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December 28, 2023

The Honorable Ronald D. Kouchi,
President and Members
of the Senate
Thirty-Second State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki,
Speaker and Members of
the House of Representatives
Thirty-Second State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kouchi, Speaker Saiki, and Members of the Legislature:

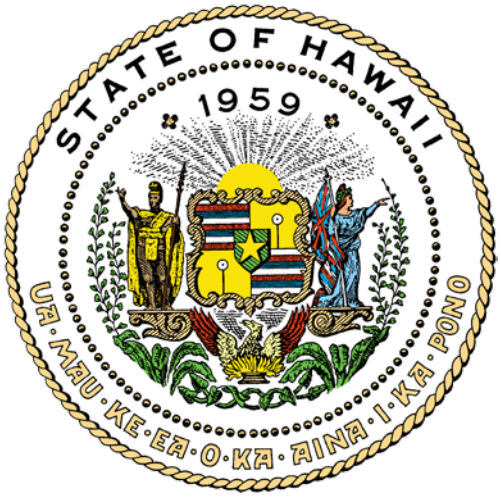
For your information and consideration, I am transmitting a copy of the **Energy Efficiency Portfolio Standards Legislative Report as required by section 269-96, Hawaii Revised Statutes (HRS).**

In accordance with Section 93-16, HRS, I am also informing you that the report may be viewed electronically at **https://puc.hawaii.gov/reports/**.

Sincerely,

Leodoloff R. Asuncion
Chair

Enclosures



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

EXECUTIVE SUMMARY

In 2008, the State of Hawaii 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 ("Legislature") subsequently passed House Bill (HB) 1464 that was signed into law by Governor Linda Lingle as Act 155, Session Laws of Hawaii 2009, and codified under §269-96, Hawaii Revised Statutes (HRS), which established the State's energy efficiency goals into an Energy Efficiency Portfolio Standard ("EEPS"). As specified in HRS § 269-96, the statewide EEPS goal is 4,300 gigawatt-hours ("GWh") of electricity savings by 2030.

This report is respectfully submitted by the Hawaii Public Utilities Commission ("Commission") in advance of the 2024 Legislative Session and addresses the Second EEPS Performance Period (2016-2020), including more recent data where available. Pursuant to HRS § 269-96, this report ("Report") summarizes the Commission's evaluation of the Energy Efficiency Portfolio Standard, including whether the EEPS remains effective and achievable. Several principle findings in this Report are listed below:

KEY FINDINGS

The EEPS Goal continues to be effective for accelerating deployment of energy efficiency resources throughout Hawaii, as reflected in both first-year savings and cumulative persisting savings achievements. Hawaii achieved 135% of first-year savings interim targets across the First and Second Performance Periods (3,095 of 2,350 interim GWh goal) in first-year savings. The State reached 104% of the interim EEPS targets across the First and Second Performance Periods (2,453 of 2,350 interim GWh goal) in achievement of cumulative persisting savings, an updated interpretation of the EEPS target that was soft-adopted during this Second Performance Period (and is addressed in the Achievements section of this Report).

The Hawaii Energy portfolio continues to deliver a majority of the savings towards the EEPS interim goals. Similar to the first reporting period, the majority of the energy savings comes from the Hawaii Energy portfolio. Hawaii Energy contributed 58% of the first-year energy savings (and 62% of the cumulative persisting savings) delivered in the First Performance Period, and 77% of the first-year savings (53% of the cumulative persisting savings) delivered in the Second Performance Period. These impacts are expected to generate over five billion dollars of utility bill savings for customers over the

life of the installed efficiency measures.[1] Furthermore, Hawaii Energy program activities from 2009 through 2020 reduced on-peak demand by nearly 300 MW.[2]

Hawaii Energy continues to be a cost-effective energy resource in Hawaii, having maintained program costs per saved kWh that are far lower than electricity prices in Hawaii. Between program years 2016 and 2020, direct program spending ranged between 1.2 and 2.4 cents/lifetime kWh. 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 favorably to the current electricity rates that range from 43 to 55 cents/kWh.[3]

Energy efficiency provides benefits to low-income customers. Hawaii Energy programs targeted towards low-to-moderate income customers serve to reduce the customers' energy usage and costs, thereby reducing their energy burden. Program offerings for low-income customers include programs that directly install energy-saving measures in the home and buy down the cost of larger appliances like refrigerators, washing machines and dryers. Small businesses and non-profits can benefit through grants that help offset the costs of planning and executing energy upgrades, on top of Hawaii Energy's equipment rebates. Serving hard-to-reach customers continues to be a primary focus of the Hawaii Energy portfolio of programs.

Energy efficiency provides additional benefits, particularly in support for renewable resource planning. Hawaii's utilities and stakeholders are preparing for a 100% renewable energy portfolio by 2045 and energy efficiency serves as the lowest-cost resource by reducing and offsetting the energy demand. This results in fewer renewables required on the grid, less land use needed for infrastructure, and an overall cost savings to the utility and customer.

More aggressive strategies will be needed to meet the 2030 EEPS goal. While the state has been successful in energy savings achievement through calendar year 2020, impacts such as the shift from capturing low-hanging fruit (i.e. residential lighting) efficiency opportunities, to changing markets and post-pandemic economic conditions, are

[1] See Table 5 in this Report.

[2] 2*021 EEPS Review Research Report*. Prepared for the Hawaii Public Utilities Commission by Applied Energy Group, Inc. December 27, 2023.

[3] https://www.hawaiianelectric.com/billing-and-payment/rates-and-regulations/average-price-of-electricity, accessed December 12, 2023.

resulting in more expensive efficiency measures needed to attain the same level of achievement. Furthermore, in terms of cumulative persisting savings, the energy savings achieved in the early years fall away as the measures reach the end of their useful lives. That means that just achieving the annual first year energy savings targets identified in the EEPS Framework will not be sufficient to meet the EEPS goal in 2030. This was anticipated and identified in both the 2020 Market Potential Study and the Second EEPS Report to the Legislature[4] and is supported by the findings in this report. Therefore, meeting the overall 2030 EEPS target will require scaling up the level of effort in future years to both achieve the savings required to span the gap between the current level of savings and the 4,300 GWh target and to achieve savings to make up for measures that will reach the end of their useful lives between 2020 and 2030. In 2024, the Commission will, based on a regular cycle of procurement, select an energy efficiency program administrator for program years 2025 – 2027. This offers an opportunity for the Commission to align the specific objectives of energy efficiency programs over the coming years with the 2030 EEPS goal and to ensure the program administrator is ready and able to deliver such energy savings for the State.

[4] The Second EEPS Report to the Legislature was delivered in December 2018 and reported on the EEPS progress over the first reporting period from January 2009 to December 2015.

Figure 1. Annual Statewide First-Year Energy Efficiency Accomplishments towards EEPS Goals (GWh system level savings)

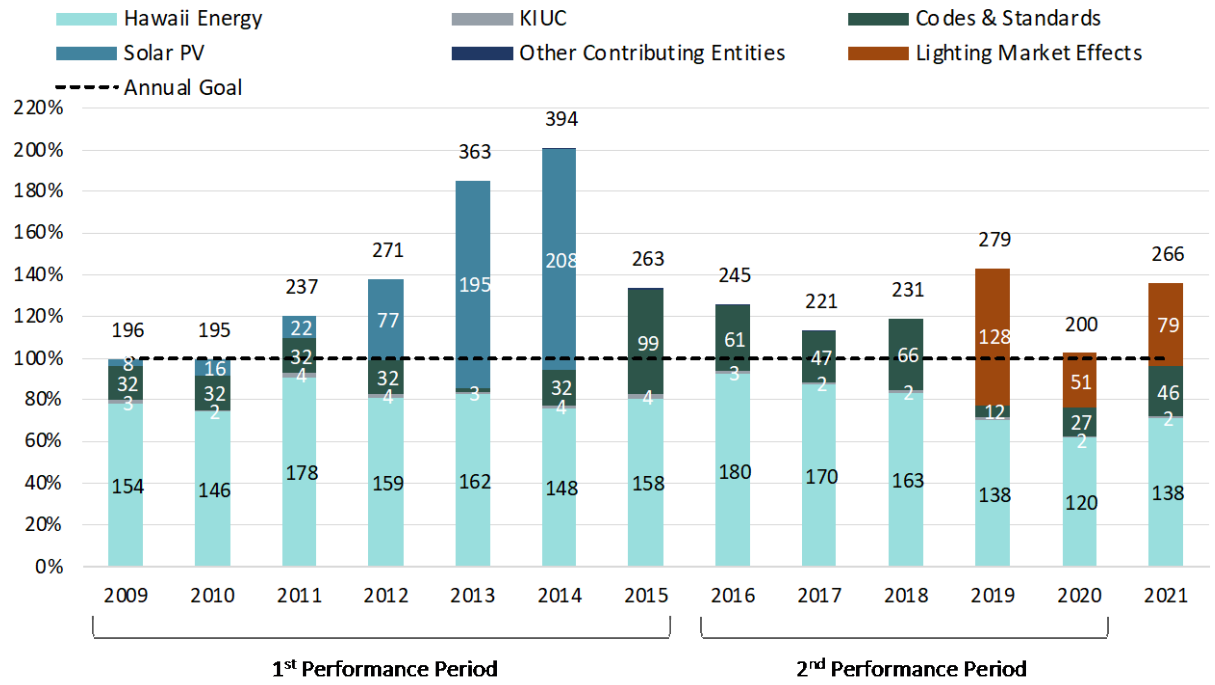
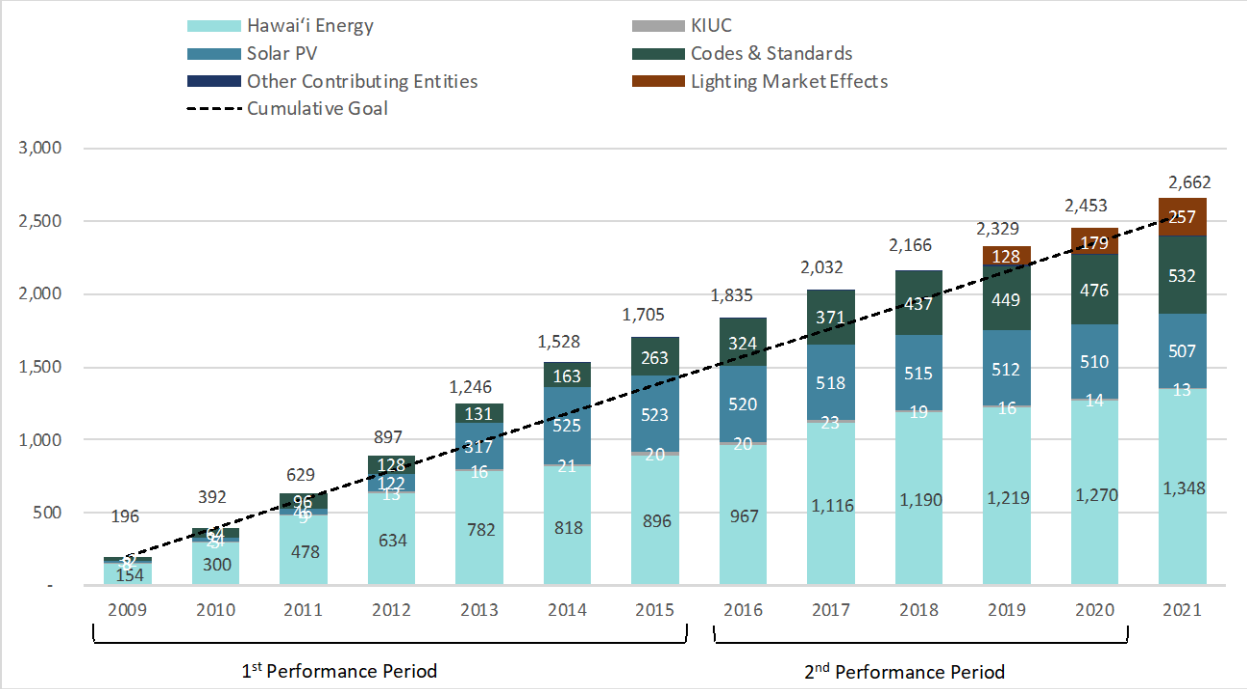


