTA completed 149 surveys with dual trade contractors, plumbers, and general contractors across California climate regions, electric utility service areas, and ESJ categories as part of the market characterization study. However, since implementation of the HPWH MTI will initially focus

on CalMTA-identified submarkets, the evaluator should devise an approach that includes surveying a representative sample of installers working in the targeted submarkets, while also enabling comparison between those installers and water heater installers working in other parts of the California market.

The evaluator may opt to recruit installer participants through the Qualtrics panel network, as did the CalMTA team, or take another recruitment approach. Attachment A to the Market Characterization Report includes thorough discussions of the weighting methodology and installer ESJ classification process CalMTA used in that study.

2.4.5 Consumer and building owner/property manager surveys

While the HPWH MTI's interventions are designed to affect upstream and midstream market actors, the interventions are also ultimately designed to affect downstream consumer and building owner/property manager perceptions of HPWHs and their water heater purchase decisions. The evaluator will field residential consumer and building owner/manager surveys in the first year and in alternate years thereafter to assess:

- Longitudinal changes in consumer and building owner/manager awareness and attitudes toward HPWHs
- Perceived availability of HPWHs
- Willingness to consider an HPWH purchase
- Awareness of HPWH rebates
- Perceived barriers to adoption
- Other factors that could support HPWH uptake,

The Phase III consumer survey will also ask recent-water-heater-purchaser respondents additional questions to understand their purchasing motivations, type/fuel of their prior water heater, type of HPWH purchased, purchase channel, installation experiences, and post-installation experiences using their HPWHs.

These surveys should build on questions from the residential consumer and building owner/manager surveys used in the baseline market characterization research to allow statistically valid comparisons of the observed changes. The evaluator will refine the sampling strategies developed for the baseline market characterization study as necessary to align it with observed changes in consumer segments from the U.S. Census or other data. Attachment A to the Market Characterization Report includes thorough discussions of the weighting methodologies and ESJ classification processes CalMTA used in that study.

The Phase III consumer survey will use a sampling approach that ensues representation across climate region, electric utility, housing type, and ESJ criteria. The evaluator may work with the

CalMTA evaluation lead to explore combining the consumer and building owner/property manager surveys or to piggyback on other CalMTA consumer surveys.

The Phase III building owner/manager survey will also use a sampling approach that ensures representativeness. As CalMTA did for the baseline survey, the evaluator will weight survey findings by the number of rental dwellings managed so that results reflect the rental market as a whole, rather than giving equal weight to each property manager. The baseline building owner/manager survey achieved 162 completes.

2.5 Timeline for data collection and analysis activities

Table 3 outlines the initial timing recommended for evaluation activities through 2031. MPIs correspond with MTI market interventions and associated activities and outputs, which occur at different times and result in logic model outcomes that are achieved over different time horizons. The evaluator will need to plan the timing and frequency of data collection and other evaluation activities accordingly to enable timely assessment of MPIs and to provide market insights that will support improvements to the MTI. The evaluator, in coordination with CalMTA, will update this timeline to address any changes in MTI implementation or to reflect when MPIs need additional review or no longer need to be evaluated. The data collection activities in the first year will be critical for measuring baseline MPI values and for providing early, timely feedback to the MTI implementation team.

The evaluator will produce annual evaluation reports documenting evaluation findings and progress toward market transformation goals. Reporting format may vary by year and could include a written report, memo, or slide deck depending on the scope and nature of evaluation activities completed during that period.

Table 3. Timeline for data collection and analysis activities

Data Collection and Analysis Activity		Year 1	Year 2	Year 3	Year 4
CalMTA program data and materials review		X	X	X	X
Secondary data and literature review		X	X	X	X
Sales and program data collection and analysis	ESRPP sales data	X	X	X	X
	Circana/NeilsenIQ data	X	X	X	X
	PA program and CEDARS data	X	X	X	X
	Other sales or shipment data	X	X	X	X
Primary data collection and analysis: market actors	MTI staff, stakeholder, SME, and program partner interviews	X	X	X	X
	Manufacturer interviews	X	X	X	X
	Distributor and retailer interviews	X	X	X	X
	Installer surveys (in early targeted submarkets)	X		X	
	Consumer and building owner/manager surveys	X		X	
Forecasting and cost-effectiveness model reviews		X	X	X	X

3 Program theory and implementation review

The evaluator will thoroughly review and compare the MTI PTLM and MPIs to the market interventions implemented by CalMTA and the resultant outputs in the first evaluation year. After conducting MTI staff interviews and reviewing program documents, the evaluator will make recommendations on how to improve the PTLM and MPIs.

