

Application No.: 24-12-009 (CalMTA)  
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Exhibit No.: MTA-05-A  
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Witnesses: Karen Horkitz  
\_\_\_\_\_  
Commissioner: Matthew Baker  
\_\_\_\_\_  
ALJ: Julie A. Fitch  
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**ERRATA TO PREPARED DIRECT TESTIMONY OF  
KAREN HORKITZ  
Exhibit MTA-05**

Application 24-12-009  
California Market Transformation Administrator (CalMTA)

*June 27, 2025*

A.24-12-009 (CALMTA)  
 ERRATA TO CALMTA PREPARED DIRECT  
 TESTIMONY  
 Exhibit MTA-05-A  
 June 27, 2025

Pages	Lines	Errata
2	10, 12, 13; footnote 1	Updated combined TSB and cost-effectiveness values for the two MTIs: <ul style="list-style-type: none"> <li>• TSB: from \$1.1B to \$1.02B</li> <li>• TRC: from 2.20 to 2.11</li> <li>• PAC: from 10.56 to 10.15</li> <li>• SCT: from 5.22 to 5.06 (base) and from 5.21 to 5.05 (high)</li> </ul>
3	7-8	<ul style="list-style-type: none"> <li>• Updated additional statewide TSB from \$363M to \$350M</li> <li>• Updated combined TSB from \$1.1B to \$1.02B</li> </ul>
5	3, 4,11,13,14, 16,17,23	Updated values for RHP MTI: <ul style="list-style-type: none"> <li>• TRC: from 330.15 to 304.09</li> <li>• PAC: from 8.29 to 7.64</li> <li>• Adjusted TRC: from 5.46 to 5.03</li> <li>• Total incremental statewide societal benefits: from \$1.4B to \$1.3B</li> <li>• SCT: from 30.24 to 27.81</li> <li>• Adjusted SCT: from 11.2 to 10.3</li> <li>• TSB: from \$521M to \$480M</li> <li>• Spelled out “Total Societal Benefits” instead of calling it “TSB”, to avoid confusion</li> </ul>
Attachment 1		The changes in MTA-05-A (this errata) affect several pages in the Application and Appendix 1: RHP MTI Plan and Appendices. These changes are detailed in Table 1 of Attachment 1 <ul style="list-style-type: none"> <li>○ Table summarizing errata to 11 pages in Application and Application Appendix 1</li> <li>○ Redlined and clean pages from the Application documents</li> </ul>

## Redlined versions

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

4  
5 **B. Value of Proposed MTIs to California**

6  
7 Q. 2. *What are the combined incremental TSB and cost-effectiveness ratios for the two*  
8 *MTIs in this application, and how were these combined values calculated?*

9  
10 A. 2. CalMTA calculates a combined TSB of ~~\$1.1~~\$1.02 billion for the Induction Cooking  
11 and Room Heat Pump MTIs. CalMTA forecasts a life cycle TRC benefit-cost ratio  
12 of ~~2.202.11~~, a PAC benefit-cost ratio of ~~10.56~~10.15, and an SCT ratio of ~~5.225.06~~  
13 for the combined MTIs.<sup>1</sup> As is the case with other statewide energy efficiency  
14 (EE) programs funded by the ratepayers of California’s investor-owned utilities  
15 (IOUs), these estimates include only those benefits that would occur within the  
16 service territories of the IOUs.<sup>2</sup>

17  
18 Combined TRC is calculated as the sum of the TRC life cycle benefits that the two  
19 MTIs will deliver divided by the sum of the costs associated with achieving those  
20 benefits for both MTIs. Similarly, the combined PAC is calculated as the sum of  
21 the PAC life cycle benefits that the two MTIs will deliver divided by the sum of the  
22 costs for both MTIs. Combined SCT is calculated using the same

23  

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<sup>1</sup> 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~~)(~~5.05~~) so only base case values are reported.

<sup>2</sup> 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.

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

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

6  
7 A. 3. The two MTIs in this Application will deliver an estimated additional ~~\$363~~\$350  
8 million in statewide TSB, beyond the ~~\$1.1~~\$1.02 billion TSB noted above.  
9 Additional details of the methodology used to develop the statewide analysis are  
10 provided in Appendix B of each MTI Plan.

11  
12 Q. 4. *Did D.19-12-021 set a cost-effectiveness threshold for MTIs?*

13  
14 A. 4. Decision 19-12-021 did not impose an MTI cost-effectiveness threshold. Rather,  
15 the expected cost-effectiveness of each MTI will be considered as one of many  
16 factors in selection of the MTI portfolio.<sup>4</sup> However, CalMTA is expected to  
17 manage the cost-effectiveness of the market transformation portfolio as a whole,  
18 with an eye toward increasing cost-effectiveness of the entire portfolio over the  
19 long term.<sup>5</sup>

20  
21 Q. 5. *Why did CalMTA use TRC, PAC, SCT, and TSB and the schedule of cost-*  
22 *effectiveness as the metrics to demonstrate the value of the proposed MTIs?*

23  
24 A. 5. Ordering Paragraph (OP) 10 of D.19-12-021 directs CalMTA to report the  
25 expected costs and benefits of each MTI proposed by CalMTA according to the  
26 TRC and PAC tests and to include costs and benefits associated with related

27  

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<sup>4</sup> D.19-12-021, p.87.

<sup>5</sup> D.19-12-021, p.131.

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

2

3 A. 6. CalMTA forecasts a life cycle TRC benefit-cost ratio of ~~330.15~~304.09 and a PAC  
4 benefit-cost ratio of ~~8.297~~6.4 for the Room Heat Pumps MTI. The high TRC ratio  
5 is driven by negative incremental measure costs (IMCs) for some use cases; the  
6 present value of total MTI costs is positive but small, resulting in a very high  
7 benefit-cost ratio. CalMTA calculated this value using the negative IMCs, per the  
8 CPUC’s Energy Division guidance memo that required negative IMCs to be  
9 entered into Cost Effectiveness Tool (CET) and not set to zero.<sup>7</sup> For informational  
10 purposes, we also calculated an “adjusted” TRC ratio by setting negative IMCs to  
11 zero: the “adjusted” TRC value is ~~5.465~~0.3.

12

13 CalMTA also calculated Total Societal Benefits and cost-effectiveness using the  
14 SCT—for informational purposes. CalMTA forecasts ~~\$1.4~~\$1.3 billion in  
15 incremental life cycle TSB, using the SCT calculations, resulting from the Room  
16 Heat Pump MTI, and an associated life cycle SCT ratio of ~~(30.24)~~(27.81) with  
17 negative IMCs and “adjusted” SCT value of ~~11.2~~10.3 with IMCs set to zero. The  
18 SCT benefit-cost ratio is negative because the present value of MTI costs  
19 remains negative when discounted at the lower SCT discount rate.<sup>8</sup>

20

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

22

23 A. 7. CalMTA forecasts ~~\$521~~\$480 million in incremental life cycle TSB resulting from  
24 the Room Heat Pumps MTI. Documentation of inputs and assumptions used to  
25 estimate this value are included in the MTI Plan Appendix B.

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<sup>7</sup> 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/>.

<sup>8</sup> The higher TRC discount rate discounts the negative IMCs to the point that the present value of total MTI costs is positive.

CLEAN VERSION

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

4  
5 **B. Value of Proposed MTIs to California**

6  
7 Q. 2. *What are the combined incremental TSB and cost-effectiveness ratios for the two*  
8 *MTIs in this application, and how were these combined values calculated?*

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10 A. 2. CalMTA calculates a combined TSB of \$1.02 billion for the Induction Cooking and  
11 Room Heat Pump MTIs. CalMTA forecasts a life cycle TRC benefit-cost ratio of  
12 2.11, a PAC benefit-cost ratio of 10.15, and an SCT ratio of 5.06 for the combined  
13 MTIs.<sup>1</sup> As is the case with other statewide energy efficiency (EE) programs  
14 funded by the ratepayers of California’s investor-owned utilities (IOUs), these  
15 estimates include only those benefits that would occur within the service  
16 territories of the IOUs.<sup>2</sup>

17  
18 Combined TRC is calculated as the sum of the TRC life cycle benefits that the two  
19 MTIs will deliver divided by the sum of the costs associated with achieving those  
20 benefits for both MTIs. Similarly, the combined PAC is calculated as the sum of  
21 the PAC life cycle benefits that the two MTIs will deliver divided by the sum of the  
22 costs for both MTIs. Combined SCT is calculated using the same

23  

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<sup>1</sup> 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 (5.05) so only base case values are reported.

<sup>2</sup> 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.

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

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

6  
7 A. 3. The two MTIs in this Application will deliver an estimated additional \$350 million  
8 in statewide TSB, beyond the \$1.02 billion TSB noted above. Additional details of  
9 the methodology used to develop the statewide analysis are provided in  
10 Appendix B of each MTI Plan.