Figure 2. Annual Statewide Cumulative Persisting Energy Efficiency Accomplishments towards EEPS Goals (GWh system level savings)



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HAWAII'S ENERGY EFFICIENCY PORTFOLIO STANDARD

Energy efficiency is a means of using less energy to provide the same (or greater) level of energy services. Hawaii's EEPS is a statutory requirement to achieve an aggressive, long-term energy efficiency goal. Hawaii's EEPS law is similar in concept to Hawaii's Renewable Portfolio Standard (RPS),[5] which requires electric utilities to acquire increasing levels of energy from renewable resources by specified deadlines. Whereas the RPS goals are focused on the supply or generation of electricity, the EEPS goals are focused on reductions in the demand, or consumption, of electricity.

ACT 155

In January 2008, the State of Hawaii and the United States Department of Energy established a long-term partnership with the purpose of transforming the way in which renewable energy and energy efficiency resources are planned and developed in the State. This partnership, referred to as the Hawaii Clean Energy Initiative ("HCEI"), set a goal for the State to meet 70% of its energy needs by 2030 through clean energy, with 30% coming from energy efficiency measures, and 40% coming from renewable sources.

Subsequently, the Legislature passed HB 1464 that was signed into law by Governor Linda Lingle as Act 155, Session Laws of Hawaii 2009, and codified as HRS § 269-96, which provides:

a) The Commission shall establish energy-efficiency portfolio standards that will maximize cost-effective energy efficiency programs and technologies.

b) The energy efficiency portfolio standards shall be designed to achieve 4,300 GWh of electricity use reductions statewide by 2030; provided that the Commission shall establish interim goals for electricity use reduction to be achieved by 2015, 2020, and 2025 and may also adjust the 2030 standard by rule or order to maximize cost-effective energy-efficiency programs and technologies.

c) The Commission may establish incentives and penalties based on performance in achieving the energy efficiency portfolio standards by rule or order.

d) The Commission shall evaluate the energy efficiency portfolio standard every five years, beginning in 2013, and may revise the standard, based on the best information available at the time, to determine if the energy efficiency portfolio standard established by this section remains effective and achievable. The Commission shall report its findings and

[5] Hawaii's RPS (codified as HRS § 269-92) establishes percentages of renewable energy that must comprise net electricity sales: 30% of net electricity sales by December 31, 2020; 40% of net electricity generation by December 31, 2030; 70% of net electricity generation by December 31, 2040; and 100% of net electricity generation by December 31, 2045.

revisions to the energy-efficiency portfolio standard, based on its own studies and other information, to the Legislature no later than twenty days before the convening of the regular session of 2014, and every five years thereafter.

e) Beginning in 2015, electric energy savings brought about by the use of renewable displacement or off-set technologies, including solar water heating and seawater air conditioning district cooling systems, shall count toward this standard.

Development of the EEPS Framework

Pursuant to HRS § 269-96, on March 8, 2010, the Commission opened Docket No. 2010-0037 to establish a stakeholder-based process to develop and implement a framework for achieving the State's EEPS goal. The purpose of the EEPS Framework is to set forth broad principles and strategies for achieving the EEPS goal and to establish interim goals that will set the course for achieving the 2030 EEPS goal.

The Parties to Docket No. 2010-0037 consisted of key stakeholders, including the Public Benefits Fee Administrator (PBFA),[6] the electric utilities, government agencies, and industry and advocacy groups. After extensive stakeholder discussions, the Commission approved the EEPS Framework in Decision and Order No. 30089 on January 3, 2012.

The Commission acknowledged the inherent challenges of developing interim goals for a relatively new program with a statutory goal set for 2030. One important consideration was the need for adequate data and analysis of statewide energy efficiency potential on which to base interim goals and for allocating responsibilities for achievement. Another important challenge relates to the "jurisdictional gap," which describes the fact that the Commission has jurisdiction over some entities that are expected to contribute to achievement of the EEPS goal (e.g., the electric utilities and the PBFA), but the Commission has no jurisdiction over many other critical contributors ("other contributing entities"), including federal, state, and county government agencies, non-profit organizations, and other large electricity consumers.

The EEPS Framework addresses these and other challenges by providing broad guidance on responsibilities and roles for various entities that can contribute to meeting EEPS goals. It also set interim goals broken out in five-year increments corresponding to the reporting periods prescribed in HRS §269-96. The Commission acknowledged that while the Framework is intentionally broad and flexible, it is based on the information and resources available during its development (2010-2011). The Commission expected that regular evaluation of the EEPS

[6] The Public Benefits Fee Administrator is the third-party administrator of the Public Benefits Fee (PBF) programs in Hawaiian Electric's service territories, selected by the Commission under HRS Chapter 269, Part VII. The PBF statutory framework is contained in HRS § 269-121 through -124.

Framework and the EEPS goals would continue and may result in modifications or adjustments over time.

While the EEPS legislation established a statewide energy efficiency goal for 2030 of 4,300 GWh, the EEPS Framework provides additional detail and guidance, including interim goals and metrics for achieving the EEPS. The interim target for the second EEPS reporting period is 975 GWH and is further broken into annual targets, as illustrated in Table 1 below.

Table 1. Annual Targets for EEPS Second Reporting Period

Year	GWh Goal
2016	195
2017	195
2018	195
2019	195
2020	195
Total	975

The EEPS Technical Working Group was established in Decision & Order No. 30220 and their primary functions are to make "recommendations regarding prioritizing savings strategies for the portfolio, determining eligible measures and programs and revising goals as necessary".

The EEPS Framework does not give detailed specific direction around the counting of savings. Given that EEPS is ultimately intended to result in reduced energy sales in 2030, the TWG has provided clarifying guidance during meetings held in 2019-2020 that the annual savings targets are first year energy savings (defined below) while the overall 4,300 GWh target are the savings that remain in place, or "persisting", in 2030. This means that energy efficiency measures installed in the early years but that have reached the end of their useful lives and are no longer in service are not considered to be delivering energy savings in 2030. Rather, to realize the benefit of energy reductions in 2030, only savings from energy efficiency measures still in place in 2030 should count towards EEPS. The TWG defined these savings as cumulative persisting savings, and this Second Review Period provided an opportunity to evaluate the EEPS achievements based on performances toward both metrics.

Public Benefits Fee Energy Efficiency Portfolio

Hawaii Energy is the branded name of the ratepayer-funded energy efficiency portfolio program administered by the PBFA under contract with the Commission. Established in 2009 prior to the EEPS Framework, Hawaii Energy serves electric utility customers on the islands of Hawaii, Maui, Molokai, Lanai, and Oahu. Kauai Island Utility Cooperative (KIUC) administers its own energy efficiency program for its customers. Hawaii Energy's programs and services are

funded by a PBF surcharge collected through customer bills. Energy savings reported through the programs developed by the PBFA are subject to verification by an independent evaluator.

Leidos Inc., serves as the current PBFA. Leidos' contract with the Commission to design and implement the Hawaii Energy program runs though December 31, 2025. When the EEPS program was established, the Hawaii Energy program was expected to be a primary contributor to the EEPS goal with codes and standards and other contributing entities also materially contributing.

ESTIMATES OF 2016-2020 STATEWIDE ENERGY EFFICIENCY SAVINGS

Pursuant to HRS § 269-96, the Commission has evaluated progress towards meeting the statewide EEPS goal of a 4,300 GWh of savings by 2030. This report documents EEPS savings beginning in 2009, the first performance year, through 2021. This report captures savings from the first and second performance periods (January 2009 to December 2015 and January 2016 to December 2020, respectively). The total performance goal for this thirteen-year reporting period (2009-2020) is cumulative persisting savings of 2,350 GWh. This report also includes performance for 2021 to provide the most current data available.[7]

Tables and figures in this report show two primary metrics describing energy savings of Hawaii Energy's portfolio and the EEPS program:

- 1st year savings: the aggregate energy savings from an energy efficiency measure, program, or portfolio achieved during the 12 months subsequent to implementation.
- Cumulative persisting savings: a summation of the energy savings achieved for all the measures delivering energy savings in that year. Savings for each measure are counted in each year over the lifetime of the measure.

STATEWIDE EEPS SAVINGS

The 2030 EEPS goal was expected to be achieved by a combination of regulated and non-regulated contributing entities, including:

- Public Benefits Fee Administrator, branded as Hawaii Energy, is currently administered by Leidos, Inc. under contract with the Commission.
- Kauai Island Utility Cooperative implements its own efficiency program for its customers. It is both a regulated entity and a contributing entity.[8]
- Hawaiian Electric[9] makes improvements to their utility system that generate energy savings, such as high efficiency transformer replacement, re-conductoring and voltage regulation or optimization.

