



Evaluation of the Hawai'i Energy Conservation and Efficiency Programs

Calendar Year 2023

Prepared for: Hawaii Public
Utilities Commission

By: Applied Energy Group, Inc.

Date: June 24, 2024

AEG Key Contact: Ingrid Rohmund



This work was performed by:

Applied Energy Group, Inc.
2300 Clayton Road., Suite 1370
Concord, CA 94520

Project Director: I. Rohmund
Project Manager: A. Chamberlain
TRM Update Lead: K. Parmenter

In consultation with the Hawaii Public Utilities Commission

Chief of Policy

& Research: G. Relf

EE Program Manager: A. Norman

And the Energy Efficiency Manager team

Project Team Lead: T. Pope
J. Barnes

PBF EM&V Lead: T. Rasmussen

EXECUTIVE SUMMARY

This report presents the results of all completed or partially completed Evaluation, Measurement, and Verification (EM&V) related activities associated with the Hawai'i Energy Conservation and Efficiency Programs (Hawai'i Energy programs) in the calendar year 2023 (CY23). Further, it summarizes the most critical findings from completed CY23 EM&V activities, focusing on implications for the Hawai'i Energy programs.

The EM&V work conducted for CY23 contributes to three overarching research objectives:

- **Verification of accomplishments:** Verifying Hawai'i Energy's program year 2022 (PY22) achievements.
- **Robustness of savings approaches:** Updating and improving approaches used to estimate savings for Hawai'i Energy's programs and measures.
- **Program planning:** Using results to inform future program planning.

Approach

The EM&V-related research activities for CY23 were determined in consultation with the Hawaii Public Utilities Commission (HPUC) and the Energy Efficiency Manager (EEM).

The EM&V Contractor (Applied Energy Group [AEG]) engaged in five research activities in CY23:

- **Completed:** Reviewing and updating the PY23 Technical Reference Manual (TRM)
- **Completed:** Making mid-year updates to the PY23 TRM
- **Completed:** Energy Efficiency Portfolio Standard (EEPS) research, including support for the Report to Legislature¹
- **Partially completed:** Verifying Hawai'i Energy's PY22 program portfolio
- **Initiated:** Reviewing and updating the PY24 TRM

AEG used various research and analysis methods. Table ES-1 summarizes the primary methods employed for each completed and initiated EM&V research activity.

¹ State of Hawaii Public Utilities Commission, Report to the 2024 Legislature on Hawaii's Energy Efficiency Portfolio Standard, Issued Pursuant to Section 269-96, Hawaii Revised Statutes, December 2023.

Table ES-1 Summary of EM&V Research Activities and Methods for Work Completed or Initiated in CY23

EM&V Research Activity	Status at the end of CY23	Research and Analysis Methods	
PY23 TRM Major Update	Completed	<ul style="list-style-type: none"> • TRM review • Measure/content prioritization 	<ul style="list-style-type: none"> • Benchmarking analysis • TRM updates
PY23 Mid-Year Update	Completed	<ul style="list-style-type: none"> • Addition of three new measures 	<ul style="list-style-type: none"> • Expansion of one existing measure
EEPS Review Research	Completed	<ul style="list-style-type: none"> • Documentation review • Program tracking system review and analysis 	<ul style="list-style-type: none"> • In-depth interviews • Analysis of codes and standards
PY22 Verification	Partially completed	<ul style="list-style-type: none"> • Documentation reviews • Program tracking system review and analyses • Sample design, selection, and extrapolation • Engineering desk reviews 	<ul style="list-style-type: none"> • Business Custom (CBEEM) on-site visits • Total resource benefit (TRB) analysis • Low-to-Moderate Income Performance Incentives Mechanisms (LMI PIM) analysis
PY24 TRM Major Update	Initiated	<ul style="list-style-type: none"> • TRM review • Measure/content prioritization 	<ul style="list-style-type: none"> • Benchmarking analysis • TRM updates

Key Findings and Implications

In CY23, AEG completed both the major and mid-year updates to the PY23 TRM and the PY22 verification of awards. Key findings and their implications for the Hawai'i Energy programs follow.

PY23 TRM Major and Mid-Year Updates

Ongoing TRM updates have focused on improving the accuracy of deemed savings estimates and expanding the use of semi-prescriptive calculators to better customize savings for a given measure based on the specific installation characteristics (e.g., program delivery approach, equipment capacity, efficiency, building segment). Many of the updates consist of revisions to baseline criteria to address changes in federal and state codes and standards. In addition, for ENERGY STAR® equipment measures, periodic updates are needed to bring the efficient case criteria in line with the latest ENERGY STAR specifications. The TRM updates also provide deemed savings and semi-prescriptive calculators for new measures.

In CY23, AEG completed major and mid-year updates to the PY23 TRM.

EEPS Review Research

EEPS review research supports the evaluation of progress toward EEPS goals during its second performance period (2016–2020). While the majority of the EEPS savings has historically been provided by the Hawai'i Energy portfolio, other entities also contribute to achieving the EEPS goals. Therefore, AEG's research included evaluating savings from two categories of

contributors to the EEPS goals: Commission-Regulated Entities² and Other Contributing Entities.³

PY22 Verification

In CY23, AEG completed most tasks associated with the verification of Hawai'i Energy's claimed savings and performance for PY22,⁴ including savings replication, desk reviews, and achievements associated with Clean Energy Technologies (CET) and non-CET targets.

The verification's chief purpose was to provide an independent review of Hawai'i Energy's performance relative to the contractually agreed-upon performance targets. Performance is measured by a range of indicators, including targets for CET energy and demand savings and, outside of CET, targets for Accessibility & Affordability (A&A), Market Transformation & Economic Development (MTED), and Customer Satisfaction. Successfully meeting the performance targets related to these indicators can lead to a financial award of up to \$750,000 for Hawai'i Energy's implementer (Leidos).

AEG completed the verification using methods and activities consistent with past years, including savings replication, documentation and desk reviews, and program manager interviews. AEG worked with Hawai'i Energy to collect the data necessary for the verification and the EEM and HPUC to agree on the appropriate methods and activities.

AEG found that Hawai'i Energy achieved 40% (\$301,421) of the potential awards. Shortfalls primarily came from not meeting CET targets. Hawai'i Energy met all non-CET performance metrics except for the A&A target set for program spending in the County of Maui. Accordingly, Hawai'i Energy did not receive full awards in this area.

The following summarizes the PY22 performance targets compared with Hawai'i Energy's claimed results and the verified results derived by AEG. Specifically:

- **Hawai'i Energy did not meet the target for installing Grid Services Ready measures.** In PY21, AEG verified nearly 200% of the target. In PY22, the programs fell short of the target of 2,200 measures by 23%. The measures included grid-interactive water heaters, smart devices, smart thermostats, and smart electric panels. Grid Services Ready measures are commonly installed in hotels as part of an energy management system (EMS). Measure installation is thus dependent on room occupancy, and occupancy was higher than anticipated (based on 2021-22 trends), causing projects delays.
- **Hawai'i Energy's implementation of PY22 TRM algorithms for prescriptive programs was nearly perfect.** AEG made minimal TRM adjustments to the claimed savings, leading to TRM adjustment factors close to 1.0 for all programs.
- **Hawai'i Energy achieved just 29% of available CET awards in PY22,** largely driven by the Business Prescriptive and Business Custom programs, which faced lower participation than

² Commission-Regulated Entity savings include savings from utility-administered and third-party-administered energy efficiency programs. The bulk of these savings are anticipated to be provided by Hawai'i Energy and Kauai Island Utility Cooperative (KIUC).