11  
12 Q. 4. *Did D.19-12-021 set a cost-effectiveness threshold for MTIs?*

13  
14 A. 4. Decision 19-12-021 did not impose an MTI cost-effectiveness threshold. Rather,  
15 the expected cost-effectiveness of each MTI will be considered as one of many  
16 factors in selection of the MTI portfolio.<sup>4</sup> However, CalMTA is expected to  
17 manage the cost-effectiveness of the market transformation portfolio as a whole,  
18 with an eye toward increasing cost-effectiveness of the entire portfolio over the  
19 long term.<sup>5</sup>

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

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

27  

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<sup>4</sup> D.19-12-021, p.87.

<sup>5</sup> D.19-12-021, p.131.

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

2

3 A. 6. CalMTA forecasts a life cycle TRC benefit-cost ratio of 304.09 and a PAC benefit-  
4 cost ratio of 7.64 for the Room Heat Pumps MTI. The high TRC ratio is driven by  
5 negative incremental measure costs (IMCs) for some use cases; the present  
6 value of total MTI costs is positive but small, resulting in a very high benefit-cost  
7 ratio. CalMTA calculated this value using the negative IMCs, per the CPUC's  
8 Energy Division guidance memo that required negative IMCs to be entered into  
9 Cost Effectiveness Tool (CET) and not set to zero.<sup>7</sup> For informational purposes,  
10 we also calculated an "adjusted" TRC ratio by setting negative IMCs to zero: the  
11 "adjusted" TRC value is 5.03.

12

13 CalMTA also calculated Total Societal Benefits and cost-effectiveness using the  
14 SCT—for informational purposes. CalMTA forecasts \$1.3 billion in incremental  
15 life cycle TSB, using the SCT calculations, resulting from the Room Heat Pump  
16 MTI, and an associated life cycle SCT ratio of (27.81) with negative IMCs and  
17 "adjusted" SCT value of 10.3 with IMCs set to zero. The SCT benefit-cost ratio is  
18 negative because the present value of MTI costs remains negative when  
19 discounted at the lower SCT discount rate.<sup>8</sup>

20

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

22

23 A. 7. CalMTA forecasts \$480 million in incremental life cycle TSB resulting from the  
24 Room Heat Pumps MTI. Documentation of inputs and assumptions used to  
25 estimate this value are included in the MTI Plan Appendix B.

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<sup>7</sup> 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/>.

<sup>8</sup> The higher TRC discount rate discounts the negative IMCs to the point that the present value of total MTI costs is positive.

**ATTACHMENT 1**  
**EXHIBIT MTA-05-A**

Table 1. Summary of Errata affecting the Application and Appendix 1 to the Application

Application Section	Pages	Errata
Application	p.16	Changed \$363 million to \$350M
	p.17	<ul style="list-style-type: none"> <li>• Updated Table 1 RHP values:                             <ul style="list-style-type: none"> <li>○ TSB: from \$521M to \$480M</li> <li>○ Total Societal Benefits: from \$1.4B to \$1.3B</li> <li>○ TRC: from 330.15/5.46 to 304.09/5.03</li> <li>○ PAC: from 8.29 to 7.64</li> <li>○ Base/High SCT, with negative IMCs: from (30.24)/(30.26) to (27.81)/(27.83)</li> <li>○ Base/High SCT, with negative IMCs set to zero: from 11.20/11.21 to 10.3/10.3</li> </ul> </li> <li>• Updated Table 1 combined values:                             <ul style="list-style-type: none"> <li>○ TSB: from \$1.1B to \$1.02B</li> <li>○ Total Societal Benefits: from \$3.7B to \$3.6B</li> <li>○ TRC: from 2.20 to 2.11</li> <li>○ PAC: from 10.56 to 10.15</li> <li>○ SCT: from 5.22 to 5.06 (base) and from 5.21 to 5.05 (high)</li> </ul> </li> </ul>
	p.18	<ul style="list-style-type: none"> <li>• Updated Figure 1 with revised TSB values</li> <li>• Updated the value of RHP non-refrigerant GHG TSB benefit from \$331M to \$321M</li> </ul>
Appendix 1: RHP MTI Plan	p. 9	Changed \$521M to \$480M
	p.12	<p>Updated TSB values in Table 1 and text, as follows:</p> <ul style="list-style-type: none"> <li>• Updated Total TSB value from \$521M to \$480M</li> <li>• Updated non-refrigerant TSB-GHG benefits from \$331M to \$321M</li> <li>• Updated TSB-Grid benefits from \$30M to \$28M</li> <li>• Updated TSB-Energy benefits from \$160M to \$143M</li> <li>• Added Table column showing TSB-GHG benefits associated with refrigerant impacts = (\$12M)</li> </ul> <p>Updated Cost-Effectiveness values in Table 1, as follows:</p> <ul style="list-style-type: none"> <li>• TRC: from 330.15/5.46 to 304.09/5.03</li> <li>• PAC: from 8.29 to 7.64</li> <li>• SCT: from (30.24)/(30.26) to (27.81)/(27.83) (base/high; with negative IMCs) and from 11.20/11.21 to 10.30/10.31 (base/high; with negative IMCs set to zero)</li> </ul>
	p.29	Updated TSB and Cost-Effectiveness values in text and in Tables 2 and 3, with same values detailed above on p.12.
Appendix 1: Appendix B	p.10	Updated TSB and Cost-Effectiveness values in text and in Tables 2 and 3, with same values detailed above on p.12 of the RHP MTI Plan.

to the RHP MTI Plan	p.41	<p>Updated Table 23, Unit Energy Savings, with corrected electric and gas savings for the “No Cooling” counterfactual equipment scenarios:</p> <ul style="list-style-type: none"> <li>• Changed single-family WHP electric savings (SDG&amp;E) from (607.6) kWh to (364.6) kWh</li> <li>• Changed single-family WHP gas savings (SDG&amp;E) from 85.2 therms to 51.1 therms</li> <li>• Changed single-family WHP electric savings (SCE) from (663.2) kWh to (397.9) kWh</li> <li>• Changed single-family WHP gas savings (SCE) from 98.5 therms to 59.1 therms</li> <li>• Changed single-family WHP electric savings (PGE) from (1244.8) kWh to (746.9) kWh</li> <li>• Changed single-family WHP gas savings (PGE) from 183.9 therms to 110.3 therms</li> </ul> <ul style="list-style-type: none"> <li>• Changed PHP single-family electric savings (SDG&amp;E) from (1097.5) kWh to (658.5) kWh</li> <li>• Changed PHP single-family gas savings (SDG&amp;E) from 85.2 therms to 51.1 therms</li> <li>• Changed PHP single-family electric savings (SCE) from (1191.7) kWh to (715.0) kWh</li> <li>• Changed PHP single-family gas savings (SCE) from 98.5 therms to 59.1 therms</li> <li>• Changed PHP single-family electric savings (PGE) from (2164.2) kWh to (1298.5) kWh</li> <li>• Changed PHP single-family gas savings (PGE) from 183.9 therms to 110.3 therms</li> </ul>
	p.43	<ul style="list-style-type: none"> <li>• Updated TSB values in text and in Table 24, with same values detailed above on p.12 of the RHP MTI Plan, including TSB components</li> <li>• Updated cost-effectiveness values in Table 25, with same values detailed above on p.12 of the RHP MTI Plan</li> </ul>
	p.44	<ul style="list-style-type: none"> <li>• Updated the RHP Cost-Effectiveness schedule in Table 26</li> <li>• Updated co-created and statewide TSB values in Table 27</li> </ul>
	p.67	<ul style="list-style-type: none"> <li>• Updated TSB and cost-effectiveness values in text and in Tables 1 and 2; changed TSB in the scenario that excludes fuel substitution from \$470M to \$429M</li> </ul>

## REDLINE CHANGES TO APPLICATION AND APPENDIX 1

interventions, they are not reflected in CalMTA’s TSB and cost-effectiveness forecasts because CalMTA will subtract out verified EE savings that the EE PAs claim for the same products included in the MTIs.

## **2. CalMTA’s Proposed MTIs are Cost-Effective and Deliver Substantial TSB to California Ratepayers.**

The two MTI Plans included in this Application initiate the beginning of an MT portfolio for California. As shown in Table 1, the combined MTIs result in over \$1 billion in cost-effective TSB that will be lost or substantially delayed if the initiatives do not move forward. As shown in Figure 1, the initial combined investment of \$92.6 million is concentrated in the first 7 to 10 years of the MTIs’ market deployment. Once structural market barriers are removed, this investment will continue to generate substantial incremental benefits for the following 10 years of the 20-year MTI market deployment without the need for ongoing investment and interventions. The TSB estimated in Table 1 does not reflect the full value of these initiatives to the State, as these MTIs will also generate an additional ~~\$363~~\$350 million in TSB beyond the IOUs’ service territories.

For more detailed information on the projected cost-effectiveness and TSB delivered by the individual MTI Plans, see the supporting testimony in Exhibit MTA-05 and Appendix B of each MTI Plan.