After completing additional market evaluation activities, the evaluator will assess the extent to which the MTI interventions are addressing the market barriers and leading to the theorized outcomes. The evaluator will identify opportunities to improve the logic model and to refine market interventions to influence the market and make recommendations for doing so.

CalMTA will provide the PTLM, other program materials and data listed in Section 2.1, and any data or perspectives provided by program delivery contractors and partners to date, to the evaluator. The evaluator will review these materials and data and identify information needs to be addressed in primary and secondary research tasks.

The evaluator should revisit the PTLM annually to assess the extent to which the PTLM accurately describes observed market dynamics and to suggest any needed refinements to the program theory and its implementation.

4 Evaluating market progress

Market transformation experience demonstrates that well-chosen and vetted MPIs are critical to MTI risk management and success. Yet there has been a tendency to judge market progress primarily on units of adoption. This metric can be a misleading indicator of success for MTIs in their early years because market share and adoption typically increase slowly and accelerate only after addressing critical market barriers, such as–in the case of HPWHs. HPWH barriers to adoption include:

- Form factors that are not well suited to much of California's housing stock
- Complex and inconsistent HPWH program offerings that are not engaging and are difficult for chain actors and consumers to navigate
- High first costs relative to standard water heater first costs
- Installers' and consumers 'uncertainty about the bill impacts of replacing incumbent technology with a HPWH product

To appropriately evaluate market progress and ensure accountability, the evaluator must assess short- and medium-term MPIs that align with the logic model. The HPWH MTI is designed to gain momentum early in identified submarkets where program partners are committed to working with CalMTA to accelerate adoption in targeted submarkets, manufacturers are committed to bringing HPWH technology that matches more of the California housing stock to the market, and customers are likely to see energy bill reductions. CalMTA therefore expects market adoption of HPWHs to hasten in these early submarkets before it accelerates more widely. Nonetheless, the evaluator will assess units of adoption throughout California from the outset because it is of paramount importance to estimating the MTI's incremental energy impacts and cost-effectiveness.

4.1 Market adoption

Determining units of adoption is a key focus of the evaluation because defensible measurement is essential for estimating the incremental energy impacts of the MTI. Market adoption estimation is also one of the most challenging components of the evaluation, because the HPWH supply chain encompasses multiple sales channels including:

- Large and small retail brick-and-mortar stores
- Online retailers
- Manufacturer direct purchases
- Distributor direct purchases
- Utility or contractor programs

To develop a complete picture of the market and calculate units of adoption across all sales channels, the evaluator must identify, procure, and "stitch" together information from multiple sources.

The evaluator will independently estimate market adoption through the following steps:

1) **Identify all sales channels.** The evaluator will investigate and identify the complete set of sales channels for HPWHs and competing water heaters. This task will build on CalMTA's market research in which installers, consumers, and building owners/managers identified in-person large retail stores, in-person smaller retail stores, online retailers, distributor-to-buyer vendors, manufacturer-to-buyer vendors, and utility and contractor program purchase channels.
2) **Finalize data sources for each channel.** CalMTA has identified the data sources shown in Table 4 for each of the identified sales channels. The evaluator will investigate and finalize the best data sources for each channel.

Table 4. Data sources by sales channel

Retail sales data	Manufacturer/distributor data	Supplementary shipment data
ESRRP retailer sales data	Negotiated data sharing agreements with manufacturers and distributors or bulk purchase agreements	ENERGY STAR data
Circana or NeilsenIQ data		AHRI data

Descriptions of each data source follow:

- **Retail channel data.** The retail channel includes large brick-and-mortar stores, smaller brick-and-mortar stores, and online retail storefronts. The evaluator will estimate market adoption through this channel using sales data contractually provided to CalMTA from ESRPP-participating retailers that include big box retail stores (e.g., Home Depot and Lowe's), online retail storefronts, and independent retail stores. The evaluator will supplement ESRPP data with purchased retail data, as needed, from additional sources like Circana or NeilsenIQ (described in the "Secondary data and literature review" section).
- **Manufacturer/distributor channel data.** Other sales channels include wholesale distributors and/or direct online or bulk purchases from manufacturers. The evaluator may have access to data gathered through CalMTA negotiated data sharing agreements with manufacturer and distributor market partners or bulk purchase agreements to estimate data through this channel.
- **Supplementary shipment data.** CalMTA expects sales data from these sources to cover most of the California market, although there may be overlap and/or gaps across the datasets. CalMTA also expects some sources of data to include an estimate of their market coverage. To verify the total market size, the evaluator will coordinate with CalMTA to also gather shipment data from another source, such as AHRI, to serve as a point of comparison.