³ Other Contributing Entity savings include savings from legislative mandates, non-profits, other coordinated programs, building codes, and federal, state, and local appliance standards.

⁴ In CY24, the AEG team completed its remaining on-site visits, after which it finalized its verification.

expected and did not achieve any awards. The verification had a limited impact on the achieved awards.

- **Hawai'i Energy met all A&A performance targets despite not claiming awards for commercial customer first-year bill savings targets.** By using verified first-year energy savings and peak demand reduction in conjunction with current commercial customer retail rates, AEG verified 108% of Hawai'i Energy's A&A commercial first-year bill savings target.
- **Hawai'i Energy Public Benefits Fee Administrator (PBFA) programs met or exceeded targets for all MTED performance metrics except for Outcome Metrics,** a new focus area for the Commercial Kitchen Equipment (CKE) channel. Hawai'i Energy fell short of the target for the adoption of high-efficiency kitchen equipment, which increased by 5% over the PY21 target.⁵ Significant achievements included conducting research about and advocating for updates to appliance standards that were passed in the legislature.
- **AEG verified customer satisfaction scores of 9.7 and 9.5 (out of 10) for business and residential participant satisfaction, respectively.** Each metric exceeded the 9.0 target by at least 6%.

Table ES-2 provides the key research findings from the PY22 verification and their implications for claimed values, which impacted Hawai'i Energy's awards.

Table ES-2 Key Research Findings and Their Implications/Outcomes: PY22 Verification

Key Result/Finding	Outcome
Ten Residential Energy Efficiency Measures (REEM) window AC opportunities (14% of all PY22 units) did not claim demand reductions. Another project omitted SEER and EER information.	After applying the correct deemed kW values, the window AC measure achieved a 1.59 TRM adjustment factor, contributing to REEM's 1.06 TRM adjustment factor overall.
It was unclear whether some ductless split system AC opportunities were completed in 2022 or in 2023. The TRM has different guidance for 2022 and 2023.	Because of the minimal impact of the issue, the ductless split system AC measure achieved a 1.00 TRM adjustment factor across the portfolio; however, the issue can still be seen in the TRM adjustment factors for the Business Energy Efficiency Measures (BEEM) and Residential Hard-to-Reach (RHTR) programs.
Ten Energy Advantage lighting opportunities (less than 2% of claimed Business Hard-to-Reach [BHTR] savings) did not provide measure characteristics or savings algorithms in the tracking database. Additional projects had measures described as "Custom Lighting" or "Hawai'i Energy Historical Product" rather than a discrete measure name from the TRM.	The lack of discrete measure names for some projects prevented AEG from verifying measure details with certainty. Given the accuracy of claimed savings estimates for Energy Advantage projects generally, AEG accepted the claimed savings (1.00 TRM adjustment factor) for projects with incomplete database information.
Hawai'i Energy applied an effective useful life (EUL) of 14 years to all Energy Advantage opportunities and did not apply a dual baseline where necessary. Hawai'i Energy indicated to AEG that the EUL of 14 years is a default value for Energy Advantage based on average hours of use (HOU) submitted by contractors and an average lamp life assumption of 50,000 hours.	AEG used lamp life ratings from product spec sheets to update Energy Advantage EULs, apply dual baselines, and calculate lifetime savings. This improved lifetime savings, resulting in a 1.11 desk review adjustment factor for BHTR.

⁵ There is no performance award associated with the Outcome Metrics key focus area at this time.

Key Result/Finding	Outcome
Nine percent of opportunities samples for desk review appeared to have been completed and rebated during PY21.	AEG credited Hawai'i Energy with savings for these projects but recommends, to prevent confusion and double-counting of savings, that Hawai'i Energy flags opportunities that were completed in a previous program year but not claimed until the current program year.
Because of a data processing issue, many Energy Advantage coincidence factors (CFs) exceeded 1.0. Hawai'i Energy unintentionally included weekend peak hours (in addition to weekday peak hours) in its CF calculations, artificially inflating CFs, often above the upper bound of 1.0.	Hawai'i Energy provided corrected CFs for sampled projects, and AEG updated demand reductions accordingly, contributing to the 0.87 desk review adjustment factor for BHTR. Since the discovery of this issue, Hawai'i Energy noted that it has been corrected.
Within REEM, AEG changed baseline vintages for all sampled central air conditioner (CAC) retrofit desk review opportunities and updated home occupancies for all sampled solar water heater opportunities. Per project documents, the CAC retrofits replaced equipment installed prior to 2006, triggering lower baseline efficiencies. Similarly, documentation revealed that occupancies for residential solar water heater projects were smaller than the TRM's deemed average occupancy.	These two sets of changes yielded offsetting impacts on REEM desk review adjustment factors, which were close to 1.00 for first-year energy savings, lifetime energy savings, and peak demand reduction.
Hawai'i Energy used an Early Replacement baseline to claim savings for a large transformer project despite the age of the pre-existing transformer exceeding 30 years. Hawai'i Energy confirmed the age of the pre-existing equipment upon request. Per the PY22 TRM V2.0, justifying an EUL that exceeds 30 years requires documentation that (1) the transformer is underloaded during average and peak operating conditions and (2) is in good working order.	For this project, AEG verified only 9% of its savings. Because Hawai'i Energy did not have documentation available, AEG calculated the savings as a Replace-on-Burnout (ROB) project using a single baseline based on DOE2016 standard efficiency, which significantly reduced savings.
Two sampled transformer projects did not meet criteria outlined in the PY22 TRM for a single-baseline approach for Early Replacements.	AEG applied dual baselines, consistent with ROB measures, which lowered lifetime savings for these projects by about 60% (a 0.40 adjustment factor).
One sampled custom chiller project used an EUL of 13 years, per the TRM guidance for custom projects.	AEG updated this to 22 years according to the chiller-specific EUL, increasing lifetime energy savings.
In the document of record that calculated energy savings for smart device demand response (DR) measures, multiple projects lacked meter read data for May and June 2023, short-changing sampled projects of energy savings.	Supplemental documentation contained the May and June meter reads, from which AEG credited Hawai'i Energy with more savings. Additionally, AEG removed any visibly duplicated line items, which lowered savings slightly. Smart device DR opportunities achieved a 1.02 adjustment factor.
The variable flow drive (VFD) pool pump opportunity sampled for desk review did not meet program criteria. AEG verified from project documentation and confirmed with Hawai'i Energy staff that the installed pool pumps operated at one reduced speed rather than two different speeds as required by Hawai'i Energy's program eligibility requirements.	AEG accepted the project and re-calculated savings, resulting in a 0.82 project-level adjustment factor. However, zero savings could have been justified.
AEG found several cases where project appeared to have been installed before applications for rebates were submitted to Hawai'i Energy.	Evaluating net-to-gross (NTG) ratios was outside of AEG's scope for the PY22 Verification. However, AEG continued flagging projects that could be examples of free-riders of the Custom Business (CBEEM) program based on unclear timelines or a lack of documented pre-approval.

Key Result/Finding	Outcome
AEG could not adequately verify savings using engineering best practices in any of the sampled non-lighting custom projects associated with a large energy efficiency initiative at several military housing communities. The supplemental project documentation did not include any of the raw data used to develop per-unit savings estimates, and AEG had to rely on the per-unit savings estimates developed by the implementation contractor. AEG was also limited to visiting vacant units during the onsite visits.	No adjustments made (based on onsite visit or desk reviews). AEG feels that the substantial savings and incentives associated with these military housing opportunities (which included lighting upgrades, weatherization, and HVAC upgrades at more than 5,000 housing units) warrant a more robust verification of the initiative in full upon its completion. This would include identifying all opportunities associated with the military housing energy efficiency initiative and verifying the project as a whole, ideally with the time and budget required to sample vacant and occupied units from all affected communities.

