EVERGREEN ECONOMICS

Evaluation of the *Hawaii Energy* Conservation and Efficiency Programs

Program Year 2009

Volume 1 of 2: Main Report

March 31, 2011

Prepared for the Public Utilities Commission of the State of Hawaii

Table of Contents

1 Executive Summary

This report presents the results of a comprehensive evaluation conducted on Hawaii Energy's Energy Efficiency Program during its first year of operations, Program Year 2009 (PY2009), from July 1, 2009 through June 30, 2010.[1] The evaluation verified program impacts, assessed program processes, and included a comprehensive market assessment. The Hawaii Energy programs addressed by this evaluation are:

- **Energy Solutions for the Home (ESH).** Provided prescriptive incentives to residential customers who purchased and installed energy efficiency measures that met or exceeded Energy Star standards. Rebates for high efficiency ceiling fans, clothes washers, dishwashers, air conditioners (ACs) and AC maintenance, refrigerators, and window ACs were provided through an application process. Rebates were not provided for compact fluorescent lamps (CFLs), which had retailer point-of-sale price reductions.

- **Residential Efficient Water Heater (REWH).** Provided rebates to homeowners, apartment owners and tenants, and military housing agencies replacing existing water heaters with solar and high efficiency hot water heaters. Delivered through solar installation contractors and promotion by retailers.

- **Residential Low Income (RLI).** Enabled qualified low-income single-family customers to receive installation of CFLs and high efficiency water heating measures at no cost to the customer. Delivered by a network of Community Action Programs and Economic Opportunity agencies.

- **Residential New Construction (RNC).** Provided rebates to new home builders for solar water heaters (through December 31, 2009), high efficiency electric water heating with peak load timer devices, and Green Homes bundled measures.

- **Commercial and Industrial New Construction (CINC).** Provided technical project assistance, financial incentives, and training opportunities to building owners and design teams for new construction and major renovation projects to reach highest achievable energy efficiency levels. Application forms were made available to customers, developers, architects, and engineers.

- **Commercial and Industrial Customized Rebate (CICR)**. Provided custom financial incentives based on calculated savings to non-residential, institutional, governmental, and industrial sector customers.

- **Commercial and Industrial Energy Efficiency (CIEE).** Provided prescriptive incentives for measures including high efficiency lighting; heating, ventilating, and

[1] On July 1, 2009, Hawaii Energy took over management of the demand side management programs from Hawaiian Electric Company (HECO) and its subsidiaries, Maui Electric Company (MECO) and Hawaii Electric Light Company (HELCO), referred to as the HECO utilities.

air conditioning (HVAC); and appliances to commercial, institutional, governmental, and industrial sector customers. Rebate application forms were made available to customers and their channel allies.

- **Commercial and Industrial Efficient Water Heating (CIEWH).** A new program addressing non-residential solar water heating projects with limited activity during Program Year 2009.

1.1 Impact Evaluation

The goal of the impact evaluation was to develop an independent estimate of energy savings accomplished by the program in Program Year 2009. Evaluation activities included:

- Review of the program's energy savings assumptions documented in the Technical Reference Manual
- Validation of tracking database and savings calculations
- Participant phone and on-site verification inspections
- Engineering desk review of large project applications
- Invoice audit for participating CFL retailers

We reviewed the Technical Reference Manual and compared it to a wide variety of industry sources such as program evaluations and market studies from across the nation. Our review found that all of the savings calculations and assumptions were reasonable and well documented. We did not make any recommendations for changes for Program Year 2009. However, we recommended some changes for Program Year 2010, including a reduction in lighting hours of operation based on recent study results that indicated fewer operating hours than were assumed in the Technical Reference Manual.

We validated the program's savings claims by summarizing the program tracking database and comparing it to the claimed savings in R.W. Beck's Annual Report. We reviewed the savings calculations and other inputs and checked for consistency with the Technical Reference Manual. We verified program measure installations based on telephone and on-site surveys and engineering desk reviews. Our overall estimate of validated and verified program savings claims were within one percentage point of the program's claimed savings.

The program claimed 155 GWh/year and we verified 153.7 GWh/year in first-year gross electricity savings, with claims of $126,547,369 and $124,436,234 verified total resource benefits.

1.2 Process Evaluation

The goal of the process evaluation was to provide feedback from participants, non-participants, contractors, and other market actors on how well the program is being implemented. Process evaluation activities included:

- Participant phone surveys
- In-depth interviews with program staff and market actors
- Development of program theory and logic models
- Store visits for participating retailers

In general, the evaluation team has found that the program is operating well. The transition from the HECO utilities to the Hawaii Energy staff has been smooth. This is especially true for participating customers and retailers, with only a few minor exceptions. Evidence of a successful transition and effective program implementation is clear in the results of our analysis of program operations. In particular, R.W. Beck's ability to manage multiple roles and make use of the capabilities of a sphere of partners has been a substantial benefit to the program.

However, the evaluation team found very low program awareness among non-participating lighting and HVAC contractors. The lack of awareness among contractors is a significant barrier to the program being more successful—the most common initial contact with the Hawaii Program for participating non-residential customers was a contractor or distributor. The evaluation team encourages program staff to enhance efforts at both informing contractors and leveraging relationships with these trade allies in marketing the program in the coming program year.

Some challenges to the evaluation of the program resulted from the state of the database as evaluation activities began. Most of issues have been resolved, but additional improvements could still strengthen the system.

Another challenge to the evaluation of the program was that many customers were not prepared to have projects verified. The evaluation team believes the program documentation is a critical area, and the implementation team should monitor this closely. Program documentation and verification data in future years will need to be more complete to support evaluation activities to the fullest extent.

Understandably, Hawaii Energy's suite of program offerings is still closely tied to earlier program offerings in the eyes of consumers, businesses, and other stakeholders, as many have been involved with the program for several years. Marketing support reported by these trade allies may not be as extensive as it was under the previous program structure. Misperceptions exist in the market and a fresh marketing approach may be needed to help stakeholders understand that energy efficiency programs are now being implemented by a third-party organization.

1.3 Market Assessment

The goal of the market assessment was to research the markets that the program is targeting and provide suggestions for aligning the program more closely to the markets. The market assessment activities included:

- General population surveys
- Non-residential non-participant survey
- Contractor interviews
- Lighting and appliance retailer interviews
- Comprehensive review of energy efficiency potential studies and other secondary research

The current residential portfolio is dominated by CFLs, accounting for 20 percent of the rebate dollars and 78 percent of the first-year energy saving estimates. Solar water heating accounts for another 57 percent of the rebate dollars and 11 percent of first-year energy savings.

Dependence on these two technologies is understandable. Lighting is the dominant technology in almost every residential program across the US. Those few programs where lighting is not dominant have determined that CFLs have successfully been commercialized and no longer require incentivizing. The previous utility-based efforts emphasized these two technologies, and their emphasis is a logical policy in this year of transition.

As the program matures, Hawaii Energy will need to expand the portfolio of measures and the share assumed by these other measures in reaching overall program goals. The dependence on lighting and solar water heating will not continue indefinitely as some sub-sectors of the residential market are reaching the saturation point. In addition, Federal legislation to require higher efficiency levels for general purpose lighting will reduce potential energy savings from CFL installations.

Non-residential savings were concentrated both by measure and by sector. As with the residential market, lighting was the measure contributing the most savings, accounting for 66 percent of non-residential savings overall, followed by custom/other measures and cooling. In comparing Program Year 2009 program savings to the potential identified in two recent studies, we found that the program tapped about 10 to 13 percent of the 2019 maximum achievable potential for non-residential lighting savings, but that this percentage was less than two percent for HVAC and all other measures. We believe this shows over-dependence on lighting and indicates a need to more effectively promote other technologies and end uses.

Similarly, savings were concentrated in relatively few sectors, with military non-residential, offices and hotels accounting for about two-thirds of the total. In general, the

sectors with a high percentage of potential achieved tend to comprise relatively fewer, larger customers. This enabled the program to effectively reach its goals, but it limits the remaining potential customers in these sectors and also suggests it will be more difficult to achieve similar levels of participation in other, more diverse sectors.

While reliance on non-residential lighting to achieve program goals is not uncommon, we believe that there are problems associated with the high percentage of savings accounted for by a single end use and the concentration of savings in a few business sectors. Reliance on sectors with relatively few, large customers (military, hotels/resorts, large offices) allowed goals to be met without building infrastructure to reach other markets, since direct program contact with targeted decision makers yielded significant savings. Reaching out beyond these sectors and measures will require development of infrastructure that would support a trade ally driven program.

Another concern is that the very high penetration of the non-residential military sector relative to the total potential estimated by previous studies suggests that similar lighting savings will be more difficult to achieve in the future.

Finally, while Hawaii Energy has reached out to contractors to help deliver its programs, relatively few trade allies deliver the bulk of lighting installations and savings, particularly for the military. In addition, it appears that the broader market of potential trade allies has little contact with the Hawaii Energy program, with half of the non-participating contractors surveyed reporting they were unaware of the program.

1.4 Conclusions and Recommendations

Hawaii Energy, with the cooperation of the HECO utilities, has done a commendable job transitioning the program. The data transfer was accomplished quickly with little interruption, and programs underway were effectively absorbed into the new organization and were administered as they had been under the old management with little disruption.

The program is heavily dependent on lighting measures for both residential and non-residential sectors.

To meet the long-term goals set forth by the state in the Hawaii Clean Energy Initiative, Hawaii Energy needs to build its portfolio to include more non-lighting measures and expand its outreach and support to get these measures adopted on a wider scale. Program activity is concentrated such that a minority of firms and households are participating and a few sectors, particularly the military, account for a disproportionate share of all activity. To reach long-term goals, the program must soon develop strategies to reach firms and households that have not traditionally participated.

Moving into Program Year 2010, which runs from July 1, 2010 to June 30, 2100, R.W. Beck has proposed a number of program changes and new initiatives that should help expand the program offering. These changes are positive steps that reflect a recognition of R.W.

Beck's role in expanding the portfolio. The changes for Program Year 2010 changes include:

- A refrigerator recycling program
- A direct install lighting program
- A policy change that limits rebates for air conditioners to replacement units only
- The addition of solar attic fans and whole house fans as rebated measures
- Tiered incentives for custom non-residential projects

The impact of these initiatives will be closely monitored over the next year. At the same time, Hawaii Energy should consider implementing other programs, actions, and policies that are used successfully in other states. A detailed discussion of recommendations is presented in Chapter 7 of this report.

1.4.1 Residential Sector

The current residential portfolio is dominated by CFL lighting, accounting for 20 percent of the rebates and 78 percent of the first-year energy saving estimates. Solar water heating accounts for another 57 percent of the rebate dollars and 11 percent of first-year energy savings.

Dependence on these two technologies is understandable. Lighting is the dominant technology in every residential program across the United States. The previous utility-based efforts emphasized these two technologies, and their emphasis is logical policy in this year of transition.

As the program matures, Hawaii Energy will need to expand its portfolio of measures and the share assumed by these other measures in reaching overall program goals. Dependence on lighting and solar water heating will not continue indefinitely, as some sub-sectors of the residential market are reaching the saturation point. In addition, federal legislation to eliminate standard incandescent lamps or to require higher efficiency levels will reduce potential energy savings from CFL installations.

1.4.1.1 Residential Lighting Recommendations

We offer the following residential lighting recommendations:

- Even as it works to expand its portfolio beyond lighting, the program should continue its upstream lighting program.
- Continue efforts to expand sales of CFLs in other retail outlets.
- Expand efforts to broaden awareness, availability, and purchase of specialty CFLs.
- Consider greater support of pin-based CFLs and LED fixtures.
- Consider adding educational support on lighting.

1.4.1.2 Residential Appliance Recommendations

- Consider higher rebates for higher tiers and lower rebates for lowest tier Energy Star products.
- Expand the programs by mining for replacement opportunities.
- Develop initiatives that reach low-income and renter households.

1.4.1.3 Residential Solar Water Heating Recommendations

The solar water heating program remains the most active in the country. Sales continue despite the drop of the rebate from $1000 to $750. It is important to recognize that the rebate is only one aspect of program success. The solar water heating program marketed the program, encouraged the development of reliable products, developed a group of qualified installers, and inspected the installations to reassure buyers. These elements created the program. When considering other initiatives, Hawaii Energy should consider the role of each of these elements.

As penetration continues, the program will need to rely on reaching less wealthy households and renters, which will be more difficult than are current efforts. As this report will show, most of the current activity is in the wealthier neighborhoods. Program financing, targeted marketing, and specialized services will need to be a larger consideration if the program is going to reach lower income households and landlords.

1.4.2 Non-Residential Sector

Lighting was the major contributor to non-residential sector program savings, which were highly concentrated by sector (military non-residential, hotels, offices) and technology (T8s and CFLs). Although reliance on non-residential lighting to achieve program goals is common, there are problems associated with concentrating in a few business sectors and technologies:

- Reliance on sectors with relatively few, large customers (military, hotels/resorts, large offices) allowed goals to be met without building infrastructure to reach other markets, since direct program contact with targeted decision makers yielded significant savings. Reaching out beyond these sectors and measures will require development of infrastructure that would support a trade ally driven program.

- Very high penetration of the non-residential military and office sectors relative to the total potential estimated by previous studies suggests that similar lighting savings will be more difficult to achieve in the future.

- Although Hawaii Energy has reached out to contractors to help deliver its programs, relatively few trade allies deliver the bulk of lighting installations and the broader market of potential trade allies has only limited involvement with the program.

- Measures that account for 67 percent of savings – regular T8s and CFLs – are well on their way to becoming standard practice and may represent already transformed markets.

HVAC savings were about one fourth those from lighting, and were less than two percent of the 2019 HVAC maximum achievable potential, ranging from less than one percent for most sectors to 6.5 percent for education and 11.7 percent for military non-residential. HVAC savings appear to have been achieved by working with a limited number of customers and trade allies in the military, education, and large office sectors, making such savings more difficult to replicate in sectors with less concentrated decision making.

Savings from custom and other measures were concentrated in the military non-residential and other non-residential sectors, with low-e windows in military non-residential new construction projects representing a significant share of these savings. Window film projects, which accounted for about 10 percent of custom and other savings, were concentrated in the medium office sector. Window film contractors are generally aware of the program but say there is little interest because incentives are relatively low.

1.4.2.1 Non-Residential Lighting Recommendations

Recommendations with regard to non-residential lighting are designed to address the current over-reliance on lighting measures and large end users. We recommend the following:

- Hawaii Energy should target sectors that are currently underserved by the program, such as retail, healthcare, and small offices.
- Hawaii Energy should conduct more aggressive outreach to lighting and electrical contractors, with training, promotional materials, and frequent communication on program updates.
- We recommend that the program both investigate other lighting technologies or applications and more aggressively promote proven but not widely accepted technologies such as non-exit LEDs, high-bay T5s, third-generation T8s, and various controls.

1.4.2.2 Non-Residential HVAC Recommendations

Given the huge mismatch between actual savings and available potential, the non-residential HVAC market should offer ample opportunities for Hawaii Energy to diversify its sources of savings beyond tried and true HVAC measures. We recommend the following actions as steps Hawaii Energy can take to realize more of these opportunities:

- Target sectors with significant cooling savings potential that are currently underserved by the program, notably small offices, hotels, retail/grocery stores, and healthcare facilities – the larger ones through built-up systems, the smaller ones through package units.
- To reach these markets, identify and select leading vendors for each sector and technology, then train them and provide them with the tools needed to deliver efficient cooling solutions through the program. For packaged HVAC, that would mean working with trade allies – both individuals and trade associations – to

develop more contractor-driven marketing approaches that leverage limited program resources. For chillers, work with engineering firms, individual mechanical engineers and organizations such as the American Society of Heating, Refrigeration and Air-Conditioning Engineers to spread awareness of the program and make it easier for designers to incorporate qualifying models into their projects.

1.4.2.3 Non-Residential Custom and Other Measure Recommendations

We offer two recommendations related to custom and other measures:

- We recommend that Hawaii Energy more actively promote the custom aspects of the program with specific examples of custom projects based on past experience, together with step-by-step training for trade allies on how to complete the necessary application forms.

- For window film, consider increasing incentives and provide trade allies with support in the form of unbiased information on the savings potential from window film. In addition, make it clear to both trade allies and customers that the application process is straightforward and can reduce the payback associated with window film installations.

1.4.3 Overarching Recommendations

In both the residential and non-residential sectors, the most important near-term recommendation is to maximize the marketing impact of existing channels and relationships and leverage the existing market infrastructure as much as possible. Most importantly, retailers and trade allies are central to the success of the existing programs.

- The program should continue to work with current participating retailers to maximize the visibility of promotional materials and consumer information and should continue to recruit additional stores that are not yet participating.

- Bolstering trade ally participation, in both residential and non-residential sectors, is important for those programs in which participation and purchase-related decision-making is heavily influenced by these entities. In particular, the programs should find ways to increase the participation of contracts, HVAC technicians, and lighting providers.

A theme that has been highlighted throughout this evaluation is the fact that in the mid-term the program will need to evolve away from lighting and move deeper into markets that have not yet been tapped.

- Much of the most cost-effective lighting potential in both the residential and the non-residential markets will likely be captured within the next two to three years of program operation. During this time, it will be important to begin focusing on other end uses, such as HVAC and motors, so that on-going progress toward statewide goals is not interrupted.

- Additional marketing expenditures are likely needed to increase market awareness and support the efforts of trade allies to leverage the program in their sales cycles. Social media campaigns are potentially useful in this regard, depending upon the target audience, and should be incorporated into a broader marketing strategy.

- Moving beyond lighting is likely to require additional attention on building infrastructure that is not yet in place. Training of trade allies, engineers, and other equipment specifiers, for example, is likely needed in addition to straight financial incentives.

- Much of the participation to date has been from larger customers, including military facilities. The program will need to transition toward ways of reaching smaller users as well. Accomplishing this in a manner that is cost effective is likely to be a challenge and will require continued support from market actors to leverage limited program funding.

- New approaches and increased focus is needed in the mid-term to increase participation among low-income customers and renters. These markets overlap considerably in the residential sector and are challenged by split incentives among tenants and property owners.

In the longer term, the initiatives highlighted for mid-term focus will become essential.

- Because future savings reside in end uses and markets that are not currently captured through these programs, efforts to move beyond lighting and deeper into other end uses will be imperative as the programs move beyond 2013.

- The ability of the portfolio to meet aggressive statewide goals may require whole new programs that supplement rather than simply augment the current programs. Business and consumer electronics initiatives, for example, are growing in several states and are key to addressing growing energy use associated with plug loads.

- Utilities in California and the Pacific Northwest are placing considerable emphasis on the support of initiatives to commercialize emerging technologies. The State of Hawaii may need to assess the role of emerging technologies in achieving its goals and either conduct its own commercialization efforts or join in with other states.

During the course of conducting this evaluation of the PY2009 Hawaii Energy programs, several policy-related issues were highlighted.

- A more direct link between the Hawaii Energy action plans and the technical potential work conducted by Booz Allen Hamilton (BAH) would be extremely useful.

- The current two-year contracting cycle may not provide a sufficient timeframe to synch the current programs with the long-term strategy. Many of the programs

currently in place are in need of a 2-4 year action plan, along with the development of new programs outside of the current program window.

- Because the benefits derived from developing infrastructure initiatives are not likely to manifest in actual kWh savings until the mid-longer term, the TRC is quite high on such investments. As such, a restructuring of performance incentives may need to be considered to provide the implementation contractor with sufficient motivation to develop long-term infrastructure.

2 Introduction

This report presents the results of a comprehensive evaluation conducted on Hawaii Energy's Energy Efficiency Program during its first year of operations, Program Year 2009 (PY2009), from July 1, 2009 through June 30, 2010. The evaluation verified program impacts, assessed program processes, and included a comprehensive market assessment.

2.1 Background

In 2006, the Hawaii Legislature authorized the state's Public Utilities Commission (PUC) to transfer the existing demand side management surcharge collected by Hawaii's electric utilities to a third-party administrator. The transferred surcharge would be called the Public Benefits Fee (PBF) and would be used by the contracted third-party administrator (the Public Benefits Fee Administrator, or PBFA) to manage and deliver energy efficiency and demand side management programs and services under the oversight of the PUC. By Decision & Order # 23258 (Docket No. 2005-0069) dated February 13, 2007, the PUC established a Public Benefits Fund to promote the development of programs and services that increase energy efficiency, reduce electricity consumption and demand, and ultimately decrease Hawaii's dependence on imported fossil fuels. In 2008, the PUC took further actions to direct Hawaii electric utility companies to begin collecting a PBF surcharge.

On September 18, 2008, the PUC issued a competitive Request for Proposal (RFP) soliciting proposals for a Program Administrator for the Hawaii Energy Efficiency Program (Hawaii Energy). Science Applications International Corporation (SAIC) was selected to administer the PBF through 2013. In January 2010, an SAIC internal corporate restructuring resulted in Hawaii Energy being turned over to R.W. Beck, a wholly owned subsidiary of SAIC.

Hawaii Energy uses several subcontractors, including Honeywell (residential program administration support), Wall-to-Wall Studios (marketing and creative design services), The Bennet Group (public relations), Home-Tech (equipment inspections), JN Plumb Tech (equipment inspections), Paul Maki (legal services), PN Public Relations (website design), and WECC (technical support for photovoltaic program design).

Hawaii Energy also has an implementation and oversight organization, the Technical Advisory Group (consisting of the PUC, PBFA contract manager, fiscal agent and contract evaluator, and local energy stakeholders), to provide expertise and technical guidance.

Hawaii Energy began implementing federal stimulus grants (associated with the American Recovery and Reinvestment Act of 2009) in the second half of Program Year 2009 for the State Energy Office to boost energy conservation and efficiency measures. The program is also participating in the Integrated Resource Planning (IRP) Framework and Energy Efficiency Portfolio Standards (EEPS) open dockets.

2.2 Program Overview

The goals for the first year of program operations included the successful transition of the programs from the Hawaiian Electric Company (HECO) and its subsidiaries, Maui Electric Company (MECO) and Hawaii Electric Light Company (HELCO). The goals also were to offer new programs that supplement the existing program components, engage local stakeholders, launch outreach and marketing, and streamline management and information technology systems.

The Program Year 2009 Hawaii Energy portfolio consisted of eight programs, with four programs targeting the residential sector and four targeting the non-residential sector:

- **Energy Solutions for the Home (ESH).** Provided prescriptive incentives to residential customers who purchased and installed energy efficiency measures that met or exceeded Energy Star standards. Rebates for high efficiency ceiling fans, clothes washers, dishwashers, air conditioners (ACs) and AC maintenance, refrigerators, and window ACs were provided through an application process. Rebates were not provided for compact fluorescent lamps (CFLs), which had retailer point-of-sale price reductions.

- **Residential Efficient Water Heater (REWH).** Provided rebates to homeowners, apartment owners and tenants, and military housing agencies replacing existing water heaters with solar and high efficiency hot water heaters. Delivered through solar installation contractors and promotion by retailers.

- **Residential Low Income (RLI).** Enabled qualified low-income single-family customers to receive installation of CFLs and high efficiency water heating measures at no cost to the customer. Delivered by a network of Community Action Programs and Economic Opportunity agencies.

- **Residential New Construction (RNC).** Provided rebates to new home builders for solar water heaters (through December 31, 2009), high efficiency electric water heating with peak load timer devices, and Green Homes bundled measures.

- **Commercial and Industrial New Construction (CINC).** Provided technical project assistance, financial incentives, and training opportunities to building owners and design teams for new construction and major renovation projects to reach highest achievable energy efficiency levels. Application forms were made available to customers, developers, architects, and engineers.

- **Commercial and Industrial Customized Rebate (CICR)**. Provided custom financial incentives based on calculated savings to commercial, institutional, governmental, and industrial sector customers.

- **Commercial and Industrial Energy Efficiency (CIEE).** Provided prescriptive incentives for measures including high efficiency lighting; heating, ventilating, and air conditioning (HVAC); and appliances to commercial, institutional,

governmental, and industrial sector customers. Rebate application forms were made available to customers and their channel allies.

- **Commercial and Industrial Efficient Water Heating (CIEWH).** A new program addressing non-residential solar water heating projects with limited activity during Program Year 2009.