[7] Therefore, this report includes one additional year of data on top of the two EEPS performance periods outlined in the EEPS Framework.

[8] For KIUC, estimated savings reflect the guidelines established by the HRS § 269-91 definition of "[r]enewable electrical energy," and energy efficiency technologies. These savings include heat pump water heating, ice storage, ratepayer-funded energy efficiency programs, and use of rejected heat from co-generation and combined heat and power systems. Fossil-fueled qualifying facilities that sell electricity to electric utility companies and central station power projects are not included.

[9] "Hawaiian Electric" for purposes of this document is a collective term referencing Hawaiian Electric Company, Hawaii Electric Light Company, and Maui Electric Company providing electric resources to Oahu, Hawaii Island, and Maui County, respectively.

- US Department of Defense is subject to federal Energy Independence and Security Act energy efficiency goals, which require a 30% energy use reduction by 2025.
- Hawaii State Government has a goal of 30% electricity use reduction by 2030.
- Codes and standards savings are attributable to federal and state appliance standards and building codes.
- Customer-Sited Solar Photovoltaic ("PV") systems provided 1st year savings prior to 2015 for PV systems installed before 2015.[10] These savings are estimated based on Hawaiian Electric Companies data.[11]

Collectively, these contributing entities in the State play an important role in the statewide achievement of EEPS. While the US Department of Defense and State Government agencies are not subject to oversight by the Commission,[12] Hawaii Energy has been actively coordinating with most non-regulated contributing entities. As a result, most of the savings from other contributing entities – with the exception of contributions from KIUC, solar PV installed before 2015, and codes and standards – are captured through the Hawaii Energy program and therefore are not reported separately to avoid double counting.[13]

Achievements – First year Savings

During the thirteen years since the EEPS requirements were established, Hawaii exceeded the interim annual energy savings goals in terms of first-year savings in most years. During the

[10] Though new savings from PV systems are only allowed to be counted prior to 2015, for the calculation of cumulative persisting savings, savings delivered over the lifetime of the PV systems are counted.

[11] Success of the net energy metering program for customer PV installations was seen in 2013 and 2014, where first year impacts from PV installations well exceeded Hawaii Energy portfolio 1st year impacts. Per HRS § 269-91: "…beginning January 1, 2015, electrical energy savings shall not include customer-sited, grid-connected renewable-energy systems." After 2014, customer PV installations no longer count towards the EEPS goal, so PV values drop to zero on a 1st year savings basis but do provide ongoing cumulative persisting savings that can be counted toward achievement of the EEPS goal.

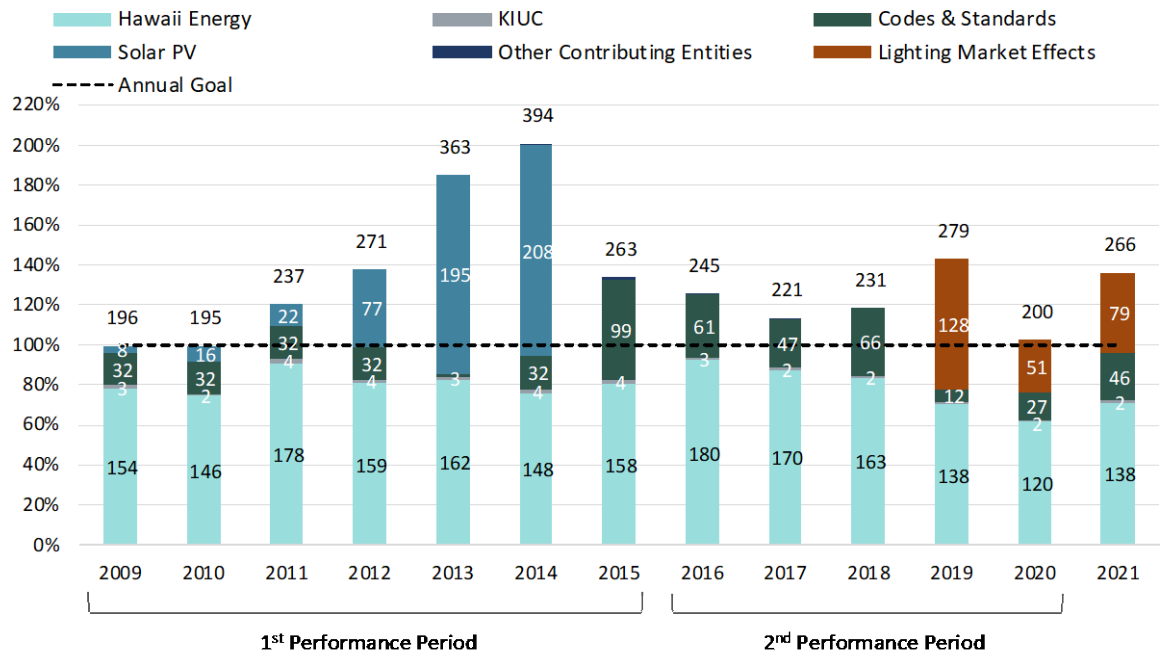
[12] In recognition of this reporting challenge, the EEPS Framework included consideration of explicit energy efficiency goals for all entities contributing to achievement of EEPS, including measurement and reporting of energy savings to the Commission. However, at this time, based on consultation with the TWG, the Commission has not established specific goals and reporting requirements for non-regulated entities contributing to the EEPS goal.

[13] Figure 3 on page 14 presents 1st year savings for the First and Second EEPS Reporting Periods, plus 2021. Hawaii Energy savings have been verified by a third-party evaluator. Building codes and appliance standards (which account for most of the "non-regulated entity" savings) estimates are based on current building practices and historical energy consumption but have not been independently verified. As with other potential studies, the forecasted savings in this analysis are based on previously adopted codes and standards and are conservative given the 40-year history of increasingly rigorous building code and appliance standard adoptions.

second EEPS Performance Period, the interim target was exceeded by 21% (1,176 of 975 GWh), and over the combined two periods, by 32% (132% of goal – 3,096 of 2,350 GWh). Savings in the second reporting period include lighting market effects for 2019 – 2021, due to efficient lighting purchases not explicitly transacted by the Hawaii Energy program but achieved as a result of the past program's influence and market preparation for the federal lighting standard (which went into effect in 2023). This is described further on page 30 of this Report (EISA section).

Hawaii Energy's achievements amounted to 80% of the interim goal and just over half of the total EEPS 1st year savings contributions during the First EEPS Performance Period, and 79% of the interim goal and 66% of the total EEPS 1st year savings during the Second EEPS Performance Period. The Commission expects that Hawaii Energy will continue to provide the bulk of the energy savings in the Third EEPS Performance Period (2021-2025). However, residual impacts from the COVID-19 pandemic will likely affect Hawaii Energy's ability to reach their annual targets in the near term. In addition, building codes and appliance standards are expected to provide an increasingly significant contribution toward EEPS savings over time. Hawaii also has opportunities to further increase these savings through local codes and appliance standards development and adoption. Coordination with other non-regulated contributing entities will continue to be important for maximizing contributions toward EEPS goals.

Figure 3. Annual Statewide First Year Energy Efficiency Accomplishments towards EEPS Goals (GWh system level savings)[14]



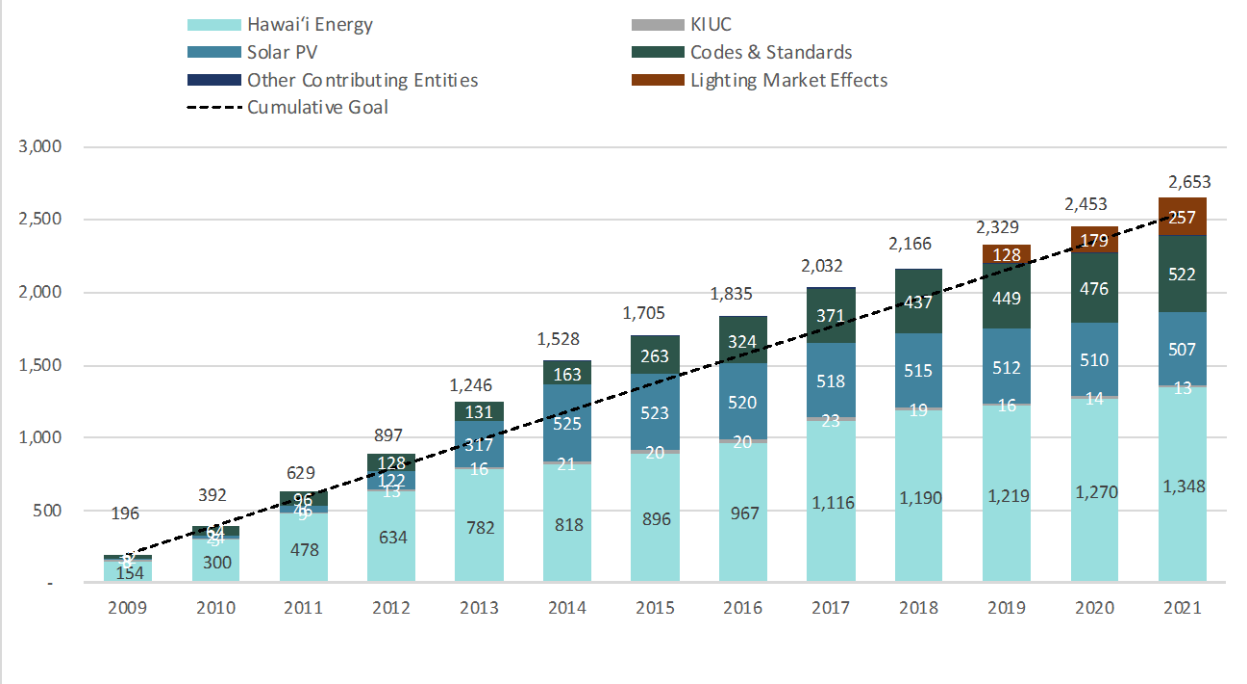
Achievements – Cumulative Persisting Savings

For this third EEPS Report, savings are also being reported based on cumulative persisting savings, which accounts for the savings that accumulate over time as more measures are installed, as well as savings that drop off as measure reach the end of their effective useful lives. At the end of the second EEPS Performance Period, 104% of the EEPS interim goal (2,453 of 2,350 GWh) has been achieved in terms of cumulative persisting savings.