PY24 Major TRM Update

In CY23, AEG completed the TRM review and prioritization processes. Those steps are necessary for gathering input from the Technical Advisory Group (TAG) and determining which updates should be given priority during the PY24 TRM update. AEG also began carrying out benchmarking analysis to inform the update process.

CONTENTS

Executive Summary	i
Approach	i
Key Findings and Implications	ii
Introduction	1
Research Objectives.....	1
EM&V Research Activities	1
PY22 Verification	2
Approach to Verification	2
Verification Results.....	4
Recommendations	9
EEPS Review Research	11
Approach	11
Key Findings	11
TRM Updates and Related Research	13
PY23 TRM Major Update (Completed).....	13
PY23 TRM Mid-Year Update (Completed)	14
PY24 TRM Major Update (Initiated).....	15

LIST OF FIGURES

Figure 1 Achievement of Performance Targets for Clean Energy Technologies for PY22	7
Figure 2 Achievement of Performance Targets for Accessibility & Affordability for PY22.....	8
Figure 3 Market Transformation & Economic Development Verified Performance	8
Figure 4 Progress Towards EEPS Goal: First-Year Energy Savings	12

LIST OF TABLES

Table ES-1	Summary of EM&V Research Activities and Methods for Work Completed or Initiated in CY23	ii
Table ES-2	Key Research Findings and Their Implications/Outcomes: PY22 Verification	iv
Table 3	PY22 CET Verification Methods	3
Table 4	PY22 Non-CET Verification Methods	4
Table 5	PY22 Claimed and Verified Performance Award by Performance Indicator	6
Table 6	Verification Recommendations	9

INTRODUCTION

This report presents the results of all Evaluation, Measurement and Verification (EM&V) related activities associated with the Hawai'i Energy Conservation and Efficiency Programs (Hawai'i Energy programs) initiated or completed during the prior calendar year (CY) 2023 (referred to as CY23). This report also summarizes the most important findings from the completed CY23 EM&V activities, with a focus on implications for the Hawai'i Energy programs.

Research Objectives

The EM&V work conducted for CY23 contributes to three overarching research objectives:

- **Verification of accomplishments:** Verifying Hawai'i Energy's program year 2022 (PY22) achievements.
- **Robustness of savings approaches:** Updating and improving approaches used to estimate savings for Hawai'i Energy's programs and measures.
- **Program planning:** Using results to inform future program planning.

EM&V Research Activities

The EM&V-related research activities for CY23 were determined in consultation with the Hawaii Public Utilities Commission (HPUC) and the Energy Efficiency Manager (EEM).

The EM&V Contractor (Applied Energy Group [AEG]) engaged in five research activities in CY23:

- **Completed:** Reviewing and updating the PY23 Technical Reference Manual (TRM)
- **Completed:** Making mid-year updates to the PY23 TRM
- **Completed:** Energy Efficiency Portfolio Standard (EEPS) research, including support for the Report to Legislature⁶
- **Partially completed:** Verifying Hawai'i Energy's PY22 program portfolio
- **Initiated:** Reviewing and updating the PY24 TRM

The remainder of the report first presents an overview of the PY22 verification of Hawai'i Energy's portfolio followed by an overview of EEPS research. Subsequently, we offer a summary of the TRM tasks that were completed and initiated.

⁶ State of Hawaii Public Utilities Commission, Report to the 2024 Legislature on Hawaii's Energy Efficiency Portfolio Standards, Issued Pursuant to Section 269-96, Hawaii Revised Statutes, December 2023.

PY22 VERIFICATION

The HPUC contracted AEG to verify the savings and performance of Hawai'i Energy's Public Benefits Fee Administrator (PBFA) programs in PY22 (July 1, 2022, to June 30, 2023). PY22 marked Hawai'i Energy's first year in the Triennial Plan for program years 2022 to 2024 (PY22-24) and its 12th year implementing energy efficiency programs as a PBFA. AEG verified whether Hawai'i Energy met the targets for the performance indicators and key focus areas (listed in Table 3 and Table 4), which determined the performance awards that Hawai'i Energy was eligible to receive in PY22.

This chapter summarizes the PY22 verification approach, results, and recommendations. More detailed information on the verification can be found in the Hawai'i Energy PY22 Verification Report⁷ located on the Hawai'i Energy website.⁸

Approach to Verification

Verification activities included a tracking database review, savings replication for deemed and semi-deemed measures, engineering desk reviews, and onsite visits for custom projects, as well as documentation reviews to verify program funding equity, engagement with hard-to-reach communities, and customer satisfaction. AEG used the methods shown in Table 3 and Table 4 to verify PY22 performance in the Clean Energy Technologies (CET) and non-CET key performance areas, respectively. Non-CET performance areas include Accessibility & Affordability (A&A), Market Transformation & Economic Development (MTED), and Customer Satisfaction.

AEG did not design PY22 verification activities to review the validity of the TRM's stipulated savings or adjustment factors, only to assess whether Hawai'i Energy applied them appropriately when calculating claimed values for the PY22 programs. Therefore, our verification does not scrutinize measure-level gross savings values or associated adjustments beyond ensuring the correct application of TRM-stipulated savings and factors and documentation of incented measures through desk reviews.⁹

⁷ Hawai'i Energy PY2022 Verification Report, Prepared by Applied Energy Group, Prepared for Hawaii Public Utilities Commission, June 11, 2024. (This report has not been published yet.)

⁸ <https://hawaiienergy.com/about/information-reports>

⁹ AEG compared Hawai'i Energy database information to the PY22 TRM V2.0 information.

Table 3 PY22 CET Verification Methods

Performance Metric	Description of Metric	Verification Activities and Adjustments
Energy and Demand Savings* <i>First-Year Energy Savings</i> <i>Lifetime Energy Savings</i> <i>Peak Demand Reductions</i>	Customer-Level Savings Gross savings for each customer before accounting for line losses or what the customer would have done absent the program (i.e., no application of a net-to-gross ratio at this step)	TRM Adjustment through a savings replication for all deemed and semi-prescriptive measures in the tracking database Desk Review Adjustment through engineering desk reviews on a sample of custom and non-custom projects On-site Adjustment through in-person site visits to spot-check key savings estimation parameters and confirm the installation and operation of rebated equipment
	System-Level Savings Savings reflected at the generator incorporating line losses	System-Loss Adjustment through a review of the system loss factors (in PY22 TRM) applied to the customer-level savings
	Program-Level Savings Net savings that account for free-ridership and spillover (system-level savings multiplied by the net-to-gross ratio)	Net-to-Gross (NTG) Adjustment through a review of the NTG ratios (in PY22 TRM) applied to the system-level savings
Total Resource Benefits	The estimated total net present value (NPV) of the avoided cost for the utility from the reduced lifetime demand (kW) and energy (kWh) from energy efficiency projects and measures	TRB Adjustment using customer-level verified savings and NTG ratios to calculate TRBs for each program and measure (avoided costs already include line losses, so are not included in savings at this step); avoided costs as stipulated in PY22 TRM
Grid Services Ready Products	The total number of projects completed or products installed that qualify as Grid Services Ready (e.g., grid-connected water heaters)	Product Adjustment using the count of Grid Services Products included in the reconciled tracking database
Demand Flexibility	Total potential/additional load flexibility (kW) from Grid Services Ready technologies	Demand Adjustment using the sum of program-level flexible demand (kW) established through grid services projects
GHG Reductions	The avoided emissions and equivalent avoided barrels of oil due to program-level annual energy savings	GHG Avoided Emissions Adjustments using the program-level verified savings and metric tons-per-kWh and barrels of oil-to-metric tons conversion factors provided in the PY22 TRM

*Performance targets for energy and demand savings metrics are based on program-level savings, which are built up from customer- and system-level savings.

