Application No.:	24-12-XXX (CalMTA)
Exhibit No.:	MTA-05
Witness:	Karen Horkitz
Commissioner:	
ALJ:	

CALIFORNIA MARKET TRANSFORMATION ADMINISTRATOR

PREPARED TESTIMONY OF KAREN HORKITZ

EXPECTED COSTS AND BENEFITS OF PROPOSED
MARKET TRANSFORMATION INITIATIVES

Application 24-12-XXX
California Market Transformation Administrator (CalMTA)

December 20, 2024

MTA-05
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A. Overview

Q. 1. *What is the purpose of your testimony in this Application?*

A. 1. As indicated in my Statement of Qualifications, I am a market transformation evaluation expert and principal consultant at KSH Advising LLC and work as the Lead of Market Research and Evaluation for CalMTA. In my role, I led the efforts to forecast the benefits and cost-effectiveness of the two MTIs proposed by CalMTA for Commission approval in this Application. My testimony addresses the expected costs and benefits resulting from approval and funding of the Room Heat Pump and Induction Cooking MTI Plans.

CalMTA applied California and Market Transformation (MT) industry best practices to forecast the benefits of these two Market Transformation Initiatives (MTIs) using total system benefits (TSB). Cost effectiveness was determined using the total resource cost (TRC) test, program administrator cost (PAC) test, and societal cost test (SCT). The analysis, as summarized in this testimony and detailed in Appendix B of the MTI Plans, demonstrates that investment in these two MTIs is forecast to cost-effectively generate more than $1 billion in incremental life cycle TSB.[1] I also provide a summary of the methodology used to determine benefits and cost effectiveness for the MTIs, including the three

[1] The forecasted benefits are incremental to CalMTA's forecast of verified benefits associated with energy efficiency program claims reported in CEDARS. Appendix B to the MTI Plan provides details of how verified PA benefits were forecasted.

modifications anticipated and described in D.19-12-021 and how this methodology differs from traditional energy efficiency cost-effectiveness forecasting.

B. Value of Proposed MTIs to California

Q. 2. *What are the combined incremental TSB and cost-effectiveness ratios for the two MTIs in this application, and how were these combined values calculated?*

A. 2. CalMTA calculates a combined TSB of $1.1 billion for the Induction Cooking and Room Heat Pump MTIs. CalMTA forecasts a life cycle TRC benefit-cost ratio of 2.20, a PAC benefit-cost ratio of 10.56, and an SCT ratio of 5.22 for the combined MTIs.[2] As is the case with other statewide energy efficiency (EE) programs funded by the ratepayers of California's investor-owned utilities (IOUs), these estimates include only those benefits that would occur within the service territories of the IOUs.[3]

Combined TRC is calculated as the sum of the TRC life cycle benefits that the two MTIs will deliver divided by the sum of the costs associated with achieving those benefits for both MTIs. Similarly, the combined PAC is calculated as the sum of the PAC life cycle benefits that the two MTIs will deliver divided by the sum of the costs for both MTIs. Combined SCT is calculated using the same

[2] SCT ratio calculated using base case values provided in the avoided cost calculator workbook – electric - https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/demand-side-management/acc-models-latest-version/2024-acc-electric-model-v1b.xlsb. Note: SCT using "high case" values was not appreciably different (5.21), so only base case values are reported.

[3] Per OP 16 of D.10-04-029, it is standard practice to include only benefits accrued in the service territories of the IOUs in the cost-effectiveness calculations for statewide energy efficiency programs.

approach—the sum of the SCT life cycle benefits that the two MTIs will deliver divided by the sum of the costs for both MTIs.

Q. 3. *What additional TSB benefits will these MTIs deliver to California outside of the IOU service territories?*

A. 3. The two MTIs in this Application will deliver an estimated additional $363 million in statewide TSB, beyond the $1.1 billion TSB noted above. Additional details of the methodology used to develop the statewide analysis are provided in Appendix B of each MTI Plan.