Several performance metrics were established in the PBFA contract to set measureable performance targets that meet the PUC's objectives. The performance indicators for Program Year 2009 were:

- Cumulative Annual Net Electric Energy Savings – reducing the consumption of imported fossil fuels
    - Target: 68,722,000 kWh for residential and 57,331,000 kWh for non-residential
- Summer Peak Demand – reducing electrical loads during the traditional peak period that occurs on weekdays between 5 p.m. and 9 p.m.
    - Target: 20,097 kW
- Total Resource Benefit – the estimated total net present value of the avoided cost for the utility from the reduced demand (kW) capacity and energy (kWh) from energy efficiency projects over the life of the projects
    - Target: $140,079,739
- Market Transformation – encouraging lasting change with regard to how energy is used in businesses and homes
    - Emerging Technologies Target: Foster 20 projects using emerging technologies, with at least four unique emerging technology projects
    - Trade Ally Referral Target: Receive 40 projects from trade allies for the program
- Broad Participation-Island Equity – intending to indicate that program services and incentives are promoted and offered in a geographically equitable manner
    - Target: +/- 20 percent of each island's contribution to the PBF

2.3 Evaluation Overview

Evergreen Economics is currently under contract with the Hawaii Public Utilities Commission to conduct a comprehensive multi-year evaluation of the Hawaii Energy

Efficiency Program.[2] The evaluation team consisted of the following firms and expert associates:

- **Evergreen Economics** led the impact evaluation work.
- **EMI** led the process evaluation and assisted with the market effects and market baseline work.
- **Michaels Engineering** managed all on-site metering and verification work and conducted fieldwork. They also led the review of ex ante savings values.
- **ECONorthwest** staff conducted research and analysis**.**
- **InSynergy Engineering** conducted on-site verification work.
- **SMS** fielded all of the phone surveys in this evaluation, as well as conducted store visits.
- **Dr. Robert Wirtshafter** was involved with the process evaluation and market studies and the low income program evaluation.
- **Dr. Phil Willems** assisted with all the process evaluation, market effects, and market baseline work.
- **John Stevenson** led the development of the phone survey instruments.

The results of this analysis serve to meet requirements of SB 3001 (2008), Hawaii Revised Statutes §269-124.[3] During the 2010 calendar year, we conducted extensive research on Hawaii's residential and non-residential sectors to evaluate the effectiveness of the program, assess the state's energy efficiency markets, and estimate energy savings. The program evaluation objectives were to:

1. Review the program's savings estimates and ensure that sound values and methodologies were used to estimate energy savings in the Hawaii Energy Technical Reference Manual

2. Verify and validate the program's reported energy savings, including site inspections and "desk" reviews of R.W. Beck project reports

3. Conduct ex-post impact evaluations of all programs, with an emphasis on measures and sites with high impact (and/or relatively high savings uncertainty), while allowing for expenditures on other useful evaluation activities

[2] The draft version of this report and its supporting analyses were conducted and managed by ECONorthwest. The Hawaii Public Utilities Commission reassigned the evaluation contract to Evergreen Economics on February 25, 2011. The principle staff that worked on this project at ECONorthwest are currently employed by Evergreen Economics.

[3] "Before January 2, 2008, and every three years thereafter, require verification by an independent auditor of the reported energy and capacity savings and incremental renewable energy production savings associated with the programs delivered by the public benefits fee administrator contracted by the Public Utilities Commission to deliver energy-efficiency and demand-side management programs under section 269-121."

4. Calculate ex-post cost-effectiveness program and portfolio analyses using the Total Resource Cost Test

5. Conduct process evaluations of the transition to Hawaii Energy, program portfolio benchmarking (with an emphasis on new activities), and establishment of market penetration tracking priorities

6. Coordinate with R.W. Beck market research

The evaluation approach consisted of the following key activities:

- Impact Evaluation to provide an independent assessment of the program's energy savings accomplishments, including:
    - Technical Reference Manual Review – an engineering review of the program's deemed savings values
    - Verification Research – savings validation and measure installation verification, including participant telephone and on-site surveys and project file review
- Process Evaluation to determine the effectiveness of program processes, based on program staff interviews, program data and materials review, participant surveys, and trade ally interviews
- Market Assessment to characterize the supplier and customer markets in Hawaii, using participant and non-participant surveys, trade ally interviews, and secondary research

3 Evaluation Approach

This section provides an overview of the evaluation methods used to conduct the Technical Reference Manual review, verification research, primary research, and secondary research. We provide additional detail in Appendix C on sample design. The reader is also referred to Appendix A, Technical Reference Manual Review Results Memorandum, and Appendix B, Verification Results Memorandum, for the comprehensive methods and results for these two research tasks.

3.1 Technical Reference Manual Review

An early evaluation task was to review the energy savings assumptions that are used by Hawaii Energy and documented in a Technical Reference Manual. The review included the Manual itself as well as cited documentation to ensure consistency. In addition, we compared the claimed savings against other sources, such as savings values used in other jurisdictions and research documentation from KEMA (the firm that evaluated the HECO utilities' prior energy efficiency programs); the American Society of Heating, Refrigeration and Air-Conditioning Engineers; the National Renewable Energy Laboratory; and other organizations. We examined not only the derived deemed savings values, but also assumptions regarding operating conditions and baseline equipment. Additionally, we evaluated the reasonableness of the supporting documentation (e.g., expected useful life, system loss factor) when compared to available sources and findings from other utility programs. Refer to Appendix A, Technical Reference Manual Review Results Memorandum, for more detail on the evaluation methods.

3.2 Verification Research

We conducted two major research tasks to verify the program's energy savings claims: savings database validation and measure verification. The combination of the results from these two activities comprised the overall verification results. The savings database validation provided a set of ratios by program and energy efficiency measure category that reflect the proportion of energy savings we verified in the program tracking database relative to the savings reported in the *Hawaii Energy Conservation and Efficiency Programs Annual Report, Program Year 2009* (Annual Report).[4] The measure verification provided a second set of ratios that reflect the proportion of measures and their associated savings that we verified to be installed and program-qualifying.

We multiplied the two sets of ratios to yield a final set of overall verification and validation ratios that we applied by program and measure to the Annual Report values. The resulting savings are our independent assessment of the verified energy savings associated with

[4] R.W. Beck. Submitted to Hawaii Public Utilities Commission, September 10, 2010. Gross savings reported at the measure level in Attachments A and B. The Annual Report and Attachments can be downloaded at http://hawaiienergy.com/75/hawaii-energy-report-card.

Hawaii Energy's Program Year 2009. Below we provide a summary of the results. Refer to Appendix B, Verification Results Memorandum, for more detail on the evaluation methods.

3.2.1 Savings Database Validation

We obtained a database from R.W. Beck that included program participants and energy savings values for Program Year 2009. We summarized the savings claims by program (e.g., Residential Efficient Water Heating) and energy efficiency measure (e.g., water heaters or fluorescent lamps) and compared that summary to R.W. Beck's program and measure-level summary of its savings claims in Attachment A of the Annual Report.

The validation exercise required that we replicate the measure installation counts included in the Annual Report in our independent review of the tracking database. Similarly, we checked the per unit savings values used in the Annual Report in the tracking data (for those measures included in the Technical Reference Manual) to ensure that we were using the appropriate values from the Manual for each measure and program. Finally, we replicated the gross savings, net savings, and Total Resource Benefit results from the Annual Report by conducting our own calculations for these parameters using the final tracking system data.

3.2.2 Measure Verification

We conducted telephone and site surveys with statistically representative samples of participants by program and conducted an engineering review of large customer projects to verify that measures contained in the program tracking database were actually installed and program-qualifying. For CFLs, which were delivered upstream through manufacturer and distributor rebates, we verified that the measures were program-qualifying, that measures were being sold in retail stores with the proper rebate amount applied, and that the invoices submitted by retailers matched the measure counts claimed by the program.

The measure verification research methods included fielding a number of telephone and site surveys and reviewing program participation records. We used the data collected from the surveys, project reviews, and invoice audits to develop verification ratios by program and measure category. These ratios are the fraction of energy savings that was verified to be installed and program-qualifying. Where samples were used, we developed sample weights so that results would reflect the population of participating customers. In the telephone surveys, we asked customers if the measure was still installed and operating. We developed an initial verification ratio equal to the fraction of measures verified by telephone.

We augmented the telephone surveys with customer site surveys in which we inspected a sample of households and non-residential facilities to confirm that the measure was still installed, operable, and program-qualifying. We developed a correction factor for the nested sample of customers who had both a telephone and site survey, where the customer site survey was assumed to be correct if there was a discrepancy. For example, if two of 10 measures were self-reported as verified by telephone but were not installed or not program-qualifying based on the site survey (and the remaining eight matched between

telephone and site), a correction factor of 20 percent was applied to the telephone survey verification ratio to produce a final verification ratio.

We attempted to confirm the energy savings claims in the database for large, custom, and military non-residential facilities with engineering reviews based on electronic project files and customer site surveys. We reviewed vendor records, observed equipment size and specifications on-site, and interviewed customers. We developed verification ratios for each project based on the energy savings that we could confirm. Where we could not confirm the energy savings, we relied on at least two sources of information (e.g., a site survey combined with a project file review).

We applied these verification ratios by program and measure to the final program tracking database, which covered the entire year.

3.3 Primary Research

We conducted primary data collection during the summer of 2010. As Table 1 below shows, we conducted nearly 3,000 telephone surveys, 175 in-depth interviews, and more than 200 on-site surveys to support the impact, process, and market assessments.

The table depicts the type and number of surveys and interviews done for each customer group. For the residential sector, we used participant phone surveys, non-participant phone surveys, and participant site surveys. We used similar surveys for the non-residential sector as well as in-depth interviews and file reviews. We also used the in-depth interview format for trade allies in order to facilitate a deeper discussion. Lighting retailers were studied with visits to the stores and through invoice audits.

Table 1 Primary Data Collection Summary

Customer Group	Participant Phone Survey	Non-participant Phone Survey	Participant Site Survey	Store Visits	In-Depth Interview	Invoice Audit	File Review
Residential	800	1,200	156		0		
Non-residential	144	604	79		60		73
Lighting retailer				14		14	
Trade allies					115		
Totals	**944**	**1,804**	**235**	**14**	**175**	**14**	**73**

3.3.1 Participant Survey Sample Design

We used program tracking data from the first three quarters of Program Year 2009 as the basis for the participant sample frame, from which we drew samples for the participant surveys. We used this subset of the full-year program tracking database because the verification results were due in the fall of 2010, requiring us to pull our research samples before the close of the program year. Our intent was that the samples drawn from the first

three quarters and the subsequent research results would be representative of the full-year program, because the program design did not change in the fourth quarter.

R.W. Beck provided ECONorthwest an extract of the program tracking database covering the first three quarters on June 22, 2010. We worked closely with R.W. Beck and its subcontractor Honeywell over the summer to collect additional detailed information to support the sampling approach.[5]

The program claimed 57 percent of its PY2009 savings during the first three quarters of Program Year 2009 (our participant survey sample frame) and the remaining 43 percent in the final quarter. Most program savings were fairly equally distributed across the quarters or were concentrated in the first three quarters, with the exception of the Energy Solutions for the Home and Non-Residential Customized Rebate programs.[6] These programs achieved more than half of their savings in the fourth quarter, representing a surge in CFL incentives and custom non-residential projects before the end of the program year. The samples that we drew to conduct verification research using the first three quarters of data are just as representative of the fourth quarter data as they are of the first three quarters of data because these programs did not change their delivery or design in the fourth quarter.

The Residential Low Income program, however, had no activity during the first three quarters and was excluded from the sample frame and the first round of verification research. This program delivered 50,000 CFLs, 900 solar water heater inspections, and approximately 900 water heater measures to low-income households in the fourth quarter.[7] The 2009 Residential Low Income program is currently being evaluated and verification activities are being planned. Refer to Appendix C, Sample Design Detail, for additional information about the sample design.

3.3.2 Participant Survey Data Collection

The evaluation team conducted a variety of research activities involving program participants to verify program measure installations and support the process evaluation and market assessment, with the research approach varying based on the type of customer.

Most of the program participants were *downstream* customers that live in a residential home or work in a business or government agency and received a rebate for program-qualifying equipment. Typically they mailed in a rebate application and later received a check. The program also paid rebates directly to lighting manufacturers and distributors (*upstream* or *mid-stream* market actors) for CFLs. The manufacturers and distributors then

[5] Honeywell provides administrative support for the Energy Solutions for the Home, Residential Efficient Water Heater, and Residential New Construction programs on behalf of R.W. Beck.

[6] The program actually claimed fewer solar water heaters for its Residential New Construction program in the full-year tracking database compared to what was tracked through the third quarter. This is because the final year database not only included the fourth quarter but also reflected the cleaned and final first three quarters of data.

[7] The solar water heater inspections were delivered in conjunction with solar water heater rebates that were offered through federal stimulus funding that was administered through the Office of Community Services.

sold discounted products to lighting retailers. The retailers passed that discount directly on to customers who bought CFLs and received a discount via a point-of-sale rebate that was redeemed instantly.

Research methods used for downstream customers included telephone and site surveys and an engineering review to confirm savings for large and custom non-residential projects. For upstream CFLs, we visited a sample of stores selling program-discounted products to confirm that the products were program-qualifying and being sold at the correct discounted price. We also audited a sample of retailer invoices to verify that the invoice totals matched the program tracking database and that the CFL model numbers were program-qualifying.

3.3.2.1 Downstream Participant Research

The following is a brief description of the telephone surveys, on-site surveys, and engineering reviews that were used to verify measure installations and program qualifications and to support the process evaluation and market assessment for downstream customers.

- **Telephone surveys.** SMS, a Hawaii-based telephone survey research firm, conducted computer-assisted telephone interview (CATI) surveys for both residential and non-residential customers in July 2010. The surveys included questions to verify that the customer had received a rebate for a program measure, had installed the measure, and that the measure was still operable. The survey also included batteries on process evaluation (e.g., customer satisfaction and program awareness) and market assessment (e.g., energy efficiency equipment saturation and energy efficiency awareness, behaviors, and attitudes). The survey asked respondents if they would be willing to participate in an on-site verification survey that would follow for a sample of telephone survey respondents.

  The telephone surveys were conducted with a sample of participants from the following programs: Energy Solutions for the Home, Residential Efficient Water Heater, Residential New Construction, Non-Residential Energy Efficiency, and Non-Residential New Construction. For residential customers, we used a modified proportional sample allocation based on measure category and island, ensuring at least 50 sample points per island. The survey targeted 800 customers, addressing up to two measures per customer. For small and medium non-residential customers we did not draw a sample of customers; because the population was so small (228 customers), we called all participants. SMS completed 893 residential surveys and 144 non-residential surveys.

- **Customer site surveys.** We conducted on-site visual inspections of measures installed in residences and businesses. Michaels Engineering based in Wisconsin and InSynergy Engineering, Inc. based in Honolulu conducted the on-site surveys to verify that the measures were installed, qualified for the program, and were operational. We also collected some market information such as energy efficiency equipment saturation and remaining potential. The residential on-site sample was

generated in two ways: SMS recruited willing participants through the CATI survey, yielding 102 completed on-site surveys of measures at 91 sites. We conducted an additional 40 on-site surveys of solar water heaters installed by developers in new residential housing who had been excluded from the telephone survey.

The non-residential on-site sample was also generated in two ways: SMS recruited willing participants through the CATI survey, yielding 72 completed on-site surveys of measures in the Non-Residential Energy Efficiency program at 31 sites; and we inspected an additional 187 measures at seven business locations that had received a large number of measures through the Non-Residential Energy Efficiency program and had been excluded from the telephone survey.

- **Engineering project file review.** The evaluation engineers reviewed project files associated with claimed measures to verify measure counts and program eligibility. For large customers, such as the military, we drew a random stratified sample of projects to verify. For installed measures, the evaluation team checked data in the Hawaii Energy tracking system against participants' rebate applications. We also compared any available purchase invoices and post-inspection forms to the Hawaii Energy tracking system. If equipment specifications or photographs of the equipment were available, we verified that the equipment was program-qualifying. We conducted desk reviews for 37 measures at military sites representing 33 percent of military savings and 36 measures for large non-residential customers representing 15 percent of large non-residential savings.

3.3.2.2 Upstream CFL Research

We conducted site visits and invoice audits to verify the CFLs sold through the upstream program and to collect pricing information on bulbs. Because the program does not collect end-user customer data (i.e., the residents and businesses where the CFLs are ultimately installed), our research focused on the participating manufacturers, distributors, and retailers. We confirmed that measures are being sold in participating retail stores and reviewed retailer invoices, as described below.

- **Lighting retailer site visits.** The evaluation team conducted 14 on-site visits across Oahu, Maui, and Hawaii (there were no participating retailers on Lanai or Molokai) with a sample of participating lighting retailers to verify that the stores met the requirements of the Memorandum of Understanding (MOU) that retailers were required to sign to participate in the CFL rebate program. The on-site surveys represented 44 percent of participating stores, but those stores represented 66 percent of savings from total rebated CFL sales, based on the extract of the first three quarters of PY2009 data.

- **CFL retailer invoice audit.** The evaluation team also reviewed a sample of invoices from lighting retailers participating in the CFL rebate program. We reviewed a random stratified sample of invoices from participating retailers to ensure that the information in Hawaii Energy's databases matched the invoices and to verify that the stores met the requirements of the MOU that the program issued

to each store. We compared the fields for store name, stock-keeping unit (SKU) number, and number of packages to those values on the invoices. We then compared the SKU numbers from the invoices with a list of Energy Star-certified CFLs, as reported on the Energy Star website.[8] The invoice audit represented 34 percent of energy savings associated with CFL sales, based on the extract of the first three quarters of PY2009 data.

3.3.3 Non-Participant Survey Sample Design

We conducted general population and non-participant, non-residential customer surveys to support the market assessment. We collected information on barriers to installing energy efficiency equipment and potential for energy efficiency measure installations.

3.3.3.1 Residential (General Population)

The general population survey was conducted on a stratified sample of Hawaii residents using random digit dial, including cell phones. We intended to include all residential customers – renters, owners, individually metered, master-metered, military, and civilian. We oversampled residents on the less populated islands and areas of the islands. We set a target of 1,200 surveys: 500 on Oahu, 325 in Maui County, and 375 on the Big Island. We set maximums of 300 renters, 100 master-metered, and 50 military residents. Ultimately those maximums did not affect the number of completed surveys; we reached fewer renters, master-metered, and military residents. Refer to Appendix C, Sample Design Detail, for additional information about the sample design.

3.3.3.2 Non-Residential

The non-residential, non-participant survey was conducted on a stratified sample of non-residential customers. We screened out participants from the PY2009 Hawaii Energy program. We oversampled large customers, targeting 75 large (> 300 kW), 300 medium (> 5,000 kWh per month [at least three times in a 12 month period] or > 25 kW and < 300 kW, supplied through a single meter) and 300 small (< 5,000 kWh per month and < 25 kW, supplied through a single meter) customers. Refer to Appendix C, Sample Design Detail, for additional information about the sample design.

3.3.4 Non-Participant Data Collection

We used a combination of CATIs (conducted by SMS Research) and in-depth interviews conducted by senior evaluation staff to complete the non-participant research.

3.3.4.1 Residential (General Population)

The general population survey included the following survey batteries:

- Home and household characteristics for demographics and market potential

[8] http://www.energystar.gov/

- General energy efficiency awareness, attitudes, and behaviors, and awareness of other Hawaii energy programs/campaigns
- CFL awareness, purchases, satisfaction, saturation, storage, and installations

The survey of the general residential population was conducted using CATIs. The ECONorthwest team designed the survey instrument and SMS fielded the interviews during August 2010 and the first week of September 2010. SMS used random digit dialing to reach the population. The sample population included cell phones.

Table 2 shows the targeted and completed number of surveys by island and region. We exceeded the quota of 1,200 completed surveys—1,206 surveys were completed. Based on our review of the first 200 respondents' demographics, the evaluation team decided not to institute any quotas based on ownership, housing type, income, or whether the respondents pays their bill, because we were unlikely to reach maximums set in our sample design.

Table 2 General Population Survey-Targeted and Completed Surveys

	Target	Completed
Oahu		
Honolulu	250	251
Other	250	250
Total	*500*	*501*
Maui County		
Maui	250	251
Molokai	40	41
Lanai	35	36
Total	*325*	*328*
Hawaii		
Kona	125	126
Hilo	125	126
Other	125	125
Total	*375*	*377*
Grand Total	**1,200**	**1,206**

3.3.4.2 Non-Residential

The goal of the non-residential, non-participant survey was to provide a snapshot of market conditions:

- Overall installation activity and plans
- Previous activity in utility efforts
- Penetration of energy efficient technologies
- Awareness of energy efficient options

- Attitudes toward / barriers to energy efficiency
- Basis of comparison for future changes

SMS Research surveyed the small and medium customers and our senior evaluation staff conducted the large-customer interviews. The survey included the following batteries:

- Account Characteristics
- Participation in Hawaii Energy and Earlier Programs
- Barriers to Participation
- General and Energy Saving Investment Activity in Last Two Years
- Plans for Future Investment
- Detailed Invest in Shell, Cooling, Motors and Drives, Lighting, Air Compressors, Commercial Cooking, Pools, Clothes Washers, Controls, Process, and Other
- Investment Criteria

The evaluation team categorized customers by account size:

- Small—less than 5,000 kWh per month and less than 25 kW
- Medium—more than 5,000 kWh per month (at least three times in a 12 month period) or more than 25 kW and less than 300 kW
- Large—more than 300 kW

SMS implemented the CATI from mid-September through the end of October 2010. Table 3 shows the sample design and number of completed surveys for the survey of small and medium non-residential customers.

Table 3 Sample Size and Completed Surveys for Small and Medium Non-Participating Non-Residential Accounts

	Small		Medium	
	Target	Completes	Target	Completes
Oahu	100	91	100	113
Hawaii	100	102	100	111
Maui, Lanai, Molokai	100	96	100	91
Total	**300**	**289**	**300**	**315**

Table 4 shows the sample design and number of completed interviews of large non-residential customers. Evaluation staff on the evaluation team conducted the in-depth interviews of large customers. We relied on SMS to call the firms and recruit interviewees

and schedule an interview date. The interviews were conducted from late September 2010 through early November 2010.

Table 4 Sample Size and Completed Interviews for Large Non-Participating Non-Residential Accounts

	Target	Completes
Oahu	20	23
Hawaii	20	16
Maui, Lanai, Molokai	20	16
Total	**60**	**55**

3.3.5 Quantitative Survey Data Analysis

The four CATI surveys yielded data used by the evaluation team for the impact evaluation, process evaluation, and market assessment. Appendix F, Quantitative Survey Results, shows the CATI survey results in banner table format. The banner tables present data for every variable in the survey, cross-tabbed against key variables, such as island, measure type (for participating residential), and firm size (for non-residential). The evaluation team used the banner tables to support the assessments of the Hawaii Energy programs.

Under the direction of staff at ECONorthwest, SMS generated the banner tables by first weighting the data, as appropriate:

- For the Residential Participant survey, SMS weighted the data by measure and island
- For the Non-Residential Participant survey, SMS surveyed all participating firms and did not need to weight those results
- For the Residential General Population survey, SMS weighted the data by overall island population
- For the Non-Residential, Non-Participant survey, SMS weighted the data by size (based on electricity account rate) and island

Staff at ECONorthwest reviewed the banner tables and confirmed that our staff was able to recreate the numbers generated by SMS staff. We worked closely with SMS to ensure that assumptions about excluded records and weights were consistent with ours.

In addition to relying on the banner tables for the analysis, the evaluation team conducted its own ad hoc analysis of the survey data. We used SPSS software to generate cross-tabbed data as we conducted the evaluation. All calculations using the survey data were reviewed by at least one other staff member to determine that results could be recreated. This quality control exercise ensured that results were consistent and accurate across all evaluation team members.

3.3.6 In-Depth Interview Sample Design

3.3.6.1 Contractors

The sample for the in-depth interviews with trade allies was designed to gather information from the contractor groups most closely allied with measures targeted by the Hawaii Energy programs. The evaluation team's original target for interviews with contractors was 93 completed interviews: 30 lighting/electrical contractors, 30 HVAC contractors, 15 plumbing contractors, 15 solar hot water heater contractors, and 3 window film contractors. The sample design in Appendix C shows that the sample included a combination of residential and non-residential contractors and both participants and non-participants. This section will discuss the HVAC, plumbing, solar hot water heater, and window film contractors.

Sources of potential interview respondents included the following:

- Trade ally names from the residential and non-residential participant database
- Solar contractors listed on the Hawaii Energy website
- Names of firms identified from Dun & Bradstreet data using NAICS and SIC codes to identify their participation in the relevant markets and to screen for the number of employees at the given location

Although the original design oversampled participants in order to obtain feedback on various aspects of program participation as well as the broader market, the relatively few participating contractors led us to conduct more interviews with firms who were not currently participating. This enabled us to focus more specifically on program awareness and barriers to participation. Table 5 shows the targeted number of interviews.

Table 5 Targeted Sample for Contractors

		Targets		
Type of Contractor	Number of Employees	Participant	Non-Participant	Total
HVAC	>10	10	5	15
	1-10	10	5	15
	Total	20	10	30
Plumbing	>10	3	1	4
	1-10	7	4	11
	Total	10	5	15
Solar Hot Water	>10	5		5
	1-10	10		10
	Total	15	0	15
Window Film	Total	3		3
All Contractors	**Total**	**48**	**15**	**63**

3.3.6.2 Lighting and Appliance Suppliers

We identified the manufacturers, distributors, and retailers of lighting and appliances in the Hawaii Energy service area. The evaluation team initially planned to conduct 40 in-depth interviews to research issues related to residential lighting an appliance initiatives. It became clear that there were too few suppliers to meet that interview goal, so we adjusted the goal to 20 suppliers.