1) **Collect data and identify gaps.** The evaluator will assemble the available sales and shipment data, as described above. As with all data, there are expected to be gaps (e.g., non-reporting retailers). If the volume sold through non-reporting retailers as a percentage of the total market size as estimated based on shipment data is significant, the evaluator will identify non-reporting retailers and manufacturers and conduct interviews with a sample of them to estimate how many HPWHs are sold by them each year, to estimate the total sales from non-reporting vendors.
2) **Calculate total units of adoption.** The total units of adoption will be calculated by combining the reported sales data analysis and the estimated units of adoption for the non-reporting vendors. The evaluator will review these market adoption estimates and update them annually to calculate market share to assess MPIs.

4.2 Evaluating MPIs

CalMTA completed a baseline market characterization study published in early 2026 that provides foundational data for several MPIs (e.g., HPWH installed cost, HPWH market share). For these metrics, the evaluator will strive to validate information from the market characterization report to use as the baseline. The evaluator could, for example, ask respondents to the consumer survey who report recently installing a HPWH product, how long ago they purchased the HPWH product, and ask them to upload a photograph of the product.

For all other MPIs, the evaluator will establish baseline measurements during the first year of the evaluation through targeted data collection activities. The evaluator will then track MPIs over time and note when measured MPIs do not follow expected trends, investigating potential causes for deviations and their implications for the MTI's theory of change.

4.3 Evaluating equity

Several MPIs require the evaluator to gather information from installers working in ESJ communities and about the HPWHs installed in homes in ESJ communities. These MPIs are identified in Table 1 as starting with "EQ:" EQ5, EQ6, EQ11, EQ15, and EQ19. The evaluator will use the same primary and secondary data collection to assess equity MPIs as they use to assess similar MPIs for the general population. In addition to these MPIs, the evaluator should evaluate equity across all aspects of the MTI it believes CalMTA should consider. The evaluator will also examine other aspects of equity through the process evaluation, such as HPWH awareness, adoption, purchasing motivations, and installation experiences of consumers in ESJ communities. The evaluator will then compare these aspects to the motivations and experiences of consumers in non-ESJ communities, described below in Section 6. Primary identification of ESJ communities is based on the location of the installed HPWHs within California census tracts designated as Disadvantaged Communities (DACs) by CalEnviroScreen or otherwise

classified as ESJ by the CPUC's definitions (e.g., tribal lands, low-income census tracts).[18] The evaluator will take the approach that CalMTA employed for the HPWH MTI Market Characterization Report to identify supply chain actors working in, and homes located within, ESJ communities. Primary identification of ESJ communities is based on the zip code-associated California census tracts designated as DACs by CalEnviroScreen or otherwise classified as ESJ by the CPUC's definitions (e.g., tribal lands, low-income census tracts). Therefore, in all survey instruments, the evaluator should ask supply chain actor respondents to report their business zip code and the communities in which they most frequently sell/install water heaters.

4.4 Evaluating causality

Causality assessment in market transformation programs is required to link incremental adoption and other changes in the market to MTI interventions as firmly as possible. The PTLM includes theorized linkages between interventions and market outcomes. By conducting research to assess the MPIs, the evaluator will gather data from multiple lines of evidence to validate those linkages, assessing whether the program is influencing the market in the manner hypothesized in the PTLM, and establish causality between MTI activities and outcomes. The evaluator will assess causality for each MPI where practical, to support the overall causality assessment.

The evaluator will conduct the causality assessment based on a preponderance of evidence approach, which seeks to demonstrate influence across multiple metrics, with methods including document review, in-depth interviews and surveys with stakeholders, SMEs, market actors, and program partners, and other evidence documenting causes of applicable market changes over time. This approach uses empirical evidence to explain how changes in market adoption can be traced back to MTI interventions and non-MTI market drivers.

For example, to determine whether the HPWH MTI accelerated and increased market adoption of HPWHs in existing California homes, the evaluator would consider all available evidence that the MTI interventions led to the theorized outcomes—such as partner programs including a greater diversity of HPWHs, increased installer confidence and acceptance of HPWH technology, and decreased installed HPWH costs—as well as evidence that those outcomes increased and accelerated market adoption. In addition, the evaluator will consider alternative explanations and causes for the observed market outcomes. Consideration of evidence to support alternate explanations of change is important to avoid confirmation bias.