Q. 4. *Did D.19-12-021 set a cost-effectiveness threshold for MTIs?*

A. 4. Decision 19-12-021 did not impose an MTI cost-effectiveness threshold. Rather, the expected cost-effectiveness of each MTI will be considered as one of many factors in selection of the MTI portfolio.[4] However, CalMTA is expected to manage the cost-effectiveness of the market transformation portfolio as a whole, with an eye toward increasing cost-effectiveness of the entire portfolio over the long term.[5]

Q. 5. *Why did CalMTA use TRC, PAC, SCT, and TSB and the schedule of cost-effectiveness as the metrics to demonstrate the value of the proposed MTIs?*

A. 5. Ordering Paragraph (OP) 10 of D.19-12-021 directs CalMTA to report the expected costs and benefits of each MTI proposed by CalMTA according to the TRC and PAC tests and to include costs and benefits associated with related

[4] D.19-12-021, p.87.

[5] D.19-12-021, p.131.

development and implementation of building codes and appliance standards, if applicable.[6]

At the time of D.19-12-021, the TRC and PAC tests used energy and peak demand savings as the benefit metric. However, in D.21-05-031, the Commission adopted a new single benefits metric, TSB, which is an expression (in dollar terms) of the life cycle energy, capacity, and greenhouse gas (GHG) benefits. TSB uses the savings and load shape of the MTI measure(s) and applies the hourly values for energy, capacity, and GHG compliance costs from the Avoided Cost Calculator (ACC) to understand the total net system benefits from an energy efficiency resource. TSB allows portfolios to be better optimized to capture all the benefits of energy efficiency. D.21-05-031 ordered the TSB metric to replace energy and peak demand savings goals as the single goals metric (though portfolio outcomes will continue to be reported in terms of energy and peak demand savings, as well). Therefore, CalMTA has used TSB to demonstrate the benefit of the MTIs and as input to the TRC and PAC tests.

More recently, in D.24-07-015, the Commission adopted the SCT as an additional information-only cost-effectiveness Distributed Energy Resource test and set values for the social discount rate, a statewide air quality adder, base and high values for the social cost of carbon (SCC), and a value for methane leakage. D.24-07-015 orders that by April 1, 2025, program administrators (PAs) shall be required to submit SCT test results with both the base and high SCC values for all proceedings that use the 2024 ACC (or future ACCs), except where directed otherwise by statute or Commission decision. After that date, all Commission activities will review and consider the SCT results.

[6] Costs and benefits associated with building codes and appliance standards are not applicable to the two MTIs included in this application.

Q. 6 . *What are the life cycle TRC, PAC, and SCT forecasts for room heat pumps?*

A. 6. CalMTA forecasts a life cycle TRC benefit-cost ratio of 330.15 and a PAC benefit-cost ratio of 8.29 for the Room Heat Pumps MTI. The high TRC ratio is driven by negative incremental measure costs (IMCs) for some use cases; the present value of total MTI costs is positive but small, resulting in a very high benefit-cost ratio. CalMTA calculated this value using the negative IMCs, per the CPUC's Energy Division guidance memo that required negative IMCs to be entered into Cost Effectiveness Tool (CET) and not set to zero.[7] For informational purposes, we also calculated an "adjusted" TRC ratio by setting negative IMCs to zero: the "adjusted" TRC value is 5.46.

CalMTA also calculated TSB and cost-effectiveness using the SCT—for informational purposes. CalMTA forecasts $1.4 billion in incremental life cycle TSB, using the SCT calculations, resulting from the Room Heat Pump MTI, and an associated life cycle SCT ratio of (30.24) with negative IMCs and "adjusted" SCT value of 11.2 with IMCs set to zero. The SCT benefit-cost ratio is negative because the present value of MTI costs remains negative when discounted at the lower SCT discount rate.[8]

Q. 7. *What is the TSB forecast for room heat pumps?*

A. 7. CalMTA forecasts $521 million in incremental life cycle TSB resulting from the Room Heat Pumps MTI. Documentation of inputs and assumptions used to estimate this value are included in the MTI Plan Appendix B.