We developed a sample that captured large "big box" types of stores that comprise a large portion of the total volume of sales in the program and which are also likely to cover both lighting and appliances, such as Costco, Sears, and Home Depot. The sample also included independent retailers that sell lighting (e.g., hardware stores) and those that sell appliances. The sample also included the major distributors and manufacturers of CFLs that supply Hawaii. Table 6 shows the targeted number of interviews. There was uncertainty in the overlap of sales for CFLs and appliances as we developed the interview sample. Only after we had contacted the firm were we able to clarify the inventory of certain retailers.

Table 6 Targeted Sample for Lighting and Appliance Suppliers

	CFLs	Appliances	Both
Retailer	10-14	10-15	7
Distributor	1		
Manufacturer	5		
Total			**20**

3.3.7 In-Depth Interview Data Collection

The evaluation team conducted all 77 in-depth interviews with trade allies (lighting, HVAC, and solar water heating contractors) between August 8, 2010 and September 29, 2010. The 20 interviews with lighting and equipment suppliers took place between September 22, 2010 and October 29, 2010. The high-level results of these interviews are summarized in Appendix E. Some of the findings are discussed in Section 5, Process Evaluation.

In total, we completed 63 interviews with participating and non-participating contractors. The summary of completed interviews by contractor type, number of employees, and participant/non-participant is presented in Appendix C. Interviews were conducted by telephone using professional staff, and results were entered onto a dedicated secure website. This enabled the evaluation team to track the number of completed interviews by type and also facilitated analysis of the results. In addition, calls were recorded (with the respondents' permission), thereby allowing review of information when needed. The final results are indicated in the table of completed interviews provided in Appendix C.

3.3.8 In-Depth Interview Qualitative Assessment

The in-depth interviews provided data that supported our analysis for the impact evaluation, process evaluation, and market assessment. The evaluation team reviewed and summarized the comments from the in-depth interviews for each category of interviewee.

The qualitative assessment includes a summary of trends the evaluation team found within the interview responses, with a review of how businesses perceive Hawaii Energy's programs and their preferences for changes in the future. The summary in Appendix E, Trade Ally Interview Summary Results, includes the number of interviews conducted and the type of firm interviewed.

The evaluation team relied on the in-depth interviews for all aspects of the evaluation. We used the interviews with trade allies to gain insight into how the programs have been perceived by retailers and contractors for the process evaluation. We also used the interviews to assess the market—the interviews revealed how utility customers think about investment in efficient equipment and how trade allies can be engaged to expand the market.

3.4 Secondary Research

We reviewed a number of secondary sources to support our evaluation, including prior Hawaii energy efficiency program evaluations and regulatory filings, energy efficiency studies from other states and regions, Census and geographic data, Hawaii potential studies, Hawaii population energy consumption data, and Hawaii Energy program materials and documents.

3.4.1 Prior Hawaii Energy Efficiency Evaluations and Regulatory Documents

We obtained and reviewed information about the HECO utilities programs that were operating in Hawaii prior to Program Year 2009 to inform our evaluation:

- 2001-07 HECO Utilities Evaluations – impact evaluations conducted every three years that provided independent estimates of program savings
- 2008 Hawaii Integrated Resource Planning Document – contains energy savings and energy efficiency equipment saturation estimates

3.4.2 Census and Geographic Data

To prepare the maps in the market characterization, we used U.S. Census data and other geographic information system (GIS) data resources:

- U.S. Census – The American Community Survey 2006-08 for data on household characteristics and poverty levels.
- GIS data – Locations of each household using ESRI's ArcInfo geocoding software[9]

[9] ArcView Street Map Extensions and Data. USA: ESRI, 2009.

3.4.3 Hawaii Potential Studies

We reviewed energy efficiency potential studies conducted for Hawaii to inform our market characterization:

- A 2004 study by Global Energy Partners (GEP) that estimated maximum achievable potential by 2019 by sector and end use (we scaled these results to actual 2009 usage for comparison purposes)

- A 2010 study by Booz Allen Hamilton (BAH) that updated and expanded upon the study listed above, focusing on six sectors that account for 62 percent of Hawaii's energy usage

Because the BAH study only addressed six high usage sectors, we based comparisons to other sectors on the GEP study. Before comparing program savings to those projected by the potential studies, we determined the distribution of both participants and non-participants by business sector (defined by the SIC/NAICS code assigned to the accounts in the Hawaii utilities' customer information systems). Neither the GEP nor the BAH study specifically addressed two sectors that accounted for a significant share of program savings: military non-residential and other non-residential. As a result we had to compare program savings for these sectors to a portion of the "other non-residential" savings estimated by the potential studies. Note that these comparisons were not designed to be used as hard performance indicators, but were meant to provide an indication of the program's relative success by sector as well as problems that could arise down the road because much of the potential has already been tapped.

In the process of comparing actual program savings to the potential identified in the two studies, we worked closely with BAH to understand how their estimates of potential were determined. We learned, for example, that estimates of potential assumed that most large office buildings had already converted from T12 to T8 lighting, thus focusing the potential for future savings in the large office sector on air conditioning rather than lighting.

3.4.4 Hawaii Population Energy Consumption Data

We analyzed Hawaii population energy consumption data that was provided by the HECO utilities, via R.W. Beck, on March 19, 2010. The dataset contained customer information and billing data for all customers between December 2006 and March 2010.[10] We used these data to inform our non-participant sample designs and to update the energy efficiency potential study estimates.

We used rate schedule and business structure code information that we received from the HECO utilities to separate customers into residential and non-residential sectors. We were able to further use the rate schedule and the business structure code to group non-residential customers by use level and to group customers by building type.

[10] Because of an error that excluded certain accounts in the March 19, 2010 HECO dataset, we received an updated and corrected dataset from R.W. Beck on June 22, 2010.

Although R.W. Beck does not store the rate schedule or business structure code in their customer information database, we were able to join the two databases using customer utility account numbers. This allowed us to accurately identify customers in the population data who had participated in Hawaii Energy's energy efficiency programs, as well as to maintain a common customer classification by sector, use level, and building type.

We were then able to obtain summary information, including customer counts and average energy use (kWh), by sector, use level, and building type, as well as by whether or not the customer had participated in an energy efficiency program.

3.4.5 Hawaii Energy Program Information

We reviewed the Hawaii Energy PY2009 plan and annual and monthly reports to gain an understanding of the program design and its operations. We also periodically visited the Hawaii Energy website and joined its mailing list. We reviewed information from Hawaii Energy about the Hawaii Clean Energy road map and the program's administration of federal stimulus funds. We supplemented this information with interviews with key Hawaii Energy program staff from R.W. Beck and Honeywell.

3.4.6 Outside Hawaii Energy Efficiency Studies

We reviewed a number of studies that were conducted at the national, state, or regional level outside of Hawaii to inform the market characterization:

- Energy Star appliance sales figures by state from the U.S. Environmental Protection Agency (EPA)
- National CFL market profiles – each year D&R International prepares a profile of the CFL market, including sales and market share estimates
- Various CFL industry papers and studies – we reviewed key papers and studies on CFLs from the IEPEC and ACEEE conferences as well as recent evaluations conducted in California and the Northwest
- Rankings of state energy efficiency activities from the American Council for an Energy Efficient Economy (ACEEE)
- Rebate levels from other regions from the Database of State Incentives for Renewables and Efficiency (DSIRE)
- Program evaluation reports posted at calmac.org, energytrust.org, nwalliance.org, and neep.org

4 Impact Evaluation

The impact evaluation included the Technical Reference Manual review, savings validation, and measure installation verification. The reader is also referred to Appendix A, Technical Reference Manual Review Results Memorandum, and Appendix B, Verification Results Memorandum, for the comprehensive methods and results for these two research tasks.

4.1 Technical Reference Manual Review

There were several objectives for the review of the Hawaii Energy Technical Reference Manual:[11]

- Ensure that the savings values were calculated correctly and cover the measures currently promoted in the Hawaii Energy programs
- Identify any significant issues regarding the calculated savings that may affect the savings that can be claimed for Program Year 2009 and Program Year 2010
- Develop recommendations for addressing any significant issues identified, including:
    - Recommend alternative values for immediate use based on secondary sources
    - Identify research that needs to be done by the program administrator to improve the savings values and/or underlying parameters
    - Identify fieldwork or other research that the evaluation team should do to improve the savings values

For the majority of the measures included in the Technical Reference Manual, the savings values were derived from earlier estimates contained in the *Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Side Management Programs* (DSM 2008), written by KEMA in December 2008. In many cases, the savings calculations are shown in the Technical Reference Manual and then manually adjusted to match the savings values in the 2008 KEMA study.

4.1.1 General Observations

In general, the level of documentation associated with many of the measures is to be commended. The measures appear to be well researched and documented accordingly. Also, many of the savings values appear to be based on data collected from evaluations of previous programs. Therefore, the majority of the recommendations offered in this report are minor.

[11] We reviewed the Technical Reference Manual document dated April 8, 2010.

Second, as noted above, for many of the measures, savings are adjusted to be consistent with secondary sources such as *Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Side Management Programs* or Appendix N to the *HECO IRP4: Energy Efficiency Potential Study* by GEP. It would be useful if a fuller reference were included for these documents as the reference information used in the Technical Reference Manual is often incomplete. Providing specific citations, including a complete document name or docket number, will increase the thoroughness of the document and aid reviewers in locating the referenced data.

For many of the projects, savings were calculated using traditional means, and then an adjustment factor was applied. This adjustment factor was required to produce savings values that matched the energy savings reported in the 2008 HECO DSM Docket, as R.W. Beck was instructed to do. It is our understanding that calculations were performed to provide documented, and therefore reviewable, methodology and parameters that were not present in the data found in the 2008 HECO DSM Docket. The reasonableness of the original savings calculations is not addressed in this review.

4.1.2 Summary of Recommendations

The following are changes that we recommend be applied to the savings values for Program Year 2010, in order of priority:

- In the next version of the Technical Reference Manual, we strongly encourage that key terms such as *realization rate* and *net-to-gross ratio* be precisely defined and used consistently throughout the document. The definitions for these terms should also be consistent with those used by efficiency programs in other states.

- Adjust the hours used per day for CFLs from 4.98 to 2.3 to be consistent with research findings in other jurisdictions.

- For non-residential customers, revise lighting hours of operation and peak coincidence factors to match Database for Energy Efficiency Resources values.

- Develop incremental costs for all measures and use this information to calculate the Total Resource Cost test. The Total Resource Cost should be used to assess cost effectiveness in addition to the Total Resource Benefit test.

- Revise the Effective Useful Life of measures that vary from the DEER 2008 database by more than 20 percent. In cases where the discrepancy is more than 20 percent, either the DEER value or both weather-sensitive and non-weather-sensitive measures should be used.

- Adjust the peak coincidence factor from 0.3334 to 0.12 to be consistent with the literature.

- Adjust claimed demand savings based on participant data from all service territories covered.

- For Energy Star appliances, revise savings to be consistent with Energy Star estimates and the literature. Savings should also be broken out by appliance rather than by using a group average.

- Incorporate the effect of solar hot water heating into savings estimates for Energy Star appliances.

- For non-residential lighting, develop savings estimates by lamp size.

- For non-residential HVAC, develop savings estimates by equipment size.

- For chillers and packaged AC, use the International Energy Conservation Code (IECC) 2006 to determine baseline efficiencies and equipment savings.

- For T5 lighting, revise savings to be consistent with common installation practices.

There are areas in which there is some uncertainty regarding the savings values used in the Technical Reference Manual, but research is needed before determining how the savings values should be revised (or if a revision is needed at all). Recommendations that relate to evaluation research activities are summarized below in order of priority:

- Conduct additional research to determine the significance and appropriateness of HVAC interactive effects for non-residential measures.

- Expand the documentation regarding the development of the persistence factors and the reasoning behind their application, and apply a persistence factor (even if it is equal to 1) to every measure.

- Include a discussion of shell losses in the savings analysis and supporting documentation.

- Conduct additional research to verify the most appropriate coincidence factor for the Hawaii customer base, which can be incorporated into future years.

Refer to Appendix A, Technical Reference Manual Review Results Memorandum, for more detail on the review results.

4.2 Verification

This section presents the results of two verification activities, or energy savings estimation activities, that we conducted for Program Year 2009: the savings database validation and the measure verification. These two activities are typically performed as one component of a larger program impact evaluation. They are intended to

- verify that the program installed the measures it claimed savings for,

- determine that the measures are program-qualifying, and

- validate that the summary of program accomplishments matches the program tracking database.

These verification activities are distinguished from measurement activities that are intended to measure energy savings from program measures through activities such as equipment metering or analysis of changes in electricity bills. The combination of the results from these two verification activities, the savings database validation and the measure verification, comprises the overall verification results that are presented in this section.

The overall verification results indicate that nearly 100 percent of the energy savings claimed in R.W. Beck's *Hawaii Energy Conservation and Efficiency Programs Annual Report, Program Year 2009* (Annual Report)[12] were found to be installed, program-qualifying, and validated in the program tracking database. Table 7 presents the overall verification results by program. The values shown in the table by column are:

- **Sector** and **Program**, which indicate the sector (residential or non-residential) and the Hawaii Energy program
- **Claimed First-Year Gross Savings (kWh)**, which summarize the first-year energy savings claims from the Annual Report in kilowatt hours by program[13]
- **Verified First-Year Gross Savings (kWh)**, which summarize the overall verified energy savings by program, based on the combination of the savings validation and measure verification results
- **Percent Verified of Claimed Savings**, which presents the overall verified savings ratios by program, also reflecting the combination of the savings validation and measure verification results

The evaluation team presented the full results of the verification research in a memorandum to the Hawaii PUC in November 2010. Please see Appendix A for the full text of the verification memorandum.

[12] R.W. Beck. Submitted to Hawaii Public Utilities Commission, September 10, 2010. Gross savings reported at the measure level in Attachments A and B. The Annual Report and Attachments can be downloaded at http://hawaiienergy.com/75/hawaii-energy-report-card

[13] The primary focus of the verification was on gross rather than net energy savings, as the net-to-gross ratio is stipulated in the Technical Reference Manual and is constant for all programs. The net savings numbers reported by R.W. Beck were also verified, however, and included in the detailed verification results appendix provided within Appendix A.

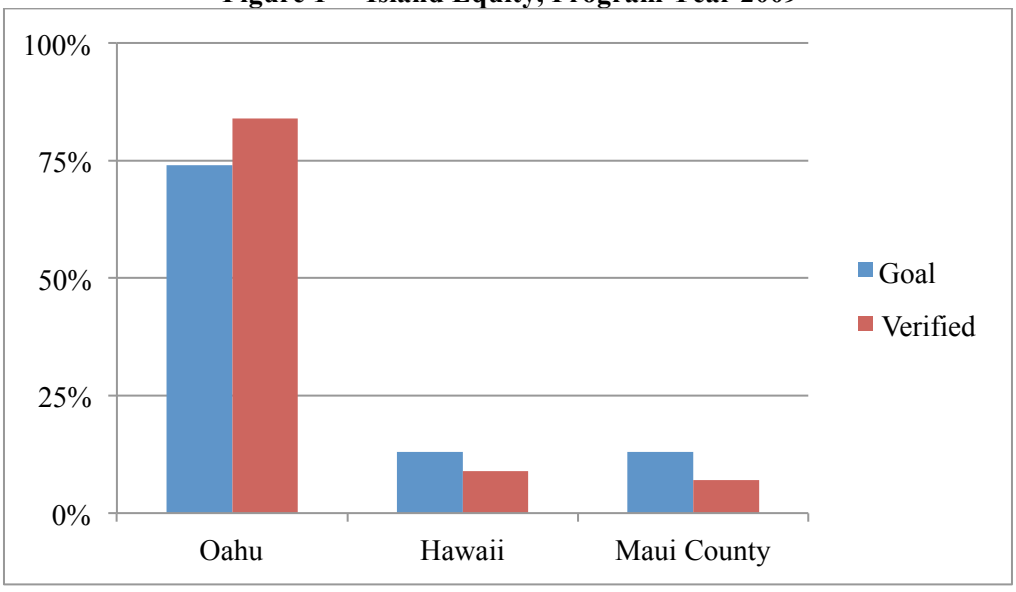
Table 7 Verification Results Program Year 2009

Sector (Program)	First-Year Gross Savings (kWh) Claimed	Verified	Percent of Verified Savings
Residential			
Energy Solutions for the Home (ESH)	76,523,904	76,395,003	99.8%
Residential Efficient Water Heater (REWH)	7,902,126	7,628,233	96.5%
Residential Low Income (RLI)	4,188,948	4,188,948	100.0%
Residential New Construction (RNC)	2,462,987	2,416,768	98.1%
Residential Total	91,077,964	90,628,952	99.5%
Non-Residential			
Non-Residential New Construction (CINC)	23,696,549	23,439,521	98.9%
Non-Residential Customized Rebate (CICR)	2,925,740	2,924,752	100.0%
Non-Residential Energy Efficiency (CIEE)	37,262,781	36,657,135	98.4%
Non-Residential Efficient Water Heating (CIEWH)	49,805	49,805	100.0%
Non-Residential Total	63,934,876	63,071,213	98.6%
Total	155,012,840	153,700,165	99.2%

Source: ECONorthwest PY2009 Verification Memo

Figure 1 shows the island equity achievements compared to the PY2009 goal. The program did not meet its island equity goals but made some significant progress in expanding participation to Hawaii and Maui counties.

Figure 1 Island Equity, Program Year 2009

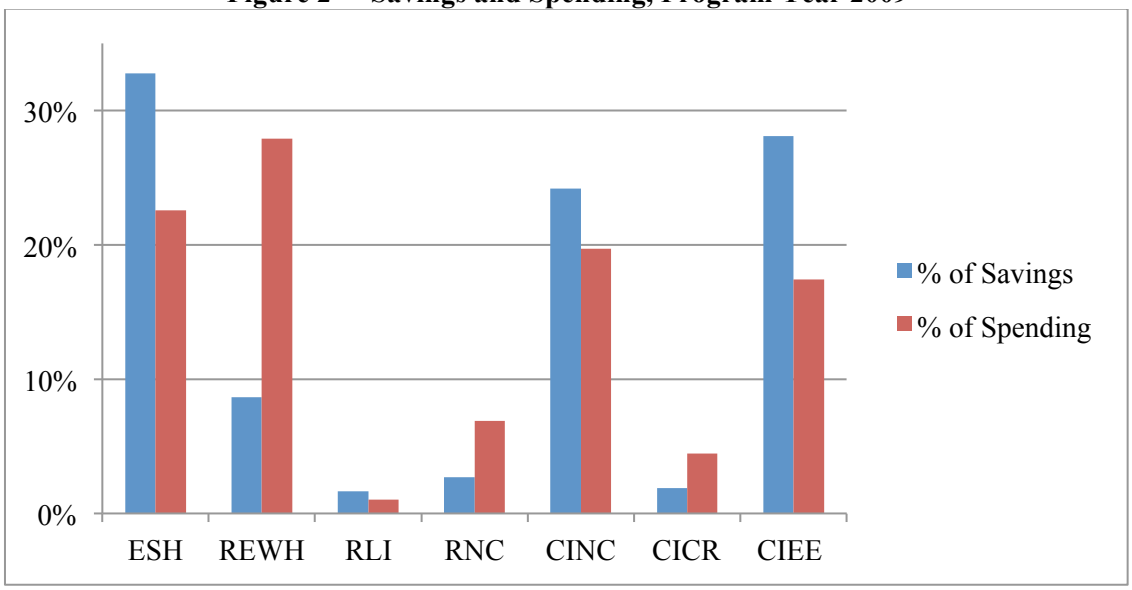


Source: ECONorthwest analysis of PY2009 program tracking database

Figure 2 compares the portion of total savings attributable to each program and the portion of total spending for each program. The chart shows that three programs, ESH, CINC, and CIEE, generated most

of the savings, 85 percent total, but only consumed 60 percent of all spending. The REWH program made up nine percent of all savings but accounted for 28 percent of all spending.

Figure 2 Savings and Spending, Program Year 2009



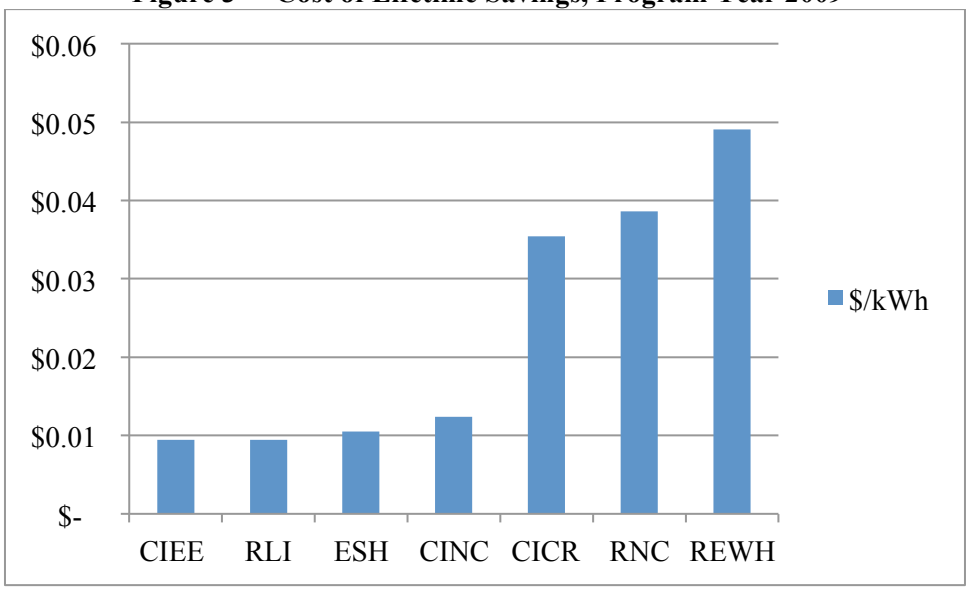
Source: ECONorthwest analysis of PY2009 program tracking database (system-level savings, first year savings)

Note: ESH: Energy Solutions for the Home, REWH: Residential Efficient Water Heater, RLI: Residential Low Income, RNC: Residential New Construction, CINC: Commercial and Industrial New Construction, CICR: Commercial and Industrial New Construction, CIEE: Commercial and Industrial Energy Efficiency

Figure 3 shows the cost of savings from a different perspective, illustrating the cost per kWh of lifetime savings. The three programs that made up the majority of total savings—ESH, CINC, and CIEE—had the lowest cost per kWh of savings, at only $0.01 per kWh. The RLI program also had a lost cost per kWh in savings, but the program comprised a much smaller portion of overall savings. The CICR, RNC, and REWH programs cost four to five times as much to generate the same amount of savings.

The costs are consistent with other studies. The Northwest Power Planning Council's Fifth Power Plan found that non-residential measures cost about $0.02 per kWh and a Pacific Northwest National Laboratory study found that common non-residential measures ranged in cost from $0.02 to $0.05 per kWh. Electricity costs in the Northwest are much lower than in Hawaii, such that energy efficiency provides Hawaii residents and businesses even more value than in other regions of the country.

Figure 3 Cost of Lifetime Savings, Program Year 2009

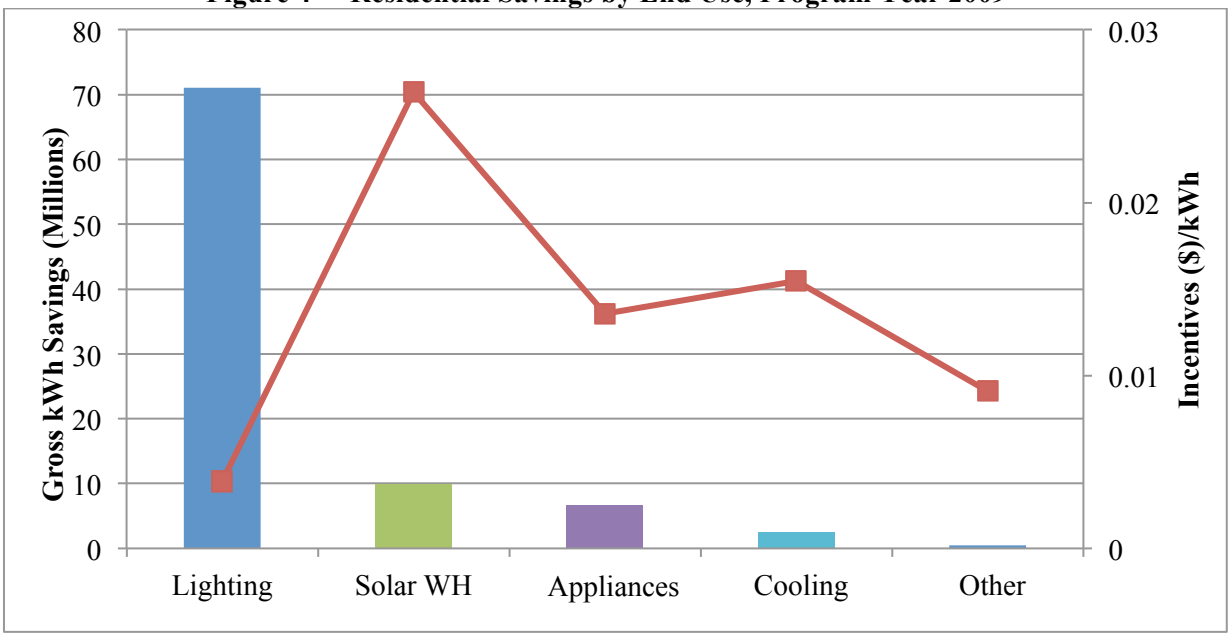


Source: ECONorthwest analysis of PY2009 program tracking database (system-level savings, life cycle)

Note: CIEE: Commercial and Industrial Energy Efficiency, RLI: Residential Low Income, ESH: Energy Solutions for the Home, CINC: Commercial and Industrial New Construction, CICR: Commercial and Industrial Customized Rebate, RNC: Residential New Construction, REWH: Residential Efficient Water Heater

Figure 4 compares the cost of the incentives to the gross kWh savings in the residential sector. The chart shows that lighting measures provide the most savings for the lowest cost: savings are substantially larger than for any other measure type and the cost of the incentive is lower on a per kWh basis. Solar water heaters are the costliest measures to incent, but they were the second largest source of gross kWh savings.