Table 4 PY22 Non-CET Verification Methods

Performance Area	Metric	Verification Approach
Affordability & Accessibility	Economically Disadvantaged Requires serving a minimum number of customers (who save a minimum amount on their energy bills) through the Energy Advantage and single- and multi-family direct install programs, distinct communities through the Community-Based Energy Efficiency program, and nonprofits through the EmPOWER Hawaii Project.	Energy Advantage. Confirmed customer counts in the tracking database. Single Family/Multifamily Direct Install. Confirmed customer counts in the tracking database and calculated customer bill savings using average Hawaiian Electric rates and 2019 customer billing data. Community-Based Energy Efficiency (CBEE). Confirmed community counts through project documentation review.
	Island Equity Requires that 13 percent of program spending occurs in each of Hawaii and Maui counties.	Confirmed equitable distribution of funds by reviewing program spending by island (program tracking database includes a variable that states the island for each rebate).
Market Transformation & Economic Development	Behavior Change Professional Development & Technical Training Codes & Standards Clean Energy Innovation Hub Outcome Metrics	Reviewed contractor invoices, attendance records, participant agreements, and other backup documents.
Customer Satisfaction	Residential Customer Satisfaction Business Customer Satisfaction	Reviewed survey results from Medallia and in-house survey tools.

Verification Results

In total, Hawai'i Energy achieved 40% of the potential awards. Shortfalls primarily came from not meeting CET targets (Figure 1, page 7). Hawai'i Energy met all the non-CET performance metrics except for the A&A target (Figure 2, page 8) set for program spending in the County of Maui (Figure 3, page 8). Accordingly, it did not receive full awards in this area.

Table 5 (page 6) summarizes the PY22 performance targets compared with Hawai'i Energy's claimed results and the verified results derived by AEG. Specifically:

- **Hawai'i Energy did not meet the target for installing Grid Services Ready measures.** In PY21, AEG verified nearly 200% of the target. In PY22, the programs fell short of the target of 2,200 measures by 23%. The measures included grid-interactive water heaters, smart devices, smart thermostats, and smart electric panels. Grid Services Ready measures are commonly installed in hotels as part of an energy management system (EMS). Measure installation is thus dependent on room occupancy, and occupancy was higher than anticipated (based on 2021-22 trends), causing projects delays.
- **Hawai'i Energy's implementation of PY22 TRM algorithms for prescriptive programs was nearly perfect.** AEG made minimal TRM adjustments to the claimed savings, leading to TRM adjustment factors close to 1.0 for all programs.
- **Hawai'i Energy achieved just 29% of available CET awards in PY22,** largely driven by the Business Prescriptive and Business Custom programs, which faced lower participation than expected and did not achieve any awards. The verification had a limited impact on achieved awards overall.
- **Hawai'i Energy met all A&A performance targets despite not claiming awards for commercial customer first-year bill savings targets.** By using verified first-year energy

savings and peak demand reduction in conjunction with current commercial customer retail rates, AEG verified 108% of Hawai'i Energy's A&A commercial first-year bill savings target.

- **Hawai'i Energy PBFA programs met or exceeded targets for all MTED performance metrics except for Outcome Metrics**, a new focus area for the Commercial Kitchen Equipment (CKE) channel. Hawai'i Energy fell short of the target for the adoption of high-efficiency kitchen equipment, which increased by 5% over the PY21 target.¹⁰ Significant achievements included conducting research about and advocating for updates to appliance standards that were passed in the legislature.
- **AEG verified customer satisfaction scores of 9.7 and 9.5 (out of 10) for business and residential participant satisfaction, respectively.** Each metric exceeded the 9.0 target by at least 6%.

¹⁰ There is no performance award associated with the Outcome Metrics key focus area this time.

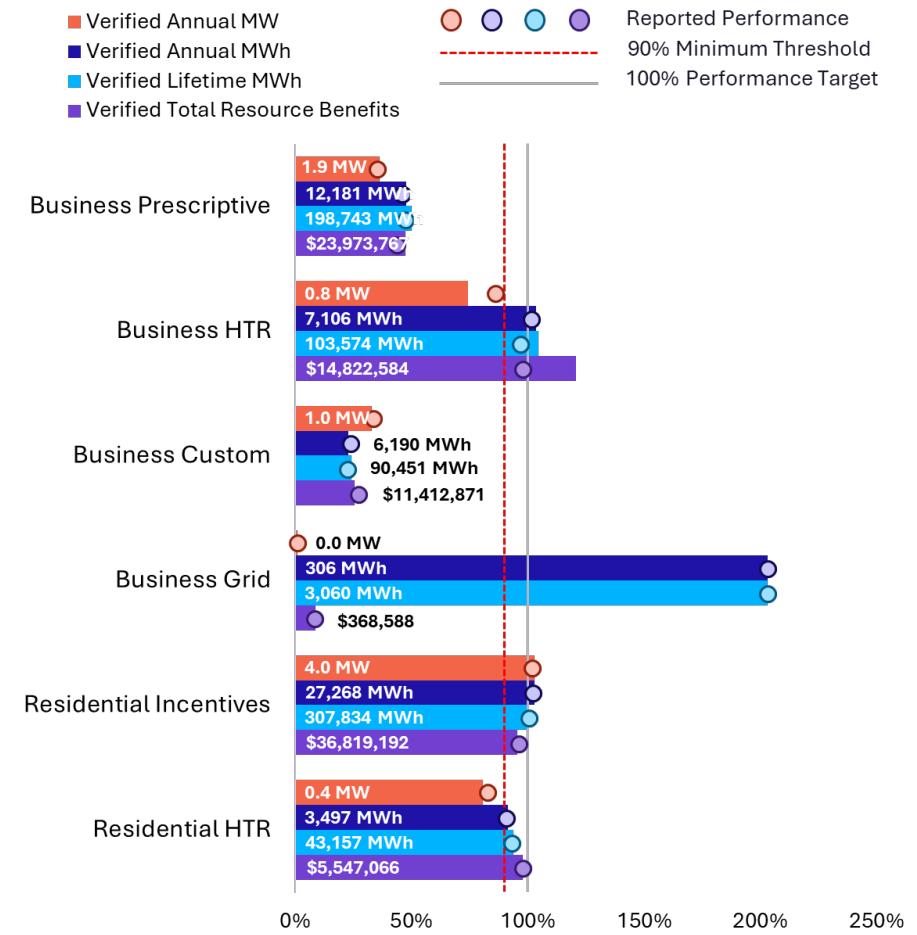
Table 5 PY22 Claimed and Verified Performance Award by Performance Indicator