## **3. CalMTA’s Proposed MTIs will Support California and the Commission’s EE and Building Decarbonization Efforts and Result in Substantial GHG Emission Reductions and Energy Savings.**

In early 2019, the Commission opened the Building Decarbonization Rulemaking (R.19-01-011) to reduce GHG emissions from the building sector in California, which contribute approximately 24 percent of the state’s GHG emissions.<sup>50</sup> Components of reducing GHGs from the building sector are: 1) replacing natural gas with electricity as the fuel source for appliances that heat and cool spaces and water, or provide for cooking; and 2) encouraging customers to use the most-efficient versions of these appliances. CalMTA’s two proposed MTIs—Room Heat Pumps and Induction Cooking—further California’s decarbonization goals by accelerating adoption of increasingly efficient products and using electricity as their fuel source instead of natural gas.

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<sup>50</sup> See California Energy Commission’s 2021 Integrated Energy Policy Report (available at: TN241599\_20220222T093512\_Final 2021 Integrated Energy Policy Report Volume I Building Decarbonization.pdf).

**TABLE 1: Summary of Benefits and Cost Effectiveness of Room Heat Pump and Induction Cooking MTIs**

	Room Heat Pumps	Induction Cooking	Combined
TSB	<del>\$521</del> <u>\$480</u> Million	\$537 Million	<del>\$1.1</del> <u>\$1.02</u> Billion
SCT TSB	<del>\$1.4</del> <u>\$1.3</u> Billion	\$2.3 Billion	<del>\$3.7</del> <u>\$3.6</u> Billion
Estimated Costs			
Initiative/Concept Development (Phase II) Costs (2024-2025) <sup>51</sup>	\$3,681,000	\$3,950,000	\$7,631,000
Market Deployment (Phase III) Costs (2026-2045) <sup>52</sup>	\$59,128,000	\$33,477,000	\$92,605,000
Initial 5-Year MTI Costs	\$36,447,700	\$28,880,000	\$65,327,700
Cost Effectiveness Ratios			
TRC	<del>330.15</del> <u>304.09</u> <sup>53</sup> / <del>5.46</del> <u>5.03</u> <sup>54</sup>	1.12	<del>2.20</del> <u>2.11</u>
PAC	<del>8.29</del> <u>7.64</u>	14.36	<del>10.56</del> <u>10.15</u>
Base / High SCT	<del>(30.24</del> <u>27.81</u> ) <sup>55</sup> / <del>(30.26</del> <u>27.83</u> ) <sup>56</sup> <del>11.20</del> <u>10.3</u> / <del>11.21</del> <u>10.3</u> <sup>57</sup>	3.04/3.04 <sup>58</sup>	<del>5.22</del> <u>5.21</u> / <del>5.06</del> <u>5.05</u>

<sup>51</sup> Approved by the CPUC via CalMTA’s 2024 and 2025 Annual Budget Advice Letters. While not included in the MTI Plan or Application budget, these costs are included in the cost-effectiveness calculations to capture the full cost of MTI development and deployment

<sup>52</sup> Include in the Appendix H of each MTI Plan.

<sup>53</sup> The high TRC ratio is driven by negative incremental measure costs (IMCs) for some use cases, where the CPUC’s Energy Division provided guidance that negative IMCs should be entered into the Cost Effectiveness Tool (CET) and not set to zero. See CPUC Energy Division guidance memo, located here: <https://cedars.cpuc.ca.gov/deer-resources/deemed-measure-packages/guidance/resource/9/history/>.

<sup>54</sup> This TRC ratio set the negative IMCs to zero.

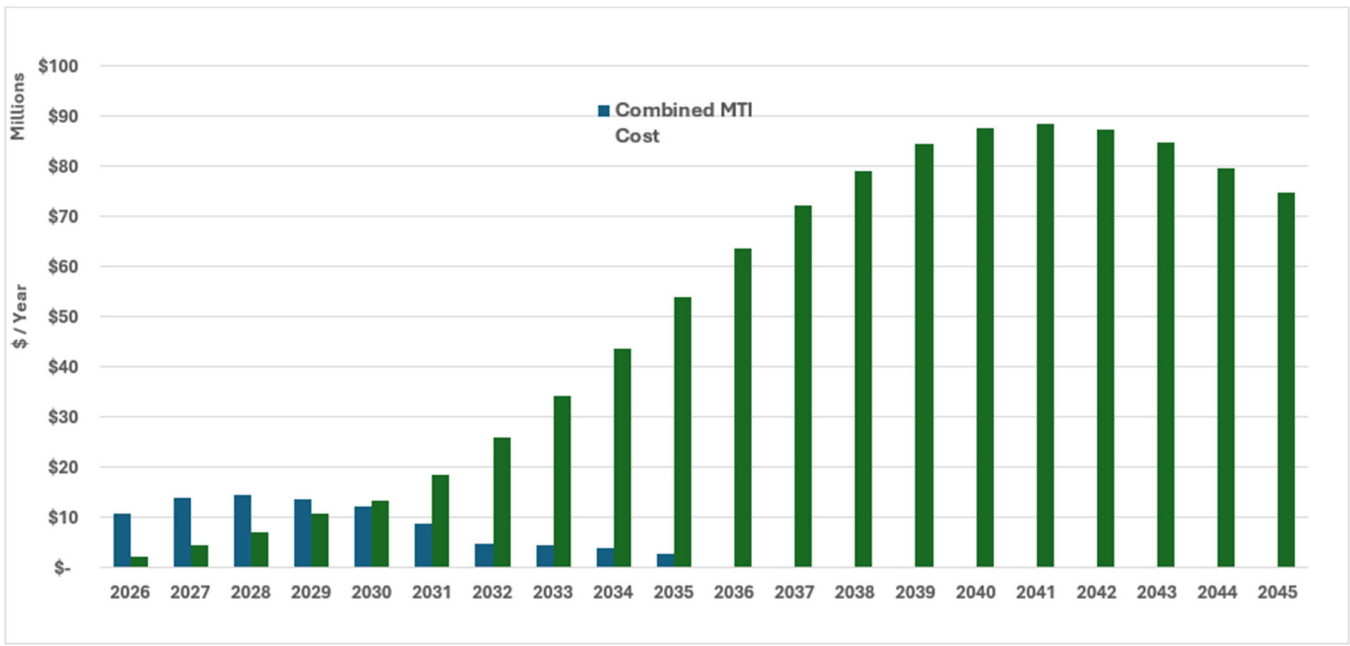
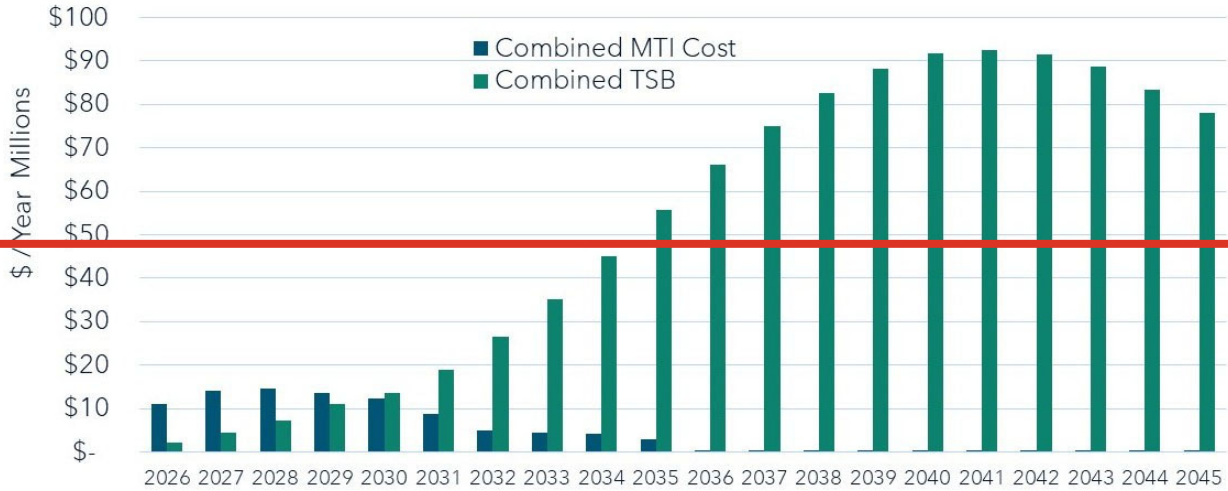
<sup>55</sup> Including negative IMCs as directed by the CPUC Energy Division Guidance memo results in a negative SCT.

<sup>56</sup> D.24-07-015 adopted the SCT for information purposes and included two values for the societal cost of carbon, a base and high case.

<sup>57</sup> This SCT ratio set the negative IMCs to zero.

<sup>58</sup> For the Induction Cooking MTI, the SCT ratios using both the base and high values for the societal cost of carbon result in SCT ratios of 3.04.