Table 5 provides examples of some of the questions the evaluator may consider.

[18] DACs are designated by the California Environmental Protection Agency as per Senate Bill 535, are defined by CalEnviroScreen 4.0: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40. The baseline residential consumer survey used census data to identify those who live in census tracts or households at or below 80% of the statewide median income. This sampling approach was expedient for the baseline study but the third-party evaluator should refine it, if possible.

Table 5. Causality assessment

Example Causality Question	Example Data Sources/Evidence
Did the MTI lead partner programs to include a greater diversity of HPWH product tiers/offerings? How?	• MTI Salesforce documentation of meetings and conversations with program partners • Program partner interviews • Program partner materials (e.g., comparisons of programs' pre- and post-partnership HPWH QPLs)
Did the MTI lead installers to believe there is a HPWH solution for the majority of their customers?	• Installer surveys • Program partner and manufacturer interviews (e.g., questions addressing training and tools about home-to-technology matching)
Did increased California program consistency strengthen the supply chain business case for HPWHs as evidenced by larger annual HPWH shipments to the state and a greater variety of HPWH types that better meet the needs of California's housing stock?	• Shipment data trends • Manufacturer interviews • SME and stakeholder interviews • Consumer survey (increased customer interest/demand for HPWHs corresponding with MTI interventions)
To what degree could the observed market changes have been caused by non-MTI alternative market dynamics or interventions? What market results could have occurred in the absence of the MTI?	• Review of observed market changes, including analysis of documentation, program materials, and timing of interventions • SME, stakeholder, the program partner interviews • Market actor interviews and surveys

4.5 Forecasting, impacts, and cost-effectiveness review

This section describes the approach to evaluating the MTI's incremental energy impacts. CalMTA has developed forecasts for BMA and TMA, along with estimates of unit energy impacts. CalMTA developed *ex ante* estimates of incremental MTI impacts using this formula:

Net Incremental MTI impacts = [(TMA units – BMA units) * UES] – utility verified impacts

The evaluator will review CalMTA's market adoption and cost-effectiveness forecasting models, including inputs, data sources, and assumptions, and make recommendations for improvement. Net incremental MTI units of adoption will exclude adoption claimed by other efficiency programs.

4.5.1 Total market adoption forecast

CalMTA will regularly update its TMA forecast, incorporating actual sales or shipment data as it becomes available. The evaluator will conduct its review of the TMA using the most recent data available.

4.5.2 Baseline market adoption forecast

In the first year, the evaluator will review CalMTA's process for developing the BMA, including inputs and assumptions, and make recommendations for improvements based on:

1) Availability of new data.
2) Whether the causality assessment found adoption being driven by non-MTI market forces that are missing from the baseline.
3) Any other reasons given in the evaluation framework guidance document.[19]

The BMA should only be revised when the evaluator has confidence that initial assumptions were incorrect and that the MTI did not significantly contribute to an observed change in market adoption. CalMTA identified three scenarios that warrant consideration of revising the BMA in the evaluation framework: an incorrect BMA assumption was discovered, an unanticipated or previously highly uncertain exogenous event occurred, or an unanticipated product/technology advancement was introduced and becomes competitive with or subsumes the MTI.

The evaluator will also provide recommendations to close any data gaps that were found in this review. CalMTA will request additional reviews in subsequent years as needed. Note that BMA includes adoption from established resource acquisition programs because they would have occurred absent the MTI, but excludes savings associated with collaborative efforts under the umbrella of the MTI.[20]

4.5.3 Unit energy savings (UES)

The methodology to develop UES for HPWHs is detailed in Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach. The evaluator will review UESs (including savings estimates, load shapes, and effective useful life), and assumptions and methodology to assess completeness and accuracy and make recommendations for improvements, such as the appropriateness of the hot water draw profiles by building type or HWPH tank sizes.

4.5.4 Program Administrator impacts

The evaluator will review net verified impacts attributable to the PAs based on claimed and verified data from CEDARS. These impacts will be subtracted from incremental adoption (TMA minus BMA) as shown in the equation at the start of this section, ensuring no double-counting of impacts between CalMTA and other PAs.