Performance Indicator	Performance Target	Metric	Fraction of Award	Target Award	Claimed Results			Verified Results		
					Performance	Percentage of Performance Target	Award	Performance	Percentage of Performance Target	Award
Clean Energy Technologies - Key Focus Areas ¹			70.00%	\$525,000		28.7%	\$150,873		28.8%	\$151,421
First Year Energy Reduction	89,807,910	kWh	15.00%	\$112,500	56,162,776	62.5%	\$44,528	56,548,198	63.0%	\$44,791
Lifetime Energy Reduction	1,227,351,042	kWh	15.00%	\$112,500	727,354,827	59.3%	\$38,952	746,817,730	60.8%	\$39,851
Peak Demand Reduction	17,605	kW	20.00%	\$150,000	8,079	45.9%	\$32,714	8,005	45.5%	\$32,714
Total Resource Benefit	\$155,921,667	\$	15.00%	\$112,500	\$89,569,518	57.4%	\$34,679	\$92,944,068	59.6%	\$34,064
Grid Services Ready	2,200	projects/ demand management products installed or customers served	5.00%	\$37,500	1,663	75.6%	\$0	1,686	76.6%	\$0
Demand Flexibility (new)	3,500	potential or additional load flexibility from grid service ready technologies (kW)	0.00%	\$0	1,286	36.7%	\$0	1,286	36.7%	\$0
Greenhouse Gas Emissions/ Barrel of Oil	63,659 / 146,887	tons / barrels	0.00%	\$0	38,760 / 90,192	60.9% / 61.4%	\$0	40,083 / 93,216	63.0% / 63.5%	\$0
Accessibility & Affordability - Key Focus Areas			20.00%	\$150,000		40.0%	\$60,000		50.0%	\$75,000
Economically Disadvantaged										
Business A&A (Energy Advantage, Energy Relief Grant)										
Customers Served	550	Customers served	2.00%	\$15,000	631	115%	\$15,000	631	115%	\$15,000
Bill Savings	\$1,754,612	Customer bill savings (annual)	2.00%	\$15,000	\$1,375,541	78%	\$0	\$1,892,585	108%	\$15,000
Residential A&A (Single & Multifamily Direct Install, Water Heating Direct Install, Bulk Appliances)										
Customers Served	1,800	Customers served	2.00%	\$15,000	1,990	111%	\$15,000	1,975	110%	\$15,000
Bill Savings	\$2,631,891	Customer bill savings (lifetime)	2.00%	\$15,000	\$2,810,182	107%	\$15,000	\$3,314,562	126%	\$15,000
Community Based Energy Efficiency (new)	4	Communities served	2.00%	\$15,000	5	125%	\$15,000	5	125%	\$15,000
Island Equity										
County of Hawaii	13%	Target spend must be met in Hawaii & Maui Counties for Milestone & Target Award	10.00%	\$75,000	14.2%	109%	\$0	14.2%	109%	\$0
County of Maui	13%				12.6%	97%		12.6%	97%	
City & County of Honolulu	74%				73.2%	99%		73.2%	99%	
Economic Development & Market Transformation - Key Focus Areas			8.00%	\$60,000		100.0%	\$60,000		100.0%	\$60,000
Behavior Change										
Workshop and Presentations										
STEM based student workshop	1,200	Number of participant-hours of Training	1.00%	\$7,500	2,208	184%	\$7,500	2,047	171%	\$7,500
Adult learning	2,500	Number of participant-hours of Training	1.00%	\$7,500	2,774	111%	\$7,500	2,745	110%	\$7,500
Gamification Campaigns and Competitions	700	Number of participants	0.00%	\$0	1,111	159%	\$0	884	126%	\$0
Professional Development & Technical Training										
Clean Energy Ally Support										
Targeted Ally Training Opportunities										
Targeted Participant Training Opportunities	7,000	Number of participant-hours of Training	5.00%	\$37,500	7,890	113%	\$37,500	7,154	102%	\$37,500
Educator Training and Grants										
Degree Program Support										
Vocational Training										
Codes and Standards										
Appliance Standards Advocacy	7	Advocacy Events	1.00%	\$7,500	15	106%	\$7,500	15	106%	\$7,500
Improve Code Compliance	1	Establishing compliance roadmap and tracking savings			1			1		
Code-Related Training	150	Number of participant-hours of Training			151			151		
Clean Energy Innovation Hub										
Innovation and Emerging Technologies	1	Companies supported	0.00%	\$0	1	100%	\$0	1	100%	\$0
Outcome Metrics (new)	5% increase	Increase in High Efficiency Equipment Adoption	0.00%	\$0	Not Met	0.0%	\$0	Not Met	N/A	\$0
Customer Satisfaction - Key Focus Areas			2.00%	\$15,000		100.0%	\$15,000		100.0%	\$15,000
Application Processing Customer Experience - Commercial	>9	Overall customer satisfaction score	1.00%	\$7,500	9.70	108%	\$7,500	9.66	107%	\$7,500
Application Processing Customer Experience - Residential	>9	Overall customer satisfaction score	1.00%	\$7,500	9.50	106%	\$7,500	9.50	106%	\$7,500
Total Performance Award			100%	\$750,000		38%	\$285,873		40%	\$301,421

The remainder of this section details the key findings from the CET and non-CET verification activities.

Figure 1 shows Hawai'i Energy PBFA program verified performance against CET performance indicator targets for first-year and lifetime energy savings (MWh), peak demand reductions (MW), and total resource benefits (\$).

Figure 1 Achievement of Performance Targets for Clean Energy Technologies for PY22



The verification findings show the following with respect to the CET targets:

- The **Business Prescriptive** programs (BEEM and BESM) and the **Business Custom** program (CBEEM) missed the minimum awards threshold for every metric. Energy savings fell short of targets as claimed by Hawai'i Energy and verified by AEG (the verification did not contribute to these shortfalls). Hawai'i Energy stated that local businesses still face economic hardships and uncertainty caused by the pandemic, which leaves them wary of or unable to commit to large capital investments in energy efficiency.
- The **Business Hard-to-Reach** (BHTR) and **Business Grid** (BGRID) programs achieved 100% of first-year and lifetime energy savings but fell short of the peak demand minimum threshold. Only BHTR met the threshold for TRBs among business programs. BGRID targets were

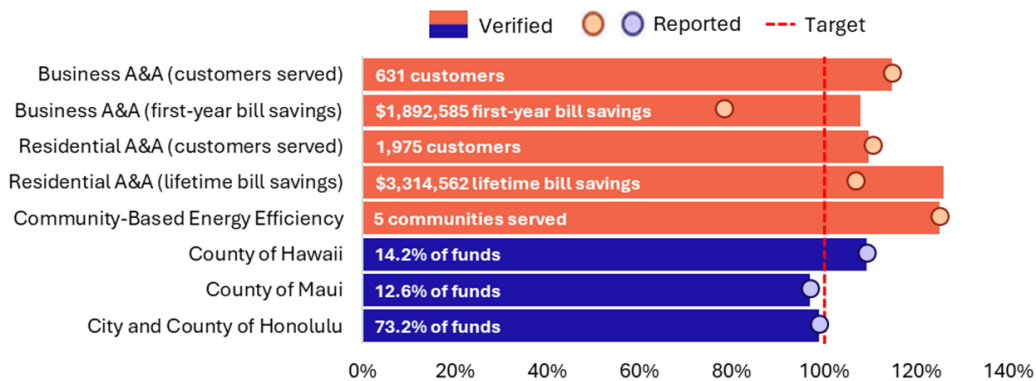
associated primarily with the PowerMove battery program, which did not gain as much traction as expected until late in PY22.