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[7] See CPUC Energy Division Guidance on the use of Negative IMCs in the CET for Non-fuel Substitution Measures: https://cedars.cpuc.ca.gov/deer-resources/deemed-measure-packages/guidance/resource/9/history/.

[8] The higher TRC discount rate discounts the negative IMCs to the point that the present value of total MTI costs is positive.

Q. 8. *What are the life cycle TRC, PAC, and SCT forecasts for induction cooking?*

A. 8. CalMTA forecasts a life cycle TRC benefit-cost ratio of 1.12 and a PAC benefit-cost ratio of 14.36 for the Induction Cooking MTI.

CalMTA also calculated TSB and cost-effectiveness using the SCT—for informational purposes. CalMTA forecasts $2.3 billion in incremental life cycle TSB resulting from the Induction Cooking MTI, and an associated SCT ratio of 3.04.

Q. 9. *What is the TSB forecast for induction cooking?*

A. 9. CalMTA forecasts $537 million in incremental life cycle TSB resulting from the Induction Cooking MTI.

Q. 10. *What methodologies, tools, and assumptions were used to come up with the cost-effectiveness and TSB forecasts for the room heat pumps and induction cooking initiatives?*

A. 10. The CET is the Commission's publicly available tool used to assess cost-effectiveness of EE programs in California. However, CalMTA developed an in-house Excel-based version of CET because CET-16 does not currently support a custom 8,760 loadshape, which is required to calculate cost-effectiveness for the Room Heat Pump and Induction Cooking MTIs. The CET also condenses the ACC values into quarterly profiles and only the averaged quarterly results of the vector multiplication of the end-use load shape by the avoided costs are stored in

the CET.[9] To ensure methodological consistency with the approach used by CET, CalMTA did the following:

- Developed its cost-effectiveness model in accordance with CPUC Energy Division guidance documents regarding cost-effectiveness calculations.[10]
- Used the electric and gas avoided cost workbooks in the 2024 version of the ACC. [11]

In addition, CalMTA's in-house cost-effectiveness calculator enables these additional analytical advantages:

- Perform comprehensive QA/QC on calculations, including those resulting from the custom loadshapes.
- Develop the cost-effectiveness "schedule," as requested by D.19-12-021.[12]

[9] California Public Utilities Commission (CPUC) staff-level guidance provides a high-level overview of how to calculate TSB using the CET and a detailed step-by-step guide for performing these calculations. Total System Benefit Technical Guidance, V E R S I O N 1 . 1, August 16, 2021. https://pda.energydataweb.com/api/view/2530/DRAFT%20TSB%20Tech%20Guidance%20081621.pdf

[10]The California Standard Practice Manual, Economic Analysis of Demand-Side Programs and Projects (October 2001) identifies the cost and benefit components and cost-effectiveness calculation procedures for Program Administrator Cost (PAC), and Total Resource Cost (TRC) tests. https://www.cpuc.ca.gov/-/media/cpuc-website/files/uploadedfiles/cpuc_public_website/content/utilities_and_industries/energy_-_electricity_and_natural_gas/cpuc-standard-practice-manual.pdf

[11] 2024 Distributed Energy Resources Avoided Cost Calculator Documentation For the California Public Utilities Commission https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/demand-side-management/acc-models-latest-version/updated-2024-acc-documentation-v1b.pdf; Electric and Gas Models as of September 2024 https://www.cpuc.ca.gov/dercosteffectiveness

[12] The cost-effectiveness schedule shows the MTI cost effectiveness forecast as of 2030, 2035, and 2045, along with the incremental investment required for each period, to achieve those results.