[19] To learn more about the Market Transformation Evaluation Framework, please see https://calmta.org/wp-content/uploads/2025/04/Market-Transformation-Evaluation-Framework-FINAL.pdf.
[20] Per the CalMTA MTI Evaluation Framework, p. 11, footnote 15.

4.5.5 Cost-effectiveness model

As part of the ongoing evaluation, the evaluator will review the cost-effectiveness model, and the model inputs, assumptions, and data sources that CalMTA used to calculate cost-effectiveness of the MTI. CalMTA's approach is fully documented in Appendix B of the MTI Plan.

Evaluating cost-effectiveness involves outputs from the market-forecasting model as well as initiative costs, incremental measure cost, avoided cost, load shape, and UESs. This application of inputs considers the baseline installation conditions, baseline and efficient technologies, fuel types, target sector, and costs incurred by all stakeholders in the MTI implementation. Moreover, both the costs and benefits change over time due to factors such as effective useful life, regulatory policy, electricity and gas rates, and initiative funding.

During the first evaluation year, the evaluator will review the inputs, assumptions, and the model used by CalMTA that inform the cost-effectiveness forecast; during subsequent years, the evaluator will review any updates made to the models. The review will include the following model inputs:

- **Incremental Adoption Forecast**. Incremental adoption will be forecasted as an input to the cost-effectiveness model. The evaluator will review this forecast and make recommendations for improvement.
- **Incremental Measure Costs.** Incremental measure costs reflect the difference in cost between the baseline water heating technology and HPWH technology. For the full discussion of how the incremental cost was forecasted see Appendix B. The evaluator will review the incremental costs and cost trends applied in the CalMTA cost-effectiveness model. The evaluator will determine, given recent market data and market conditions, if the cost assumptions are reasonable or need to be adjusted.

5 MTI evaluability map

This is a proposed evaluability map which shows baseline values (where available) and expected data sources the evaluator can use to assess each MPI and milestone. The evaluator is encouraged to make recommendations for improvement.

Table 6. MTI evaluability map

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
1 - Status of HPWH product and program support roadmaps	Roadmaps developed and ready for use by EOY 2028	Not started	Program documentation	MTI documentation; MTI staff, manufacturer, and partner program interviews
2 - Number of manufacturers partnering with CalMTA on Scale-Up Plans	Two or more manufacturers sign MOUs with CalMTA by EOY 2028	0	Program documentation (MOUs); manufacturer interviews	MTI documentation; manufacturer interviews
3 - Number of programs partnering with CalMTA on Scale-Up Plans	Two or more programs sign partnership agreements with CalMTA to provide ongoing support (funding, other) in specified submarket(s) by EOY 2028	0	Program documentation (partnership agreements); program partner interviews	MTI documentation; program partner interviews
4 - Number of energy efficiency partner organizations/programs that support integrated and split HPWHs, 120V and 240V HPWHs, and other HPWH solutions	Ten or more energy efficiency partner organizations/programs support integrated and split HPWHs, 120V and 240V HPWHs, and other HPWH solutions in their product offerings by mid-2032	0	Program partner materials; program partner interviews	Program partner materials; program partner interviews

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
5 - Supply chain partners support/participate in trainings and use tools/resources to match HPWH technologies to California housing stock	At least 50% of installers report using tools/resources to match HPWH technologies to their customers' homes by mid-2032	0	Manufacturer, distributor, and retailer interviews; installer surveys	Manufacturer and distributor interviews; installer surveys
EQ5 - Supply chain partners working in ESJ communities support/participate in trainings and use tools/resources to match HPWH technologies to California housing stock	At least 50% of installers working in ESJ communities report using tools/resources to match HPWH technologies to their customers' homes by mid-2032	0	Manufacturer, distributor, and retailer interviews; installer surveys	Manufacturer and distributor interviews; installer surveys
6 - Percentage of installers who report they have suitable HPWH solutions for most of their customers' homes	50% of installers report they have suitable HPWH solutions for most of their customers' homes by mid-2032	0	Installer surveys	Installer surveys; program partner and supply chain interviews/surveys (re: training and tool resources offered)
EQ6 - Percentage of installers working in ESJ communities who report they have suitable HPWH solutions for most of their customers' homes	50% of installers working in ESJ communities report they have suitable HPWH solutions for most of their customers' homes by mid-2032	0	Installer surveys	Installer surveys; program partner and supply chain interviews/surveys (re: training and tool resources offered)
7 - Number of manufacturers selling HPWHs that use lower GWP refrigerants to the California market	TREND: Increasing number of manufacturers (including historically dominant firms) selling HPWHs with lower GWP refrigerants in response to regulatory requirements and market forces	First year evaluation	Sales and shipment data; secondary data (manufacturer spec sheets); manufacturer interviews	Stakeholder, SME, and manufacturer interviews; MTI documentation (communications logs, presentations, and submissions to government agencies)
8 - Percentage of annual HPWHs installations in California that meet AHRI 1430 load shift requirements	TREND: Increasing percentage of HPWHs installed annually that meet	First year evaluation	Sales and shipment data; secondary data (manufacturer spec	Stakeholder, SME, program partner, and manufacturer interviews; MTI documentation