- The **Residential Incentives** programs (REEM, RESM, and CREEM) and **Residential Hard-to-Reach** program (RHTR) achieved some awards in almost every category. Among residential awards, Hawai'i Energy only fell short of achieving any awards for peak demand for RHTR.

As shown in Figure 2 (page 8), Hawai'i Energy met all **Economically Disadvantaged** performance targets. Despite Hawai'i Energy not claiming an award for business A&A first-year bill savings, AEG verified 108% of its target using verified first-year energy savings and demand reduction in conjunction with current commercial customer retail rates. This increased Hawai'i Energy's non-CET awards by \$15,000.

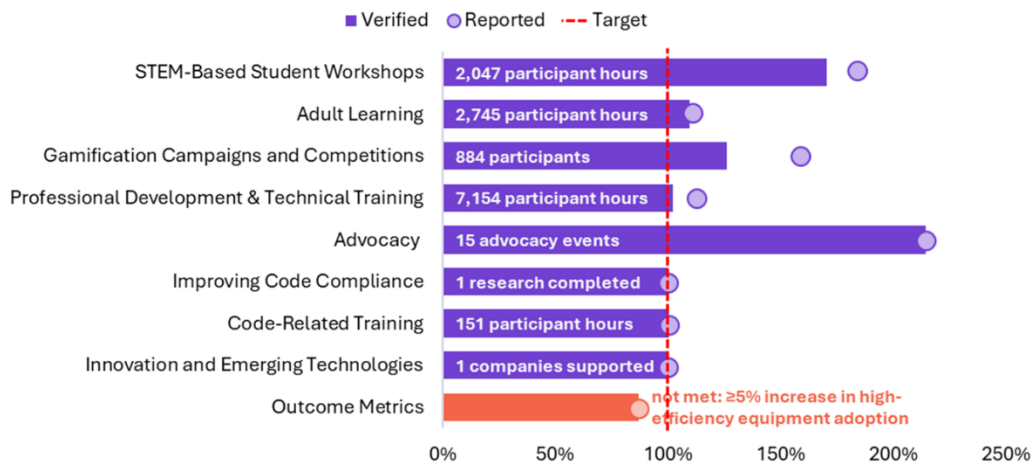
AEG verified Hawai'i Energy's claim that it did not achieve **Island Equity** awards because incentive spending for the Counties of Hawaii and Maui fell short of the performance target.

Figure 2 Achievement of Performance Targets for Accessibility & Affordability for PY22



AEG verified MTED activities and achievements by reviewing contractor invoices, participant agreements, virtual workshop rosters and screengrabs, and other backup documents. As shown in Figure 3, Hawai'i Energy met all MTED performance targets except for its new Outcome Metrics target, which pertains to high-efficiency refrigeration equipment adoption.

Figure 3 Market Transformation & Economic Development Verified Performance



In documentation pertaining to the Refrigeration Efficiency initiative, program staff indicated it sought to increase the number of customers participating in a refrigeration efficiency project by 5%, increasing its target number of participants from 75 in PY21 to 78 in PY22. To Hawai'i Energy's credit, it increased its participant count by 8% (from 63 in PY21 to 68 in PY22); however, it did not achieve the original target number of participants in PY21, which set itself up to fall short of a similarly aggressive target in PY22.

One of Hawai'i Energy's performance targets relates to customers' satisfaction with their rebate experience. To measure residential participant satisfaction, Hawai'i Energy uses the customer management tool Medallia, which sends customers an automated email survey soliciting feedback on their experience with a variety of program interaction elements. Once a month, Hawai'i Energy sends surveys to new business participants through an in-house customer experience management tool.

Recommendations

Based on the verification activities, AEG developed a set of recommendations for Hawai'i Energy to consider. Table 6 documents historical recommendations made by AEG beginning in PY17 that remain relevant. Other recommendations may have been made over the past five evaluations; however, either they were implemented by Hawai'i Energy, or they are no longer relevant for another reason, i.e., change in awards, targets, or focus.

Table 6 Verification Recommendations

Recommendation	PY17	PY18	PY19	PY20	PY21	PY22	Comments
Account for dual baselines when calculating Lifetime Energy savings and TRBs.			X	X	X	X	Adjustments for dual baselines were still needed in BHTR and CBEEM.
Collect invoices (or an equivalent form of documentation) for all measures and projects prior to paying out incentives.		X	X	X	X	X	AEG saw little improvement over PY21 particularly for custom projects.
When using regression models to estimate annual savings for custom projects, ensure that models incorporate sufficient data from both the pre- and post-implementation period to cover the range of operating conditions experienced in a typical year and produce accurate and precise savings estimates.		X		X	X	X	CBEEM chiller projects sampled for desk review lacked sufficient pre- and post-implementation data to conform with best practices.
Adhere to Custom Project Guidance.					X	X	Custom projects adhered to guidance more consistently than in PY21 but leaves room for improvement.

<i>Recommendation</i>	<i>PY17</i>	<i>PY18</i>	<i>PY19</i>	<i>PY20</i>	<i>PY21</i>	<i>PY22</i>	<i>Comments</i>
<i>Ensure site inspections are sufficiently rigorous to verify measure type and quantity.</i>		X	X	X	X	X	Post-installation site inspections often do not collect sufficient data to verify the type and quantity of all measures. This issue has been significant and ongoing for custom and new construction projects.
<i>Consider using typical meteorological year (TMY) weather data when using regression analysis to estimate lifetime savings for custom projects.</i>				X	X	X	Using TMY is a best practice and conforms with the Custom Project Guidance Document.
<i>Collect supplemental project documentation before paying out incentives for projects.</i>				X	X	X	This is a documentation best practice that conforms with the Custom Project Guidance Document.

EEPS REVIEW RESEARCH

This chapter summarizes CY23 activities related to EEPS research, including support for the Report to Legislature. More information, including data presented below, can be found in AEG's 2021 EEPS Review Research Report.¹¹

In 2008, the State of Hawaii ("State") partnered with the United States Department of Energy to establish the Hawaii Clean Energy Initiative (HCEI), with a goal of meeting 70% of the State's energy needs through renewable energy and energy efficiency by 2030. The Hawaii State Legislature subsequently passed Act 155, Session Laws of Hawaii 2009 ("Act 155"), codified under § 269-96, Hawaii Revised Statutes (HRS), which established the State's energy efficiency goals into an Energy Efficiency Portfolio Standard. As specified in HRS § 269-96, the statewide EEPS goal is 4,300 gigawatt-hours (GWh) of first-year electricity savings by 2030.

Approach

In CY23 AEG researched annual first-year energy savings from Commission-Regulated, which are comprised of Hawai'i Energy and Kauai Island Utility Cooperative (KIUC), and from Other Contributing Entities, which consist of local, state, and federal agencies, the Green Energy Market Securitization (GEMS) financing program, and federal, state and local appliance standards. AEG quantified savings for each category of entities as follows:

- **Commission-Regulated Entities:**
 - **Hawai'i Energy.** AEG reviewed publicly available documents and reports including Annual Reports, Annual TRMs, and Annual Verification reports.
 - **KIUC.** AEG interviewed KIUC representatives to discuss their program savings and reviewed publicly available reports and filings.
- **Other Contributing Entities:**
 - **Local, state, and federal agencies, and GEMS.** AEG conducted interviews with representatives of each agency/entity to discuss their program savings and reviewed publicly available reports when appropriate.

In previous iterations of EEPS research, AEG updated the Statewide Energy Efficiency Potential Study and, in CY18, had been planning to conduct a statewide baseline study and additional market research to be fielded in CY19.