- Update cost-effectiveness forecast calculations more quickly and easily, as new market data become available.
- Calculate the SCT forecast, which the CET does not currently calculate.
- Extend the analysis to include the full measure Effective Useful Life (16 years) for induction cooking, for the duration of Phase III of the MTI.

Complete documentation of cost-effectiveness model assumptions and sources is provided in the MTI Plan's Appendix B, Market Forecasting and Cost-Effectiveness Modeling Approach.

Q. 11. *Are the methodologies, tools, and assumptions used consistent with what is considered "best or standard practices" for forecasting cost-effectiveness, market adoption, and energy savings for MT programs? Are they used by other organizations that are focused on MT?*

A. 11. Yes. The approaches CalMTA uses to forecast market adoption, energy savings, and cost-effectiveness are consistent with standard/best practice for MT programs. The same approaches are used by the Northwest Energy Efficiency Alliance (NEEA), which is the most established market transformation organization in the United States. NEEA has been using these same approaches for more than 20 years. More recently, the New York State Energy Research and Development Authority, Minnesota Center for Energy and the Environment's Efficiency Technology Accelerator program, and Illinois investor-owned utilities have invested in MT program portfolios and are also using these approaches.

Q. 12. *How do the methodologies used to develop the cost-effectiveness and TSB forecasts for the MTIs differ from traditional EE cost-effectiveness forecasting?*

A. 12. Per D.19-12-021, CalMTA uses the same methodologies to calculate cost-effectiveness that are used for traditional EE programs, with a few narrowly focused but notable modifications intended to align with the longer-term nature of MT efforts.[13] These modifications are summarized in Table 1, which also appears in the CalMTA MTI Evaluation Framework included in Attachment 3 to Testimony.[14]

[13] See D.19-12-021, Section 7: Market Transformation Cost-Effectiveness Framework, p. 129. Section 14.1 of the framework addresses the need to modify three elements of the cost-effectiveness calculations – one of which is the timeframe of costs and benefits. These elements were identified in Prahl, Ralph, and Ken Keating. December 9, 2014. Building a Policy Framework to Support Energy Efficiency Market Transformation in California. MT_Policy White_Paper_final_Dec 9 2014.doc (live.com), which the decision references.

[14] MTI Evaluation Framework - CalMTA. CalMTA developed the MTI Evaluation Framework based on the direction and guidance in the Decision. After creating a draft document, CalMTA shared the draft document with the MTAB and presented and discussed the Framework at two MTAB meetings. Following the discussion at the MTAB meetings, CalMTA posted the draft Framework on pda.energydataweb.com for public comment. Subsequent MTAB discussions focused on reaching consensus on two key issues: MTI attribution approach; and oversight of third-party evaluation. The final MTI Evaluation Framework reflects the consensus on those topics and other input.

TABLE 1: Comparison of Cost-Effectiveness Calculation for Resource Acquisition Programs vs. MTIs

Cost-Effectiveness Calculation Elements	CA SPM Approach for Resource Acquisition Programs	Approach for MTIs
Codes & Standards Savings	Excluded	Included for MTIs that are proposed to lead to a code or standard[15]
Timeframe of Forecasted Costs and Benefits (to support adoption decision)	Program funding period	Life Cycle of MTI [a]
Net-to-Gross Methodology (Incremental Impact)	Net impacts = (Total units * unit energy impacts [UEI]) * NTG ratio [NTG Ratio = 1 – FR ratio + SO ratio + ME ratio]	Net Incremental MTI impacts = [(TMA units – BMA units) * UEI] – PA-verified impacts
Incremental Costs	Typically remain static	Typically decline over time

[a] CalMTA will forecast 20 years forward from the current period and will continue accruing costs and savings from the date of inception for the MTI.

i. **Codes and Standards Savings.** The Decision orders CalMTA to include the MTI costs and benefits associated with development and implementation of building codes and appliance standards.[16] The MT Cost-Effectiveness framework provides specific guidance on the methodology for including projected savings.[17] Neither the Room Heat Pumps or Induction Cooking MTIs include savings associated with codes or standards.