**FIGURE 1 Combined Market Deployment Costs and TSB for Induction Cooking and Room Heat Pumps MTIs**



As a result, substantial reductions in GHGs will occur over the course of the two initiatives' market deployment. CalMTA has forecasted that the Room Heat Pump MTI will generate ~~\$331~~\$321 million in TSB benefit from non-refrigerant GHG emission reductions over the life cycle of the initiative, while the Induction Cooking MTI will generate \$626 million in TSB benefit from GHG emission reductions. Furthermore, the decarbonization benefits of Induction Cooking amplify beyond the GHG reduction from cooking alone. Cooking is one of the most visible and personal uses of energy in households, and efficient, high- performing induction cooking can increase consumer acceptance of whole-home

# 1 Executive summary

CalMTA's Room Heat Pumps (RHP) MTI aims to accelerate market adoption of RHPs to provide efficient heating and cooling in existing small, single-family (SF), and multifamily (MF) households. With a forecasted Total System Benefit (TSB) of \$521-480 million, RHPs offer a significant, cost-effective opportunity to reduce energy demand and associated infrastructure costs, which are a primary driver of electric rates in California. Over time, the initiative will transform the market and lock in energy savings, grid benefits, and greenhouse gas (GHG) reductions to help meet California's climate goals.

Heating and cooling represent the largest energy consumption end-uses for homes in California, with more than 59%<sup>1</sup> of households still using gas appliances for heating. RHPs provide a more efficient option that can be self-installed and be plugged into a standard 120V outlet without a panel or service upgrade. The technology provides an attractive alternative to low-income consumers who cannot afford the installation cost of other heat pump alternatives or are unable to install permanent equipment due to landlord restrictions.<sup>2</sup> This initiative includes strategies to bring to market affordable RHPs that low-income consumers can own, take with them in a move, and that will help deliver comfort and climate resiliency benefits to them and their families.

As California pivots to a more electrification-enabling rate structure, RHPs will be a critical solution for replacing zonal gas heating and electric resistance heating, particularly found in multifamily buildings. This MTI Plan is informed by CalMTA's extensive research on the product, market, active programs, and potential market interventions to ensure the adoption of RHPs.<sup>3</sup>

## 1.1 Market overview

Currently, single-function heating or cooling products like electric resistance heaters and window air conditioners (AC) dominate the market as the most common choice for consumers. Even with RHPs offering numerous advantages - increased efficiency, dual function and multiple form factors (portable, saddlebag, U-Shape, traditional compact window) - several barriers have inhibited their adoption. The primary barriers include insufficient availability at brick-and-mortar stores, limited consumer awareness, higher upfront costs, lack of suitable products for most

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<sup>1</sup> EIA RECS 2020; CalMTA recalibration of household population to the American Community Survey (ACS) 2022. This also includes a small percentage of oil and wood stove heating that are binned with gas zonal heating.

<sup>2</sup> According to Assembly Bill 1550, low-income communities and households are defined as those who live in census tracts or households at or below 80% of the statewide median income or meeting the threshold designated as low-income by the California Department of Housing and Community Development's Revised 2021 State Income Limits. CalMTA uses the term "low-income" to describe individuals or households whose income status poses a barrier to adoption of the technology.

<sup>3</sup> For the purposes of this MTI, "programs" are defined as energy efficiency, decarbonization, weatherization, and climate resiliency programs, regardless of their funding source. Examples of such programs are listed in Appendix E. CalMTA will collaborate with such programs to aggregate demand and send a consistent signal to manufacturers to develop California-appropriate room heat pumps.



RHPs not only demonstrate a unique opportunity to improve multifamily and small single-family home heating and cooling efficiency, but also provide strong TSB and cost effectiveness (CE) for California in the long term. TSB forecasts, using assumptions learned from Phase II research, indicates a potential of ~~\$521~~480 million. This includes all savings from 2026-2045 and costs from 2024-2045 (which accounts for development costs from 2024 and 2025). The largest share of the benefit can be attributed to mitigated non-refrigerant GHG emissions, with an estimated ~~\$331~~321 million in TSB. The smallest positive share of the TSB is driven by grid benefits with ~~\$30~~28 million in TSB from substituting heating from fossil gas with electric heat pumps. Finally, energy benefits driven by savings related to electricity and natural gas reductions generate nearly ~~\$160~~143 million in TSB. The contents of this MTI Plan summarize CalMTA’s learning from Phase II activities as well as describe the plan for market transformation over the next decade. Table 1 below includes key cost and savings numbers derived from learnings in Phase II. Given the high potential value of this work, CalMTA recommends the Room Heat Pumps MTI to advance to Phase III pending CPUC approval.

**Table 1. Overview of the Room Heat Pumps MTI**

Market	Residential and multifamily target market, consumer products			
Total Phase III investment needed to achieve TSB forecast (2026-2045):	\$59,128,000			
Phase III investment over initial CalMTA funding cycle (2026-2030):	\$36,447,000			
Phase II investment (2024-2025):	\$3,681,000			
Total investment including Phase II and Phase III investment (2024-2045):	\$62,809,000			
TSB (2026-2045)	TSB - Energy	TSB - Grid	TSB - GHG- NR	<u>TSB</u> <u>GHG-</u> <u>R</u>
	<del>\$160M</del> <u>143M</u>	<del>\$30M</del> <u>28M</u>	<del>\$331</del> <u>M321</u> <u>M</u>	<del>(\$12</del> <u>M)</u>
TSB - Total	<del>\$521M</del> <u>480M</u>			
Cost-effectiveness (2024-2045)	TRC	PAC	SCT Base/High	
Negative IMCs included	<del>330.15</del> <u>304.09</u>	<del>8.29</del> <u>7.64</u>	<del>(27.81)/(27.83)</del> <del>(30.24)/(30.26)</del>	
Negative IMCs set to zero*	<del>5.03</del> <u>5.46</u>	<del>7.64</del> <u>8.29</u>	<del>10.30/10.31</del> <del>11.20/11.21</del>	

\* CalMTA calculated cost-effectiveness using the negative Incremental Measure Costs (IMCs) estimated for some use cases, per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into the Cost-Effectiveness Tool (CET) and not set to zero.<sup>6</sup> CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero reported in this table.

<sup>6</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)



## 2.5 Total System Benefit (TSB) & Cost-Effectiveness forecast

CalMTA estimated the Total System Benefit (TSB) and cost-effectiveness for the RHP MTI, including the Total Resource Cost (TRC), Program Administrator Cost (PAC), and two Societal Cost Test (SCT) results. Table 2 below shows MTI TSB with energy, grid, and GHG impacts. The initiative will deliver an estimated \$521-480 million in TSB over the period 2024 to 2045. Most of these benefits come from GHG reductions associated with product efficiency and fuel substitution, especially in later years of the MTI - after more California appropriate RHP models become available and market adoption accelerates. The initiative will be cost effective over its lifecycle under all test perspectives (Table 3).

**Table 2. RHP TSB estimates**

TSB (\$M)	Energy (\$M)	Grid (\$M)	GHG Non-Refrigerant (\$M)	GHG Refrigerant (\$M)
480521	143160	2830	321331	(12)N/A

**Table 3. RHP cost-effectiveness estimates\***

	TRC	PAC	Base SCT	High SCT
Negative IMCs included	304.09330-15	7.648-29	(27.81)(30-24)	(27.83)(30-26)
Negative IMCs set to zero	5.035-46	7.648-29	10.3011-20	10.3111-21

\* CalMTA calculated cost-effectiveness using the negative Incremental Measure Costs (IMCs) estimated for some use cases, per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into Cost Effectiveness Tool (CET) and not set to zero. Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost (IMC) in the Cost Effectiveness Tool - CEDARS. CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero reported in this table.

To develop the TSB and cost-effectiveness estimates, CalMTA developed a model to forecast incremental units of market adoption resulting from the MTI.

### 2.5.1 Market adoption forecast

This section summarizes the forecast of the baseline market adoption (BMA) and total market adoption (TMA) of RHPs. BMA represents the expected “naturally occurring” market adoption, taking into account current and expected market, regulatory, and technological trends. TMA includes the additional adoption resulting from strategic interventions detailed in this MTI plan.

To estimate BMA and TMA, CalMTA employed an s-curve model, characterized by an initial slow growth phase, followed by a rapid growth phase, and eventually a plateau as the market reaches saturation. CalMTA took a multifaceted approach to inform assumptions and parameters of the s-curve model. For baseline adoption, insights were drawn from various sources, including Delphi



In addition to the net incremental adoption estimates attributed to households in the territories of the three IOUs, the TSB and cost-effectiveness calculations also considered initiative costs, incremental measure cost (IMC), avoided costs, load shapes, and unit energy impacts (UEI).

## 2.2 Total System Benefit & Cost-Effectiveness forecast

CalMTA estimated TSB and cost-effectiveness for the RHP MTI, including the TRC, PAC, and two SCT results. Table 2 below shows the MTI’s TSB with energy, grid, and greenhouse gas (GHG) impacts.

The initiative will deliver an estimated \$521,480 million in TSB. Most of these benefits come from GHG emission reductions associated with product efficiency and fuel substitution, especially in later years of the MTI after more California-appropriate RHP models become available and market adoption accelerates. The initiative is cost-effective over its lifetime under each test perspective (Table 3).