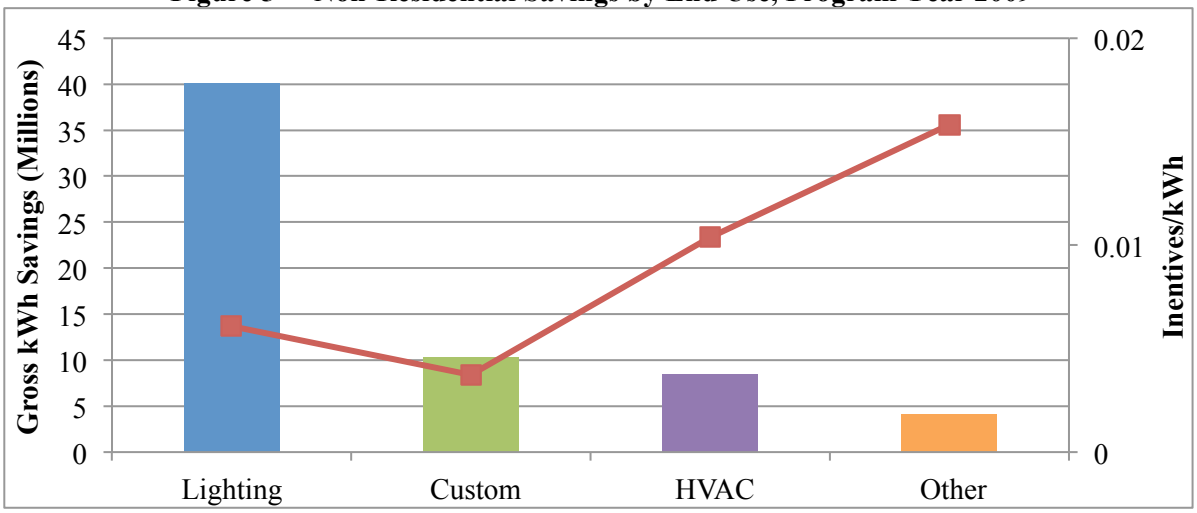
Figure 4 Residential Savings by End Use, Program Year 2009



Source: ECONorthwest analysis of PY2009 program tracking database (system-level savings)

Figure 5 also compares the cost of incentives to gross kWh savings, but in the non-residential sector. The chart shows that lighting measures provide the most savings, but in the non-residential sector lighting is not the lowest cost measure in terms of savings per kWh. Custom measures, the second largest source of savings, is the lowest cost measure category. Custom projects, however, include large amounts of lighting projects.

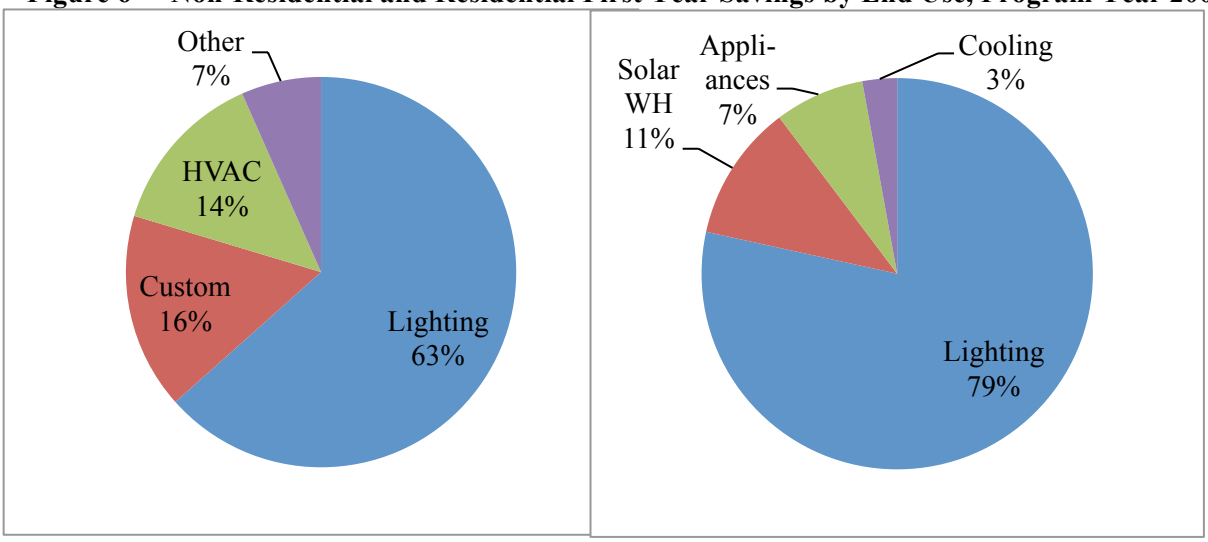
Figure 5 Non-Residential Savings by End Use, Program Year 2009



Source: ECONorthwest analysis of PY2009 program tracking database (system-level savings)

Figure 6 shows the first-year savings by end use for the residential and non-residential sectors. The figure shows that lighting makes up the majority of savings in both sectors: 79 percent of residential savings and 63 percent of non-residential savings. For the residential sector, solar water heaters are a distant second, with appliances and cooling making up 10 percent of total residential savings. For the non-residential sector, custom projects—which include all types of measures—make up 16 percent of savings, with HVAC and other projects making up 21 percent of all non-residential savings.

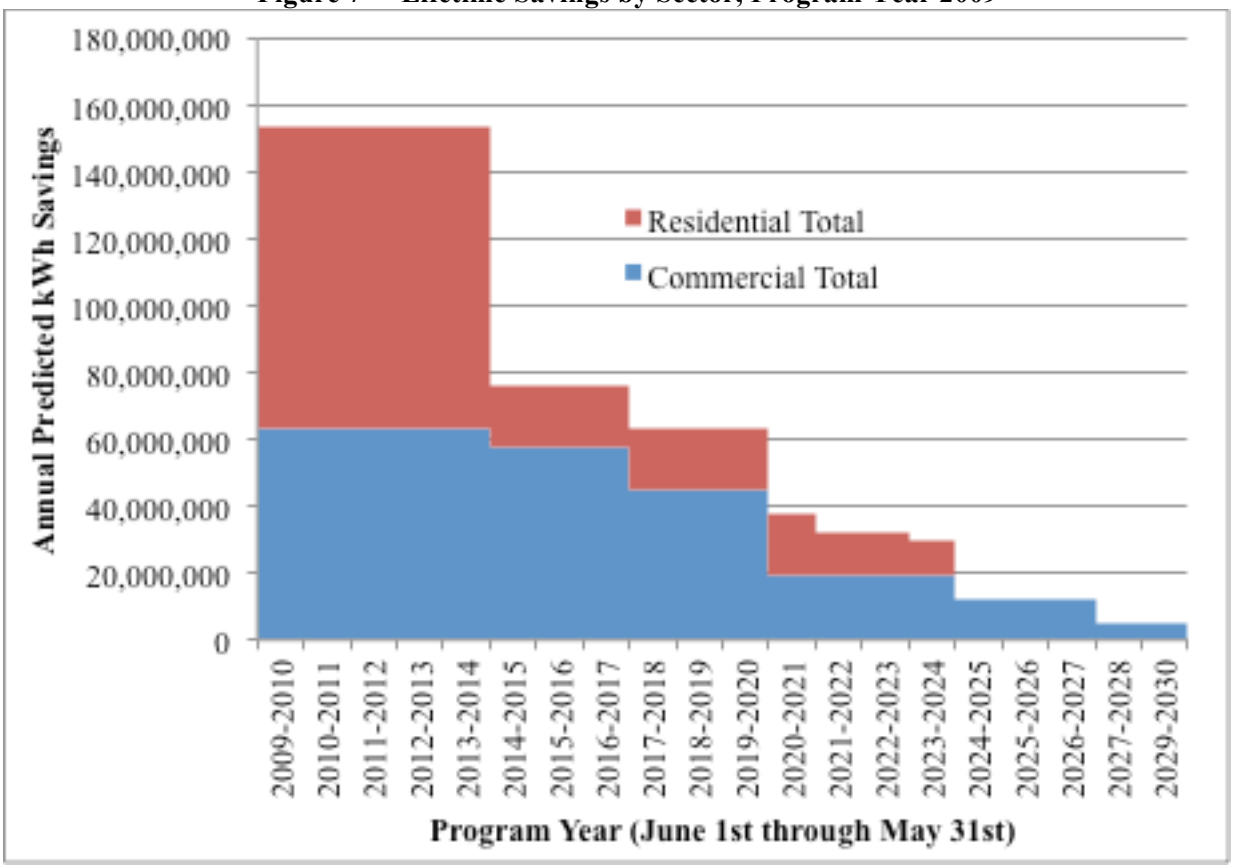
Figure 6 Non-Residential and Residential First Year Savings by End Use, Program Year 2009



Source: ECONorthwest analysis of PY 2009 program tracking database (system-level savings)

Figure 7 shows lifetime savings associated with PY2009 for the residential and non-residential sectors, incorporating the first-year savings with each measure's effective useful life.

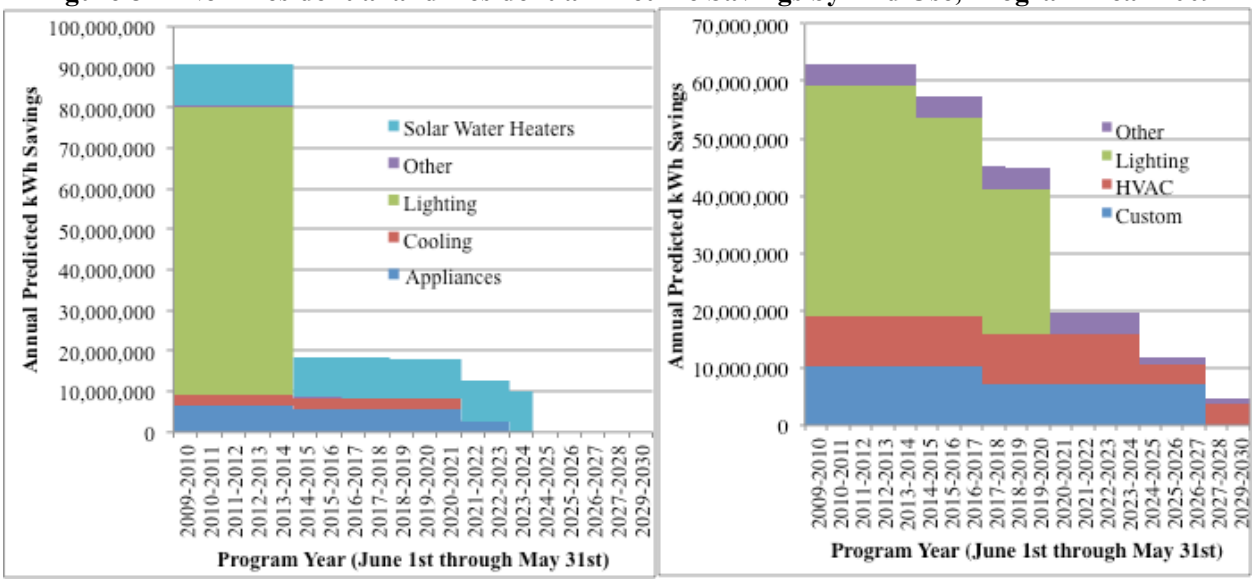
Figure 7 Lifetime Savings by Sector, Program Year 2009



Source: ECONorthwest analysis of PY 2009 program tracking database (system-level savings)

Figure 8 shows the lifetime savings by end use for the residential and non-residential sectors.

Figure 8 Non-Residential and Residential Lifetime Savings by End Use, Program Year 2009



Source: ECONorthwest analysis of PY 2009 program tracking database (system-level savings)

5 Process Evaluation

This section summarizes the results of the evaluation team's comprehensive assessment of the effectiveness of the Hawaii Energy's internal and external processes. To conduct this research, we reviewed internal data and documentation and obtained feedback from Hawaii Energy staff, customers, and other stakeholders. In particular, we used the following research activities to examine Hawaii Energy processes:

- Review of program planning and implementation documentation
- Review of program data and tracking systems
- Interviews with Hawaii Energy staff and stakeholders
- About 3,000 interviews with and surveys of program participants and non-participants
- 14 site visits with participating retail stores
- 115 in-depth interviews with contractors, retailers, distributors, and manufacturers of energy efficient equipment

The findings of our assessment of Hawaii Energy's processes are organized into six sections:

- Program Operations
- Participating Residential Customer Feedback
- Participating Non-Residential Customer Feedback
- Data Management and Program Tracking
- Verification Activities
- Program Marketing and Awareness

5.1 Program Operations

Analyzing Hawaii Energy's general operations is important because of the recent transition of program administration from the electricity utilities to the current structure as well as other major changes, such as modifications to rebate amounts. A solid understanding of program strengths and weaknesses will help guide program staff in future years.

In general, the evaluation team found that the program is operating well. The transition from the utilities to Hawaii Energy has been smooth. This is especially true for participating customers and retailers, with a few minor exceptions, as illustrated in the section below on

customer perspectives. A few challenges were the result of negative reactions to specific strategic changes.

However, the evidence of a successful transition and effective program implementation is clear in the results of our analysis of program operations. In particular, R.W. Beck's ability to manage multiple roles and make use of the capabilities of a sphere of partners has been a substantial benefit to the program.

5.1.1 Multiple Roles, Strategic Placement

The program administrator, R.W. Beck, is strategically placed as a central energy efficiency player in Hawaii and has been involved with many simultaneous activities during Program Year 2009, in addition to the implementation of the existing Hawaii Energy offerings, including the following.

- American Recover and Reinvestment Act (ARRA) funding – R.W. Beck was responsible for administering nearly $7 million in federal ARRA grants during the second half of 2009. These funds were used to create the "cash for clunkers" trade-in program that swapped older, less efficient refrigerators for new Energy Star models.

- Energy Efficiency Portfolio Standards (EEPS) and Integrated Resource Planning (IRP) – The PUC called on the administrator to be an active party in the dockets for EEPS and IRP.

- Hawaii Clean Energy Initiative (HCEI) steering committee member – The HCEI is a collaborative effort between the State of Hawaii and the U.S. Department of Energy (DOE) focusing on transforming the energy sector of Hawaii to a clean energy economy based on 70 percent clean sources by 2030.[14]

- Other roles – Membership/support for the Hawaii Energy Policy Forum (HEPF) and the HCEI End-Use Efficiency Working Group (EUEWG).

Through these roles, R.W. Beck is acquiring unique and imperative expertise, including familiarity with the interplays between the initiatives. These experiences should continue to be capitalized on, as the resulting knowledge could enable R.W. Beck to effect change in the market. Yet increasing involvement in these initiatives requires time and other resources of the program staff, which must be considered wisely. Because 2008 and 2009 were the initial years for many of these initiatives, the evaluation team did not find any particular constraint on resources. However, clearly defining and dividing each of these roles as necessary will be important in future program years.

[14] http://www.hawaiicleanenergyinitiative.org/

5.1.2 Making Use of Numerous Partners

The Hawaii Energy team has made substantial use of numerous subcontractors and other partners, including Honeywell, low-income service providers, other local firms, and the firms that comprise the evaluation team. These firms have various roles in the Hawaii Energy programs, but the involvement of multiple players with different experiences and capabilities results in a diverse and well-balanced team effort. The aggressive savings goals as well as the island equity goals make it vital for the program team to be coordinated to take advantage of the best each partner has to offer. Again, in future years, Hawaii Energy staff will need to articulate a well-defined division of roles for these partners.

5.1.3 General Satisfaction with Program Operations

Another indication of effective program operations is the high level of satisfaction among the various stakeholders. In-depth interviews indicated that customers, trade allies, and equipment suppliers are generally very satisfied with the program processes. Customers cited several reasons for their satisfaction, including:

- Rebates being paid promptly
- Clear participation processes
- Accessible program information

The in-depth interviews and site visits also revealed a few program-specific issues, including:

- *Lack of retailer compliance with memorandum of understanding (MOU) signage requirements* – Some retailers have company-wide policies to not use external signage and, as a result, do not comply with the MOU requirement that Hawaii Energy signage be used. Section III.1 of the MOU with retailers states, "A POP [Point of Purchase] sign must be posted stating that this is special promotional pricing, stating the approved language about the Program, and displaying the logo." However, on-site visits revealed that retailers are not using the Hawaii Energy logos.
- *Discontent with reductions in incentives for solar hot water* – Contractors are disappointed with the reduction in the rebate amount for solar water heaters from $1,000 to $750. Some contractors said that it has affected their business.
- *Long processing times for non-residential incentives/rebates* – Some contractors and participating customers thought that the processing and response time for non-residential projects is longer than it should be, although it is not clear whether only specific types of non-residential projects fall into this category.

The next sections discuss customer perspectives on these and other program attributes in more detail.

5.2 Residential Participant Feedback

The evaluation team surveyed 800 Hawaii Energy participants from the residential sector about their initial awareness of the program, perspectives on key program attributes, and the effects of rebates on their decision-making.

5.2.1 Initial Awareness

Residential customers became aware of the program through different avenues. More than half (59%) learned of the program at a retail store where rebates were offered on the products. Another 21 percent first heard about the program from a television, radio, or newspaper advertisement. Survey respondents mentioned many other sources of initial information, including but not limited to friends and family members, utility representatives, the program website, and contractors. The frequencies of these various sources of initial contact with the program are shown in Table 8 The effectiveness of direct marketing to customers, both in stores and through traditional media, is clear from these results, whereas alternatives such as marketing through the website or contractors appear to be less effective in the residential sector. This data indicate that continuing to assist stores by providing marketing materials is very important and that relying on traditional sources of information like newspapers is a stronger option than relying on the website or contractors. Resources should be prioritized, but these findings do not mean that any of these efforts should be completely abandoned.

Table 8 Residential Participants' Initial Contact With Program

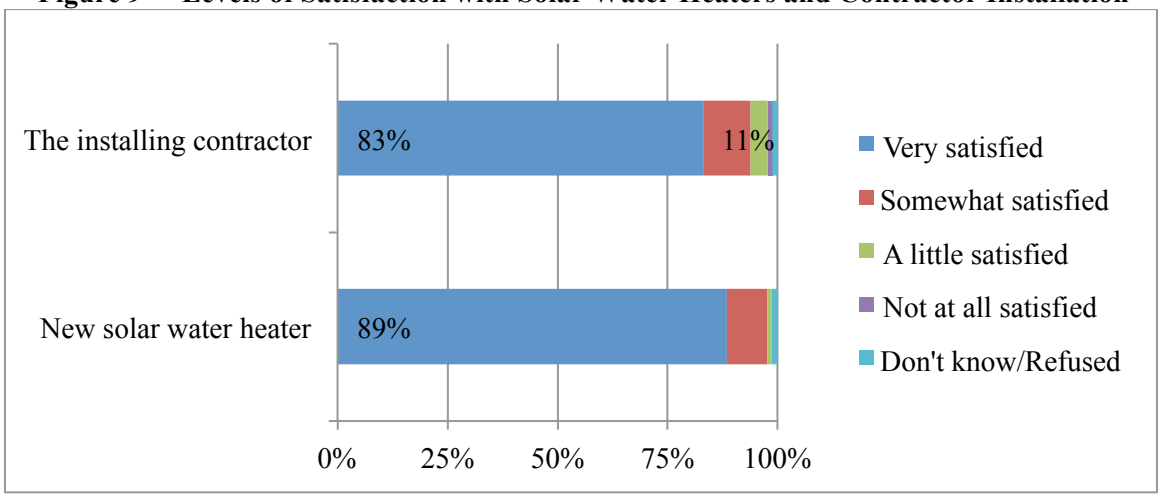
How Customer Was Initially Informed	Frequency	Percent
In store (salesperson, in-store display, retailer)	540	59%
TV, radio, or newspaper ad	214	21%
Other (e.g., utility rep, website, HECO utilities)	95	7%
Word-of-mouth, friend, family	77	6%
Contractor, installer	56	3%
Don't know	36	3%
Refused	1	0%
Total	**1,019**	**100%**

Source: Participating residential customer telephone surveys (2010).

5.2.2 Perspectives on Key Program Attributes

Residential customers predominantly reported satisfaction with the program and its various components, as shown in Figure 9 and Figure 10. Nearly all (99%) of those that purchased solar water heaters were satisfied with their purchase. Similarly, residential customers who hired contractors to install their products were nearly all satisfied (94%). Among those surveyed, the products installed by contractors included 270 solar water heaters, 35 split air conditioning systems, as well as a few smaller appliances. About six percent of customers who had solar water heaters installed by a contractor said they were *a little* or *not at all satisfied*. The reasons for their dissatisfaction typically relate to the need for multiple visits, lack of knowledge, and/or mistakes made during installation.

Figure 9 Levels of Satisfaction with Solar Water Heaters and Contractor Installation

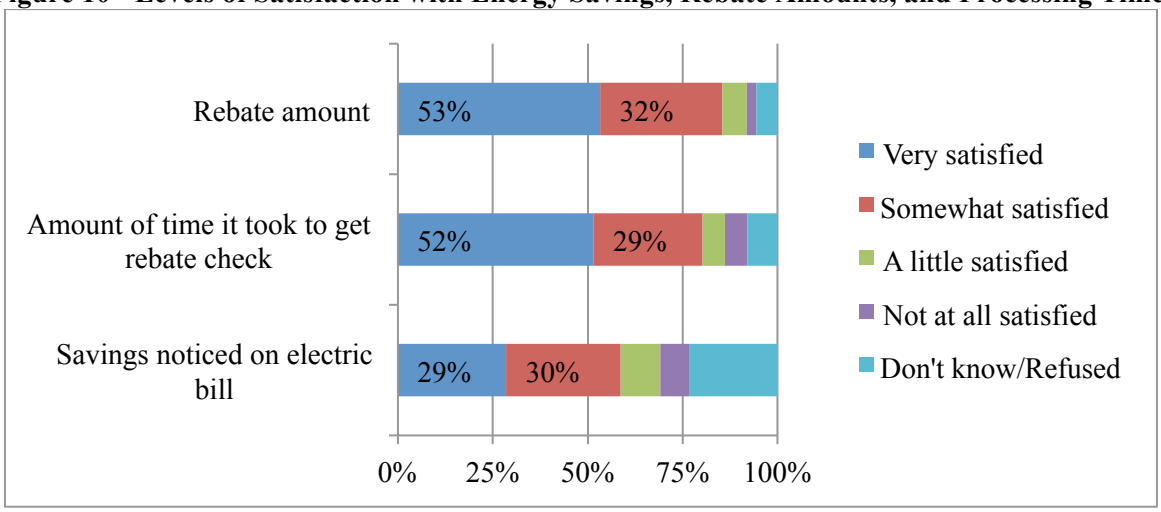


The rebate amount was also viewed in a positive light by more than 90 percent of residential participants. This finding was also true for contractors, where 85 percent reported satisfaction with the rebate amount. Other survey results, however, indicate that the effect of Hawaii Energy rebates on the purchase of energy efficient products in the residential sector is unclear. We explain this finding in detail below.

The survey responses indicated that a small number of customers were dissatisfied with a few aspects of the program, including the savings on their electric bills (18%), the amount of time it took to receive a rebate check (12%), and the rebate amount (9%). Figure 10 presents these results.[15] Moreover, nearly one quarter (23%) of residential participant respondents were either unaware or refused to answer whether they were satisfied with the savings on their electric bill. Taken as a whole, these results suggest that the program is operating well for residential customers but that the energy savings are not always as quick or as large as desired. Direct bill savings are often difficult for customers to observe and the number of customers who are unsure of these savings is in line with expectations. Importantly, with these satisfaction levels as a baseline, future evaluation efforts will track increases or decreases in subsequent years.