Key Findings

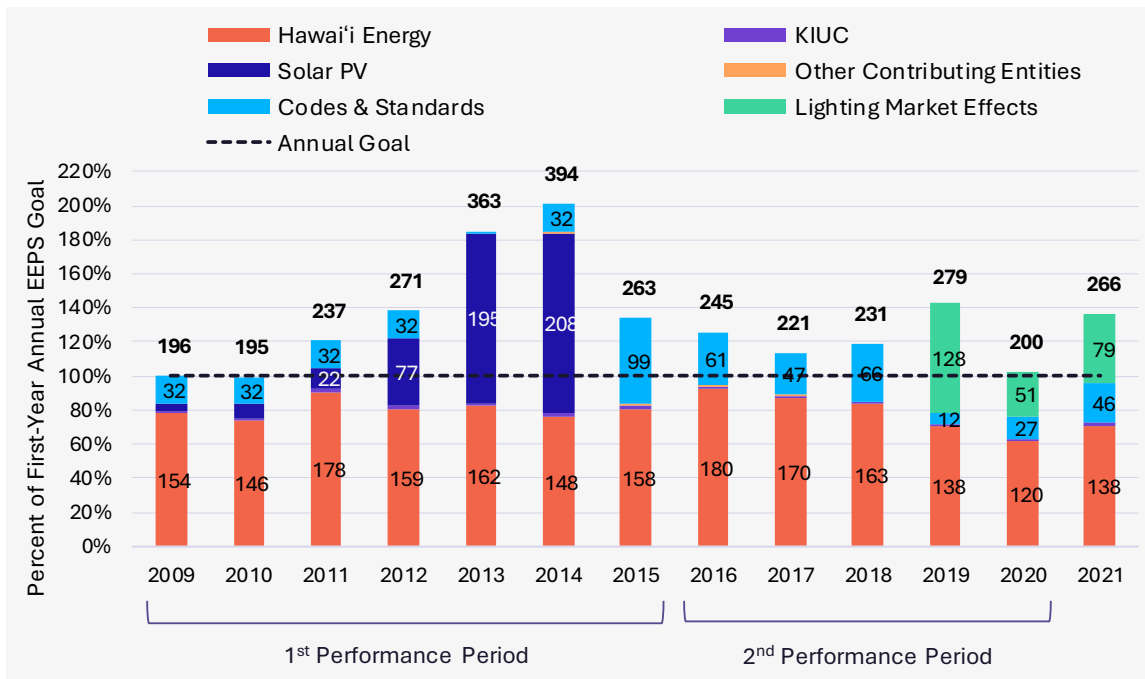
The State exceeded its 2020 interim EEPS goal by 2% for the second reporting period (2016–2020). Hawai'i Energy consistently comprises the majority of energy savings contributed toward annual EEPS goals, followed by codes and standards and lighting market effects, the latter of which accounts for changes to lighting standards via the Energy Independence and Security Act of 2007 (EISA). Aggressive lighting standards have undercut energy savings potential within the Hawai'i Energy portfolio, causing Hawai'i Energy to shift its focus among the residential

¹¹ 2021 EEPS Review Research Report, Prepared by Applied Energy Group, Prepared for the Hawaii Public Utilities Commission, December 2023.

customer segment away from LED lighting toward solar and heat pump water heaters and other big-ticket appliances.

Figure 4 illustrates statewide annual progress toward EEPS first-year energy savings goals. Hawai'i Energy's verified first-year energy savings are presented at the system level, which accounts for line losses during transmission & distribution (T&D) but not NTG adjustments. Each year since 2009, Hawai'i Energy has accounted for at least 62% of the EEPS annual goal, contributing at least 120 GWh of first-year energy savings toward EEPS goals of roughly 195.0 to 196.5 GWh annually.

Figure 4 Progress Towards EEPS Goal: First-Year Energy Savings



Hawai'i Energy continues to be a very cost-effective energy resource in Hawaii. During the second performance period (2016–2020), Hawai'i Energy's direct program expenditures ranged from 1.3 to 2.1 cents per lifetime kilowatt-hour (kWh) annually. While these costs do not account for program administration, they are well below other comparative costs in the state, such as the wholesale cost of electricity in Hawaii, including recent power purchase agreements for utility-scale solar PV, and compare even more very favorably to current retail rates of electricity, which ranged from 37 to 44 cents per kWh during PY22.¹²

¹² Oahu residential (Rate Class R) customers, July 2022 through June 2023: <https://www.hawaiianelectric.com/billing-and-payment/rates-and-regulations/effective-rate-summary>.

TRM UPDATES AND RELATED RESEARCH

This chapter summarizes CY23 activities related to the review and update of Hawai'i Energy's TRM.

PY23 TRM Major Update (Completed)

During CY22, AEG completed planning, receiving input from the Technical Advisory Group (TAG), and prioritizing updates for the PY23 TRM's major review and update. Then, in CY23, AEG completed the following steps, which culminated in the final PY23 TRM v1.0:

- Conducting benchmarking analysis to inform measure updates
- Drafting updates to TRM measures and other content
- Reviewing updates and receiving feedback from Hawai'i Energy and the EEM
- Making additional adjustments to address feedback
- Finalizing the PY23 TRM
- Receiving final approval and signatures from Hawai'i Energy, the EEM, and the HPUC

The PY23 TRM updates consisted of revisions to the following content:

- Commercial HVAC: Air Conditioning (AC) & Heat Pump
- Commercial Kitchen: Combination Oven
- Commercial Kitchen: Convection Oven
- Commercial Kitchen: Ice Machine
- Commercial Kitchen: Low-Flow Spray Nozzle
- Commercial Kitchen: Freezer
- Commercial Kitchen: Refrigerator
- Residential Appliance: Clothes Washer
- Residential HVAC: Central AC Retrofit
- Residential Water Heating: Heat Pump – Net to Gross Ratio (NTGR)
- Greenhouse Gas (GHG) Calculator
- Codes & Standards Tracking
- Commercial Plug and Process: Water Cooler Timer – Labeled as inactive

AEG expects the TRM updates will affect the PY23 portfolio-level savings in several ways:¹³

- Changes to the baseline criteria for the commercial AC and heat pump measure will likely result in a significant decrease in first-year and lifetime energy savings for BEEM, unless the efficiency of the new high-efficiency equipment installed increases in proportion to the increase in the federal standard baseline efficiency. At the same time, peak demand reduction may not be affected since there were no changes to the full-load efficiency (energy efficiency ratio, or EER) baseline.
- Changes to the six commercial kitchen measures may result in an overall increase in peak demand reduction, first-year energy savings, and lifetime energy savings for BHTR.

¹³ AEG used measure quantities from Hawai'i Energy's PY23 bottom-up analysis to estimate whether the updates to the PY23 TRM are likely to result in positive or negative portfolio-level savings relative to the PY23 program plan.

- Changes to the three residential measures may result in an overall increase in first-year and lifetime energy savings but may decrease peak demand reduction for REEM.
- Portfolio-level first-year and lifetime energy savings are likely to decrease, driven by changes to the commercial AC and heat pump measure. However, there may be a net increase in peak demand reduction due to contributions from various measure updates.
- Changes to the emission rates in the GHG calculator will decrease portfolio-level avoided emissions by roughly 4%.