**Table 2. RHP TSB estimates, 2024-2045**

TSB (\$M)	Energy (\$M)	Grid (\$M)	GHG non-refrigerant (\$M)	GHG refrigerant (\$M)
480,521	143,160	2,830	321,331	(12)N/A

**Table 3. RHP cost-effectiveness estimates, 2024-2045**

	TRC	PAC	Base SCT	High SCT
Negative IMCs included <sup>a</sup>	304,093,330.15	7,648.29	(27.81)(30.24)	(27.83)(30.26)
Negative IMCs set to zero	5,035.46	7,648.29	10,301,120	10,311,121

<sup>a</sup> CalMTA calculated cost-effectiveness using negative Incremental Measure Costs (IMCs), per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into Cost-Effectiveness Tool (CET) and not set to zero.<sup>5</sup> Because use of the negative IMCs resulted in some counterintuitive results, CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero.

## 3 MTI product definition

As described in the body of this MTI Plan, the RHP MTI seeks to transform the residential heating and cooling market by shifting consumers to a dual-purpose and more efficient product. CalMTA

<sup>5</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)

### Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach for Room Heat Pumps

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



Segment	Counterfactual equipment	Efficient equipment	Decision type	IOU	Average annual electric savings (kWh)	Average annual gas savings (therms)
	Window AC + electric resistance heat			SCE	597.9	0.0
				PGE	1215.2	0.0
Single-family	Window AC + gas wall furnace	WHP	Replacement	SDG&E	(521.1)	96.0
				SCE	(317.4)	44.6
				PGE	(657.0)	91.3
Single-family	Portable AC + electric resistance heat	PHP	Replacement	SDG&E	1038.8	0.0
				SCE	386.4	0.0
				PGE	812.5	0.0
Single-family	Portable AC + gas wall furnace	PHP	Replacement	SDG&E	(930.0)	96.0
				SCE	(528.9)	44.6
				PGE	(1059.8)	91.3
Single-family	Room AC + electric resistance heat	WHP	Displacement	SDG&E	424.1	0.0
				SCE	393.7	0.0
				PGE	698.1	0.0
Single-family	Portable AC + electric resistance heat	PHP	Displacement	SDG&E	292.0	0.0
				SCE	278.2	0.0
				PGE	428.6	0.0
Multifamily	No cooling + central gas furnace	WHP	No cooling	SDG&E	(249.4)	15.1
				SCE	(233.4)	20.0
				PGE	(329.2)	47.7
Multifamily	No cooling + central gas furnace	PHP	No cooling	SDG&E	(459.8)	15.1
				SCE	(428.0)	20.0
				PGE	(561.5)	47.7
Single-family	No Cooling + Central Gas Furnace	WHP	No cooling	SDG&E	<del>(364.6)</del>	<del>51.1</del>
				SCE	<del>(397.9)</del>	<del>59.1</del>
				PGE	<del>(746.9)</del>	<del>110.3</del>
Single-family	No Cooling + Central Gas Furnace	PHP	No cooling	SDG&E	<del>(658.5)</del>	<del>85.2</del>
				SCE	<del>(715.0)</del>	<del>59.1</del>
				PGE	<del>(1,298.5)</del>	<del>110.3</del>

**Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach  
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Below is the formula used by the tool to determine the high SCT ratio.

$$(High\ SCT\ Electric\ Benefits + High\ SCT\ Gas\ Benefits + Other\ Benefits) / SCT\ Cost$$

## Results

### Total System Benefit (TSB)

Table 24 shows the TSB estimates disaggregated for energy, grid, and GHG impacts.

**Table 24. TRC, PAC, base SCT, and high SCT TSB estimates, 2024-2045**

MTI Approach	TSB (\$M)	Energy (\$M)	Grid (\$M)	GHG non-refrigerant (\$M)	GHG refrigerant (\$M)
TRC (standard)	480524	143160	2830	321334	(12)n/a
SCT base	1,3031,417	315344	6168	9391,005	(12)n/a
SCT high	1,3041,419	315334	6168	9401,017	(12)n/a

The RHP MTI will generate approximately \$~~524~~480 million in TSB using TRC assumptions. The largest share of the benefit can be attributed to mitigated non-refrigerant GHG emissions, with an estimated \$~~331~~321 million in TSB. The smallest positive share of the TSB is driven by grid benefits, with \$~~30~~28 million in TSB. Finally, energy benefits driven by savings related to electricity and natural gas reductions generate nearly \$~~160~~143 million in TSB. SCT based TSB shows substantially higher benefits, largely driven by smaller overall discount rates and greater benefits attributed to GHG emissions reductions. In both SCT TSB approaches, the contribution of GHG benefits is significantly higher to overall TSB than it is under that standard TRC based approach. The primary driver in the difference in TSB between standard and base and high SCT is the significantly lower discount rate and the added benefits attributed to greenhouse gas reductions. The SCT discount rate of 3% affords greater value to benefits accrued in the latter years of the MTI.

### Cost-effectiveness ratios

Table 25 provides the cost-effectiveness estimates for the MTI over the period 2024-2045.

**Table 25. MTI cost-effectiveness estimates, 2024-2045**

	TRC	PAC	Base SCT	High SCT
Negative IMCs included <sup>a</sup>	304.09330.15	7.648.29	(27.81)(30.24)	(27.83)(30.26)
Negative IMCs set to zero	5.035.46	7.648.29	10.3011.20	10.3111.21

<sup>a</sup> CalMTA calculated cost-effectiveness using negative Incremental Measure Costs (IMCs), per the guidance from the CPUC's Energy Division guidance memo that required negative IMCs to be entered into Cost Effectiveness Tool (CET) and not set to zero.<sup>26</sup> Because use of the negative IMCs resulted in some

<sup>26</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)

## Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach for Room Heat Pumps

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counterintuitive results, CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero.

Table 26 provides the schedule of total system benefits and cost-effectiveness estimates for the RHP MTI.

**Table 26. Cost-effectiveness schedule**

Forecast metric	2030	2035	2045
TSB	\$ 5M\$ 5M	\$ 74M\$ 79M	\$ 480M\$ 521M
TRC ratio (negative IMCs included)	0.130:14	1.601:72	304.09330:15
TRC ratio (negative IMCs set to zero)	0.120:13	1.121:21	5.035:46
PAC ratio	0.110:12	1.191:28	7.648:29
Estimated incremental investment	\$40M	\$22M	\$1M
Approximate breakeven year for TRC (negative IMCs included): 2034			
Approximate breakeven year for TRC (negative IMC set to zero): 2035			

### Co-created and statewide TSB

**Co-created TSB:** Co-created impacts refer to the total impacts (including utility-reported savings) influenced by the MTI. CalMTA estimated market adoption associated with PA-verified savings (described in the section: Approach to estimating units associated with verified PA savings) and subtracted it from incremental market adoption to calculate net incremental adoption for each year of the forecasting period in accordance with guidance in the MTI Evaluation Framework. While the TSB reported in this plan was calculated applying net incremental adoption, CalMTA conducted an additional analysis to estimate “co-created” TSB that included adoption from PA-verified programs, for the three IOUs and on a statewide basis as shown in Table 27.

**Statewide TSB:** The RHP MTI is a California-wide effort. Because avoided costs for PG&E, SCE, and SDG&E do not fully represent the entire state, CalMTA conducted an additional analysis to estimate statewide TSB. The team developed adoption estimates for “non-IOU” territories (described in the section above Estimating IOU vs. non-IOU units) and developed avoided costs for non-IOU adoption by applying population-weighted average avoided costs for the three utilities. The resulting Statewide TSB estimates are shown in Table 27.

**Table 27. Co-created and statewide TSB**

Scenario	TSB
Co-created TSB (IOU service territory only)	\$ 558M\$ 605M
Statewide TSB (excluding PA verified savings)	\$ 644M\$ 700M
Co-created Statewide TSB	\$ 750M\$ 813M

## Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach for Room Heat Pumps

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# Attachment 3: Sensitivity analysis

This attachment summarizes analysis conducted to assess the impact of removing market adoption associated with fuel substitution on TSB and cost-effectiveness.

## Methodology

CalMTA ran a sensitivity analysis assuming zero adoption for the two use cases that assume end users install an RHP instead of a gas wall furnace:

**1. Assumed counterfactual HVAC equipment: gas wall furnace and window AC**

In CalMTA’s RHP MTI market adoption model, this use case accounts for 4% of total incremental adoption in the single-family sector and 10% for incremental adoption multifamily sector.

**2. Assumed counterfactual HVAC equipment: gas wall furnace and portable AC**

In CalMTA’s RHP MTI market adoption model, this use case accounts for 2% of the total incremental adoption in the single-family sector and 6% for the multifamily sector.

## Results and implications

The sensitivity analysis resulted in lower TSB and TRC and PAC benefit-cost ratios (Table 1). Eliminating market adoption by end users who would otherwise install gas equipment combined with room or portable A/C lowers TSB by \$51.50.3 million (10%) over the MTI lifetime and reduces TRC by 0.53 (Table 2).