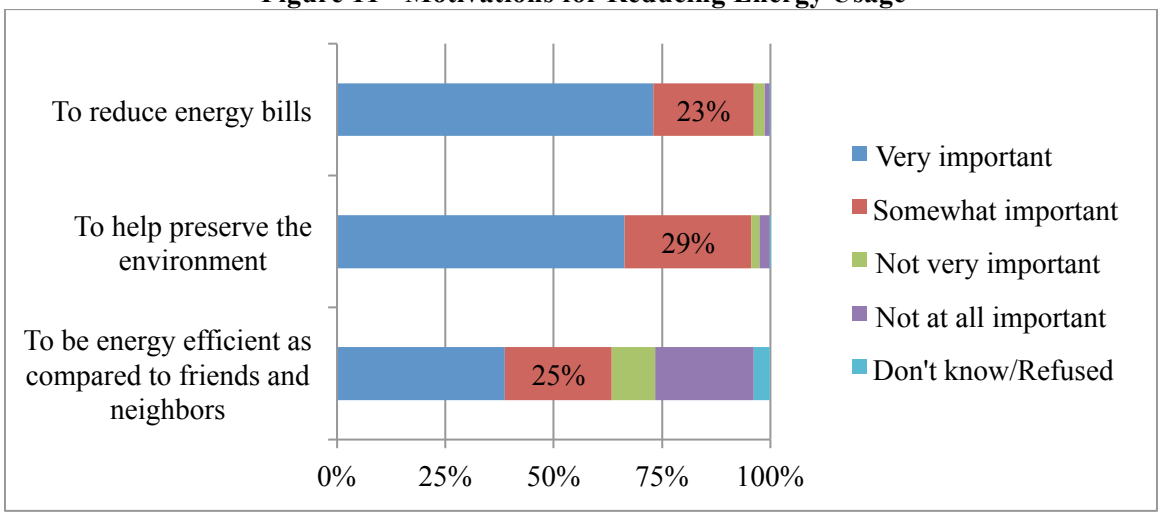
[15] Some respondents did not answer every question. For example, some respondents did not a contractor install a product and therefore could not answer the question about their satisfaction with a contractor.

Figure 10 Levels of Satisfaction with Energy Savings, Rebate Amounts, and Processing Times



The survey data further illustrate that residential customers value energy efficient products because of their primary benefits, such as savings on electric bills and protecting the environment, as shown in Figure 11. In fact, nearly all of the residential customers surveyed by telephone (96%) reported that it is *somewhat* or *very important* to use less energy to reduce energy bills, and nearly the same percentage (95%) said that it is *somewhat* or *very important* to use less energy to help preserve the environment. Moreover, most of these responses (about 70 percent in both cases) indicated that these two benefits of using less energy are *very important*. The residential participating customers' perspectives on peer comparisons are not as clear. Although nearly two thirds of residential participants (63%) responded that it is *somewhat* or *very important* to be energy efficient as compared to their neighbors; most of the remaining residential customers (33%) reported that being energy efficient compared to their neighbors is *not very* or *not at all important*. This finding illustrates how customers say their standing among neighborhood peers is less important than the basic motivating factors of saving money and protecting the environment. On the other hand, research suggests that customer motivations are often hidden and do not surface with self-report methods such as surveys and that, in fact, customers may be more influenced by their neighbors than the findings from our research can currently show. Without more research, it is difficult to state conclusively the particular motivations for Hawaii Energy residential participants.

Figure 11 Motivations for Reducing Energy Usage



5.2.3 Effects of Rebates

The full effect of Hawaii Energy rebates on the purchase of energy efficient products in the residential sector is not clear from our survey results, although the effect of the rebate is more apparent for solar water heater purchases than for all other technologies. We integrated results from several different questions to reach this conclusion. The first question deals with the perception of purchase costs as a barrier. About half (46%) of surveyed residential participants viewed upfront cost as a medium-sized or large barrier to energy efficient products (as shown in Table 9 However, almost one third did not think of the purchase cost as a barrier at all.

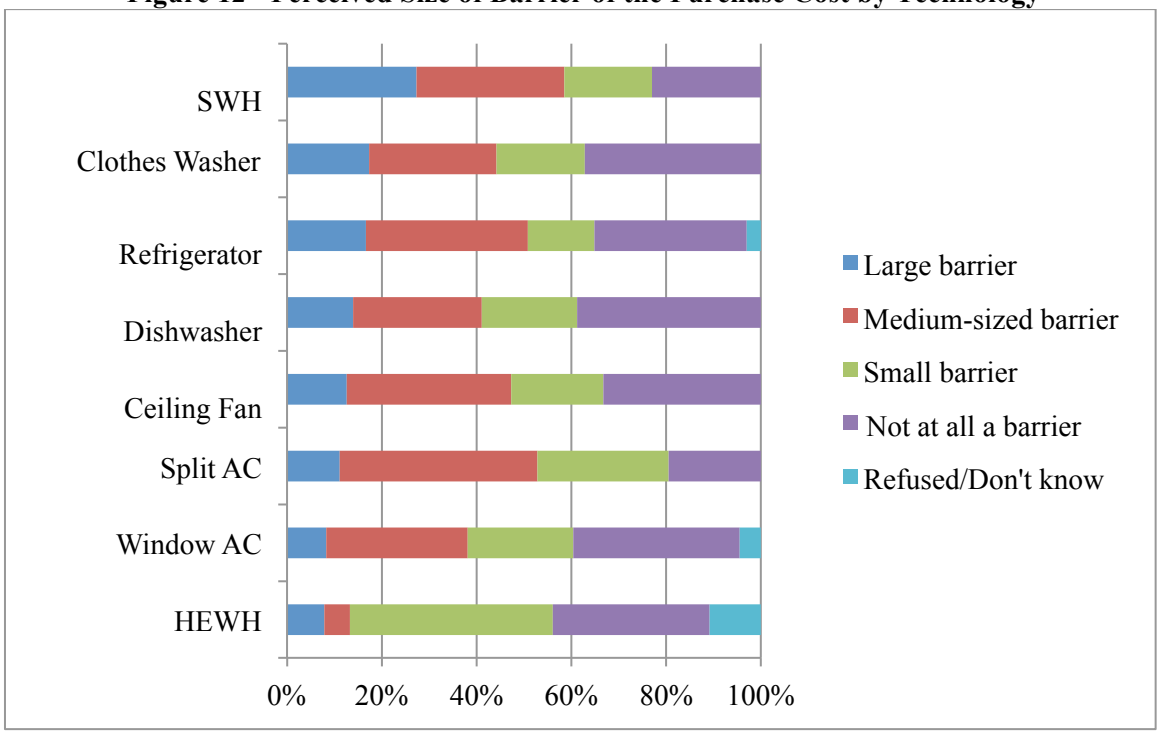
Table 9 Barrier of Purchase Cost

Perceived Size of Barrier of the Purchase Cost of Energy-Saving Products and Equipment	Frequency	Percent
Large barrier	170	16%
Medium-sized barrier	315	30%
Small barrier	187	19%
Not at all a barrier	315	32%
Refused	3	0%
Don't know	29	3%
Total	**1,019**	**100%**

Source: Participating residential customer telephone surveys (2010)

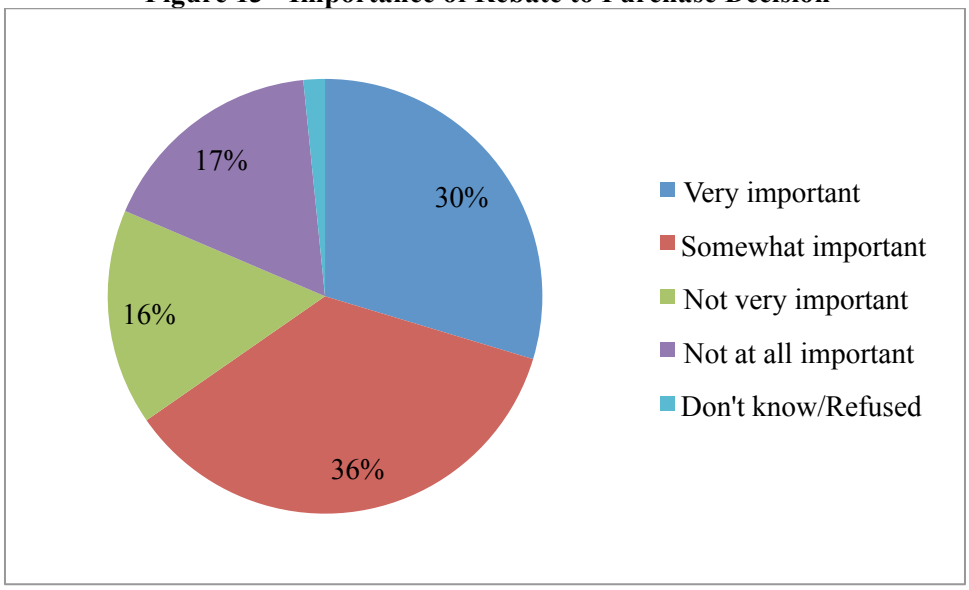
The perceived barrier of the purchase cost varies by technology, to some extent, as depicted in Figure 10. Nearly 60 percent of residential customers that purchased a solar water heater perceive the purchase cost as a large or medium-sized barrier. In contrast, the purchase cost is seen as a small barrier if it is perceived as a barrier at all for other high efficiency water heaters.

Figure 12 Perceived Size of Barrier of the Purchase Cost by Technology



Second, the importance of rebates is demonstrated in the responses to questions such as, "How important was the rebate to your decision to buy the item?" As shown in Figure 13, 66 percent of residential participants said that the rebate is *somewhat* or *very important* to their decision to purchase energy efficient products.

Figure 13 Importance of Rebate to Purchase Decision



Yet a few other findings show that rebates/incentives did not necessarily influence actual purchasing decisions. First, 69 percent of residential participants said they would have

bought the same item even if the rebate had not been available (Table 10 indicating that the rebate may not be particularly influential on purchasing decisions. The survey data was also analyzed to understand how the impact of rebates differs by technology. Interestingly, solar water heaters are the only technology where less than 60 percent of customers that purchased the technology would have bought the same item without the rebate. Only 45 percent of surveyed customers who bought a solar water heater said they would have bought the same item without the rebate, which points towards more influence of the program for this particular technology.

Table 10 Influence of Rebate on Purchase of Specific Product

If the rebate were not available, would you have bought the same item or would you have bought a less expensive or less efficient measure? Or are you not sure?	Frequency	Percent
Yes, I would have bought the same	667	69%
No, I would have bought a less expensive/less efficient measure	182	16%
Refused	12	1%
Don't know	158	14%
Total	**1,019**	**100%**

Source: Participating residential customer telephone surveys (2010)

In addition, averaging across all technologies, only 13 percent of the residential participants said they would have waited to buy the item if the rebate had not been available (Table 11 another indicator that the rebate may have limited influence on purchasing decisions. Again here, the impact of the rebate on solar water heaters is seemingly greater; about one-third (34%) of the customers who purchased a solar water heater said they would have waited to purchase the item if the rebate for this specific technology were not available. For every other technology, less than 25 percent of the customers surveyed said they would have waited and over 75 percent said they would not have waited.

Table 11 Rebate Availability and Timing of Purchase

If the rebate were not available, would you have waited to buy the item?	Frequency	Percent
No	661	83%
Yes, I would have waited	141	13%
Refused	3	0%
Don't know	32	4%
Total	**837**	**100%**

Source: Participating residential customer telephone surveys (2010)

Finally, 61 percent of survey respondents said they were aware of the rebate before they bought the product (see Table 12 This finding suggests the possibility that rebates partially influenced this portion of those surveyed. Once again, the data shows that the possibility of influence is greater for solar water heaters. Whereas on average for all technologies 61 percent of the customers responded that they were aware of the rebate

before making the decision to purchase the new item, 80 percent of the customers who bought a solar water heater had prior knowledge of the rebate.

Table 12 Prior Knowledge of Rebate

Did you become aware of the rebate before or after you decided to buy a new product?	Frequency	Percent
Before	640	61%
After	342	35%
Refused	8	1%
Don't know	29	3%
Total	**1,019**	**100%**

Source: Participating residential customer telephone surveys (2010)

Together, these results illustrate the uncertainty surrounding the influence of rebates for residential Hawaii Energy participants. About half of the residential participants cited purchase cost as a barrier, and more than two thirds said the rebate influenced their decision to purchase the item. Yet the latter point contradicts another finding: more than two thirds of surveyed residential participants said they would have bought the same item *without a rebate*. Finally, most of the residential survey respondents said they would not have waited to buy the item without a rebate offer, but more than 60 percent of respondents were aware of the rebate before they purchased the new product.

The evaluation team is not suggesting that residential customers are *not* influenced by rebate offers, but rebates are evidently not the only factor involved in purchasing decision-making. Moreover, although customers say that the rebate is a motivating factor, there are clearly other factors (e.g., need for new equipment, desire for specific product) that may be equally or more important. Additionally, two of the main factors motivating residential customers are simply the medium/long-term benefits: saving energy and preserving the environment. These findings are consistent with those in other regions where rebates are recognized to be an important driver but certainly not the sole factor in consumer decision-making. This further underscores the importance of trade allies also promoting high efficiency equipment and efforts such as point of purchase advertising that indicates an implicit approval of energy efficient equipment.

5.3 Non-Residential Participant Feedback

The evaluation team surveyed non-residential Hawaii Energy participants to measure, among other things, participants' satisfaction with certain program attributes. These respondents have varying degrees of interactions with the program. We analyzed the survey responses to understand a number of important program elements, including initial awareness, knowledge of energy efficiency, the importance of rebates, and satisfaction with the program.

5.3.1 Initial Awareness

Non-residential Hawaii Energy participants first learned about the program in a variety of ways (see Table 13 Nearly half of the survey respondents heard about the program and

obtained an application from trade allies, which is consistent with the current view in the industry that trade allies are an effective means of marketing energy efficiency programs to non-residential customers. Other sources recalled included word of mouth and utility advertisements and representatives. There were no discernible differences to initial awareness when analyzing by technology purchased.

Table 13 Non-Residential Participants' Initial Contact With Program

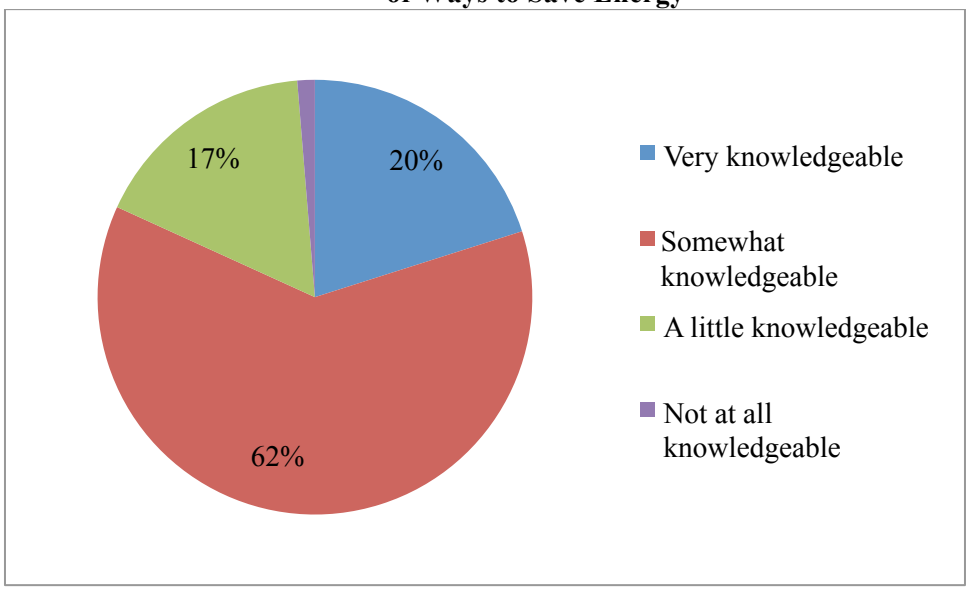
How Customer Was Initially Informed	Frequency	Percent
Contractor/distributor	69	45%
Word of mouth (business associate, co-worker)	23	15%
Online	17	11%
Utility advertisement	16	10%
Utility representative	12	8%
Other	6	4%
Event	6	4%
Previous participant	5	3%
Total	**154**	**100%**

Source: Participating non-residential customer telephone surveys

5.3.2 Knowledge of Energy Efficiency

Survey results show that 82 percent of non-residential participants claimed to be *somewhat* or *very knowledgeable* of ways to save energy (see Figure 14). Only one percent of all respondents said that they are *not at all knowledgeable*. This finding suggests that the participating non-residential market in Hawaii may be technically savvy and ready to adopt complex energy efficiency measures, and as a result, more advanced guidance may be required. There were no discernible differences worth noting when splitting out these findings when analyzing by technology purchased.

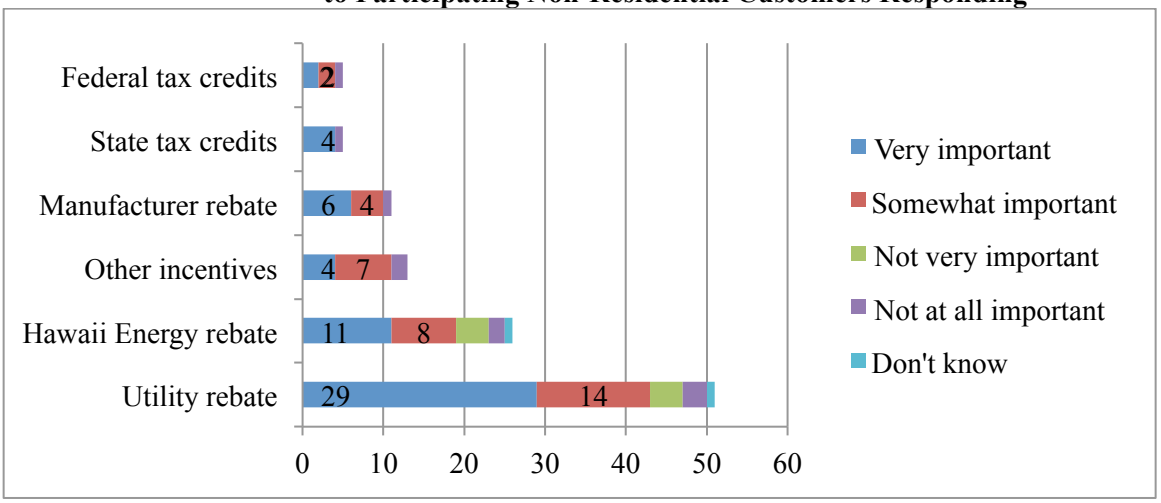
Figure 14 Non-Residential Respondents' Level of Knowledge of Ways to Save Energy



5.3.3 Importance of Rebates and Energy Efficiency

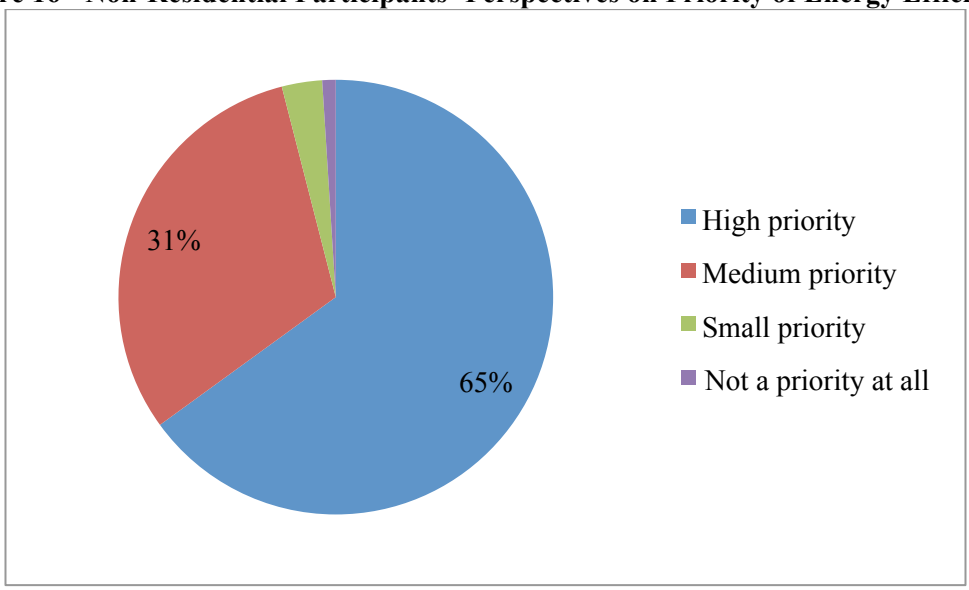
Figure 15 illustrates the importance of rebates and other sources of funding to non-residential Hawaii Energy participants. A large share of respondents ranked all types of rebates (utility rebates, Hawaii Energy rebates, and manufacturer rebates) as *somewhat* or *very important*. Most non-residential participants viewed other sources of funding, such as federal and state tax credits, as important as well, although the use of these sources among Hawaii Energy participants is relatively minimal. It appears from these results that non-residential participants may still associate rebates with the previous program structure, as many equate the rebates with the HECO utilities, although another possibility is that some projects pursued by non-residential respondents may have begun when the utilities were still implementing the programs. There were no discernible differences worth noting when splitting out these findings by technology purchased.

Figure 15 Importance of Funding Sources and Rebates to Participating Non-Residential Customers Responding



Energy efficiency is another important consideration of non-residential Hawaii Energy participants who are pursuing equipment changes. To illustrate this point, Figure 16 shows that about two thirds (65%) of the non-residential respondents said that energy efficiency is a high priority in their decision-making process. Most of the remainder (31%) said that energy efficiency is a medium priority. This finding implies that the vast majority of non-residential participants consider energy efficiency to some degree when purchasing new equipment. There were no discernible differences worth noting when splitting out these findings by technology purchased.

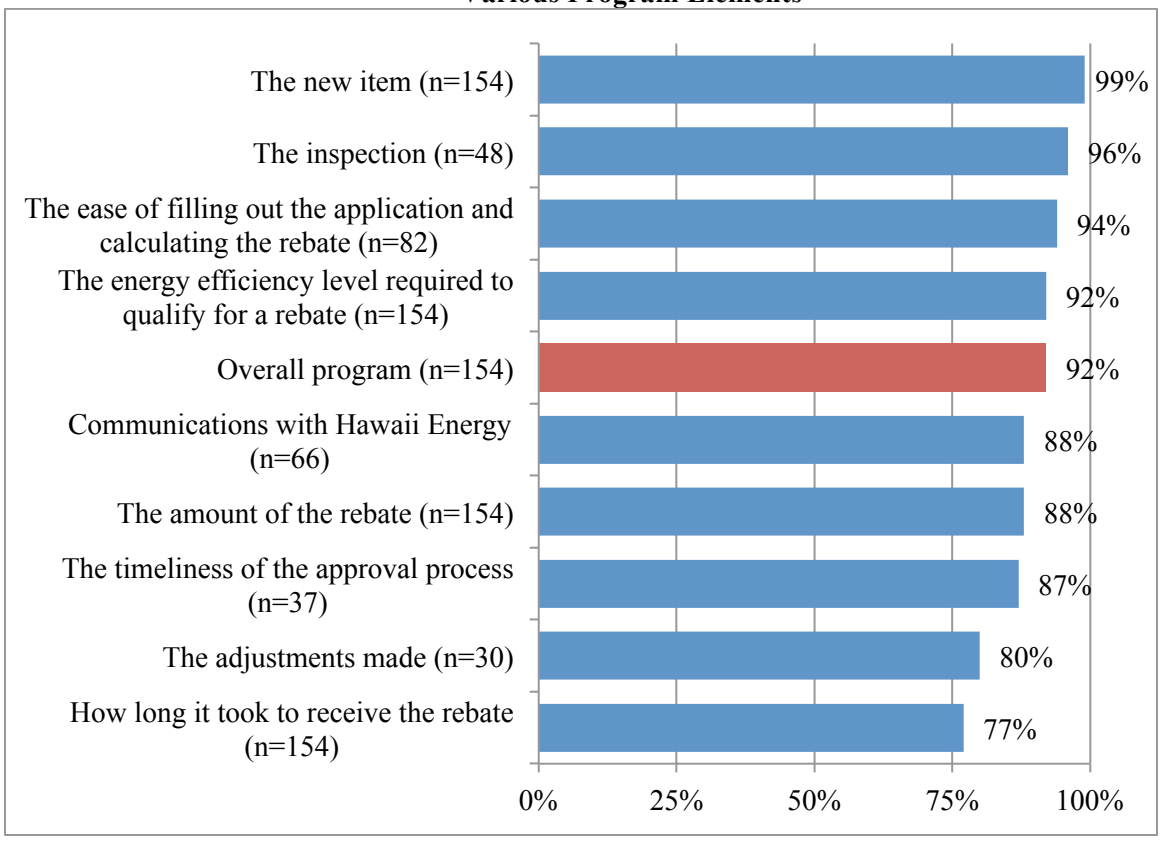
Figure 16 Non-Residential Participants' Perspectives on Priority of Energy Efficiency



5.3.4 Satisfaction with Various Program Elements

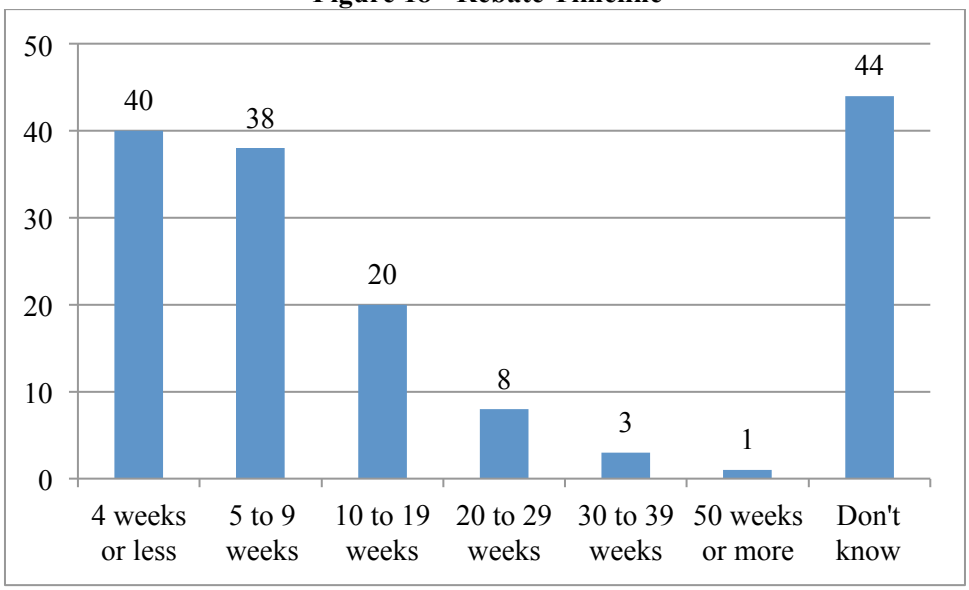
Survey responses from non-residential and residential customers were similar in that customers reported general satisfaction with most attributes of the program. In fact, 92 percent of the non-residential surveyed participants reported being either *very* or *extremely satisfied* with the rebate program as well as many elements of the program, including the ease of filling out the application and the rebate amount as shown in Figure 17. All but one non-residential participant surveyed is satisfied with their new product, which suggests that qualifying equipment has been working properly and achieving the results non-residential customers are seeking. By comparison with other programs, these results are extremely favorable.