PY23 TRM Mid-Year Update (Completed)

The TRM Framework allows for mid-year additions to the TRM if the requests are submitted and approved prior to implementation of the new or expanded measures.¹⁴ The purpose of the mid-year PY23 TRM update was to review any recommendations and add the new or modified measure entries for all opportunities approved by the HPUC into a new version of the PY23 TRM, referred to as PY23 TRM v2.0. In accordance with guidance provided in the TRM Framework related to mid-year updates, AEG reviewed the recommended mid-year TRM updates. Because all recommended updates fit within the budget currently set aside for mid-year additions, AEG granted all requests. Upon approval by the EEM and HPUC, AEG carried out the mid-year TRM updates. It went into effect early CY24.

The mid-year updates to the PY23 TRM included the following:

- **Residential Appliance, Induction Cooktop (new):** This new measure consists of replacing an electric resistance cooktop with an ENERGY STAR-certified induction cooktop in an existing home or installing an ENERGY STAR-certified induction cooktop in a newly constructed home. The energy savings estimation analysis leveraged data from the California eTRM and ENERGY STAR.^{15,16} To estimate the peak demand reduction, AEG analyzed an average cooking load shape for a single-family house using the Hawaii peak demand period of non-holiday weekdays from 5 to 9 pm.¹⁷ The original cooking load shape data source was the California Energy Commission. The load shape was compiled along with other load shapes during the 2020 Market Potential Study for Hawaii.¹⁸
- **Residential Appliance, Heat Pump Clothes Dryer (new):** This new measure consists of replacing an electric resistance clothes dryer with an ENERGY STAR-certified heat pump clothes dryer in an existing home or installing an ENERGY STAR-certified heat pump clothes dryer in a newly constructed home. The energy savings estimation analysis leveraged data

¹⁴ Hawai'i Energy Technical Reference Manual Framework, Version 1.1, June 1, 2020, Effective July 1, 2019 (superseded Version 1.0). See Section 3.4 Mid-Program Year Additions and Modifications.

¹⁵ California Technical Forum, SWAP015-02, Induction Cooking with or without Electric Range, CPUC Approved January 1, 2023. <https://www.caetrm.com/measure/SWAP015/02/>.

¹⁶ 2021-2022 ENERGY STAR® Emerging Technology Award Winning Residential Induction Cooking Top Models, June 23, 2022. <https://www.energystar.gov/sites/default/files/asset/document/2021%202022%20ETA%20QPL%20Residential%20Induction%20Cooking%20Tops%206.23.2022.xlsx>.

¹⁷ Refer to the file named "Load_shape_by_segment_110519_Cooking 09192023.xlsx." See also the "SF_Cooking" tab in AEG's 2023 Analysis File titled "Mid-year PY23 TRM - Residential Induction Cooktop - Analysis File."

¹⁸ *State of Hawaii Market Potential Study*, prepared by AEG for the HPUC, July 27, 2020.

from the California eTRM and the Federal Standard for clothes dryers.^{19,20} To estimate the peak demand reduction, AEG analyzed an average clothes dryer load shape for a single-family house using the Hawaii peak demand period of non-holiday weekdays from 5 to 9 pm.²¹ As for the cooking load shape described above, the original clothes drying load shape data source was the California Energy Commission.

- **Residential Plug/Process, Electric Vehicle Charger (new):** This new measure consists of replacing a non-ENERGY STAR Level 2 Electric Vehicle Charger with an ENERGY STAR-certified Level 2 Electric Vehicle Charger in an existing home or installing an ENERGY STAR-certified Level 2 Electric Vehicle Charger in a new or existing home instead of installing a non-ENERGY STAR charger. The savings are due to a reduction in standby energy losses.²² The energy savings estimation analysis leveraged data from the Northwest Power and Conservation Council's Regional Technical Forum (RTF) and ENERGY STAR.^{23,24} To estimate the peak demand reduction, AEG assumed that electric vehicles are charged during off-peak hours and that the standby energy use and resulting demand savings fully coincide with the peak demand period. Note: The peak demand reduction would be lower for charging during the on-peak hours. Time-of-use (TOU) rates heavily influence when electric vehicles are charged. To realize the peak demand reductions, customers receiving rebates for electric vehicle chargers through the Hawai'i Energy program should be encouraged to charge during off-peak hours, whether or not they are on a TOU rate.
- **Commercial Lighting, U-bend Lamps (update):** This mid-year update adds an option for a single LED U-bend lamp to replace a single fluorescent U-bend lamp. Hawai'i Energy requested this update because they had a problem rebating single LED U-bend lamps through the midstream program. The previous version of the measure only had savings for two LED U-bends replacing two fluorescent U-bends. The savings for the new single U-bend measure equal one-half of those for the double U-bend measure.

PY24 TRM Major Update (Initiated)

The Hawai'i Energy TRM Framework calls for an annual review and update of TRM content. The workflow includes several steps, three of which were completed in CY23:

- Completed in CY23
 - Annual TRM update planning
 - Input on updates from the TAG
 - Prioritization of measures and content to update
- To complete in CY24

¹⁹ California Technical Forum, SWAP003-04, Clothes Dryer, Residential, CPUC Approved January 1, 2023. <https://www.caetrm.com/measure/SWAP003/04/>.

²⁰ Federal Standard 10 CFR 430.32(h) Federal Required Minimum CEF Requirements for Clothes Dryers. Title 10 was last amended on 9/29/2023. <https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-430>.

²¹ Refer to the file named "Load_shape_by_segment_110519_Clothes Drying 10032023." See also the "SF_Clothes Drying" tab in AEG's 2023 Analysis File titled "Mid-year PY23 TRM - Residential Heat Pump Dryer - Analysis File."

²² Only standby energy is considered here since the ENERGY STAR electric vehicle supply equipment specification does not explicitly call for testing of steady state charging efficiency.

²³ Northwest Power and Conservation Council, Regional Technical Forum (RTF), Level 2 Electric Vehicle Charger Workbook Version 3.1, Jul 18, 2023. <https://nwcouncil.app.box.com/v/leve2evcharg-3-1>.

²⁴ ENERGY STAR Certified Electric Vehicle Supply Equipment - AC-Output, Metadata Updated October 13, 2023. <https://catalog.data.gov/dataset/energy-star-certified-electric-vehicle-supply-equipment-ac-output-v1-1>.

- Benchmarking analysis
- Draft TRM updates
- Review and feedback
- TRM adjustments
- Final TRM presented for HPUC approval

During CY22, AEG completed the first three steps (planning, receiving input, and prioritizing updates) for the PY24 TRM review and update.

After first developing a plan for the PY24 TRM updates, AEG compiled a preliminary list of measures and content to consider in the review and update process. AEG identified these items during previous TRM updates and PY22 Verification and through correspondence with Hawai'i Energy, the EEM, and the HPUC. AEG next requested additional input on the preliminary list of update ideas from the TAG and then compiled all suggested updates into a comprehensive list for prioritization. This process resulted in a list of 96 potential items to review and update. Using four criteria to score each suggested update and considering the level of effort and time required for each update, AEG recommended a “short list” of 13 existing measure updates and two new measure additions (plus two priority special studies if funding permits) for the PY24 TRM update. In response to Hawaii’s upcoming fluorescent lighting ban, several of the updates include adding sunset dates to lighting measures that have fluorescent baselines.²⁵ AEG began the remaining analysis and updating steps for the PY24 TRM in early CY24.

²⁵ The state of Hawaii’s HB 192 Act 225 calls for a ban on sales of screw-base CFLs in December 2024 and pin-base CFLs and linear fluorescent lamps in December 2025.

Applied Energy Group, Inc.
2300 Clayton Road, Suite 1370
Concord, CA 94596

P: 510.982.3525