**Table 1. Summary of changes in TSB and cost-effectiveness results by scenario**

Scenario	TSB (\$M)	TRC	PAC	ΔTSB (\$M)	ΔTRC	ΔPAC
Reported in MTI plan	480521	304.093 30.15	7.648: 29	-	-	-
No incremental adoption for use cases involving fuel substitution from gas heating	429470	7.968:7 2	6.847: 49	(50.31)	(296.13) (321.43)	(.80)

**Table 2. Summary of changes in TSB and cost-effectiveness results by scenario (negative IMCs set to zero)**

Scenario	TSB (\$M)	TRC	PAC	ΔTSB (\$M)	ΔTRC	ΔPAC
Reported in MTI plan	480521	5.035:4 6	7.64 8:29	-	-	-
No incremental adoption for use cases involving fuel substitution from gas heating	429470	4.504:9 3	6.84 7:49	(50.31)	(0.53)	(0.8)

**Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach for Room Heat Pumps**

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CLEAN VERSION TO APPLICATION AND APPENDIX 1

interventions, they are not reflected in CalMTA’s TSB and cost-effectiveness forecasts because CalMTA will subtract out verified EE savings that the EE PAs claim for the same products included in the MTIs.

## **2. CalMTA’s Proposed MTIs are Cost-Effective and Deliver Substantial TSB to California Ratepayers.**

The two MTI Plans included in this Application initiate the beginning of an MT portfolio for California. As shown in Table 1, the combined MTIs result in over \$1 billion in cost-effective TSB that will be lost or substantially delayed if the initiatives do not move forward. As shown in Figure 1, the initial combined investment of \$92.6 million is concentrated in the first 7 to 10 years of the MTIs’ market deployment. Once structural market barriers are removed, this investment will continue to generate substantial incremental benefits for the following 10 years of the 20-year MTI market deployment without the need for ongoing investment and interventions. The TSB estimated in Table 1 does not reflect the full value of these initiatives to the State, as these MTIs will also generate an additional \$350 million in TSB beyond the IOUs’ service territories.

For more detailed information on the projected cost-effectiveness and TSB delivered by the individual MTI Plans, see the supporting testimony in Exhibit MTA-05 and Appendix B of each MTI Plan.

## **3. CalMTA’s Proposed MTIs will Support California and the Commission’s EE and Building Decarbonization Efforts and Result in Substantial GHG Emission Reductions and Energy Savings.**

In early 2019, the Commission opened the Building Decarbonization Rulemaking (R.19-01-011) to reduce GHG emissions from the building sector in California, which contribute approximately 24 percent of the state’s GHG emissions.<sup>50</sup> Components of reducing GHGs from the building sector are: 1) replacing natural gas with electricity as the fuel source for appliances that heat and cool spaces and water, or provide for cooking; and 2) encouraging customers to use the most-efficient versions of these appliances. CalMTA’s two proposed MTIs—Room Heat Pumps and Induction Cooking—further California’s decarbonization goals by accelerating adoption of increasingly efficient products and using electricity as their fuel source instead of natural gas.

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<sup>50</sup> See California Energy Commission’s 2021 Integrated Energy Policy Report (available at: [TN241599\\_20220222T093512\\_Final 2021 Integrated Energy Policy Report Volume I Building Decarbonization.pdf](#)).

**TABLE 1: Summary of Benefits and Cost Effectiveness of Room Heat Pump and Induction Cooking MTIs**

	<b>Room Heat Pumps</b>	<b>Induction Cooking</b>	<b>Combined</b>
TSB	\$480 Million	\$537 Million	\$1.02 Billion
SCT TSB	\$1.3 Billion	\$2.3 Billion	\$3.6 Billion
<b>Estimated Costs</b>			
Initiative/Concept Development (Phase II) Costs (2024-2025) <sup>51</sup>	\$3,681,000	\$3,950,000	\$7,631,000
Market Deployment (Phase III) Costs (2026-2045) <sup>52</sup>	\$59,128,000	\$33,477,000	\$92,605,000
Initial 5-Year MTI Costs	\$36,447,700	\$28,880,000	\$65,327,700
<b>Cost Effectiveness Ratios</b>			
TRC	304.09 <sup>53</sup> /5.03 <sup>54</sup>	1.12	2.11
PAC	7.64	14.36	10.15
Base / High SCT	(27.81) <sup>55</sup> /(27.83) <sup>56</sup> 10.3/10.3 <sup>57</sup>	3.04/3.04 <sup>58</sup>	5.06/5.05

<sup>51</sup> Approved by the CPUC via CalMTA’s 2024 and 2025 Annual Budget Advice Letters. While not included in the MTI Plan or Application budget, these costs are included in the cost-effectiveness calculations to capture the full cost of MTI development and deployment

<sup>52</sup> Include in the Appendix H of each MTI Plan.

<sup>53</sup> The high TRC ratio is driven by negative incremental measure costs (IMCs) for some use cases, where the CPUC’s Energy Division provided guidance that negative IMCs should be entered into the Cost Effectiveness Tool (CET) and not set to zero. See CPUC Energy Division guidance memo, located here:

<https://cedars.cpuc.ca.gov/deer-resources/deemed-measure-packages/guidance/resource/9/history/>.

<sup>54</sup> This TRC ratio set the negative IMCs to zero.

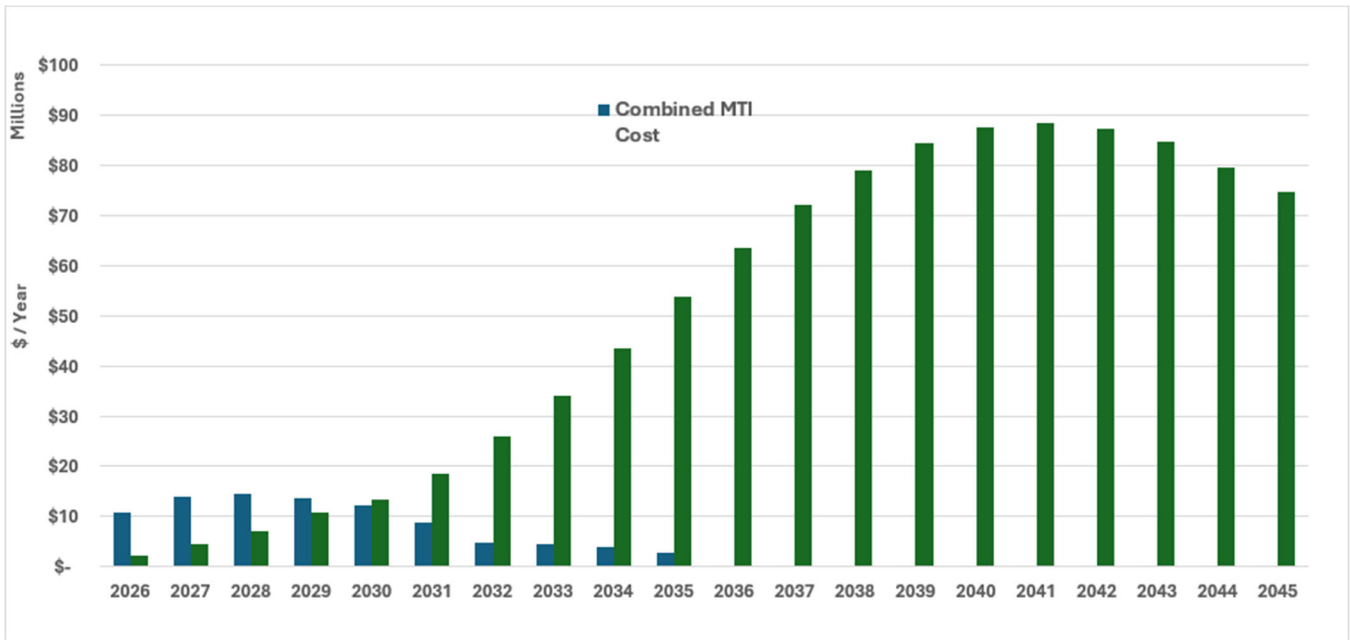
<sup>55</sup> Including negative IMCs as directed by the CPUC Energy Division Guidance memo results in a negative SCT.

<sup>56</sup> D.24-07-015 adopted the SCT for information purposes and included two values for the societal cost of carbon, a base and high case.

<sup>57</sup> This SCT ratio set the negative IMCs to zero.

<sup>58</sup> For the Induction Cooking MTI, the SCT ratios using both the base and high values for the societal cost of carbon result in SCT ratios of 3.04.

**FIGURE 1 Combined Market Deployment Costs and TSB for Induction Cooking and Room Heat Pumps MTIs**



As a result, substantial reductions in GHGs will occur over the course of the two initiatives’ market deployment. CalMTA has forecasted that the Room Heat Pump MTI will generate \$321 million in TSB benefit from non-refrigerant GHG emission reductions over the life cycle of the initiative, while the Induction Cooking MTI will generate \$626 million in TSB benefit from GHG emission reductions. Furthermore, the decarbonization benefits of Induction Cooking amplify beyond the GHG reduction from cooking alone. Cooking is one of the most visible and personal uses of energy in households, and efficient, high- performing induction cooking can increase consumer acceptance of whole-home electrification and enable California’s building decarbonization goals. If consumers electrify space conditioning and water heating and other appliances but do not embrace electric cooking, residential gas customers may be left with the cost of maintaining gas distribution infrastructure to homes for one, last remaining appliance.