Figure 17 Very or Extremely Satisfied Non-Residential Participants with Various Program Elements



Although this figure makes it clear that the majority of customers are satisfied with the program and its elements, it also illustrates that a small minority (13%) is *a little* or *not at all satisfied* with how long it took to receive the rebate check. To illustrate why this might be the case, Figure 18 presents the length of time between the installation of equipment/application for the rebate and receiving the rebate checks. In all, 29 percent of the non-residential respondents reported that it took more than 10 weeks to receive their check, whereas just over half received it within nine weeks. Nearly a third of the non-residential participants surveyed (29%) did not know when the rebate check arrived. Although these customer-reported data are likely a bit inaccurate, the length of time does seem greater than desired and may warrant closer tracking by the implementation contractor.

Figure 18 Rebate Timeline



Program administrators need to be aware of this feedback regarding delayed processing of rebates and ensure that in future program years, rebates are delivered as quickly as possible.

5.4 Data Management and Program Tracking

Program evaluation activities and other tracking of program advancement rely heavily on access to comprehensive, reliable, and timely data. The evaluation team reviewed the data management and program tracking activities to understand where strengths and weaknesses of these systems exist. The team found the database to have a variety of helpful characteristics. It was well populated, it met management reporting needs, and it incorporated utility billing data.

Some challenges to the evaluation of the program resulted from the state of the database as evaluation activities began. Most of the following issues have been resolved, but additional changes could still strengthen the system:

- Initial issues related to data access were addressed by additional log-in permissions
- Shifting data and file structures posed ongoing challenges
- All parties would benefit from a "log" to communicate changes

The data for apartments and condominiums were particularly challenging to deal with for a number of reasons, including:

- Challenges with tracking equipment in master-metered units

- Need to collect payee / occupant information
- Some confusion regarding the definition of non-residential vs. residential—some multi-family units were defined as commercial accounts although all individual tenants are residential.

The evaluation team identified some challenges with military accounts as well. Namely, it has been difficult to identify which accounts represent military accounts, as there is currently no separate tracking of these accounts. The overall evaluation process would benefit from flagging military accounts in the database. The evaluation team believes that it is important to be able to track and identify military accounts for future research and marketing activities because that sector accounts for a large portion of energy consumption and savings.

The evaluation team and R.W. Beck will need to develop a procedures manual for fulfilling future evaluation data requests and review sector classifications to ensure consistency with technical potential analyses.

5.5 Verification Activities

Measurement and verification (M&V) is a core component of a successful energy efficiency program. We selected 32 projects for verification. The verification team encountered difficulties obtaining adequate documentation of many project installations. In fact, for 15 percent of these 32 projects, a desk review could not be completed due to lack of information in the project file. In order to conduct a desk review, the file should at least include the project application, equipment make and model, quantities, locations, and a project description included in every project file. Additionally, items such as equipment specifications, invoices, savings calculations (for custom projects), and any installation verification forms are useful not only in the evaluation, but to Hawaii Energy staff for internal project checks and reviews.

During the evaluation, it was found that five of the 32 projects had a post-installation inspection form completed by the Hawaii Energy staff. It was not clear if the remaining projects did not have a post-installation inspection completed, or if they were not uploaded to the tracking system. In addition, the criteria used to determine if a site inspection by Hawaii Energy was warranted, whether it be by project cost or energy savings, was not apparent.

Many customers were not prepared to have projects verified. The evaluation team believes the program documentation is a critical area, and the implementation team should monitor this closely. Program documentation and verification data in future years will need to be more complete to support M&V activities to the fullest extent.

5.6 Program Marketing and Awareness

Effective program marketing is an essential ingredient to program success and a key element to the overall process. Transitional marketing efforts for Hawaii Energy have been noted, including:

- Strong relationships with lighting and appliance retailers
- Hawaii Energy website
- Hawaii Energy logo
- Use of social media for marketing (Facebook, Twitter)

Each of these efforts is a forward step toward a comprehensive marketing plan and the evaluation team encourages program staff to refine and strengthen each as the program progresses.

The evaluation team also recognized a few addressable issues related to the current marketing efforts, including, including lingering ties to the earlier program structure; less advertising than with the past structure, and low program awareness among certain stakeholders. These issues are addressed below.

5.6.1 Lingering Tie to Earlier Program Structure

Understandably, Hawaii Energy's suite of program offerings is still closely tied to earlier program offerings in the eyes of consumers, businesses, and other stakeholders, as many have been involved with the program for several years. The evaluation team recognizes that a portion of the program stakeholders have closely followed or been informed about program changes, although the extent and effects of this finding are not clear. In-depth interview results suggest that many stakeholders did not distinguish at all between Hawaii Energy and the HECO utilities. These misperceptions exist in the market and a fresh marketing approach may be needed to help stakeholders understand that energy efficiency programs are now being implemented by a third-party organization. The rationale for informing customers and other stakeholders about the current structure is to help them understand where to turn if they have questions or concerns. The Hawaii Energy logo and the use of social media is a solid start.

5.6.2 Less Advertising Than With Past Structure

Trade allies reported that marketing support might not be as extensive as it was under the previous program structure. A number of participating solar water heater contractors stated that predecessor programs did more advertising on television, radio, and newspaper and delivered more program flyers. The contractors asked for additional marketing to support their efforts. The program flyers, in particular, are a major source of project leads for participants in the past and contractors would like them to be provided with consistency. One of the most frequent suggestions for program improvement made by lighting and HVAC contractors was for Hawaii Energy to spend more time and resources

marketing the rebate program. They suggested regular email blasts to a listserv of contractors and other solicitations such as brochures and modifications to the website.[16] The lack of program advertising may be especially disadvantageous to small retailers and contractors that do not have large marketing budgets of their own.

5.6.3 Low Program Awareness Among Certain Stakeholders

The evaluation team found very low program awareness among non-participant lighting and HVAC contractors. Of the 34 non-participating contractors interviewed, 65 percent were completely unaware of the program before the call and 29 percent were moderately aware of the program but without much specific knowledge of program features. Similarly, solar contractors that were interviewed indicated that the lack of awareness among contractors is the greatest barrier to the program being more successful.

Nonetheless, in-depth interviews with lighting equipment and appliance suppliers indicate that awareness among customers may be increasing. Nine out of the 23 equipment suppliers interviewed, without being prompted, said that awareness of the benefits of energy efficiency is increasing and that the program was making a difference in this regard.

[16] Summaries of the trade ally interview results can be found in Appendix E.

6 Market Assessment

This section summarizes the results of research and analysis the evaluation team conducted to assess the existing and potential market. It describes the savings achieved by measure and sector and compares those savings to total potential savings, using this analysis to identify the opportunities and challenges faced by Hawaii Energy in achieving further savings in the future.

To conduct this research, we reviewed existing energy efficiency potential studies, internal data, and feedback from Hawaii Energy staff, trade allies, and customers. In particular, we used the following research activities to conduct the market assessment:

- Review of program data and tracking system
- Interviews with Hawaii Energy staff to assess the staff's understanding of their market and its potential and to learn from their insights about market potential and challenges
- 1,860 surveys and interviews with the general residential population and non-participant, non-residential customers to assess those populations' attitudes toward energy efficiency and market potential by sector
- 115 in-depth interviews with contractors, retailers, distributors, and manufacturers of energy efficient equipment to understand how trade allies perceive Hawaii Energy and its programs
- Review of a 2004 GEP study that estimated maximum achievable potential for 2019 by sector and end use and a 2010 BAH study that focused on the six sectors that account for the majority of Hawaii's energy usage

We also relied on a variety of existing studies and data sources to inform the market characterization, including studies and data from the ACEEE, EPA, D&R International, DSIRE, the American Community Survey 2006-2008 from the U.S. Census, and GIS data using ESRI's ArcInfo geocoding software. We reviewed key papers and studies on CFLs from the IEPEC and ACEEE conferences as well as recent evaluations conducted in California and the Northwest.[17]

The market assessment has three primary sections:

- Overall, which provides an overview of savings by measure type
- Residential, which discusses savings and market potential by measure type, as well as island equity issues and awareness and barriers to achieving further energy savings

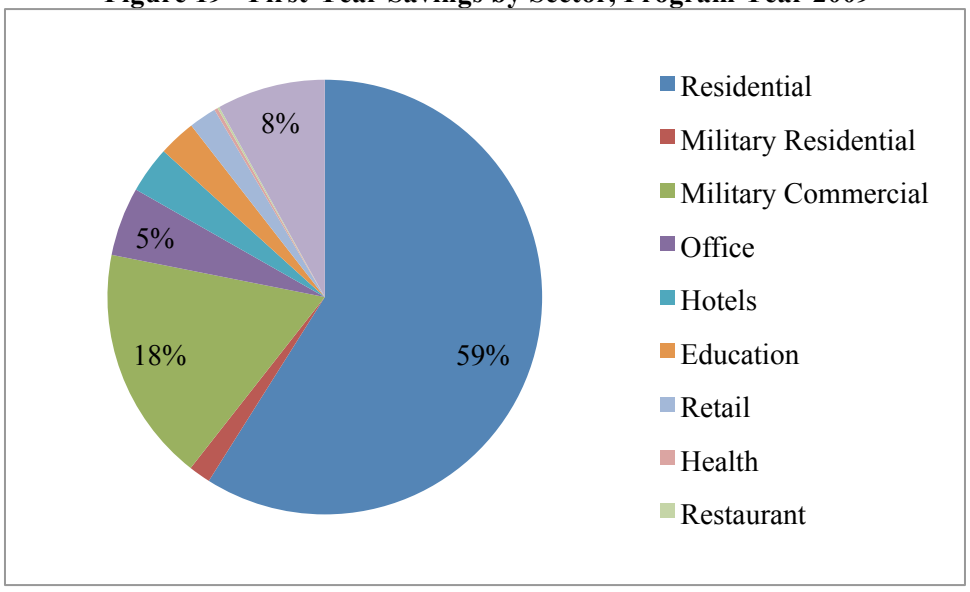
[17] Please see Section 3.4, Secondary Research, for a description of specific data sources.

- Non-Residential, which discusses savings and market potential by measure type and key industrial sectors

6.1 Overall

The purpose of the market assessment was to determine the relative effectiveness of the program in achieving savings in specific residential and non-residential markets and with specific measures. We knew that Hawaii Energy had consciously focused on lighting as an end use offering significant savings potential. They also recognized that residential customers, who account for 40 percent of usage, would be likely to provide more than their share of lighting savings. Across all sectors, residential customers accounted for almost 60 percent of savings, and residential plus military savings accounted for more than 75 percent of the total, with military comprising both residential (e.g., on-base housing) and non-residential (e.g., on-base office) applications (see Figure 19).

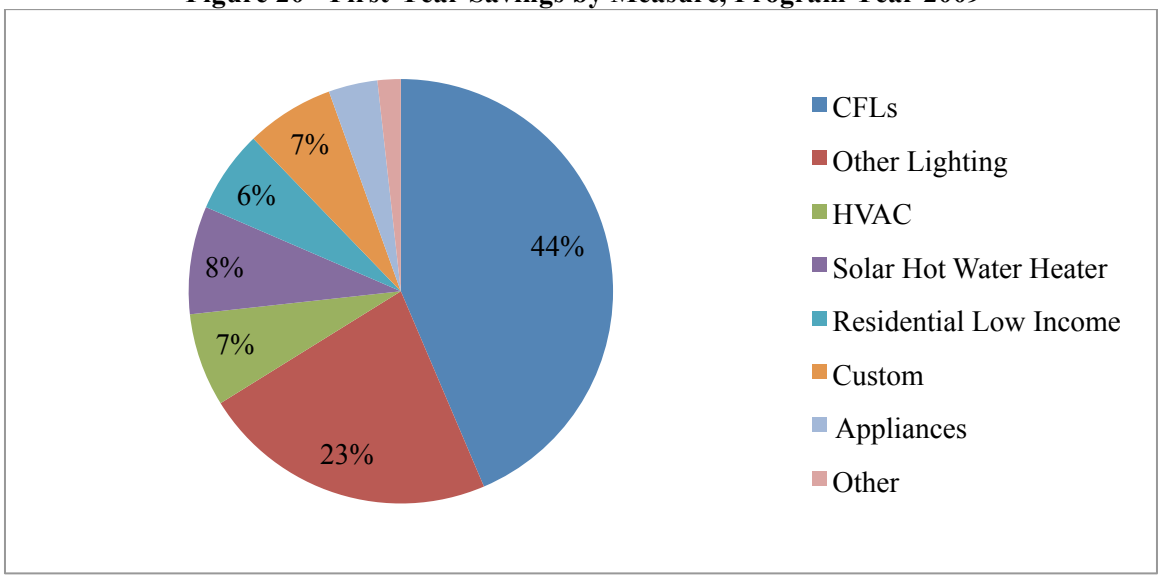
Figure 19 First-Year Savings by Sector, Program Year 2009



Source: ECONorthwest team analysis of PY2009 program tracking database

In analyzing savings by end use across both residential and non-residential participants, we found that lighting measures accounted for about two-thirds of total savings, as shown in Figure 20. CFLs alone represented 44 percent of total savings, highlighting the pivotal role played by this technology in both the residential and non-residential 2009 programs. (Note that the Residential Low Income measures, which accounted for six percent of savings, is almost exclusively also CFLs. So overall CFLs represents 50% of the total savings). No other individual end use accounted for more than eight percent of savings.

Figure 20 First-Year Savings by Measure, Program Year 2009

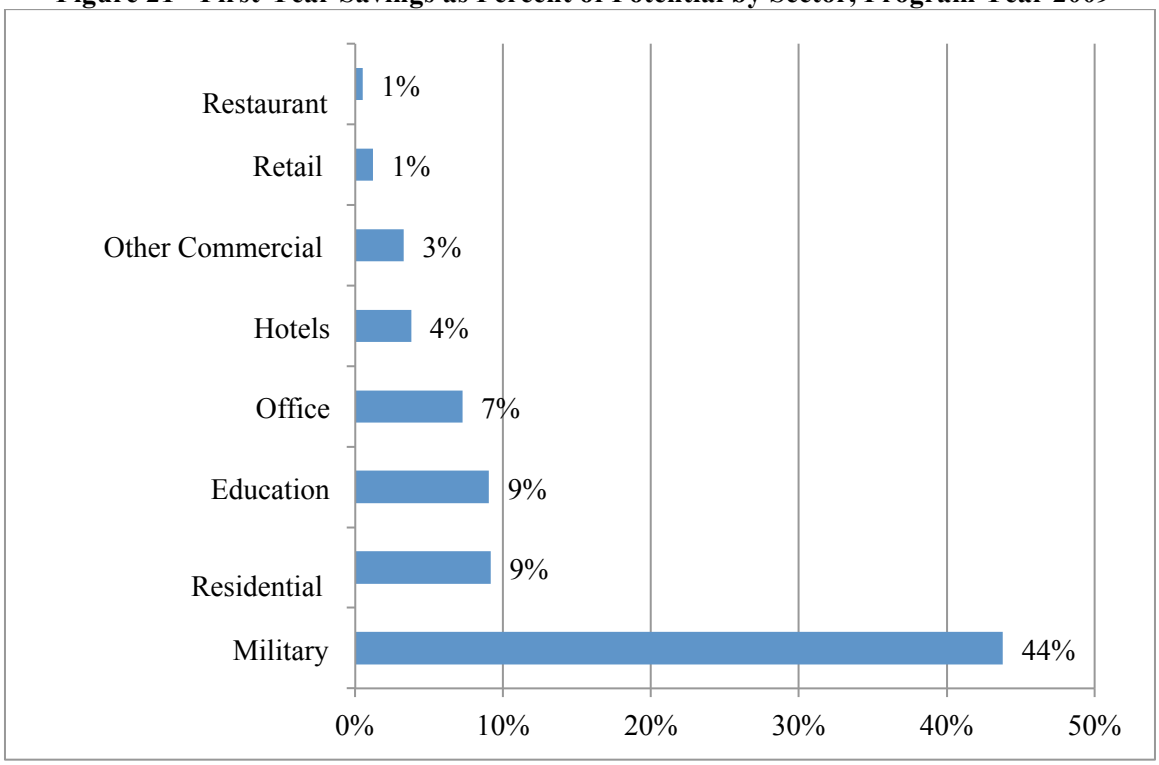


Source: ECONorthwest team analysis of Program Year 2009 program tracking database

To get a sense of how far the program has penetrated targeted markets, both by sector and by end-use, we compared program savings to the achievable savings potential estimated by various studies conducted in Hawaii in the past several years. Descriptions of these studies are provided in the Methods section, but in sum, both studies provided estimates of potential relative to 2009 baseline usage by end use and market sector, which we adjusted based on actual consumption during the 2009 Program Year and then compared to program savings. Although the resulting estimates provide only a rough measure of market penetration, they are useful for indicating whether the program is allocating its resources effectively or whether it may need to shift its focus or assign more support for some markets/measures.

The comparison of savings to potential found that residential savings were about nine percent of the potential identified in the BAH study, but that non-residential savings were less than five percent of the potential for each non-residential sector except office, education, and military, as shown in Figure 21. For the military sector in particular, savings as a percentage of potential indicates that the program was very effective in identifying and exploiting opportunities in this market but that additional savings are likely to be much more difficult to achieve in the future.

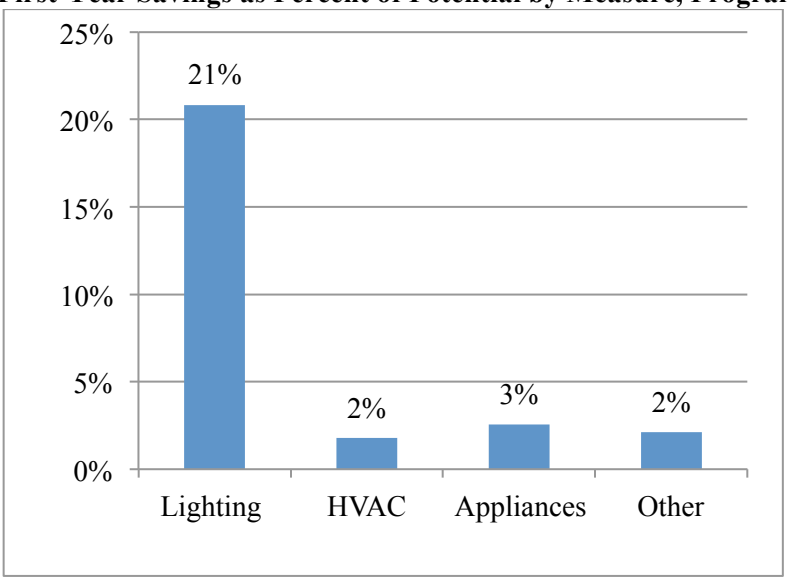
Figure 21 First-Year Savings as Percent of Potential by Sector, Program Year 2009



Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

In a similar analysis illustrated in Figure 22 we compared program savings to potential by measure and found that savings were more than 20 percent of the potential for lighting identified in the BAH study, which is impressive when recalling that potential estimates used a timeline of more than 10 years. On the other hand, program savings were three percent or less of the potential for HVAC and all other measures considered across market segments. This result highlights an excessive dependence on lighting and a relative neglect of the potential offered by other non-residential measures.

Figure 22 First-Year Savings as Percent of Potential by Measure, Program Year 2009

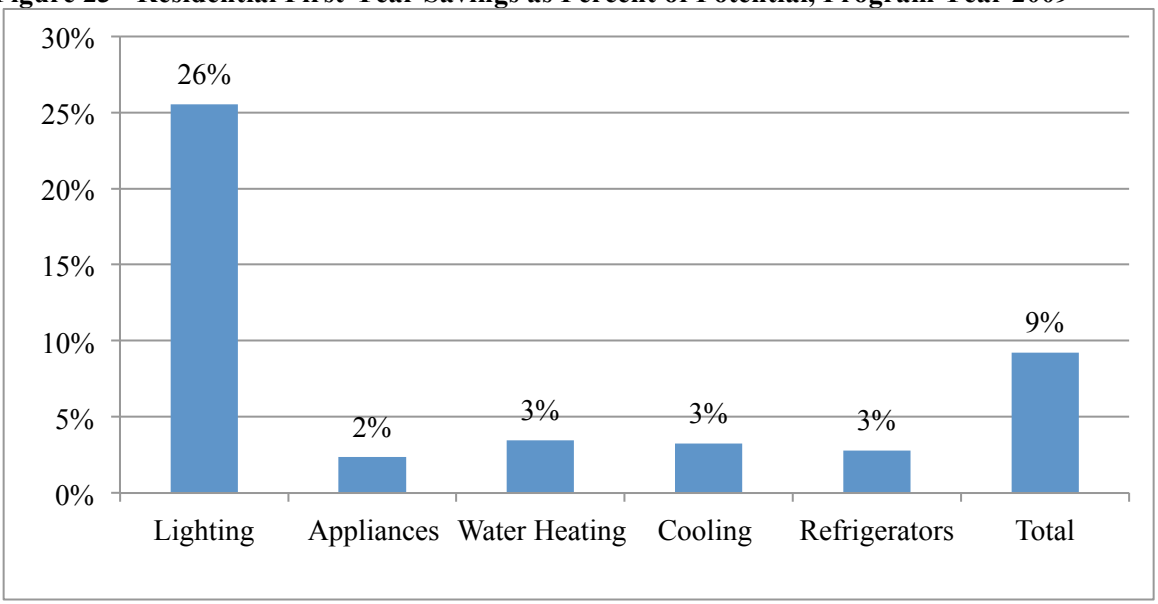


Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

6.2 Residential Sector

Our analysis of residential program participation began with a comparison of Program Year 2009 program savings to the potential identified in two recent studies to gauge the extent to which the current program succeeded in capturing that potential. In comparing the actual 2009 savings to the estimated potential, we found that the program tapped 25 percent of the residential lighting potential, but three percent or less for other measures (see Figure 23).