The State will need to consistently and materially exceed annual 1st year savings goals to make up for the drop off in savings measured in the cumulative persisting metric. This can be seen in the trend over time in cumulative persisting savings as compared to interim 1st year EEPS target, where for the first EEPS Performance Period, 124% of the interim goal (1,704 of 1,375 GWh) was achieved in cumulative persisting savings, versus only 77% (748 of 975 GWh goal) in the second EEPS Performance Period.

[14] NOTE: Pursuant to HRS § 269-91, solar PV savings after 2014 do not count towards EEPS, but instead contribute to RPS achievement.

Figure 4. Annual Statewide Cumulative Persisting Energy Efficiency Accomplishments towards EEPS Goals (GWh system level savings)



Performance of Hawaii Energy

The Hawaii Energy program portfolio was successful in delivering substantial energy savings during the First and Second EEPS Performance Periods. Table 2 presents the total program impacts by program year. For EEPS reporting, claimed savings are presented at the system level and include avoided power station use and transmission and distribution losses. Between PY09 and PY21, Hawaii Energy delivered customers nearly 2,000 GWh of first year energy savings. While first year savings have declined slightly over the last three years, nearly 1,350 GWh of program savings persisted in PY21.[15]

[15] *2021 EEPS Review Research Report*. Prepared for the Hawaii Public Utilities Commission by Applied Energy Group, Inc. December 27, 2023.

Table 2. Hawaii Energy System-Level Savings by Program Year

Program Year	Peak Demand Reduction (MW)	First Year Savings (GWh)	Lifetime Savings (GWh)	Cumulative Persisting Savings (GWh)
2009	31.1	153.7	1,342.7	153.7
2010	23.3	146.0	1,430.0	299.7
2011	23.6	178.2	1,507.3	477.9
2012	20.7	158.6	1,507.1	633.8
2013	23.9	162.2	1,746.4	781.5
2014	26.2	148.2	1,508.3	817.8
2015	28.0	157.8	1,764.3	895.5
2016	25.7	180.1	2,245.0	966.7
2017	25.0	170.2	2,298.6	1,115.5
2018	26.0	162.9	2,248.8	1,190.0
2019	24.1	137.6	1,842.8	1,218.8
2020	22.0	120.0	1,497.4	1,269.6
2021	23.5	138.4	1,549.9	1,348.4

The following sections provide further details on Hawaii Energy's performance in terms of first year and cumulative persisting savings.

First Year Savings

Figure 5, below, shows total residential and commercial first year savings that occurred between Program Year ("PY") 09 and PY21 by equipment type. With over 59% of the total first year savings, lighting has been the main driver of savings to date. The "custom" category was the second largest contributor, with 14% of the savings. The "other" programs contributed close to 10% of savings and included Peer Group Comparison, Hawaii Energy's home energy reports program that served nearly all residential customers before being removed from the portfolio in mid-2020. (The "other" program category also includes additional water saving measures such as showerheads and faucet aerators.) Heating, ventilation, and air conditioning (HVAC) measures contributed 11% of the savings, with appliances and solar water heaters contributing close to 3% each.

Figure 5. Total First Year Savings by Equipment (PY09 – PY21)

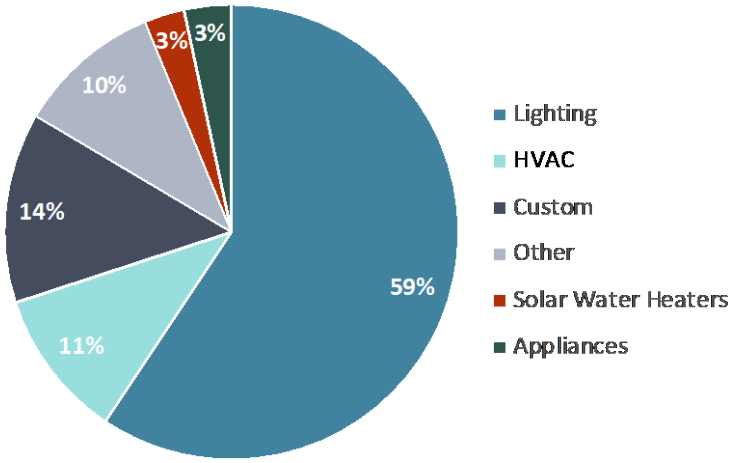


Figure 6, below, provides a comprehensive view of the first year, system-level savings achieved by Hawaii Energy's programs over the years. This view highlights the transition from residential to commercial-dominated savings, with commercial programs comprising between 53% to 60% of Hawaii Energy's portfolio from PY15 to PY19. In contrast, the residential programs contributed the majority of portfolio first year savings in PY09–PY14. In the last two program years, both sectors contributed similarly to the portfolio, with commercial programs contributing slightly more (53% and 54%) than residential programs (47% and 46%).

Figure 6. Hawaii Energy First Year System-Level Savings by Sector Over Time

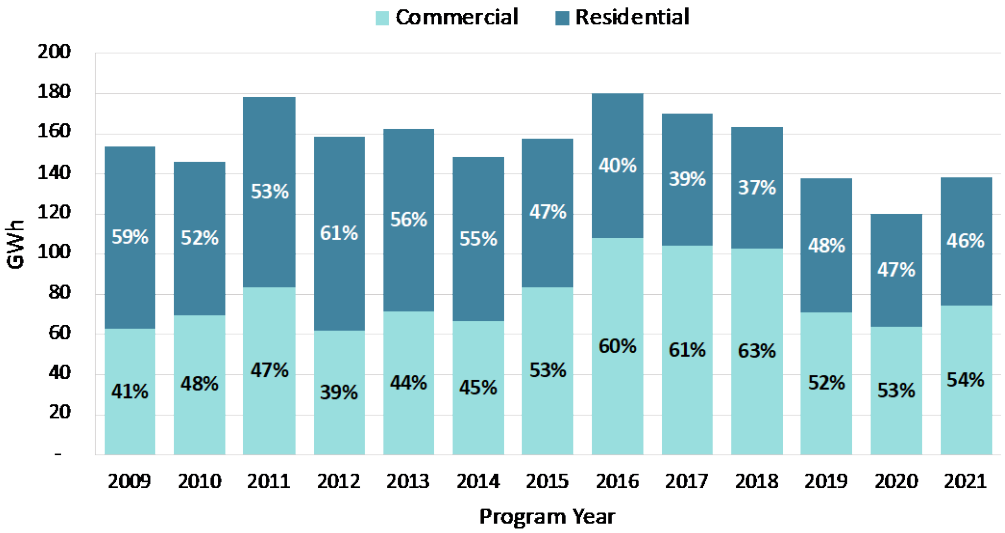
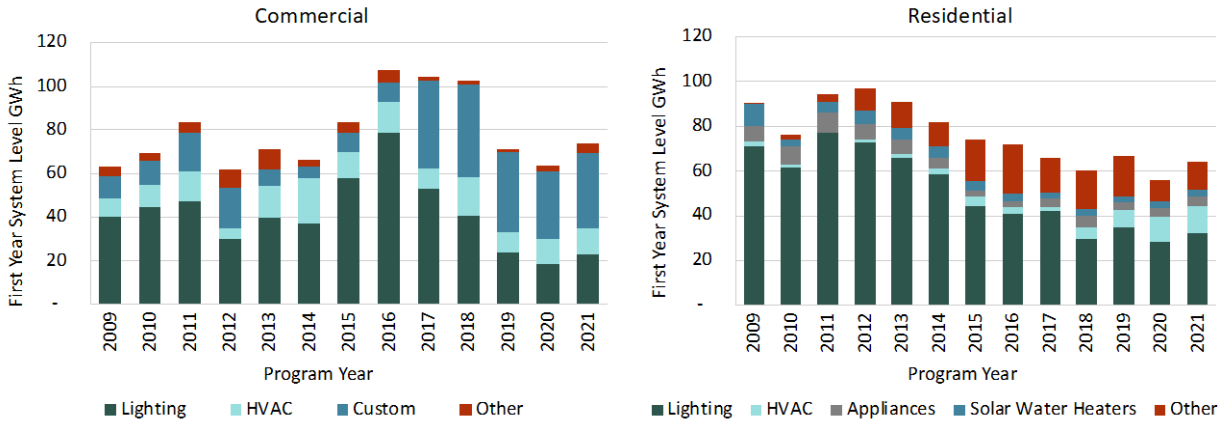


Figure 7, below, presents the first year savings by sector and major measure category over time. Hawaii Energy supported the lighting market's transformation towards higher-efficiency products, resulting in lighting-dominated portfolios in both the residential and commercial sectors, particularly before PY19. A focus on upstream programs and small business direct-install initiatives increased savings from lighting measures in the commercial sector from PY15–PY18, while the residential upstream program drove consistently high savings from the start of the PBFA programs. These accomplishments, combined with changes to federal codes and standards, have limited the recent and future opportunities for the Hawaii Energy programs, resulting in the steady decline of savings from residential lighting measures. Lighting opportunities existed in the commercial sector for longer but have also decreased in recent years. Since PY17, savings from custom projects have contributed relatively more to the commercial portfolio; custom lighting projects have historically comprised a large portion of custom projects. On the residential side, savings from HVAC, appliances, water heating savings, and other measures have increased steadily but have not offset the decline in lighting savings.

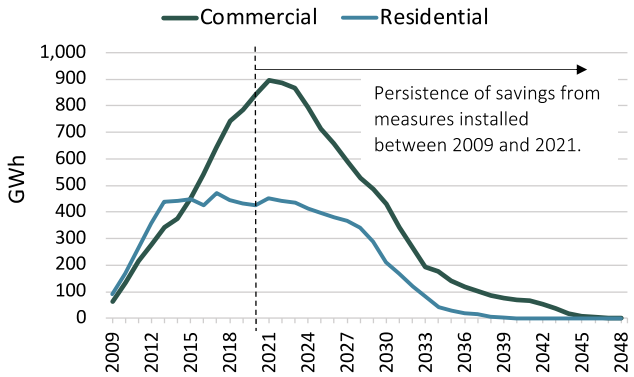
Figure 7 Sector Contribution to First Year Hawaii Energy System Level Savings by End Use



Cumulative Persisting Savings

While first year savings show the initial impact of energy efficiency measures installed in each program year, the cumulative persisting savings shown in this section illustrate the projected impact of these measures over the years that the measures are expected to generate energy savings.[16] We focus on how savings from measures installed through PY21 are expected to persist and accumulate through 2048, as shown in Figure 8. Commercial persisting savings are shown in grey, and residential persisting savings are in blue. The vertical dashed line represents the last year of program implementation included in the series. Note that commercial savings are larger and longer lasting than residential savings since commercial measures tend to have a longer useful life. This figure illustrates that most of the measures installed to date by Hawaii Energy will not contribute to the attainment of EEPS 2030 goal.