For detailed information on the GHG-reduction benefits and energy savings delivered by the MTIs, see the supporting testimony in Exhibit MTA-05, and Appendix B of the MTI Plan.

**4. CalMTA’s Proposed MTIs Will Deliver Significant Benefits to ESJ Communities and Support the Goals of the Commission’s ESJ Action Plan.**

The Adopted MT Framework attached to D.19-12-021 establishes high-level principles that every MTI should aim to achieve, including a directive to "integrate strategies to maximize equity."

# 1 Executive summary

CalMTA's Room Heat Pumps (RHP) MTI aims to accelerate market adoption of RHPs to provide efficient heating and cooling in existing small, single-family (SF), and multifamily (MF) households. With a forecasted Total System Benefit (TSB) of \$480 million, RHPs offer a significant, cost-effective opportunity to reduce energy demand and associated infrastructure costs, which are a primary driver of electric rates in California. Over time, the initiative will transform the market and lock in energy savings, grid benefits, and greenhouse gas (GHG) reductions to help meet California's climate goals.

Heating and cooling represent the largest energy consumption end-uses for homes in California, with more than 59%<sup>1</sup> of households still using gas appliances for heating. RHPs provide a more efficient option that can be self-installed and be plugged into a standard 120V outlet without a panel or service upgrade. The technology provides an attractive alternative to low-income consumers who cannot afford the installation cost of other heat pump alternatives or are unable to install permanent equipment due to landlord restrictions.<sup>2</sup> This initiative includes strategies to bring to market affordable RHPs that low-income consumers can own, take with them in a move, and that will help deliver comfort and climate resiliency benefits to them and their families.

As California pivots to a more electrification-enabling rate structure, RHPs will be a critical solution for replacing zonal gas heating and electric resistance heating, particularly found in multifamily buildings. This MTI Plan is informed by CalMTA's extensive research on the product, market, active programs, and potential market interventions to ensure the adoption of RHPs.<sup>3</sup>

## 1.1 Market overview

Currently, single-function heating or cooling products like electric resistance heaters and window air conditioners (AC) dominate the market as the most common choice for consumers. Even with RHPs offering numerous advantages - increased efficiency, dual function and multiple form factors (portable, saddlebag, U-Shape, traditional compact window) - several barriers have inhibited their adoption. The primary barriers include insufficient availability at brick-and-mortar stores, limited consumer awareness, higher upfront costs, lack of suitable products for most

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<sup>1</sup> EIA RECS 2020; CalMTA recalibration of household population to the American Community Survey (ACS) 2022. This also includes a small percentage of oil and wood stove heating that are binned with gas zonal heating.

<sup>2</sup> According to Assembly Bill 1550, low-income communities and households are defined as those who live in census tracts or households at or below 80% of the statewide median income or meeting the threshold designated as low-income by the California Department of Housing and Community Development's Revised 2021 State Income Limits. CalMTA uses the term "low-income" to describe individuals or households whose income status poses a barrier to adoption of the technology.

<sup>3</sup> For the purposes of this MTI, "programs" are defined as energy efficiency, decarbonization, weatherization, and climate resiliency programs, regardless of their funding source. Examples of such programs are listed in Appendix E. CalMTA will collaborate with such programs to aggregate demand and send a consistent signal to manufacturers to develop California-appropriate room heat pumps.



RHPs not only demonstrate a unique opportunity to improve multifamily and small single-family home heating and cooling efficiency, but also provide strong TSB and cost effectiveness (CE) for California in the long term. TSB forecasts, using assumptions learned from Phase II research, indicates a potential of \$480 million. This includes all savings from 2026-2045 and costs from 2024-2045 (which accounts for development costs from 2024 and 2025). The largest share of the benefit can be attributed to mitigated non-refrigerant GHG emissions, with an estimated \$321 million in TSB. The smallest positive share of the TSB is driven by grid benefits with \$28 million in TSB from substituting heating from fossil gas with electric heat pumps. Finally, energy benefits driven by savings related to electricity and natural gas reductions generate nearly \$143 million in TSB. The contents of this MTI Plan summarize CalMTA’s learning from Phase II activities as well as describe the plan for market transformation over the next decade. Table 1 below includes key cost and savings numbers derived from learnings in Phase II. Given the high potential value of this work, CalMTA recommends the Room Heat Pumps MTI to advance to Phase III pending CPUC approval.

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Total investment including Phase II and Phase III investment (2024-2045):	\$62,809,000			
TSB (2026-2045)	TSB - Energy	TSB - Grid	TSB - GHG-NR	TSB - GHG-R
	\$143M	\$28M	\$321 M	(\$12 M)
TSB - Total	\$480M			
Cost-effectiveness (2024-2045)	TRC	PAC	SCT Base/High	
Negative IMCs included	304.09	7.64	(27.81)/(27.83)	
Negative IMCs set to zero*	5.03	7.64	10.30/10.31	

\* CalMTA calculated cost-effectiveness using the negative Incremental Measure Costs (IMCs) estimated for some use cases, per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into the Cost-Effectiveness Tool (CET) and not set to zero.<sup>6</sup> CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero reported in this table.

<sup>6</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)



## 2.5 Total System Benefit (TSB) & Cost-Effectiveness forecast

CalMTA estimated the Total System Benefit (TSB) and cost-effectiveness for the RHP MTI, including the Total Resource Cost (TRC), Program Administrator Cost (PAC), and two Societal Cost Test (SCT) results. Table 2 below shows MTI TSB with energy, grid, and GHG impacts. The initiative will deliver an estimated \$480 million in TSB over the period 2024 to 2045. Most of these benefits come from GHG reductions associated with product efficiency and fuel substitution, especially in later years of the MTI - after more California appropriate RHP models become available and market adoption accelerates. The initiative will be cost effective over its lifecycle under all test perspectives (Table 3).

**Table 2. RHP TSB estimates**

<b>TSB (\$M)</b>	<b>Energy (\$M)</b>	<b>Grid (\$M)</b>	<b>GHG Non-Refrigerant (\$M)</b>	<b>GHG Refrigerant (\$M)</b>
480	143	28	321	(12)

**Table 3. RHP cost-effectiveness estimates\***

	<b>TRC</b>	<b>PAC</b>	<b>Base SCT</b>	<b>High SCT</b>
Negative IMCs included	304.09	7.64	(27.81)	(27.83)
Negative IMCs set to zero	5.03	7.64	10.30	10.31

\* CalMTA calculated cost-effectiveness using the negative Incremental Measure Costs (IMCs) estimated for some use cases, per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into Cost Effectiveness Tool (CET) and not set to zero. Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost (IMC) in the Cost Effectiveness Tool - CEDARS. CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero reported in this table.

To develop the TSB and cost-effectiveness estimates, CalMTA developed a model to forecast incremental units of market adoption resulting from the MTI.

### 2.5.1 Market adoption forecast

This section summarizes the forecast of the baseline market adoption (BMA) and total market adoption (TMA) of RHPs. BMA represents the expected “naturally occurring” market adoption, taking into account current and expected market, regulatory, and technological trends. TMA includes the additional adoption resulting from strategic interventions detailed in this MTI plan.

To estimate BMA and TMA, CalMTA employed an s-curve model, characterized by an initial slow growth phase, followed by a rapid growth phase, and eventually a plateau as the market reaches saturation. CalMTA took a multifaceted approach to inform assumptions and parameters of the s-curve model. For baseline adoption, insights were drawn from various sources, including Delphi



In addition to the net incremental adoption estimates attributed to households in the territories of the three IOUs, the TSB and cost-effectiveness calculations also considered initiative costs, incremental measure cost (IMC), avoided costs, load shapes, and unit energy impacts (UEI).

## 2.2 Total System Benefit & Cost-Effectiveness forecast

CalMTA estimated TSB and cost-effectiveness for the RHP MTI, including the TRC, PAC, and two SCT results. Table 2 below shows the MTI’s TSB with energy, grid, and greenhouse gas (GHG) impacts.

The initiative will deliver an estimated \$480 million in TSB. Most of these benefits come from GHG emission reductions associated with product efficiency and fuel substitution, especially in later years of the MTI after more California-appropriate RHP models become available and market adoption accelerates. The initiative is cost-effective over its lifetime under each test perspective (Table 3).

**Table 2. RHP TSB estimates, 2024-2045**

<b>TSB (\$M)</b>	<b>Energy (\$M)</b>	<b>Grid (\$M)</b>	<b>GHG non-refrigerant (\$M)</b>	<b>GHG refrigerant (\$M)</b>
480	143	28	321	(12)

**Table 3. RHP cost-effectiveness estimates, 2024-2045**

	<b>TRC</b>	<b>PAC</b>	<b>Base SCT</b>	<b>High SCT</b>
Negative IMCs included <sup>a</sup>	304.09	7.64	(27.81)	(27.83)
Negative IMCs set to zero	5.03	7.64	10.30	10.31

<sup>a</sup> CalMTA calculated cost-effectiveness using negative Incremental Measure Costs (IMCs), per the guidance from the CPUC’s Energy Division guidance memo that required negative IMCs to be entered into Cost-Effectiveness Tool (CET) and not set to zero.<sup>5</sup> Because use of the negative IMCs resulted in some counterintuitive results, CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero.