Figure 23 Residential First-Year Savings as Percent of Potential, Program Year 2009



Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

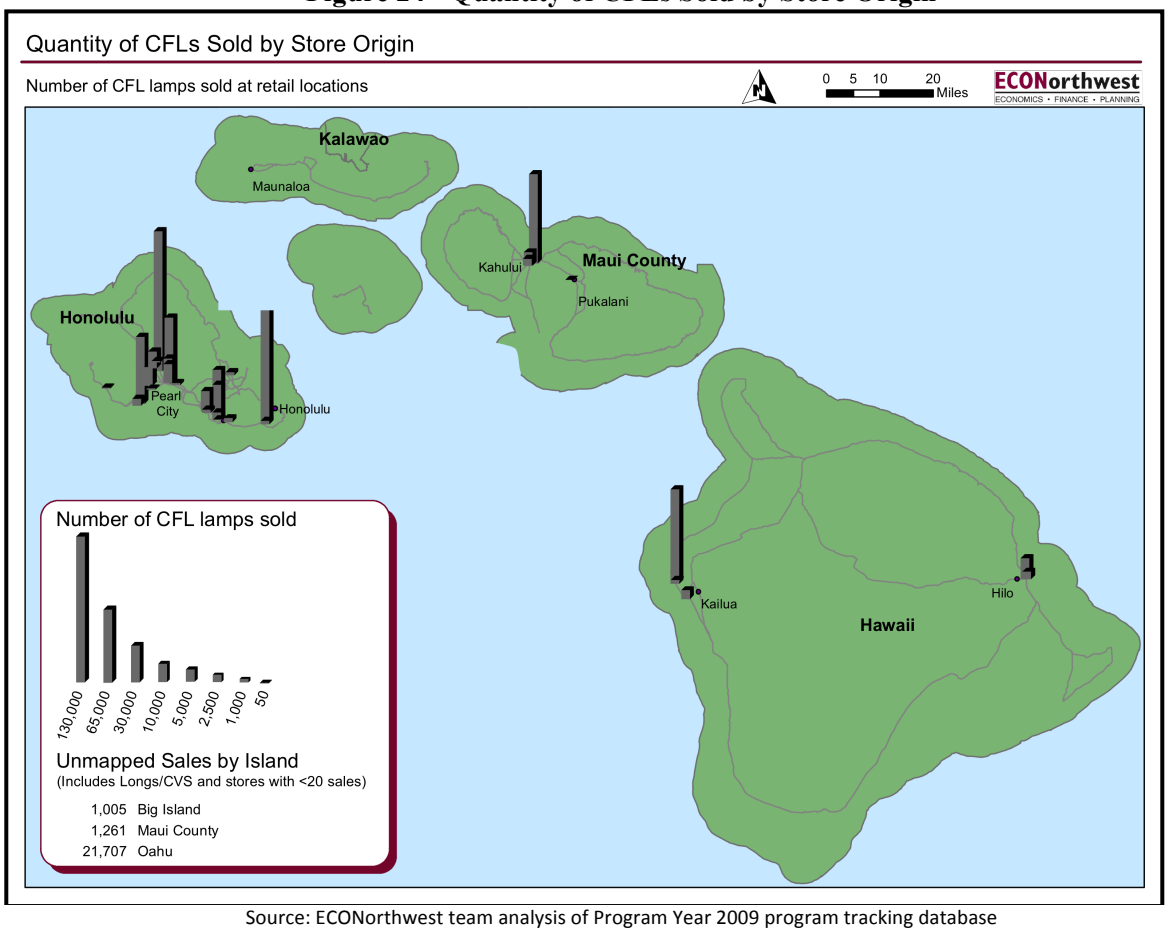
6.2.1 Lighting

Lighting dominated the program funding in PY2009, accounting for 20 percent of all resource dollars and 78 percent of first-year energy savings. Hawaii Energy uses two approaches for providing lighting: upstream support to manufacturers and distributors to lower the retail price of various types of CFLs, and direct distribution of CFLs to low-income households through giveaways and lighting exchanges operated by various organizations that support low-income households.

6.2.1.1 Assessment of Retail Data

The Upstream Incentives Program sold 950,000 CFLs across the islands. Figure 24 shows the distribution of CFL sales across the islands served by the Hawaii Energy Upstream Lighting Program. Through the first three quarters of the year, almost all (96%) of these lamps were sold in large, national big box chains. Progress was made in the latter half of the year to get smaller hardware stores, drug stores, and supermarkets to increase their displays of qualifying CFLs. The survey of the general population indicated that approximately 10 percent of CFLs purchased at retail stores are used in businesses.

Figure 24 Quantity of CFLs Sold by Store Origin



Source: ECONorthwest team analysis of Program Year 2009 program tracking database

The giveaway of lamps to low-income households was coordinated through several private and government agencies. At first, these organizations were given funds to purchase lamps

at retail outlets. Later shipments of lamps were sent directly to the organizations. Records indicate that 107,000[18] CFLs were distributed to low-income agencies and housing units. It is not clear how many of these were actually installed in low-income households. Programs across the country that drop-ship CFLs to buildings have found that some lamps do not get distributed or installed. The 2010 evaluation will include surveys and field observations to assess the actual lamp installation and retention rates for this program.

The Upstream Lighting Program provided subsidies at the distribution level. Subsidy amounts per lamp are shown in Table 14 . Although the majority of the lamps were standard spirals, the program was also successful in introducing and selling other specialty CFLs that have a low saturation across the United States.

Table 14 CFL Sales by Type, Program Year 2009

	Percentage of All Types	Incentive Per Lamp
Type 1 Bare Spiral CFL	78%	$1.00
Type 2 Specialty CFL	18%	$3.00
Type 3 Dimmable CFL	4%	$5.00

Source: ECONorthwest team analysis of Program Year 2009 program tracking database

The retail price of the lamps varied significantly by store type, and somewhat within stores, depending on the type of lamp and the number of lamps in a package. It is not surprising that big box stores, which often sold multiple-pack lamps at prices below $1.00, dominated sales. The average price per lamp across the entire selection of lamps sold at all big box stores was $1.33. The average price per lamp found at grocery and drug stores was more than $7.00.

6.2.1.2 Household Purchase and Use of CFLs

Information from the general population survey indicates how CFLs are used in homes in Hawaii. Table 15 shows that more than half of surveyed households reported buying a CFL last year. Homeowners have more CFLs installed than do renters and are more likely to use CFLs. There is a relatively high satisfaction rate for CFLs among both owners and renters.

Table 15 CFL Usage

	Owners	Renters
Have never installed CFLs in home	12%	24%
Have 12 or more CFLs in home	40%	18%
Bought CFL in last year	62%	49%
Received free CFL in last year	5%	4%
Satisfied with CFLs bought and installed last year	93%	93%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

[18] Because most of these lamps were purchased at retail outlets, they were already counted in the totals distributed across the islands.

Table 16 shows that the average number of lamps reportedly bought in the last year by all households in Hawaii was seven per home. This reported value is greatly exaggerated, as the sales data suggest that annualized sales of lamps is approximately three lamps per household. While the responses indicate that homeowners purchased more lamps than did renters, no difference in CFL purchases per household was found across the islands. The survey data show households responsible for paying the utility bill are no more likely to have purchased CFLs than households not responsible for their own bill. It is likely that renters are less likely to have purchased CFLs because they are less aware of CFLs and their homes are smaller with fewer light fixtures.

Table 16 CFL Purchases

CFL Purchases	Owners	Renters
Percent of homes that bought CFLs last year	62%	49%
Average number of CFLs bought per home	8	6

Source: ECONorthwest team Hawaii general population telephone survey (2010)

Respondents were asked how they were using the purchased lamps. As Table 17 indicates, more than three quarters of CFLs that were bought last year were installed. Almost all the rest of the purchased lamps had been put into storage to be used later. Renters were more likely than owners to install the lamps they purchased rather than store them.

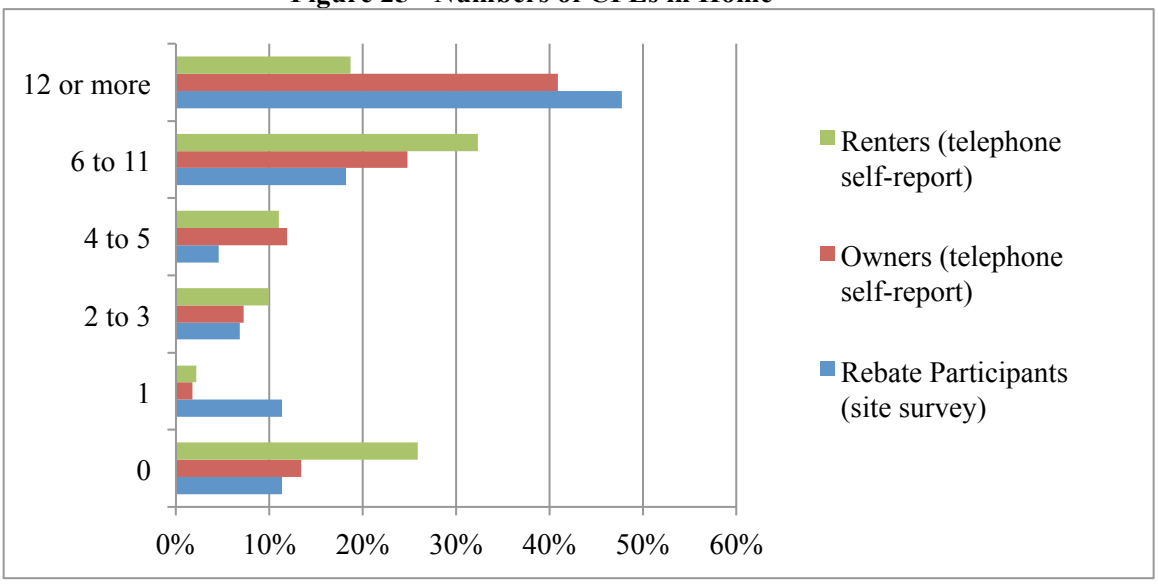
Table 17 CFL Disposition

CFL Disposition	Owners	Renters
Installed	75%	81%
In storage	24%	18%
Given away	< 1%	< 1%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

From the general population survey and the on-site observations of households that participated in residential Hawaii Energy programs, we determined the saturation of CFLs in homes. As Figure 25 indicates, few homes remain that do not have any CFLs. The on-site survey found very high levels of CFL use. This confirms that households participating in Hawaii Energy programs are generally more aware of energy efficiency options and are more willing and able to take action. The on-site visits to these homes found that on average, 54 percent of all screw-in lamps have CFLs. For many of these homes, CFL use is close to reaching a saturation point, and households are purchasing additional lamps for replacement of burned-out CFLs.

Figure 25 Numbers of CFLs in Home



Source: ECONorthwest team Hawaii general population telephone survey and participating customer on-site survey

6.2.1.3 Participating Lighting Supplier Feedback

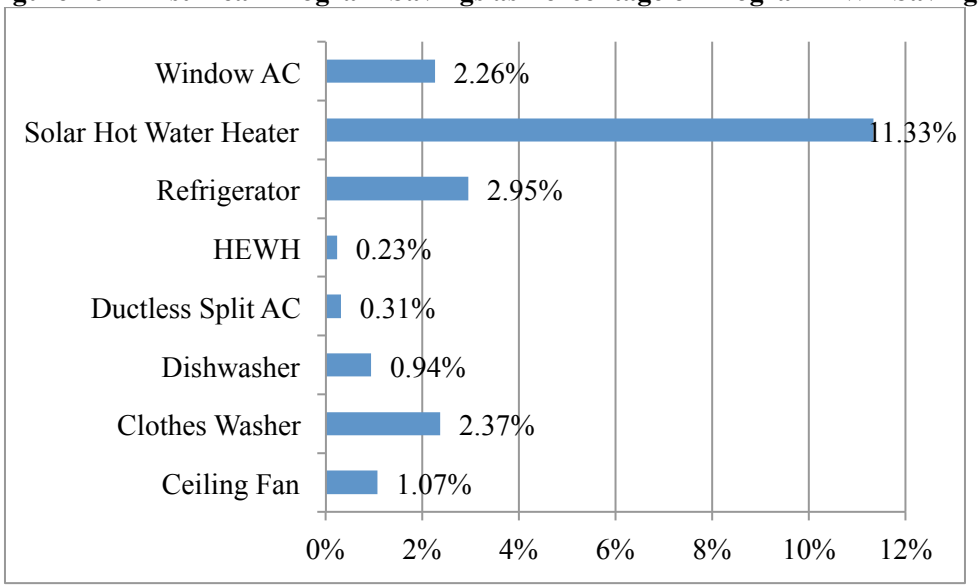
Interviews were conducted with retailers, distributors, and manufacturers involved in the Upstream Lighting Program. All of the interviewed parties were very satisfied with the program. Most believed that the program boosts CFL sales, and some acknowledged that the program has diversified their product lines. Retailers were satisfied with the support from program staff. Feedback about the program was received in the following areas:

- Retailers saw a need for the program to emphasize design of in-store marketing materials and accessibility.
- Suppliers have mixed opinions on Point of Sale (POS) instant rebates. While POS rebates improve customer response time, the rebate may be misused by customers (e.g., returns on rebated items) and their existence increases workload for store-level staff. Typically retailers prefer POS rebates since it reduces the time required to process rebates. They report that customers prefer it since they don't have to fill out a rebate application. POS is also preferred by program implementers because they deal with a dozen or so participating supplier transactions versus tens of thousands of participating customer transactions.
- Suppliers want more advance notice of program dates, particularly program start/end dates and any future inactive periods.

6.2.2 Residential Non-Lighting Equipment

Residential non-lighting measures represent just 26 percent of the residential program kWh savings. Figure 26 shows the breakdown of first-year program savings by measure. Solar water heating accounts for almost half of the remaining savings.

Figure 26 First-Year Program Savings as Percentage of Program kWh Savings



Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings); covering all residential programs (ESH, REWH, RLI, RNC)

Hawaii Energy provides rebates for the purchase of various high efficiency appliances. Table 18 shows the amounts of those rebates and compares them to the amounts offered by other utilities across the United States. In general, Hawaii Energy rebates are at the higher end of what is offered across the country. It should be noted that California offers higher rebates for some appliances than does Hawaii, but those higher rebates are for products achieving the highest tier of efficiency and not just standard Energy Star designation. Given the high free rider rates for standard Energy Star appliances, large rebates for standard Energy Star is of questionable value. Hawaii should consider developing tiered rebates to encourage purchase of the most efficient appliances.

Table 18 Appliance Rebate Nationwide

State	Clothes Washers	Dish Washers	Refrigerator	Refrigerator Recycling
Hawaii	$50	$50	$50	$100
Arizona	$50-75	$20	$0	$30
California	$35-$135	$30-$50	$0	$25-$35
Colorado	$50	$10	$10	$30
Michigan	$25	$0	$50	$50
Oregon	$75	$25	$50	$50
Vermont	$50	$0	$25-50	

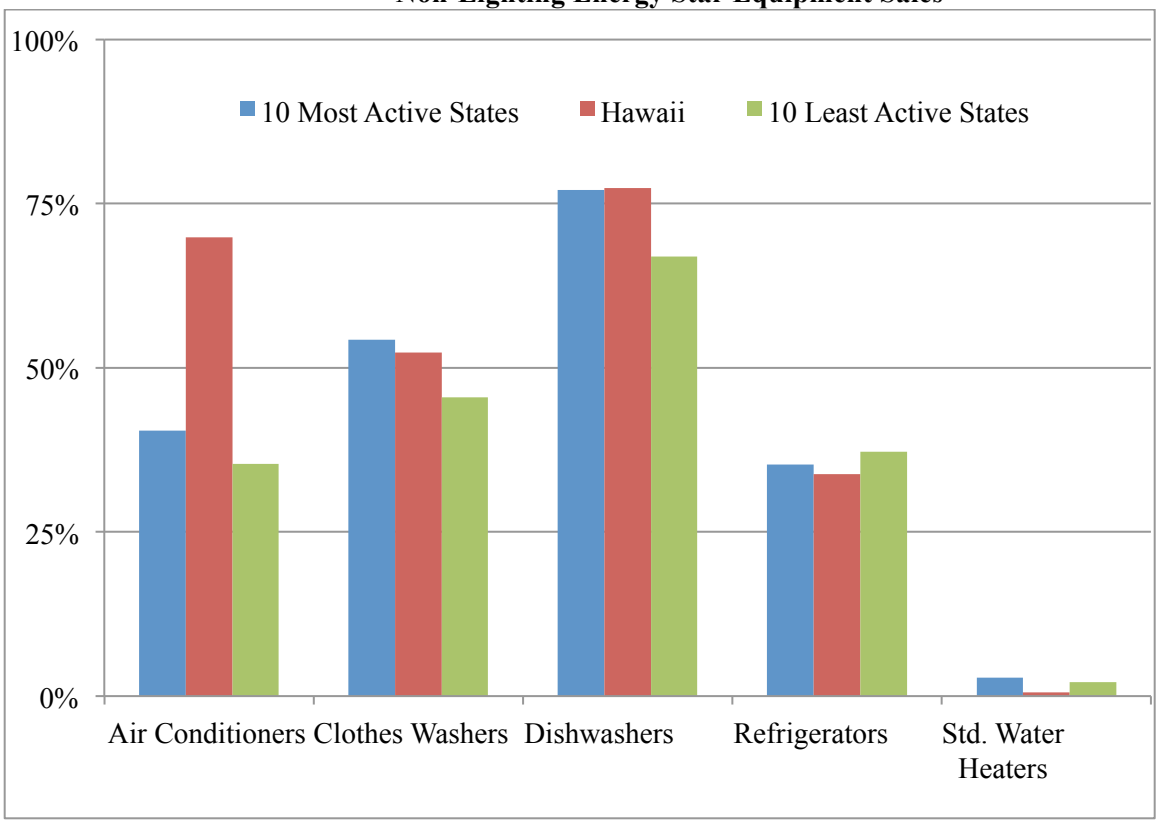
Source: ECONorthwest team review of regional/state EE portfolios, DSIRE Database of State Incentives for Renewables and Efficiency

Figure 27 illustrates measure of the importance of rebate levels on the sale of Energy Star appliances. The figure uses sales data reported to EPA by retail outlets across the United States. The EPA does not reveal the actual sources, but it acknowledges that the largest national chains are likely over-represented in the reports. We compared Hawaii's sales data to the average sales figures for the 10 states reported to be the most active and the 10

states reported to be the least active in offering energy efficiency incentives, as identified by the ACEEE. Hawaii ranks just below the top 10 most active states in the most recent study.[19]

The results in Figure 27 show that there is not much of a difference in the sales pattern between the most and least active states in terms of the percentage of Energy Star appliances sold. It does not appear that rebates have a major effect on sales patterns. One explanation of the apparent uniformity of sales despite large differences in rebate levels is that most large chains have national purchasing policies, so that even stores in non-incentivized states offer and promote Energy Star products.

Figure 27 Percentage of Nationwide Residential Non-Lighting Energy Star Equipment Sales



Sources: Sales figures from EPA. State rankings from ACEEE annual ranking of states

Interviews were conducted with retailers selling appliances that qualified for the rebates. These retailers confirmed what was found in the national data. Retailers reported that most stores sell a greater percentage of Energy Star products than non-Energy Star products. On average, 62 percent of the products sold qualified for Energy Star rebates (this percent ranged from 25 percent to 98 percent). In addition, retailers recognized the positive impact that the refrigerator recycling program has had on the sale of efficient

[19] Molina, Maggie et al. (2010, October). "The 2010 State Energy Efficiency Scorecard." ACEEE, Washington DC.

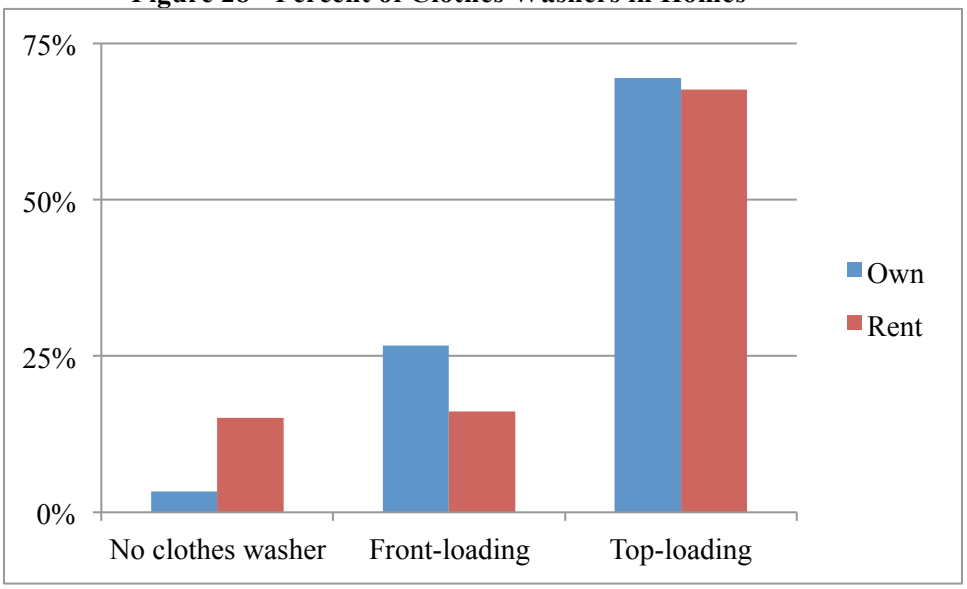
refrigerators. Retailers would like to see rebates offered for freezers, dryers, water heaters, and TVs.

6.2.2.1 Appliances

Appliances account for a small proportion of first-year residential program savings. This section of the report describes the data from the general population survey that relates to energy efficiency measures taken and opportunities for further expansion of program efforts.

The market commercialization of horizontal axis washing machines (most of which are also front-loading) has been one of the market development successes of the energy efficiency industry. The general population survey asked households whether they had top-loading or front-loading washers. Figure 28 shows that the more efficient front-loading machines are beginning to penetrate the market in Hawaii.

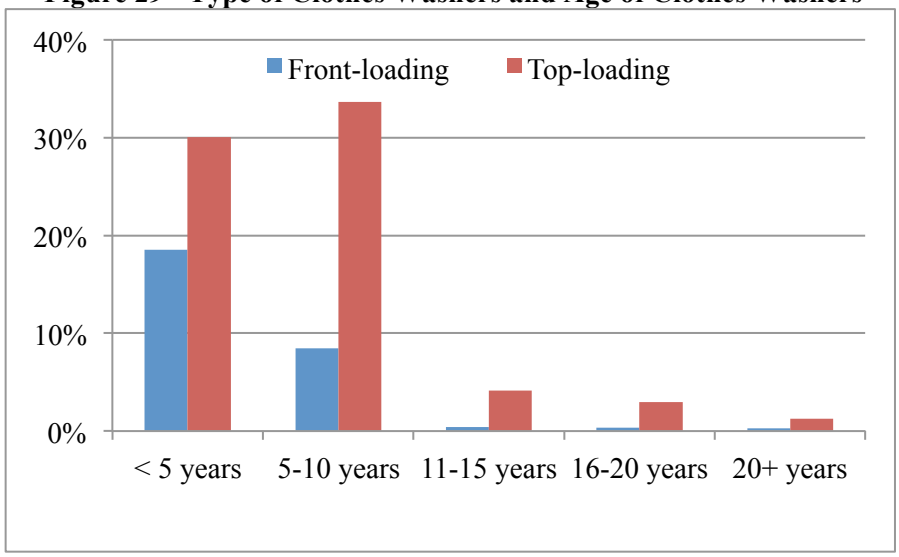
Figure 28 Percent of Clothes Washers in Homes



Source: General population telephone survey (2010)

Figure 28 shows the presorted age of the washing machines. More than 90 percent of the washers appear to be 10 years old or newer. The program can hope to replace many of the older machines, but to achieve larger activity, households will need to be convinced to trade up to more expensive models. Such a program will need to remind households that the new machines not only save energy, they save water, and handle clothes more gently.

Figure 29 Type of Clothes Washers and Age of Clothes Washers



Source: General population telephone survey (2010)

Another area of potential savings is in the replacement of refrigerators. Over the last 18 years, the United States has had two changes in refrigerator energy efficiency standards. Replacing a refrigerator built in 1989 with a new Energy Star model could save up to 1300 kWh per year. Replacing one built in 2000 could save 450 kWh. The general population survey suggests that 10 percent of the primary refrigerators in Hawaii are more than 10 years old. While there is an opportunity to replace these older units with new Energy Star models, the real savings potential lies in removing or at least replacing secondary units, which are generally much older. Thirty-seven percent of owners and 15 percent of renters have second refrigerators, and almost all (97%) are plugged in all the time, with half of those in unconditioned space. The program has contracted with third parties who see that recovered units are properly collected and recycled.

The survey found that only 20 percent of owners and 39 percent of renters would be very interested in turning in their refrigerator for a $100 bounty. However, another 12 percent of owners and 41 percent of renters who were not interested in turning in their refrigerators for $100 became very interested when they were told that the secondary unit may be costing them $400 per year in electricity. Hawaii Energy is providing a bounty of $100 for every refrigerator turned in Program Year 2010.

6.2.2.2 Solar Water Heating

Solar water heater rebates account for 57 percent of all residential rebate dollars, and 11 percent of the first-year energy savings. The higher rebate amounts for solar water heaters are needed to overcome the high initial investment required. It is reasoned that these rebates are justified because the average solar water heater system has a lifetime of 20 years. The Solar Tune-Up Pilot will provide data on lifetimes of solar water product, degradation effects, and maintenance costs. It should also give an updated assessment of lifetime benefits of solar water heaters.

Table 19 shows the rebate levels for Hawaii and how they compare to other jurisdictions that offer solar water heater rebates. While Hawaii is on the low end of the rebate level, Hawaii's program is far more advanced: Hawaii has a high saturation of solar water heating, it has developed a viable solar water heating industry, and it has enacted laws that require that all new homes include solar water heating. All of the programs in other states are looking to develop a solar industry, and none of them has a building code that requires all new residential units to have solar water heating.