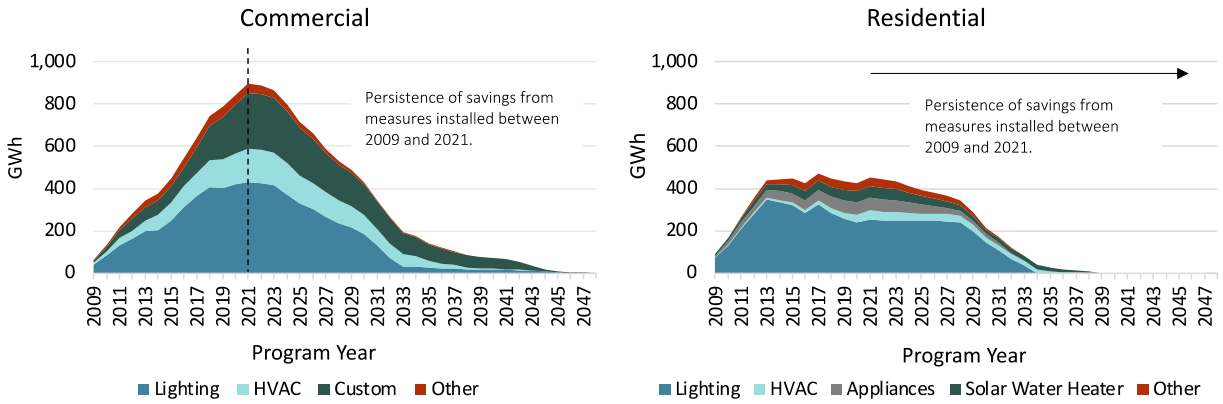
Figure 8. Cumulative Persisting Savings by Sector



In Figure 9, cumulative persisting savings are further broken out by sector and equipment. Notably, the commercial sector has achieved higher cumulative persisting savings in most program years in the EEPS performance period (through PY21) than the residential sector, despite both groups of programs achieving similar first year savings. Most commercial measures, such as lighting and HVAC, have longer useful lives than residential measures. The drop in the residential cumulative persisting savings after PY17 was due to the expiration of savings from a large batch of high-efficiency lighting installed in PY12 with a six-year life. That tranche of lighting contributed about 71 GWh savings a year.

[16] Note that cumulative persisting savings only reflect the initial program measure installed—these savings that are reported do not assume and count future measure installations after the program installed measure fails (unless the program provides a rebate for the next measure).

Figure 9 Cumulative Persisting Hawaii Energy Savings by Sector and Equipment



Hawaii Energy Savings as a Percentage of EEPS Goals

As shown in Table 3, below, Hawaii Energy continues to be a large contributor to the EEPS goal, accounting for between 62% and 92% of the interim annual EEPS goals since 2009. Most recently, the Hawaii Energy programs' contribution trended towards the lower end of that range, contributing 62% of the goal in 2020 and just over 70% in 2019 and 2021. This trend may be driven by the COVID-19 pandemic, which lowered customers' focus on and ability to invest in energy efficiency and challenged Hawaii Energy's direct-install initiatives. In addition, lighting savings shifted out of programs and into codes and standards, changing savings contribution distribution within EEPS.

Table 3. Hawaii Energy System-Level Savings Relative to Annual EEPS Goals

Program Year	Annual EEPS Goal	First Year Savings (GWh)	First Year Savings as a % of Annual EEPS Goal
2009	196.5	153.7	78%
2010	196.5	146.0	74%
2011	196.4	178.2	91%
2012	196.4	158.6	81%
2013	196.4	162.2	83%
2014	196.4	148.2	75%
2015	196.4	157.8	80%
2016	195.0	180.1	92%
2017	195.0	170.2	87%
2018	195.0	162.9	84%
2019	195.0	137.6	71%
2020	195.0	120.0	62%
2021	195.0	138.4	71%

Cost-Effectiveness of Hawaii Energy

Hawaii Energy continues to be a very cost-effective energy resource in Hawaii, having maintained program costs per saved kWh that are fractions of electricity prices in Hawaii. From PY09 to PY21, direct program spending ranged between 1.2 and 2.4 cents/lifetime kWh.[17] 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 favorably to the current electricity rates that range from 43 to 55 cents/kWh.[18]

Overall Costs

Table 4, below, shows the total annual Hawaii Energy expenditures for the EEPS performance period from PY09 to PY21. Since PY11, annual Hawaii Energy funding consistently exceeded $27 million, with PY14 and PY15 each costing over $36 million. As shown, the PBF collections were substantially cut beginning in PY16,[19] leading Hawaii Energy to decrease incentive levels and increase its focus on midstream and upstream delivery channels as strategies to achieve savings with less funding.

Expenditures for PY20 peaked again at $35 million, which was driven by the COVID-19 pandemic and the general increase in incentives aimed at mitigating the financial barriers to energy efficiency caused by the pandemic and the surge in energy grants awarded to struggling small businesses. In general, costs to deliver energy savings have been increasing over time as Hawaii Energy captures the most cost-effective opportunities, leaving more costly projects in later years.

[17] *2021 EEPS Review Research Report*. Prepared for the Hawaii Public Utilities Commission by Applied Energy Group, Inc. December 27, 2023.

[18] https://www.hawaiianelectric.com/billing-and-payment/rates-and-regulations/average-price-of-electricity, accessed December 12, 2023.

[19] The PBF collections were cut to reduce customer bill increases from the GEMS program, which was newly created at the time.

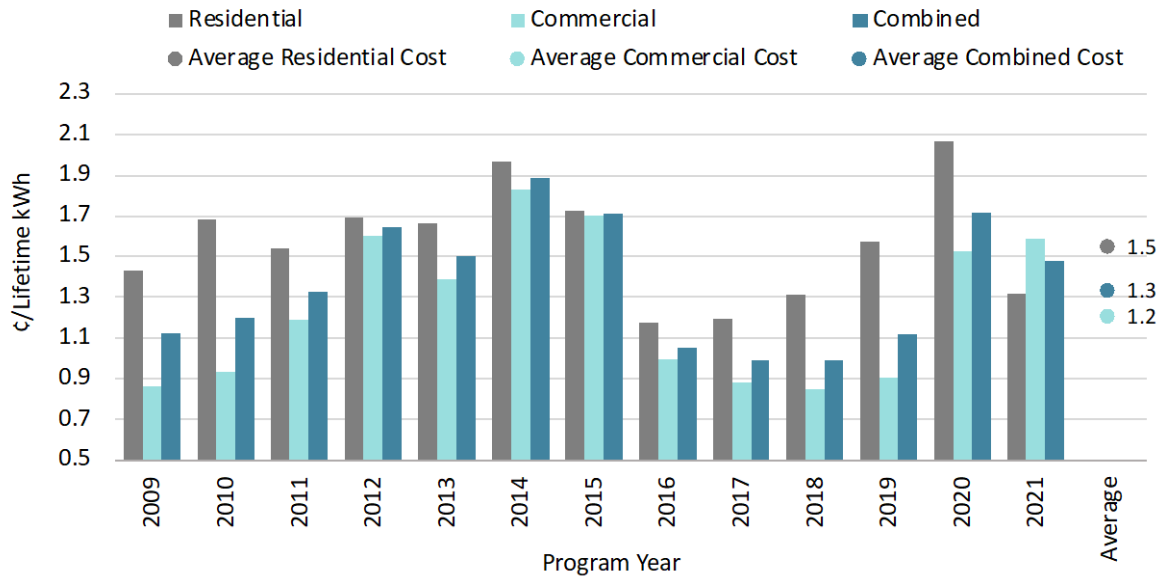
Table 4. Hawaii Energy Program Expenditures and Cost of Energy

Program Year	Total Program Expenditures ($M)	First Year Cost of Saved Energy (Cents / kWh)*	Lifetime Cost of Saved Energy (Cents / kWh)*	Lifetime Customer Bill Savings ($M)*
2009	$18.2	11.8	1.4	$255
2010	$20.1	13.8	1.4	$473
2011	$27.3	15.3	1.8	$408
2012	$32.8	20.7	2.2	$405
2013	$32.0	19.7	1.8	$517
2014	$36.0	24.3	2.4	$436
2015	$36.9	23.4	2.1	$332
2016	$29.5	16.4	1.3	$441
2017	$28.7	16.9	1.2	$488
2018	$28.0	17.2	1.2	$538
2019	$29.2	21.2	1.6	$648
2020	$35.0	29.2	2.3	$388
2021	$31.5	22.7	2.0	$414
Total / Average	**$385.2**	**19.1**	**1.7**	**$5,742**

*These figures do not include program administrative costs.

Figure 10, below, illustrates the total spending per lifetime kWh saved in each program year, by sector, and for the portfolio overall. (Average spending over the full time period is shown at the far right of the chart.) Commercial program costs were relatively low in the first few program years (around one cent per kWh saved) compared to the slightly higher residential costs that exceeded two cents per kWh saved. During the period spanning from PY11 to PY15, commercial program costs climbed due to Hawaii Energy's emphasis on introducing high-efficiency lighting technologies to the market, although they remained lower than residential costs. From PY16 to PY19, commercial program costs remained at a low level, close to one cent, while residential costs were much higher. Commercial costs increased to just above 1.5 cents for PY2020 and PY2021. In PY2020, residential costs peaked above two cents, dropping back down to just above 1.3 cents in PY2021. These changes can be attributed to the portfolio's shift towards LED lamps and other high-efficiency, longer-life lighting measures. The cost reductions achieved in LED lamps and fixtures have exceeded initial expectations, leading to more affordable and sustainable options for both residential and commercial sectors.

Figure 10 Hawaii Energy Overall Spending vs. Savings by Program Year and Sector



Hawaii Energy Program Achievements

Hawaii Energy has successfully supported achievement of EEPS interim goals, leveraging $354M in program expenditures through program year 2020 to enable several billion dollars of customer bill savings over the life of the efficiency measures installed. This section highlights key achievements over the 2nd EEPS performance period.