[15] CalMTA will work closely with the C&S teams during the process of selecting and developing MTIs to ensure the work is additive to their existing efforts.

[16] See D.19-12-021, p. 91.

[17] See D.19-12-021, p. 130.

ii. **Timeframe of Forecasted Costs and Benefits.** MTIs seek to increase and accelerate market adoption by deliberately inducing structural market changes that produce sustained market effects. It typically takes 5 to 15 years to achieve the structural market changes that must occur before market barriers are sufficiently addressed to allow acceleration of market adoption. For this reason, it is important to assess the return on MTI investment over a longer time horizon than what is used for traditional EE programs, as called out in D.19-12-021. Because a majority of MTI incremental impacts occur after the bulk of the investment has been made, to accurately assess the return on investment of an MTI, the assessment timeframe must extend through the full initiative life cycle, per the MT Framework adopted by D.19-12-021.

To appropriately align with the long-term investment profile, CalMTA forecasts incremental impacts for 20 years from the beginning of Phase III as the basis for estimating the incremental TSB and cost-effectiveness of MTIs. This is different than for RA programs, which have a primary purpose of delivering cost-effective avoided cost benefits to the electricity and natural gas systems[18] and only consider incremental impacts during the period during which incentives are being paid.

iii. **Net-to-Gross Methodology (Net Incremental Impact).** The MT Cost-Effectiveness Framework (See Section 7 of the Adopted MT Framework in D.19-12-021) notes the importance of evaluating the incremental impact of MTIs – that is, the impact above and beyond what would have happened in the absence of the MTI. Decision 19-12-021 directed CalMTA to consider and reach consensus on the best approach to attribute savings to each

[18] See D.21-05-031, p. 14.

MTI versus other programmatic efforts.[19] CalMTA comprehensively reviewed the work of CAEECC's MT Evaluation Working Group on this topic and discussed it extensively with the MTAB during development of CalMTA's MTI Evaluation Framework. The discussion, consideration process, and consensus agreement is detailed in the MTI Evaluation Framework and summarized in Table 1.

To arrive at MTI incremental impacts, CalMTA will subtract adoption associated with verified savings from EE PAs for the same products included in CalMTA's MTIs. Therefore, to develop the TSB and cost-effectiveness values for each MTI, CalMTA had to develop a forecast for adoption that would be attributed to EE PAs over the 20-year Market Deployment (Phase III) of each MTI. Appendix B to each MTI Plan describes the specific methodology used to estimate future PA-verified impacts.

iv. **Incremental Costs.** This difference was not mentioned in D.19-12-021, but it is a characteristic of MT programs that is considered in cost-effectiveness forecasts for emerging technologies. Appendix B to each MTI Plan described the specific methodologies used to estimate incremental costs over time.

CalMTA uses these same methodologies and tools as traditional EE programs:

- Cost-effectiveness calculations are based on the framework in the California Standard Practice Manual (CA SPM), with the modifications appropriate to market transformation programs noted above.

[19] See D. 19-12-021, p. 74.

- Cost-effectiveness calculations are based on values specified in the ACC.
- When available, CalMTA uses deemed values for unit energy savings from the Database of Energy Efficiency Resources and electronic Technical Reference Manual.

CalMTA's approach adheres to well-established approaches to evaluating the impact of market transformation programs, including these:

- CalMTA develops preliminary estimates of TSB and cost-effectiveness according to the TRC and PAC tests, during Phase I Concept Development of the MTI life cycle.
- During Phase II Program Development, CalMTA develops more robust TSB and cost-effectiveness estimates, which are thoroughly documented in Appendix B of the MTI Plans.
- These estimates require forecasting baseline market adoption (BMA), the counterfactual market adoption likely to occur absent the MTI, and total market adoption (TMA), the market adopted expected to occur if the MTI is funded and implemented.
- The MTI Evaluation Plans include an approach to tracking TMA over time, based on sales, shipment, and installation data from a variety of sources. These data are then used to "true up" the TMA forecast.
- Third-party evaluators will periodically review the forecasting model and documentation of assumptions, sources, and methods during Phase III Market Deployment.