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
	AHRI 1430 load shift requirements		sheets); manufacturer interviews	(communications logs, presentations, and submissions to government agencies)
9 - Increased sales of HPWHs in early MTI-identified submarkets	15% increase in HPWH sales in two MTI-identified submarkets by EOY 2029	First year evaluation	Program partner interviews; program partner incentive data; CalMTA data	Analysis of program partner incentive data trends; sales and shipment data; program partner and manufacturer interviews; installer surveys
10 - Percentage of installers who feel confident recommending and installing HPWHs in their customers' homes	35% of installers working in early MTI-identified submarkets feel confident recommending and installing HPWHs in their customers' homes by EOY 2029 50% of installers feel confident recommending and installing HPWHs in their customers' homes by mid-2032	First year evaluation	Installer surveys	Installer surveys; program partner and manufacturer interviews
11 - Total installed cost of HPWHs in MTI-identified submarkets	Average of 15% decrease in installed HPWH costs in MTI-identified submarkets by EOY 2029	Installed cost (equipment + labor): $5,000 to $6,900 without	Installer surveys; secondary data and literature review	Program partner interviews; installer surveys

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
		electrical upgrades[21]		
EQ11 - Total installed cost of HPWHs in ESJ communities within MTI-identified submarkets	Average of 15% decrease in installed HPWH costs in ESJ communities within MTI-identified submarkets by EOY 2029	TBD	Installer surveys; distributor and retailer interviews; secondary data and literature review	Program partner interviews; distributor and retailer interviews; installer surveys
12 - Price parity across retail and distributor channels throughout California	Average HPWH retail price within 10% of average distributor price by mid-2032	First year evaluation	Secondary data; retail web search; manufacturer, distributor, and retailer interviews; installer surveys	Retailer interviews; program partner interviews
13 - Percentage of HPWHs sold through the retail channel	TREND: Increasing percentage of HPWHs sold through the retail channel	First year evaluation	Sales and shipment data; retailer interviews	Sales data; retailer surveys; program partner interviews
14 - Number of HPWHs shipped to California annually	TREND: Increasing number of HPWHs shipped to California annually	43,000	Shipment data	Analysis of shipment data trends; manufacturer, SME, and stakeholder interviews
15 - Percentage of water heaters installed annually in existing residential homes that are HPWHs (market share)	32% of all water heaters installed annually in existing homes are HPWHs by mid-2032 • 11% of water heaters installed annually in	4%[22]	Sales and shipment data	Analysis of sales and shipment data trends; program partner and manufacturer interviews; installer surveys

[21] Based on inputs to CalMTA's cost-effectiveness modeling, using values for a 65-gallon tank.

[22] Table 13 in the Market Characterization Report shows the rounded value of 4%. This value is slightly more precise and is calculated from values in Table 12 in the Market Characterization Report, which show 25,429 HPWHs sold for residential retrofits in 2024 out of 669,423 total in-unit residential water heaters sold in 2024.

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
	existing homes as replacements for gas water heaters are HPWHs by mid-2032 35% of water heaters installed annually in existing homes are HPWHs by mid-2037 • 16% of water heaters installed annually in existing homes as replacements for gas water heaters are HPWHs by mid-2037			
EQ15 - Percentage of water heaters installed annually in existing residential homes in ESJ communities that are HPWHs	32% of water heaters installed annually in existing homes in ESJ communities are HWPHs by mid-2032 • 11% of water heaters installed annually in existing homes in ESJ communities as replacements for gas water heaters are HPWHs by mid-2032	4%[23]	Sales and shipment data	Analysis of sales and shipment data trends; program partner and manufacturer interviews; installer surveys

[23] The HPWH MTI Market Characterization Report did not break out the share of HPWHs going into existing homes in ESJ communities from market share of HPWHs going into existing homes overall, so CalMTA assumes the two baseline values are the same.