Maintaining momentum despite COVID-19 challenges

The COVID-19 pandemic presented unprecedented challenges as workers shifted to remote arrangements and tourism was halted. Hawaii Energy was able to maintain good momentum for some programs during the pandemic but programs that required in-person contact with customers, such as Residential Hard-to-Reach, struggled. Hawaii Energy developed and launched their EmPOWER grant in direct response to the COVID-19 pandemic in part to support smaller food service businesses as they shifted their business models to take-away service and no-touch delivery. The grant is a competitive application process where the recipients are able to stack their grant incentive with standard measure rebates to greatly reduce – if not eliminate – the cost of project implementation. In 2020, Hawaii Energy distributed more than $2 million in grants to 201 small businesses, nonprofits, and restaurants through the grant program. These upgrades are expected to save more than $447,000 a year in electricity costs. Some large commercial customers, such as hotels, were able to take advantage of the business slow down to implement projects that might normally disrupt their operations. Many of these customers used capital improvement budgets allocated for future years to implement these projects. Hawaii Energy reports that this has reduced the program's pipeline of large customer projects

in the years since the pandemic. As such, though Hawaii Energy largely met the targets in PY19-PY21, we can expect some lingering COVID-19 impacts in future years as a result.

Increasing efforts around equity and affordability

Customers in Hawaii spend 23.2% more for electricity than the national average and homeowners in Hawaii with incomes below the Federal Poverty Level spend up to 19% of their income on electricity.[20] Hawaii Energy has redoubled their efforts targeted toward low to moderate income (LMI) customers to ensure they have an opportunity to manage their energy use through energy efficiency. Their Community-Based Energy Efficiency (CBEE) program was launched in 2019 and leverages Hawaii Energy's full suite of LMI program offerings to provide a comprehensive framework for residential communities. Through CBEE, customers can access bundled services of energy-saving opportunities, installation services, grid services, and access to program incentives with a turn-key delivery approach with the objective of increasing adoption of energy efficiency solutions in hard-to-reach communities.

For small- and medium-sized business customers, Hawaii Energy's Energy Advantage program overcomes a key barrier to the adoption of energy efficiency technologies through enhanced incentives and direct installation of measures. The EmPOWER Grant program (described above) overcomes the barriers of lack of capital and technical expertise for small business and non-profit customers.

Supporting the transition to renewable energy

The electricity industry in Hawaii is in a period of dramatic transition, evolving from centralized fossil-fuel based generation to renewable energy and distributed technologies. The transition will require the adoption of increased amounts of distributed energy resources by customers and more active engagement with the grid. Beginning with the PY19-21 triennial period, Hawaii Energy expanded its core traditional business and residential energy efficiency programs with incentives for "grid service ready" measures that prepare customers to participate in future utility demand response programs. Eligible technologies include grid-tied residential water heaters and demand response capable hotel guest room controls. To support the anticipated capacity shortfall resulting from the scheduled shut down of Hawaii's last coal-fired power plant on Oahu, the Hawaii Energy team responded with two Power Move initiatives that supported peak reductions. The Power Move Commercial Battery Storage program, launched in February 2022, supported enrollment in Hawaiian Electric's Battery Bonus program by incentivizing commercial battery storage installations on Oahu.

Ensuring that customers are prepared for the clean energy transition

Lastly, the Hawaii Energy team has redoubled their efforts to educate customers and vendors to ensure that they are able to participate in the clean energy transitions. Their market transformation and economic development efforts focus on expanding community education to

[20] See *Electricity Burdens on Hawaii Households*, Research and Economic Analysis Division, Department of Business, Economic Development and Tourism, State of Hawaii. (July 2021).

new areas in tandem with Accessibility & Affordability efforts, and training for professionals on leading-edge equipment, strategies and quickly-evolving new regulations. Efforts have included building workforce capacity and certifications for facilities managers, training architects and engineers on design best practices, and ensuring that local government code officials are able to understand and enforce new building codes. In a landscape where "low-hanging fruit" at work and at home has often been picked, finding deeper savings in energy efficiency requires an increasingly energy-literate and technologically knowledgeable target audience who are empowered and motivated to implement changes in their consumer and organizational energy-related behaviors.

Performance of Other Contributing Entities

This section presents the savings estimates for KIUC, Hawaiian Electric, and the other entities contributing to the EEPS targets. Savings from these entities fall into five broad categories: commission-regulated entity savings outside of Hawaii Energy, coordinated programs implemented with state and county entities, mandates and/or benchmarking efforts conducted by state or government entities, codes and standards,[21] and solar PV installed before 2015.

With the exception of codes & standards and solar PV, it is important to note that the savings from these entities currently account for a small portion of the progress toward the EEPS goals. In addition, these contributing entities are not subject to the same regulations that require rigorous data collection and reporting nor have the savings estimates been independently verified. However, it is important that the Commission monitors progress of these entities towards their energy savings goals on an ongoing basis in order to ensure that the Hawaii Energy programs are targeting adequate savings to meet the Statewide EEPS goals. Going forward, the Commission will aim to establish more frequent reporting from these entities, in addition to their coordination with Hawaii Energy, to ensure common understanding and to support collective success. The other contributing entities are summarized in Table 5, below.

[21] Savings achievements from Codes and Standards, considered an "other contributing entity," were estimated as part of the 2020 Market Potential Study and can be found in Appendix A.

Table 5. Other Entities Contributing to EEPS Targets in First and Second Performance Periods

Regulated (Y/N)	Framework Category	Entity Group	Specific Entity or Department
Y	**Regulated Entity**	Utility	Hawaiian Electric
			KIUC
N	**Coordinated Programs**	County	City and County of Honolulu
			Maui County
			Kauai County
		State Program	Hawaii Green Infrastructure Authority (HGIA)/GEMS
N	**Mandates / Benchmarking**	State Energy Office	HSEO
		University	University of Hawaii (UH)
		Government Public Services	Department of Accounting & General Services (DAGS)
			Department of Education (DOE)
			Department of Health (DOH)
			Department of Transportation (DOT)
		US Department of Defense	Hunt Companies (Ohana Military Communities)
			Lendlease (Island Palm Communities)
			Marine Corps Base
N	**Codes & Standards**	N/A	Building codes and federal, state, and local appliance standards
N	**Solar PV**	N/A	Behind-the-meter solar installations prior to 2015.

Since most of the entities listed in Table 5 above are not required to report or track energy savings in a public forum, interviews were conducted to collect information about the characteristics of energy-saving projects completed since 2016 that were not part of a Hawaii Energy program (i.e., did not receive rebates, incentives, etc. from Hawaii Energy).[22] Interviews with Maui County staff were indefinitely postponed to allow them to focus their time and resources on recovering from the August 2023 wildfires.

[22] The interview approach was not used for Codes & Standards and Solar PV savings. Savings from those entities were reported consistent with data gathered for previous Reports to the Legislature and the Market Potential Study. See footnotes 18 and 20.

Most entities reportedly completed multiple energy-saving projects from 2016 through 2020. However, there is a very high level of coordination with Hawaii Energy meaning that most of the entities have worked with Hawaii Energy to receive the appropriate incentives and rebates for their projects. Consequently, there is a high level of overlap between the Hawaii Energy savings and contributing entity savings. To avoid double counting of savings, projects that received Hawaii Energy program rebates are not reported in this section.

Of all the entities interviewed, only KIUC savings materially and consistently contribute to the EEPS goal. This is primarily because their energy savings estimates do not overlap with Hawaii Energy and they publicly report their savings.

Savings Estimates

The only contributing entity savings, beyond Hawaii Energy programs, able to be captured were for KIUC and UH, as shown in Table 6, below. Each of the other contributing entities either did not track savings or completed their projects with Hawaii Energy. Applied Energy Group estimated savings from codes and standards and solar PV[23] for the 2020 Market Potential Study.

[23] AEG estimated solar PV savings based on Hawaiian Electric's tracked cumulative solar PV capacity.

Table 6. Summary of First Year Savings (GWh) from Other Contributing Entities

Year	KIUC [24,25]	Codes & Standards	Solar PV[26]	Tripler Army Medical[27]	UH
2009	2.6	31.9	7.9		
2010	2.0	31.9	15.6		
2011	4.4	31.9	22.3		
2012	4.3	31.9	76.5		
2013	3.0	3.4	194.7		
2014	4.4	32.4	208.4	0.9	
2015	4.1	99.2		0.9	1.2
2016	2.7	61.0		0.9	
2017	2.4	47.4		0.9	
2018	2.1	66.2			
2019	1.9	11.9			
2020	1.6	27.1			
2021	2.5	46.2			
Total First Year Savings (GWh)	**38.0**	**522.5**	**525.4**	**3.5**	**1.2**

[24] Pursuant to HRS § 269-91, under the definition of "Renewable electrical energy," KIUC energy savings include energy efficiency technologies including heat pump water heating, ice storage, ratepayer-funded energy efficiency programs, and use of rejected heat from co-generation and combined heat and power systems, excluding fossil-fueled qualifying facilities that sell electricity to electric utility companies and central station power projects. See KIUC RPS Status Report, Year Ending December 31, 2020.

[25] AEG inadvertently used lifetime energy savings in place of first year energy savings when reporting KIUC's contribution to EEPS goals in support of the second EEPS report to Legislation (covering the first EEPS performance period), which has been corrected in this report.

[26] Pursuant to HRS § 269-91, solar PV savings after 2014 count towards the RPS.

[27] Tripler's savings are based on a 2014 baseline method which estimates savings as a total change from 2014. Individual annual savings estimates were not available, therefore total estimated savings are spread evenly across the total timeframe.

ACHIEVING THE 2030 ENERGY EFFICIENCY PORTFOLIO STANDARD

This section describes the energy efficiency policy context for the ongoing review of EEPS, provides current estimates of the remaining energy efficiency potential in Hawaii, and summarizes the evolving portfolio strategies and energy savings potential going forward.

CONTEXT FOR THE EEPS REVIEW

Fifteen years into the 22-year EEPS implementation period, the clean energy revolution continues to unfold in Hawaii. A combination of policy directives, programs, and technological advancements are transforming the way electricity is produced and used in Hawaii. As a result, the value of energy efficiency to customers and the grid is increasingly linked to customer and utility-scale renewable energy, energy storage, and demand response. Energy efficiency can also support other important policy objectives the importance of which has continued to rise during the second EEPS Performance Period, including electrification of transportation, carbon neutrality, and energy system resilience.