## 3 MTI product definition

As described in the body of this MTI Plan, the RHP MTI seeks to transform the residential heating and cooling market by shifting consumers to a dual-purpose and more efficient product. CalMTA envisions an end state where consumers purchase RHPs over other competing products and where these products include air filtration and use of low global warming potential (GWP) refrigerants.

<sup>5</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)

### Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach for Room Heat Pumps

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Segment	Counterfactual equipment	Efficient equipment	Decision type	IOU	Average annual electric savings (kWh)	Average annual gas savings (therms)
	Window AC + electric resistance heat			SCE	597.9	0.0
				PGE	1215.2	0.0
Single-family	Window AC + gas wall furnace	WHP	Replacement	SDG&E	(521.1)	96.0
				SCE	(317.4)	44.6
				PGE	(657.0)	91.3
Single-family	Portable AC + electric resistance heat	PHP	Replacement	SDG&E	1038.8	0.0
				SCE	386.4	0.0
				PGE	812.5	0.0
Single-family	Portable AC + gas wall furnace	PHP	Replacement	SDG&E	(930.0)	96.0
				SCE	(528.9)	44.6
				PGE	(1059.8)	91.3
Single-family	Room AC + electric resistance heat	WHP	Displacement	SDG&E	424.1	0.0
				SCE	393.7	0.0
				PGE	698.1	0.0
Single-family	Portable AC + electric resistance heat	PHP	Displacement	SDG&E	292.0	0.0
				SCE	278.2	0.0
				PGE	428.6	0.0
Multifamily	No cooling + central gas furnace	WHP	No cooling	SDG&E	(249.4)	15.1
				SCE	(233.4)	20.0
				PGE	(329.2)	47.7
Multifamily	No cooling + central gas furnace	PHP	No cooling	SDG&E	(459.8)	15.1
				SCE	(428.0)	20.0
				PGE	(561.5)	47.7
Single-family	No Cooling + Central Gas Furnace	WHP	No cooling	SDG&E	(364.6)	51.1
				SCE	(397.9)	59.1
				PGE	(746.9)	110.3
Single-family	No Cooling + Central Gas Furnace	PHP	No cooling	SDG&E	(658.5)	51.1
				SCE	(715.0)	59.1
				PGE	(1,298.5)	110.3

### 5.3 Outputs

#### Total System Benefit

TSB is a function of the inputs described in earlier sections. For the RHP MTI, the team disaggregated the total TSB into three components: energy, grid, and GHG benefits (categorized as refrigerant and non-refrigerant). The team used the following CET-based formula to determine TSB:

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## Results

### Total System Benefit (TSB)

Table 24 shows the TSB estimates disaggregated for energy, grid, and GHG impacts.

**Table 24. TRC, PAC, base SCT, and high SCT TSB estimates, 2024-2045**

MTI Approach	TSB (\$M)	Energy (\$M)	Grid (\$M)	GHG non-refrigerant (\$M)	GHG refrigerant (\$M)
TRC (standard)	480	143	28	321	(12)
SCT base	1,303	315	61	939	(12)
SCT high	1,304	315	61	940	(12)

The RHP MTI will generate approximately \$480 million in TSB using TRC assumptions. The largest share of the benefit can be attributed to mitigated non-refrigerant GHG emissions, with an estimated \$321 million in TSB. The smallest positive share of the TSB is driven by grid benefits, with \$28 million in TSB. Finally, energy benefits driven by savings related to electricity and natural gas reductions generate nearly \$143 million in TSB. SCT based TSB shows substantially higher benefits, largely driven by smaller overall discount rates and greater benefits attributed to GHG emissions reductions. In both SCT TSB approaches, the contribution of GHG benefits is significantly higher to overall TSB than it is under that standard TRC based approach. The primary driver in the difference in TSB between standard and base and high SCT is the significantly lower discount rate and the added benefits attributed to greenhouse gas reductions. The SCT discount rate of 3% affords greater value to benefits accrued in the latter years of the MTI.

### Cost-effectiveness ratios

Table 25 provides the cost-effectiveness estimates for the MTI over the period 2024-2045.

**Table 25. MTI cost-effectiveness estimates, 2024-2045**

	TRC	PAC	Base SCT	High SCT
Negative IMCs included <sup>a</sup>	304.09	7.64	(27.81)	(27.83)
Negative IMCs set to zero	5.03	7.64	10.30	10.31

<sup>a</sup> CalMTA calculated cost-effectiveness using negative Incremental Measure Costs (IMCs), per the guidance from the CPUC's Energy Division guidance memo that required negative IMCs to be entered into Cost Effectiveness Tool (CET) and not set to zero.<sup>26</sup> Because use of the negative IMCs resulted in some counterintuitive results, CalMTA also calculated cost-effectiveness results with negative incremental costs set to zero.

Table 26 provides the schedule of total system benefits and cost-effectiveness estimates for the RHP MTI.

<sup>26</sup> [Guidance for Deemed Measures History: CPUC Guidance on the use of Negative Incremental Measure Cost \(IMC\) in the Cost Effectiveness Tool - CEDARS.](#)

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**Table 26. Cost-effectiveness schedule**

Forecast metric	2030	2035	2045
TSB	\$ 5M	\$ 74M	\$ 480M
TRC ratio (negative IMCs included)	0.13	1.60	304.09
TRC ratio (negative IMCs set to zero)	0.12	1.12	5.03
PAC ratio	0.11	1.19	7.64
Estimated incremental investment	\$40M	\$22M	\$1M
Approximate breakeven year for TRC (negative IMCs included): 2034			
Approximate breakeven year for TRC (negative IMC set to zero): 2035			

**Co-created and statewide TSB**

**Co-created TSB:** Co-created impacts refer to the total impacts (including utility-reported savings) influenced by the MTI. CalMTA estimated market adoption associated with PA-verified savings (described in the section: Approach to estimating units associated with verified PA savings) and subtracted it from incremental market adoption to calculate net incremental adoption for each year of the forecasting period in accordance with guidance in the MTI Evaluation Framework. While the TSB reported in this plan was calculated applying net incremental adoption, CalMTA conducted an additional analysis to estimate “co-created” TSB that included adoption from PA-verified programs, for the three IOUs and on a statewide basis as shown in Table 27.

**Statewide TSB:** The RHP MTI is a California-wide effort. Because avoided costs for PG&E, SCE, and SDG&E do not fully represent the entire state, CalMTA conducted an additional analysis to estimate statewide TSB. The team developed adoption estimates for “non-IOU” territories (described in the section above Estimating IOU vs. non-IOU units) and developed avoided costs for non-IOU adoption by applying population-weighted average avoided costs for the three utilities. The resulting Statewide TSB estimates are shown in Table 27.

**Table 27. Co-created and statewide TSB**

Scenario	TSB
Co-created TSB (IOU service territory only)	\$ 558M
Statewide TSB (excluding PA verified savings)	\$ 644M
Co-created Statewide TSB	\$ 750M

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## Attachment 3: Sensitivity analysis

This attachment summarizes analysis conducted to assess the impact of removing market adoption associated with fuel substitution on TSB and cost-effectiveness.

### Methodology

CalMTA ran a sensitivity analysis assuming zero adoption for the two use cases that assume end users install an RHP instead of a gas wall furnace:

**1. Assumed counterfactual HVAC equipment: gas wall furnace and window AC**

In CalMTA’s RHP MTI market adoption model, this use case accounts for 4% of total incremental adoption in the single-family sector and 10% for incremental adoption multifamily sector.

**2. Assumed counterfactual HVAC equipment: gas wall furnace and portable AC**

In CalMTA’s RHP MTI market adoption model, this use case accounts for 2% of the total incremental adoption in the single-family sector and 6% for the multifamily sector.

### Results and implications

The sensitivity analysis resulted in lower TSB and TRC and PAC benefit-cost ratios (Table 1). Eliminating market adoption by end users who would otherwise install gas equipment combined with room or portable A/C lowers TSB by \$50.3 million (10%) over the MTI lifetime and reduces TRC by 0.53 (Table 2).

**Table 1. Summary of changes in TSB and cost-effectiveness results by scenario**

Scenario	TSB (\$M)	TRC	PAC	ΔTSB (\$M)	ΔTRC	ΔPAC
Reported in MTI plan	480	304.09	7.64	-	-	-
No incremental adoption for use cases involving fuel substitution from gas heating	429	7.96	6.84	(50.31)	(296.13)	(.80)

**Table 2. Summary of changes in TSB and cost-effectiveness results by scenario (negative IMCs set to zero)**

Scenario	TSB (\$M)	TRC	PAC	ΔTSB (\$M)	ΔTRC	ΔPAC
Reported in MTI plan	480	5.03	7.64	-	-	-
No incremental adoption for use cases involving fuel substitution from gas heating	429	4.50	6.84	(50.31)	(0.53)	(0.8)

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