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
	35% of water heaters installed annually in existing homes in ESJ communities are HPWHs by mid-2037 • 16% of water heaters installed annually in existing homes in ESJ communities as replacements for gas water heaters are HPWHs by mid-2037			
16 - Percentage of active California programs aligned on CalMTA-identified definition of qualified HPWH products	At least 50% of active programs in California aligned on qualified HPWH product definition by mid-2029	First year evaluation	Program partner materials review	MTI staff and program partner interviews; program partner materials review
17 - Percentage of active California programs using shared messaging about HPWH benefits	At least 50% of active programs in California use shared messaging about HPWH benefits by mid-2029	First year evaluation	Program partner materials review	MTI staff and program partner interviews; program partner materials review
18 - Status of Market Intelligence Hub	Market Intelligence Hub developed, tested, and ready for use by mid-2029	Not started	Program documentation	MTI staff interviews
19 - Percentage of manufacturers, medium and regional retailers, and program partners, that contribute to the Market Intelligence Hub and use data from the hub	Majority of manufacturers, medium and regional retailers, and program partners, contribute data to the Market Intelligence Hub by mid-2032	0	Salesforce communications logs; program documentation: Market Intelligence Hub review; stakeholder, SME, MTI staff, program	Stakeholder, SME, MTI staff, program partner, and market actor interviews and surveys; Market Intelligence Hub

MPI	Program Milestone	Baseline	Data Source - MPI	Data Source - Causality
			partner, and market actor interviews and surveys	
EQ19 - Percentage of manufacturers, medium and regional retailers, and program partners working in ESJ communities that contribute to the Market Intelligence Hub and use data from the hub	Majority of medium and regional retailers and program partners working in ESJ communities contribute data to the Market Intelligence Hub by mid-2032	0	Salesforce communications logs; program documentation: Market Intelligence Hub review; stakeholder, SME, MTI staff, program partner, and market actor interviews and surveys	Stakeholder, SME, MTI staff, program partner, and market actor interviews and surveys; Market Intelligence Hub
20 - Market actors and programs demonstrate they value the Market Intelligence Hub by using it	Two or more market actors or programs demonstrate they value the Market Intelligence Hub by requesting or agreeing to use it by mid-2032	0	Salesforce communications logs; stakeholder, SME, MTI staff, program partner, and market actor interviews	Stakeholder, SME, MTI staff, program partner, and market actor interviews

6 Process Evaluation

The process evaluation component will assess how effectively CalMTA is implementing the HPWH MTI and identify opportunities to enhance MTI delivery. While market progress evaluation focuses on the changes occurring in the market, process evaluation examines how effectively CalMTA activities are being executed and why they are or are not achieving intended results. Process evaluation is essential for continuous improvement throughout the initiative's lifespan, enabling mid-course corrections that can strengthen market impact.

Process evaluation serves three primary purposes:

- **Assess implementation fidelity and quality**. Determine whether CalMTA activities are being executed as planned, implemented in a professional and effective manner, and reaching the MTI's target audiences in both non-ESJ and ESJ communities. The assessment includes:
  a) Evaluating whether CalMTA is effectively progressing development and deployment of planned tools
  b) Effectively engaging with market actors, program partners, and other stakeholders
  c) Leveraging resources developed by other organizations
  d) Supporting statewide programmatic messaging consistency
- **Identify implementation enablers and barriers**. Understand the factors that support or constrain effective program delivery in non-ESJ and ESJ communities. This includes examining resource allocation, partnership dynamics, market actor engagement patterns, and operational challenges that affect CalMTA's ability to influence market transformation.
- **Generate actionable recommendations for improvement**. Provide specific, evidence-based guidance for enhancing the MTI's delivery. Process evaluation findings should directly inform CalMTA's ongoing strategy refinement, activity planning, and resource reallocation decisions.

The evaluator will conduct process evaluations on an ongoing basis throughout the MTI lifecycle, with more frequent assessments, as needed, to understand the effectiveness of market interventions and enable responsive adaptation to emerging challenges. The process evaluation will cover the key MTI components described in the following subsections and other MTI components the evaluator recommends.