Time and locational value of energy

As of 2021, Hawaii generates 40% of its electricity using local, renewable resources instead of imported fossil fuel. [28] Furthermore, over 100,000 customers[29] now produce and consume energy using a range of distributed energy resources (e.g., solar PV, energy storage, and demand response) to provide essential grid services and help manage consumer energy costs. In fact, these customer-sited systems produced almost half of the utility's renewable generation in 2022.[30] Given that the State is working to reach a goal of 100% renewables by 2045, it is critical to evaluate the value of energy efficiency resources in the context of a renewables-dominated grid.

Even with a high penetration of renewable generation resources, energy efficiency programs can provide multiple benefits:[31]

- Efficiency continues to be a low-cost electricity resource that reduces utility bills for Hawaii's electricity customers.

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[28] Hawaii State Energy Office's Open Data Portal (Link) Hawaii Statewide Annual Consolidated RPS, data from 2003 to 2021.

[29] Hawaiian Electric, Quarterly Installed Solar Data, 3rd Quarter, 2023.

[30] *2022 Renewable Portfolio Standard Report*. Hawaiian Electric For the Year Ended December 31, 2022.

[31] US Environmental Protection Agency. July 2018. *Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments -- Part One: The Multiple Benefits of Energy Efficiency and Renewable Energy*. Pages 8-9. Goldstein, David. May 2018. *Renewables may be plunging in price, but efficiency remains the cornerstone of the clean energy economy*. The Electricity Journal, 31:4. Pages 16-19.

- Efficiency enables low income and hard-to-reach customers to directly participate in the benefits of Hawaii's clean energy transition.
- Efficiency reduces demand and consumption, and thus reduces the total amount (and corollary land use and cost) of renewables that must be built to achieve a 100% renewable future.
- Efficiency projects can be implemented quickly – typically within months rather than the years often required to develop, permit, build, and interconnect generation resources accelerating the schedule to meet RPS goals.
- Strategic efficiency investment supports more resilient and reliable electrical systems, reducing overloading on distribution system components that operate less efficiently and are more prone to failure when overheated.
- Effective efficiency can offset significant increases in electrical consumption associated with electrification of transportation.
- Efficiency investment provides additional benefits, including increased direct employment from energy efficiency-related jobs, as well as indirect local employment resulting from increases to customers' disposable income.[32]

To realize the full potential of energy efficiency in a renewables-dominated grid, programs must deliver savings when and where they are most valuable to the grid. Efficiency impacts may be more or less desirable at different times of day and in different locations. During a sunny afternoon, for example, there may already be more solar PV supply than needed to serve customer loads; energy efficiency may have a comparatively low value to the grid. As the proportion of renewable resources rises, the need to adjust for the moment to moment (e.g., due to passing clouds), daily, and seasonal variability of both supply and demand increases the importance of when and where energy efficiency manifests on the grid. The future Hawaii Energy portfolio can be managed to promote technologies that deliver energy savings at times that are most valuable and to complement and support increasing renewables penetration.

Generation Resource Adequacy

Since 2022, Hawaii has faced the risk of potential electricity generation shortfalls resulting in part from the closure of AES coal plant on Oahu but also due to the changing, diurnal generation capacity of the increasingly renewables-based generation mix. Senate Bill 2629, which became law in June 2020 as Act 23, banned coal-burning in power plants in Hawaii effective December 31, 2022.[33] AES Hawaii was expected to close the AES coal-burning plant on

[32] Bell, Casey. *Energy Efficiency Job Creation: Real World Experiences*. American Council for an Energy Efficient Economy. October 2012. Page 1.

[33] Hawaii State Legislature, Act 23 2020. https://www.capitol.hawaii.gov/slh/Years/SLH2020/SLH2020_Act23.pdf

Oahu in Fall of 2022, which accounted for 13% of the state's electricity generation in 2018. COVID-related supply chain problems and other challenges delayed the delivery of various, grid-scale battery storage and renewable generation plants leaving the state seriously resource-constrained in 2022 and 2023.[34] Resources continue to remain tight for the foreseeable future.

Hawaii was able to successfully manage potential generation shortfalls in 2022 and 2023 through temporarily increased oil-fired generation, active promotion of customer-sited battery management, and other strategies. Unfortunately, the switch to oil-fired generation coincided with the Russian invasion of Ukraine, which drove oil prices to historic levels, resulting in utility bill increases for customers.[35] Hawaii Energy continues to grow its energy optimization program elements and more recently, Hawaiian Electric was proposing to pursue its own energy efficiency procurement strategies to augment the energy efficiency delivered by Hawaii Energy.[36]

Growing EV infrastructure

The electrification of transportation is expected to continue at a rapid pace. In 2017, Hawaii's four counties announced their commitment to 100 percent clean transportation by 2045 and the conversion of their own fleets by 2035.[37] While Hawaii ranks fourth in terms of electric vehicles as a share of new passenger car sales,[38] Hawaiian Electric expects close to a half million EVs on the road by 2045.[39] The electrical requirements for such EV infrastructure are substantial and will drive significant demand for increased electricity supply in the next decade. Energy efficiency can be an important source to meet this growing demand. Interestingly, EV charging has the potential to both strain the grid at certain times of peak grid demand and also offer critical capacity resources through managed charging and possibly vehicle to grid (V2G) capabilities.

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[34] *Hawaii quit coal one year ago. Here's how it's been going*. Canary Media. August 31, 2023.

[35] Hawaiian Electric Press Release. Hawaii ends use of coal for power generation as 30-year contract with Oahu plant winds down. August 7, 2022.

[36] *Integrated Grid Plan*. Hawaiian Electric. May 2023.

[37] Press Release from the City and County of Honolulu. Hawaii's mayors commit to shared goal of 100 percent renewable ground transportation by 2045. December 12, 2017.

[38] *Experian Automotive, BloombergNEF*, California New Dealers Association. Q1 2023.

[39] *Hawaiian Electric Companies' Electrification of Transportation Strategic Roadmap*. March 2018.

Focus on Equity

Around the country and particularly in Hawaii, in the last several years energy efficiency portfolio stakeholders have increasingly advocated for increased attention to equity in the distribution of benefits from energy efficiency program implementation. During the current and previous triennial cycles, Hawaii Energy has increased its spending and focus on addressing middle and low income customers for whom utility bills represent a substantial financial burden. Historically, lower income customers traditionally participate in energy efficiency programs at a much lower rate, which means they do not enjoy the financial benefits brought by energy efficiency investment that they fund via their utility bills. Furthermore, the energy burden represented by utility bills is proportionately much higher for middle and lower-income customers especially in view of the high electricity rates in Hawaii.[40] For these reasons, there has been increased attention to and innovation around distributing energy efficiency investments more equitably across the customer base. The Commission is also exploring equity in the context of EEPS while developing recommendations through community engagement in the Energy Equity & Justice Docket.[41]

A properly funded and managed energy efficiency portfolio is an important policy, environmental, and energy resource for Hawaii in the context of the 100% RPS goal. Furthermore, as described in this report, the probability of meeting the current 2030 EEPS goal will be impacted by adapting energy efficiency programs to support greater penetration of renewables and serving broader policy objectives.

Energy Efficiency Levels Needed 2021-2030

Reaching the annual first-year savings targets (of 195 GWh annually) identified in the EEPS Framework will not be sufficient to reach the 2030 cumulative persisting savings target of 4,300 GWh. This is because a portion of the measures installed in the early years will reach the end of their useful lives before 2030, so their savings are no longer counted. Those savings need to be replaced by new measures in the outer years of the EEPS period.

The 2020 Market Potential Study predicted achievement of slightly more than the 2030 EEPS target using the Business-as-Usual (BAU) scenario with the caveat that attainment of the 2030 target "may necessitate additional efforts in the short-term to recover from the effects of the COVID-19 pandemic on "business as usual" for energy efficiency programs and the economy, in general."

[40] *Electricity Burdens on Hawaii Households*. Research and Economic Analysis Division, Department of Business, Economic Development and Tourism. STATE OF HAWAII, JULY 2021. Page 2.

[41] Docket No. 2022-0250.

Using the 2020 Market Potential Study annual program BAU forecast and adjusting for the factors discussed in this report (such as lighting market effects and other contributing savings), analysis shows that the 4,300 GWh cumulative persisting EEPS savings target is achievable (Table 7). We note that Hawaii Energy savings fell short of its goals in PY22, partly as a result of lingering COVID-19-related economic issues, suggesting that the concerns expressed in the 2020 Market Potential Study about BAU not being sufficient to meet the 2030 EEPS target persist.

Table 7. Forecasted First Year Savings through the EEPS Performance Period

Year	Program Savings – BAU (GWh)	Codes & Standards (GWh)	KIUC (GWh)	Lighting Market Effects (GWh)	Total First Year Savings – BAU (GWh)
	Third EEPS Performance Period				
2021	138	46	2	79	266
2022	111	54	0	69	234
2023	99	162	0	0	261
2024	108	161	0	0	269
2025	124	129	0	0	253
				Total BAU:	1,282 (3,544 CPS)
	Fourth EEPS Performance Period				
2026	120	97	0	0	217
2027	119	82	0	0	201
2028	124	68	0	0	191
2029	118	59	0	0	177
2030	110	51	0	0	162
				Total BAU:	950 (4,300 CPS)