Q. 13. *What methodologies, data sources, and assumptions were used to come up with the baseline market adoption and to forecast the total market adoption over the MTI's life cycle for Room Heat Pumps?*

A. 13. CalMTA developed the Room Heat Pump BMA and TMA forecasts by estimating parameters for a Gompertz model, a type of mathematical model that is frequently used to model market adoption of emerging technologies that are characterized by an "S-shaped" curve – that is, a slow initial phase, followed by exponential growth, and then a leveling off as saturation is approached.[20]

CalMTA took a multifaceted approach to estimating the model parameters for the BMA forecast, per the MTI Evaluation Framework. Insights were drawn from various sources, including data from secondary sources such as Energy Information Agency (EIA) Residential Energy Consumption Surveys (RECS), Delphi panel estimates and supporting comments, surveys of property managers and households (detailed in Appendix D, Baseline Market Characterization), and discussions with manufacturers. Specific data sources, assumptions, and parameter estimates are detailed in the Room Heat Pump MTI Plan Appendix B: Market Forecasting and Cost-Effectiveness Modeling Approach.

To forecast TMA (that is, the market adoption forecast assuming the Room Heat Pump MTI Plan is approved), CalMTA estimated the model parameters based on the market interventions, outcomes, and milestones specified in the MTI Plan. Specific data sources, assumptions, and parameter estimates are detailed in the Room Heat Pump MTI Plan, Appendix B: Market Forecasting and Cost-Effectiveness Modeling Approach.

Q. 14. *What methodologies, data sources, and assumptions were used to come up with the baseline market adoption and to forecast the total market adoption over the MTI's life cycle for Induction Cooking?*

[20] Kumar, R. R., Guha, P., & Chakraborty, A. (2022). Comparative assessment and selection of electric vehicle diffusion models: A global outlook. Energy, 238, 121932.

A. 14. CalMTA developed the Induction Cooking BMA and TMA forecasts using a stock-turnover model for existing homes (an estimated 95.5% of households over the MTI life cycle) and a new construction forecast for new homes (an estimated 4.5% of households over the MTI life cycle).

Stock turnover models forecast sales by considering replacement rates of existing products and are frequently used to inform inventory management for new products. CalMTA chose this modeling approach because it provides an appropriate basis upon which to forecast cooking equipment replacement and it leverages data available from a recent U.S. Department of Energy study that forecast adoption of electric residential cooking equipment.[21]

CalMTA took a multifaceted approach to developing model inputs and assumptions for the BMA forecast, per the MTI Evaluation Framework. Insights were drawn from various sources, including data from secondary sources such as EIA RECS 2020, American Community Survey 2022, the California Department of Finance, surveys of property managers and households (detailed in Appendix D, Baseline Market Characterization), industry expert opinions, and market actor interviews. Specific data sources, assumptions, and estimation methods are detailed in the Induction Cooking MTI Plan, Appendix B: Market Forecasting and Cost-Effectiveness Modeling Approach.

To develop model inputs and assumptions for the TMA forecast (that is, the market adoption forecast assuming the Induction Cooking MTI Plan is approved),

[21] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program. (2022). Technical support document: Energy efficiency program for consumer products and commercial and industrial equipment: Consumer conventional cooking products. Retrieved October 24, 2024, from https://www.regulations.gov/document/EERE-2014-BT-STD-0005-0090.

CalMTA estimated the increase in qualified product replacement associated with the market interventions, outcomes, and milestones specified in the MTI Plan. Specific data sources, assumptions, and estimation methods are detailed in the Induction Cooking MTI Plan Appendix B: Market Forecasting and Cost-Effectiveness Modeling Approach.

Q. 15. *Does that conclude your testimony?*

A. 15. Yes.