6.1 MTI Roadmaps, tools, and data hub

The process evaluation will assess the development, utility, and utilization of these HPWH MTI elements:

- Product roadmap
- Program support roadmap
- Market segment opportunity assessment tool
- Marketing and messaging tools
- Market Intelligence Hub

For each element, the evaluator will assess:

- Is development/completion occurring according to schedule?
- As designed, does the element fulfill its intended purpose according to the PTLM?[24] How, if at all, does this differ between non-ESJ and ESJ communities?
- Are there technical or usability barriers inhibiting the element's use? How, if at all, do the barriers differ between non-ESJ and ESJ communities?
- Are there data/information limitations inhibiting the element's usefulness? How, if at all, do the limitations differ between non-ESJ and ESJ communities?

In addition, for the Market Intelligence Hub, the evaluator will assess for non-ESJ and ESJ program partners and market actors:

- Are program partners and market actors aware of the hub?
- Are program partners and market actors contributing data to the hub?
- Are they using information from the hub? How?
- What features or data would increase program partners' and market actors' use of the hub? How could CalMTA make the hub more useful?
- What would increase program partners' and market actors' likelihood of contributing data to the hub?

Ensuring these MTI elements are complete, credible, and easy to understand and use is critical to the success of the HPWH MTI's strategy. CalMTA encourages the evaluator to recommend improvements to each of the elements.

6.2 Engagement and coordination with manufacturers

The process evaluation will assess the extent to which CalMTA successfully engages with HPWH manufacturers and works with them to ensure HPWHs with appropriate form factors are

[24] If, based on its PTLM review as described in Section 3, the evaluator identifies needed revisions to the PTLM, this line of questioning would focus on whether the element is useful and important to transforming the residential water heating market to support increased and accelerated HPWH adoption.

available—initially in early CalMTA-identified submarkets and eventually across the state. The evaluator will examine manufacturers' motivations for engaging with CalMTA and identify barriers preventing broader manufacturer participation. Additionally, the evaluator will explore manufacturers' training offerings and tools. This will include the potential to integrate housing characteristics-to-HPWH technology mappings into the trainings/tools. The evaluator will also investigate manufacturers' plans for integrating lower GWP refrigerants and AHRI 1430-compliant load flex capabilities in their HPWH product lines.

6.3 Engagement and coordination with PA partners

The evaluator will examine whether CalMTA's engagement activities are facilitating productive connections, information exchange, and partnership agreements with administrators of other programs, including CBOs and other partners in ESJ communities, in California.

The evaluator will investigate PAs' motivations for engaging with CalMTA, identify barriers preventing broader participation, and document patterns to reveal potential regional, demographic, or other gaps. The evaluator will pay special attention to whether CalMTA is reaching ESJ communities adequately and, if not, identify barriers that are inhibiting coordination with programs in these communities.

The evaluator will also study the value CalMTA delivers by leveraging other HPWH programs' product requirements, training and educational resources, and messaging about HPWH benefits, and aligning them across markets throughout the state.

6.4 Coordination with stakeholders and SMEs

The evaluator will examine how CalMTA coordinates with complementary efforts, including California state agencies involved with decarbonization and residential building codes, the Northwest Energy Efficiency Alliance's Advanced Water Heating Specification, U.S. Department of Energy research programs, and industry association activities such as those of AWHI. This assessment will determine whether CalMTA is successfully leveraging synergies, avoiding duplication, and positioning itself as a valued partner within the broader ecosystem of organizations advancing residential HPWHs.

The assessment will also address CalMTA's coordination with stakeholders and SMEs on addressing data and research gaps (e.g., California housing stock and its fit for HPWH technologies) and sharing actionable and timely findings.

6.5 Installer and consumer experiences

The process evaluation will gather and analyze information about installer and consumer experiences with purchasing, installing, and using HPWHs. For each of these topics, the evaluator will compare installer and consumer experiences in non-ESJ communities to those in ESJ communities, identify differences between non-ESJ and ESJ respondents, and where possible, explore likely reasons for those differences.

The installer-focused portion of the process evaluation will cover installers' awareness of HPWHs, training received and use of resources addressing HPWH technology-to-home matching, frequency of recommending and installing HPWHs, reasons HPWHs may be deemed not fit-for purpose, equipment and installation costs, the effectiveness of health-framed messaging (e.g., combustion-free, indoor air quality), and other topics the evaluator deems appropriate.

The consumer-focused portion of the process evaluation will cover consumers' awareness of HPWHs, receptivity to HPWH adoption, and awareness of HPWH rebates. For recent water heater purchasers, the evaluation will assess purchasing motivations, perceived availability of HPWHs, and decision-making influences/processes. Specifically for recent HPWH purchasers, the evaluation will assess consumers' purchase installation experiences and post-installation experiences with their HPWHs, among other topics.