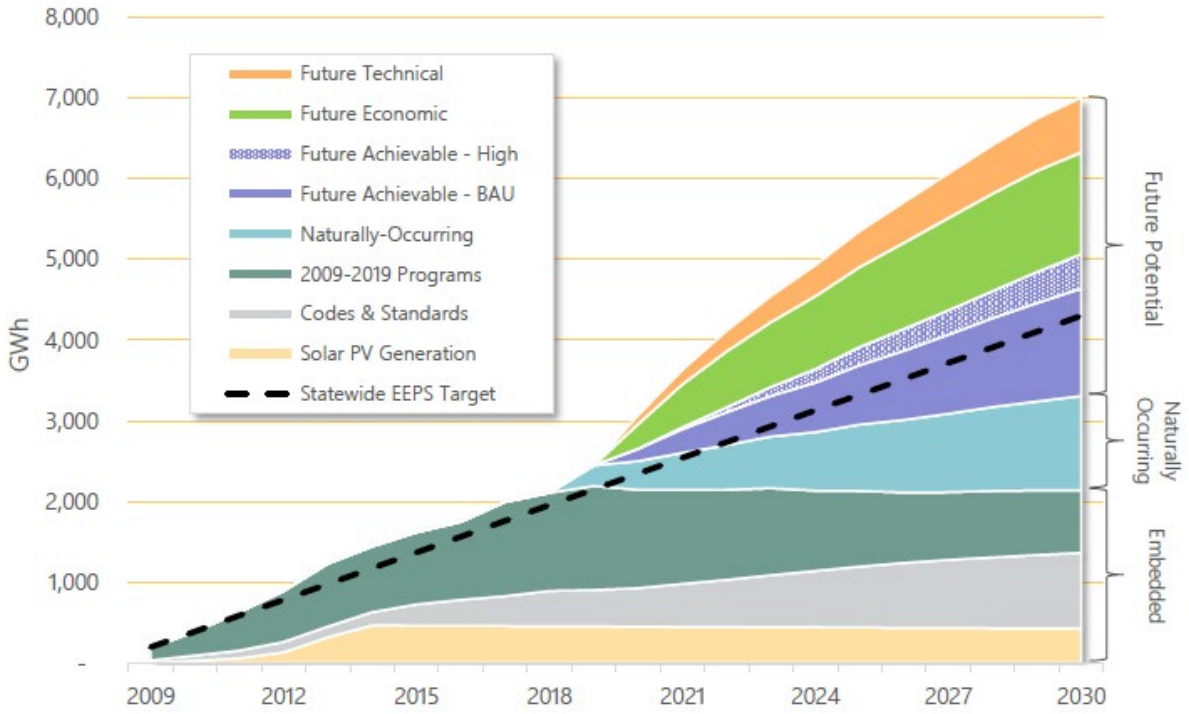
Energy Efficiency Potential Study Update

The most recent Market Potential Study was completed in 2020 and the top-level findings are shown in Figure 11. The 2020 Market Potential Study[42] findings confirmed that interim targets

[42] *State of Hawaii Market Potential Study*. Prepared by Applied Energy Group for the Hawaii Public Utilities Commission. August 5, 2020.

(meaning the sum of the annual first year savings targets) were met though 2018. It also projected that Hawaii was on track to meet their 2030 Market Potential Study targets assuming that PBFA funding levels remained consistent and the levels of effort from all contributing entities remained the same. However, given that the 2020 Market Potential Study was completed during the pandemic, the 2020 Market Potential Study correctly identified the possibility that additional efforts or funding in future years may be required, depending on the impacts from the pandemic.

Figure 11. 2020 Market Potential Study Cumulative Persisting Energy Savings (GWh), 2009-2030



The naturally occurring savings shown in Figure 11 reflects a change to the Energy Independence and Securities Act (EISA) lighting standard that took place in late December 2019, which essentially removed the second tier of the standard.[43] This change shifted energy savings that would have been attributed to codes & standards savings to savings that could be achieved through programs. Since the Tier 2 general service fluorescent lamp standard was

[43] 84 Fed. Reg. 3120 (Feb. 11, 2019)

later reinstated,[44] the portion of the naturally occurring savings that is attributable to changes in the state's lighting market as a result of prior program and codes & standards efforts is included in EEPS savings accomplishments as lighting market effects for the period 2020 – 2023.

The Commission is currently in the planning stage of the next Market Potential Study update which is targeted for release in 2026. Ideally, the Market Potential Study updates occur in advance of the reports to the Legislature so that the updates are informed by current data. The Commission plans to adjust the timing of the 2026 Market Potential Study update as well as the following update so that they are completed ahead of the scheduled updates to the Legislature. One area of focus in the 2026 Market Potential Study update is to ensure that the market adoption models used in the Market Potential Study reflect the impacts from the COVID-19 pandemic as well as the realities of implementing energy efficiency programs in Hawaii, including supply chain constraints and customer staffing shortages (e.g., operations and maintenance staff that could devote time to planning and implementing energy efficiency measures). In addition, the codes and standards estimates will be updated to reflect the reinstatement of the tier 2 EISA standards.

Near-term Program Planning

Though program participation remained relatively strong in PY20 and PY21, Hawaii Energy is experiencing delayed impacts from the pandemic, including supply chain delays and customer staffing shortages, which is impacting their ability to meet their targets in the current PY22-PY24 triennial. Hawaii Energy reports that large customers are focusing on basic operation and maintenance projects only, deferring investments in capital improvements. In addition, the commercial real estate market is shifting as remote workplaces reduce the need for dedicated office space.

The PBFA, Leidos, Inc., has been implementing the Hawaii Energy programs continuously since the Commission issued the first RFP for PBF administration in September 2008. The current PBFA contract ends in December 2025 and the Commission will be initiating an RFP process to select the PBFA for the period beginning in PY25.

Lastly, legislation to extend EEPS to 2045 was introduced but not approved in the 2023 Legislative Session. However, the Commission anticipates that the legislation will be revisited in 2024 Legislative Session, and will work with legislators and stakeholders to provide guidance for development and refinement of the bill's elements.

[44] 87 Fed. Reg. 27439 (May 5, 2022)

ONGOING CONSIDERATIONS

Energy Efficiency continues to play a primary role as an important energy and cost-saving resource for Hawaii's residents and business, and also as a means to reduce demand on Hawaii's electrical grid. Considerations for energy efficiency as a resource is being contemplated more aggressively in integrated grid planning, and as a significant factor across many Commission dockets. Hawaiian Electric's Integrated Grid Plan notes that projected energy needs cannot be met without energy efficiency, and identifies the need to add over 1,000 GWh of energy efficiency through 2030.[45] This is about 50 GWh more than projected in the BAU forecasts necessary to meet the 2030 EEPS target, indicating that additional energy efficiency provides will provide value to the system via its cost-effectiveness or ability to reduce load at valuable times.

Additionally, historic federal funding opportunities in support of energy efficiency programming will be made available to Hawaii beginning in calendar year 2024 and will support Hawaii's residents and state climate action policy goals.

[45] Hawaii Powered Integrated Grid Plan, A Pathway to a Clean Energy Future, and Hawaii Powered Integrated Grid Plan Preferred Plans and Next Steps, available at https://www.hawaiianelectric.com/clean-energy-hawaii/integrated-grid-planning. The IGP is under Commission review.

FINDINGS AND CONCLUSIONS

The EEPS Goal continues to be effective for accelerating deployment of energy efficiency resources throughout Hawaii, as reflected in both first-year savings and cumulative persisting savings achievements. Hawaii achieved 135% of first-year savings interim targets across the First and Second Performance Periods (3,095 of 2,350 interim GWh goal) in first-year savings. The State reached 104% of the interim EEPS targets across the First and Second Performance Periods (2,453 of 2,350 interim GWh goal) in achievement of cumulative persisting savings, an updated interpretation of the EEPS target that was soft-adopted during this Second Performance Period (and is addressed in the Achievements section of this Report).

The Hawaii Energy portfolio continues to deliver a majority of the savings towards the EEPS interim goals. Similar to the first reporting period, the majority of the energy savings comes from the Hawaii Energy portfolio. Hawaii Energy contributed 58% of the first-year energy savings (and 62% of the cumulative persisting savings) delivered in the First Performance Period, and 77% of the first-year savings (53% of the cumulative persisting savings) delivered in the Second Performance Period. These impacts are expected to generate over five billion dollars of utility bill savings for customers over the life of the installed efficiency measures.[46] Furthermore, Hawaii Energy program activities from 2009 through 2020 reduced on-peak demand by nearly 300 MW.

Hawaii Energy continues to be a cost-effective energy resource in Hawaii, having maintained program costs per saved kWh that are far lower than electricity prices in Hawaii. Between program years 2016 and 2020, direct program spending ranged between 1.3 and 2.3 cents/lifetime kWh. 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 favorably to the current electricity rates that range from 43 to 55 cents/kWh.[47]

Energy efficiency provides benefits to low-income customers. Hawaii Energy programs targeted towards low-to-moderate income customers serve to reduce the customers' energy usage and costs, thereby reducing their energy burden. Program offerings for low-income customers include programs that directly install energy-saving measures in the home and buy down the cost of larger appliances like refrigerators, washing

[46] See Table 5 in this Report.

[47] https://www.hawaiianelectric.com/billing-and-payment/rates-and-regulations/average-price-of-electricity, accessed December 12, 2023.

machines and dryers. Small businesses and non-profits can benefit through grants that help offset the costs of planning and executing energy upgrades, on top of Hawaii Energy's equipment rebates. Serving hard-to-reach customers continues to be a primary focus of the Hawaii Energy portfolio of programs.

Energy efficiency provides additional benefits, particularly in support for renewable resource planning. Hawaii's utilities and stakeholders are preparing for a 100% renewable energy portfolio by 2045 and energy efficiency serves as the lowest-cost resource by reducing and offsetting the energy demand. This results in fewer renewables required on the grid, less land use needed for infrastructure, and an overall cost savings to the utility and customer.

More aggressive strategies will be needed to meet the 2030 EEPS goal. While the state has been successful in energy savings achievement through calendar year 2020, impacts such as the shift from capturing low-hanging fruit (i.e. residential lighting) efficiency opportunities, to changing markets and post-pandemic economic conditions, are resulting in more expensive efficiency measures needed to attain the same level of achievement. Furthermore, in terms of cumulative persisting savings, the energy savings achieved in the early years fall away as the measures reach the end of their useful lives. That means that just achieving the annual first year energy savings targets identified in the EEPS Framework will not be sufficient to meet the EEPS goal in 2030. This was anticipated and identified in both the 2020 Market Potential Study and the Second EEPS Report to the Legislature[48] and is supported by the findings in this report. Therefore, meeting the overall 2030 EEPS target will require scaling up the level of effort in future years to both achieve the savings required to span the gap between the current level of savings and the 4,300 GWh target and to achieve savings to make up for measures that will reach the end of their useful lives between 2020 and 2030. In 2024, the Commission will, based on a regular cycle of procurement, select an energy efficiency program administrator for program years 2025 – 2027. This offers an opportunity for the Commission to align the specific objectives of energy efficiency programs over the coming years with the 2030 EEPS goal and to ensure the program administrator is ready and able to deliver such energy savings for the State.

[48] The Second EEPS Report to the Legislature was delivered in December 2018 and reported on the EEPS progress over the first reporting period from January 2009 to December 2015.