Table 19 Solar Water Heaters Rebates Nationwide

State	Rebate Amount
Hawaii	$750
Arizona	~$1,100
Arkansas	$30 ft^2
California-PGE	$0.37/kWh
California-SMUD	$1,500 plus 10 year loan
Florida-Jacksonville Electric	$800
Texas-Austin	$2,000

Source: ECONorthwest team review of regional/state EE portfolios

Interviews were conducted with representatives of the solar water industry. Solar water heater contractors offered generally positive feedback about the ease of participation, turnaround time, communications with Hawaii Energy staff, and the quality control function offered by the program. Their concerns centered on dissatisfaction with the rebates being cut from $1,000 to $750, a move that was needed to ensure that funds for other residential measures with higher benefit/cost ratios would be available. . One contractor said that this hurt sales because homeowners believe the rebate will eventually go back up. Contractors cited the economic downturn as their greatest market barrier.

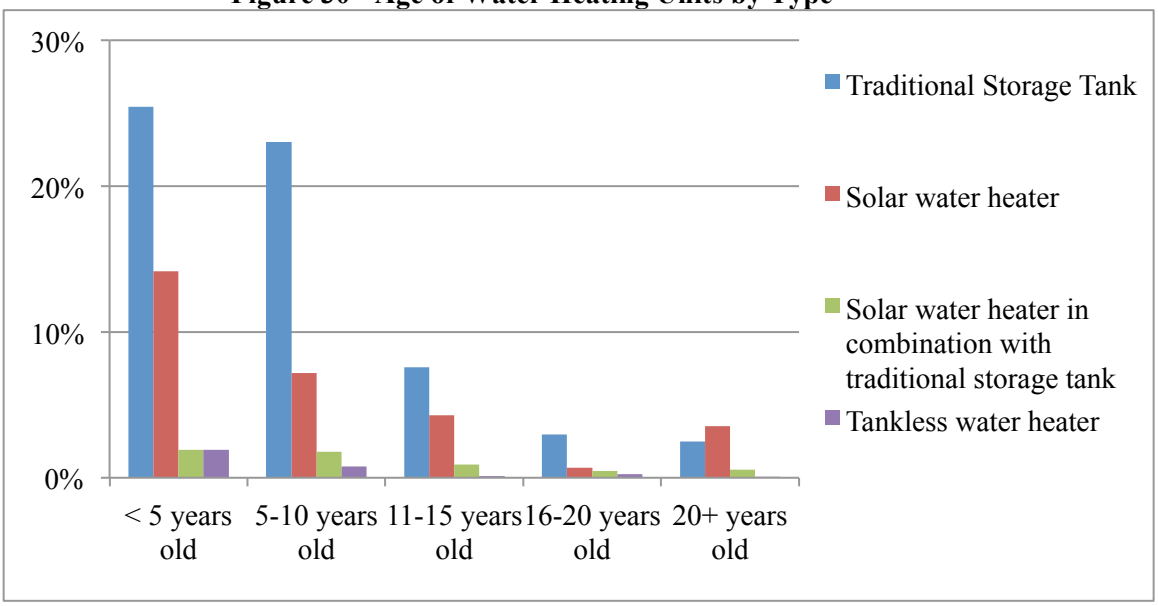
Contractors supplied numerous observations that indicate that the market is maturing and competition is making it harder for some to do business. Some contractors said that they feel pressure to compete with small "mom and pop" firms that are intensifying price competition. Customers are more reluctant to buy overall and it is harder to secure financing. According to contractors, more potential customers are getting bids from multiple contractors; forcing contractors to invest more time and money into each successful sale. Several participants contrasted current marketing support with more widespread TV, radio, print advertising, and bill inserts to generate leads in the past.

A few vendors said that photovoltaics (PVs) are a force in the market, both because some customers prefer PV systems and because a large PV vendor has a name that can be confused with Hawaii Energy.

The population survey asked respondents the age of their water heaters. Figure 30 suggests that there are a substantial number (21 %) of water heaters older than 10 years. Most of these units will need to be replaced in the next few years, and the program should

be poised to direct these customers to high efficiency options if they do not choose to install a solar water heater.

Figure 30 Age of Water Heating Units by Type



Source: ECONorthwest team Hawaii general population telephone survey (2010)

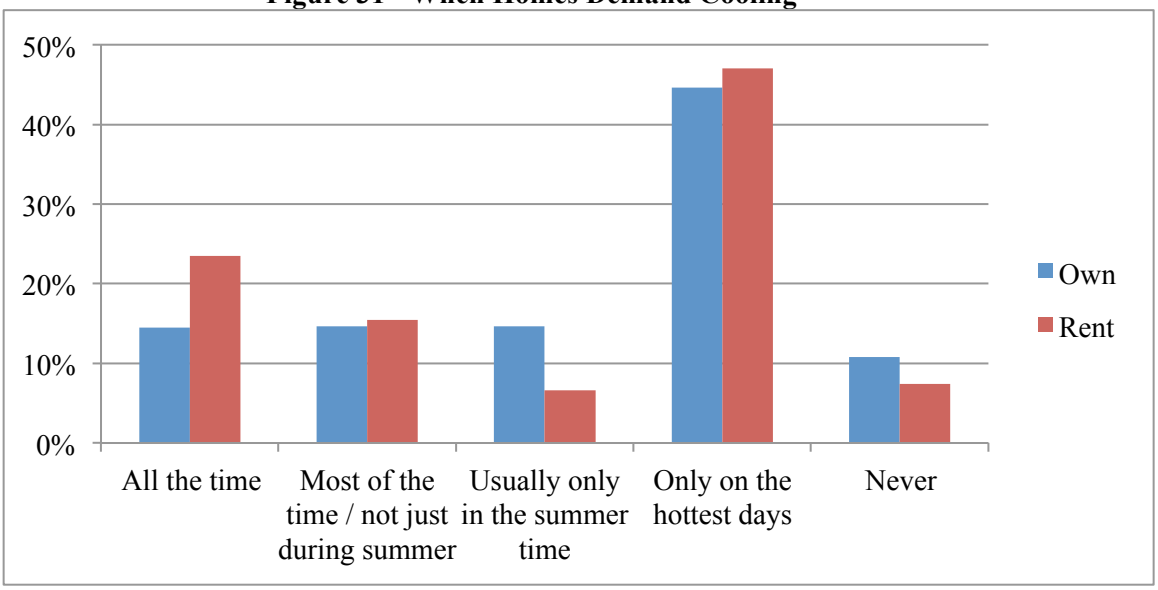
6.2.2.3 Cooling

The residential cooling load is increasing and driving the need for the expansion of generation and transmission facilities in Hawaii. Yet the residential cooling rebates account for only three percent of the Hawaii Energy program expenditures. Hawaii Energy reasons, correctly, that providing rebates for air conditioning equipment would fuel the growth in air conditioning use, creating greater load and capacity issues that would overwhelm any small improvements realized by the higher efficient units. The new policy that restricts air conditioning rebates to only customers that are replacing old, inefficient units is a wise move to limit the growth of new cooling. The general population survey found that five percent of the population was very or somewhat likely to add central air conditioning to their homes in the next two years. Almost every new home built is equipped with central air, and even homes without central air are adding more room units.

To better understand the problem with designing a program to address cooling, one needs to first look at the way residential air conditioning is used. Respondents in the Hawaii general population survey were asked when they used their air conditioning. Figure 31 shows that almost half of the households use air conditioning only on the hottest days. This means that the utilities must equip themselves with sufficient capacity to meet these spikes in demand. Because such customers use air conditioning so infrequently, buying efficient cooling equipment that costs more than standard equipment is not cost-justified. Under these circumstances, Hawaii Energy can only justify giving rebates that lower the use of existing air conditioning or encouraging alternatives to the use or installation of air conditioning. These options include rebates for ceiling fans, something already included in the Hawaii Energy portfolio, and programs that add shading, or make existing air

conditioning systems more efficient, such as programs that improve air conditioning maintenance or installation quality.

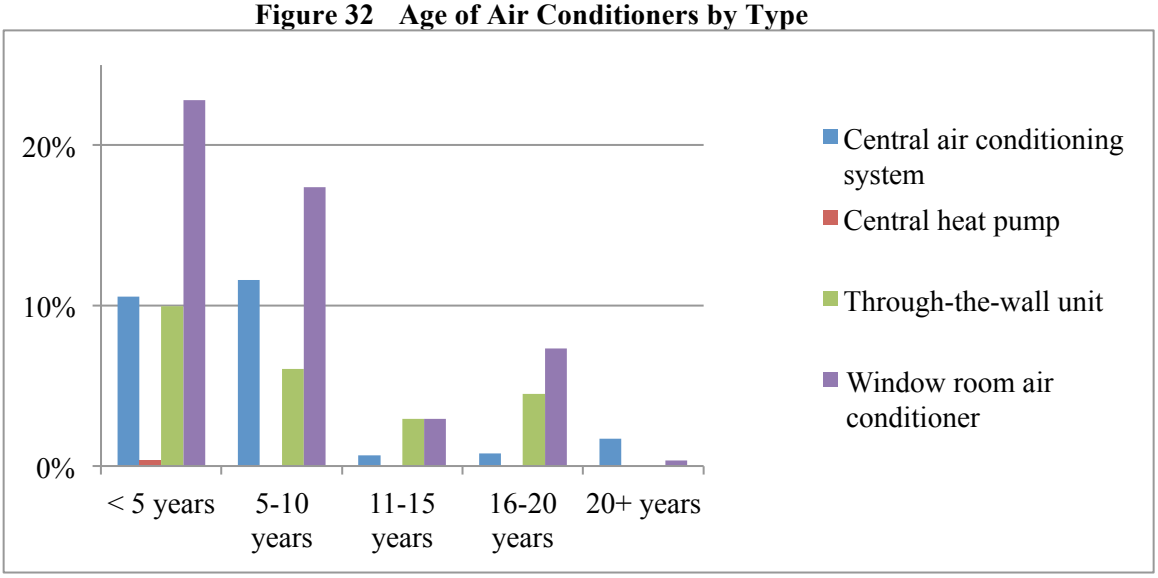
Figure 31 When Homes Demand Cooling



Source: ECONorthwest team Hawaii general population telephone survey (2010)

Figure 32 shows that there remains a large number of older, inefficient air conditioners on the islands. A larger effort to swap these out would be justified not based on energy savings, but based on savings in peak demand, and the subsequent reduction in peak generation capacity required. Hawaii Energy should consider two program activities: providing architectural assistance and/or rebates to new homes designed to *not* include air conditioning, and providing annual rebates to ensure that central air is not added in subsequent years. This idea is a novel approach that has not yet been enacted elsewhere, however, given Hawaii's climate and high peak demand costs is worth pursuing.

Figure 32 Age of Air Conditioners by Type



Source: ECONorthwest team Hawaii general population telephone survey (2010)

6.2.3 Island Equity

Using geocoding software that locates the precise longitude and latitude of each program participant, we were able to place each participant into a U.S. Census Block Group. The Census block groups are chosen to represent a homogeneous grouping of households and contain between 600 and 3,000 people. The block group is the smallest Census designation for which income and poverty status is provided. Once the participant was assigned a block group, we calculated the total rebate activity within each block group, the number of households in a block group, and the dollar amount of rebates distributed per household for each block group.

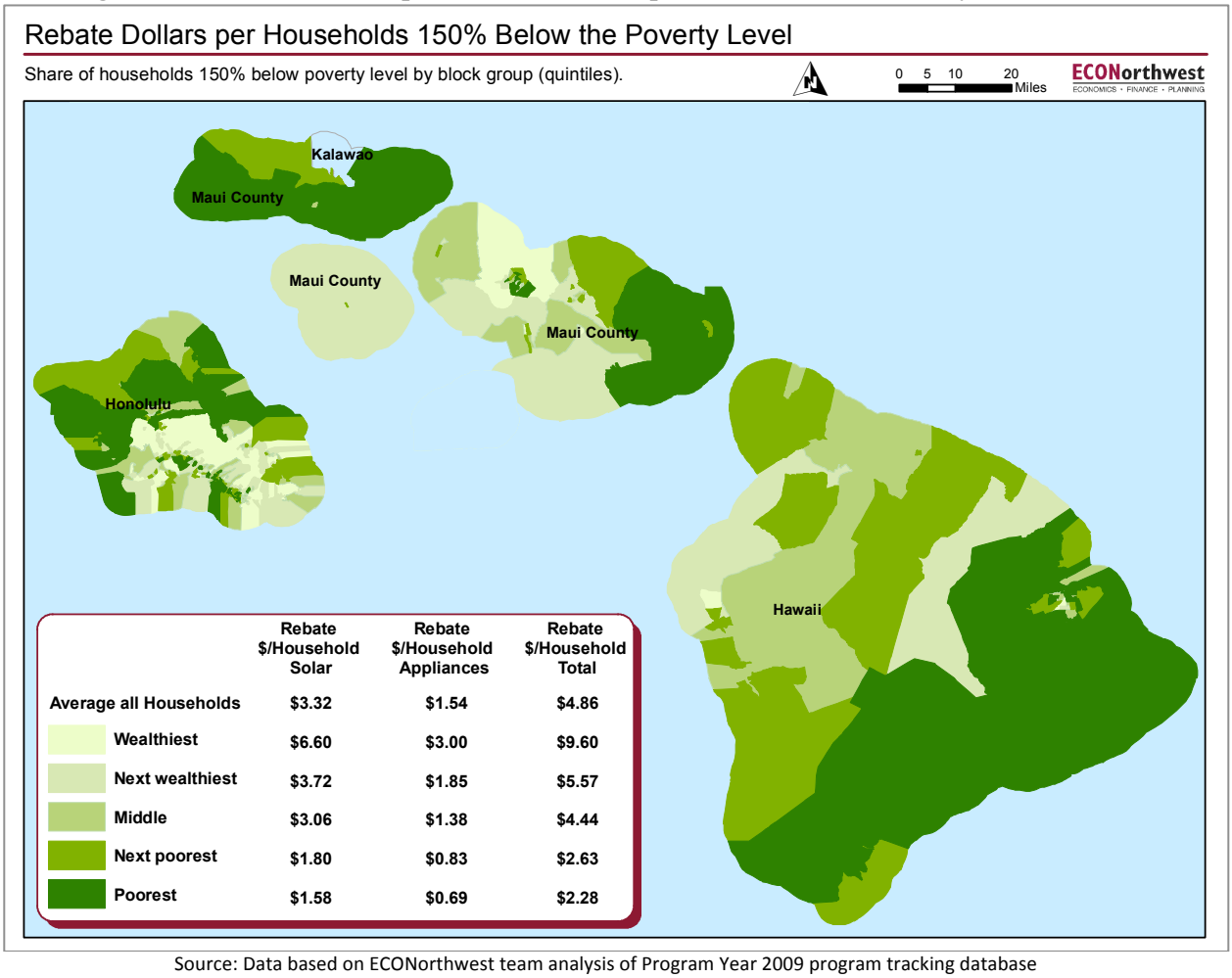
We then determined the wealthiest and poorest quintiles of block groups, using the percent of households that are at or below 150 percent of the federal poverty level. The first quintile is the 20 percent of block groups with the lowest percent of low-income households (the wealthiest block-groups). The fifth quintile is the 20 percent of block-groups with the highest percent of low-income households (the poorest block-groups). Table 20 shows the distribution of residential rebate dollars across the five block-group quintiles. This is also shown graphically in Figure 33.

The results show that rebate dollars are not distributed equally across household incomes. On average the program provided $4.86 in rebates per household. However, households in the wealthiest block groups received four times the rebate amounts as households in the poorest block-groups.

Table 20 Rebate Dollars per Household

	Rebate $/household Solar	Rebate $/household Appliances	Rebate $/household Total
Average all households	$3.32	$1.54	$4.86
Wealthiest: Block groups with the lowest percent of low-income households	$6.60	$3.00	$9.60
Next wealthiest	$3.72	$1.85	$5.57
Middle	$3.06	$1.38	$4.44
Next poorest	$1.80	$0.83	$2.63
Poorest: Block-groups with the highest percentage of low income households	$1.58	$0.69	$2.28

Figure 33 Rebate Dollars per Households 150 percent Below the Poverty Level



Source: Data based on ECONorthwest team analysis of Program Year 2009 program tracking database

6.2.4 Awareness, Attitudes and Behaviours

The behavior of residents in the Hawaii Energy service area can affect demand for electricity. Changes in behavior affect savings in two broad categories. First, households and firms can become more aware of how equipment purchases affect their consumption of energy over the long term and that Hawaii Energy offers incentives to up-front costs. Households that are aware of that difference will choose to purchase energy efficient equipment as they make changes to appliances over time and participate in Hawaii Energy rebate programs.

Households can also change their behavior in ways that do not include participation in Hawaii Energy rebate programs, but do decrease demand for electricity. Small changes in daily habits, such as turning off lights, reducing the temperature on water heaters, and washing clothes in cold water can reduce electricity demand. In some cases energy efficiency programs such as those offered in Hawaii indirectly influence these types of behavioral changes through the consumer messages they disseminate through printed materials and outreach to trade allies.

Table 21 shows the portion of households (owners and renters) that regularly engage in energy efficient behaviors. The survey data indicated that there is little difference in daily behaviors between owners and renters. For behaviors that are associated with actions taken by individuals, regardless of any equipment installed, there is almost no difference between renters and owners. But for behaviors that require some shift in equipment, owners are much more likely to have taken the extra step. Owners are more likely to lower the water heater temperature and are more likely to set electronics on standby when they are not in use. The most notable difference is for households that use lighting controls such as dimmers and timers. Just over half of owners (53%) use some kind of lighting control, and only 29 percent of renters do so. It is not surprising that there is a large difference—homeowners are more likely to invest in energy saving equipment for their home. Renters have little incentive to invest in infrastructure for a home they do not own or control.

The survey also asked if the household was responsible for the utility bill or if the landlord or building manager pays the bill. In a condominium, the resident is an owner but it is possible for the building to be master-metered, where individual households do not pay the utility bill. We found that energy-efficient behavior varied little for households regardless of whether they pay the utility bill. Households that pay their own bill are more likely to lower their hot water heater temperature (47% compared to 36%) and they were more likely to set electronic equipment in standby mode (61% compared to 45%). Other behaviors showed almost no difference between the two household types.

The small differences for behaviors that are daily habits between owners and renters and between households that pay their utility bill directly and those that do not pay it directly show that all groups are similarly inclined to make an effort to reduce electricity consumption.

Table 21 Household Energy Efficient Behaviors

Percent of households that regularly...	Own	Rent
Turn off lights	98%	96%
Take shorter showers	75%	74%
Lower water heater temperature	52%	46%
Line dry clothes	51%	51%
Wash clothes in warm or cold water	97%	93%
Use dimmers, timers, photocells or other lighting controls	53%	29%
Set electronics on standby when not in use	59%	52%
Unplug appliances, chargers or use power strip	73%	71%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

Table 22 shows the portion of households in the Hawaii Energy service area that reported the listed factors as a barrier to energy efficiency, by owners and renters. The most-cited barrier is the high up-front cost of energy efficient equipment, but just less than half of owners reported that the time required to learn about, buy, and install energy-related improvements was a barrier. A high portion of the population cited the performance of energy efficiency equipment as a barrier.

Up-front cost is typically the most-cited barrier, but we note that customers do not always reliably report their actual purchasing motivations. Hawaii Energy can help address the other barriers by providing information about energy efficiency measures and addressing incorrect perceptions that energy efficiency leads to reduced comfort and performance.

Table 22 Household Energy Efficient Barriers

Percent of households that say this is a barrier	Own	Rent
The time it takes to learn about energy-related improvements	48%	43%
The time it takes to buy and install energy-related improvements	47%	45%
Reduced performance or comfort of energy-related improvements	47%	41%
The higher up-front cost	62%	61%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

Table 23 shows that almost all households report that they are motivated by both their pocket book and their concern for the environment. Given the high costs of electricity in Hawaii and societal concern for the state's natural resources, it is not surprising that more than 90 percent of households believe they should use less energy to reduce their own costs and preserve the environment.

Table 23 Household Energy Efficient Attitudes

Percent of households that say this is very or somewhat important	Own	Rent
My household should use less energy in order to help preserve the environment	92%	93%
My household should use less energy in order to reduce my energy bills	94%	90%
My household should be energy efficient compared to my friends and neighbors	60%	65%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

Table 24 shows the general population's awareness of Energy Star and current and past rebate programs. It is clear that owners are more aware of Energy Star and rebate programs. This is expected, as homeowners are more likely to purchase household appliances and are more likely to have seen information about rebates at appliance retailers. A large portion of households is aware of Energy Star, evidence that the program has become common knowledge for households.

A very small portion of respondents reported that they had participated in a lighting rebate program. However, a majority of households reported that they had purchased a CFL in the last year. The price of the bulb purchased was likely reduced by Hawaii Energy's program, which households had not noticed when purchasing the bulb, indicating that implementation of POS materials could be improved.

Table 24 Household Awareness and Participation in Energy Efficiency

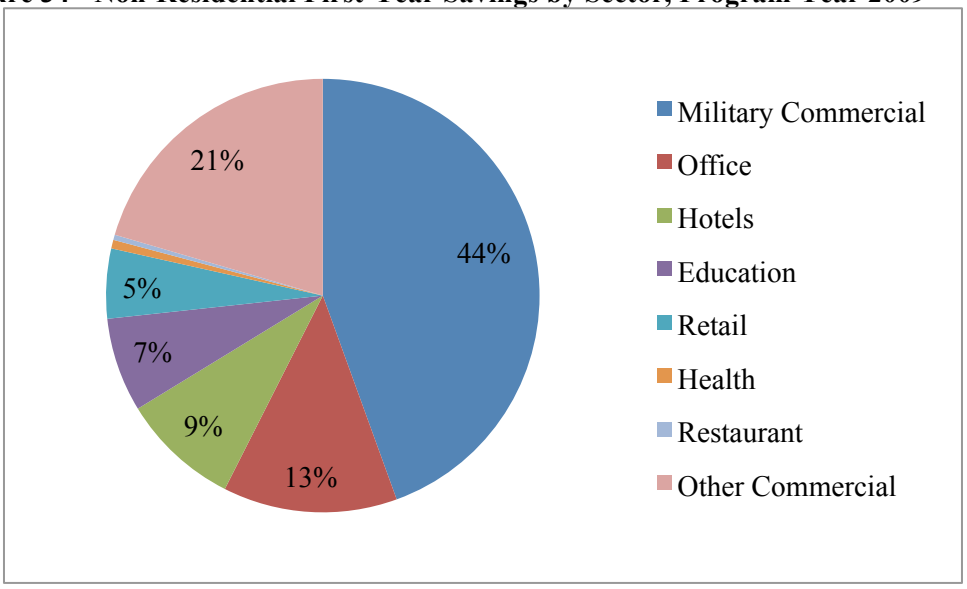
	Own	Rent
Awareness of Energy Star	84%	73%
Awareness of rebate programs in Hawaii	66%	47%
Have you participated in any Hawaii energy efficiency program	37%	16%
Have you participated in solar rebate program	10%	1%
Have you participated in refrigerator rebate program	12%	5%
Have you participated in a lighting rebate program	7%	4%

Source: ECONorthwest team Hawaii general population telephone survey (2010)

6.3 Non-Residential Sector

Our analysis of non-residential program participation began with a look at the distribution of savings by sector, using the definitions of market sectors described in the Methods section. This showed that savings were concentrated in relatively few sectors, with military non-residential, offices, and hotels accounting for about two thirds of all non-residential program savings, as shown in Figure 34.

Figure 34 Non-Residential First-Year Savings by Sector, Program Year 2009

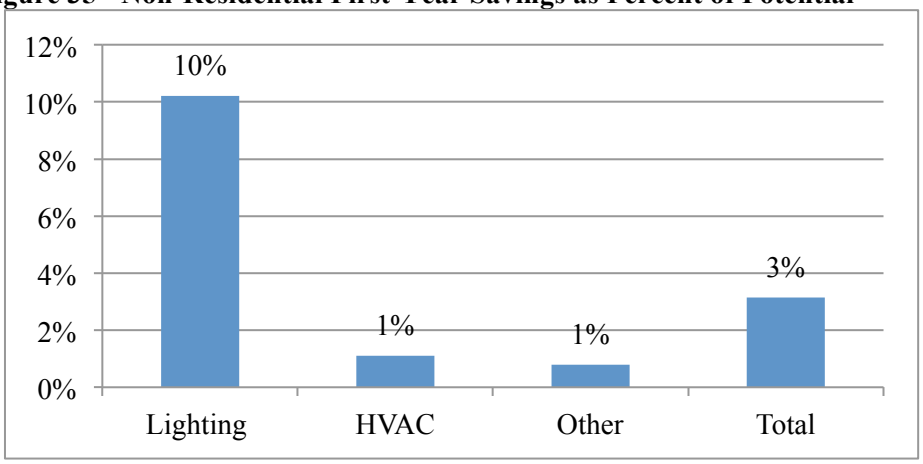


Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

We also compared Program Year 2009 program savings to the potential identified in two recent studies to gauge the extent to which the current program has succeeded in capturing that potential, by both sector and measure. In comparing the actual 2009 savings to the potential estimated by the BAH study for selected high-use sectors, we found that the program tapped 10 percent of the non-residential lighting potential but only about one percent of the potential for HVAC and all other measures (see Figure 35). We believe this indicates an over-dependence on lighting and a need to more effectively promote other

technologies and end uses, even though the cost per kWh for non-lighting measures is higher.

Figure 35 Non-Residential First-Year Savings as Percent of Potential

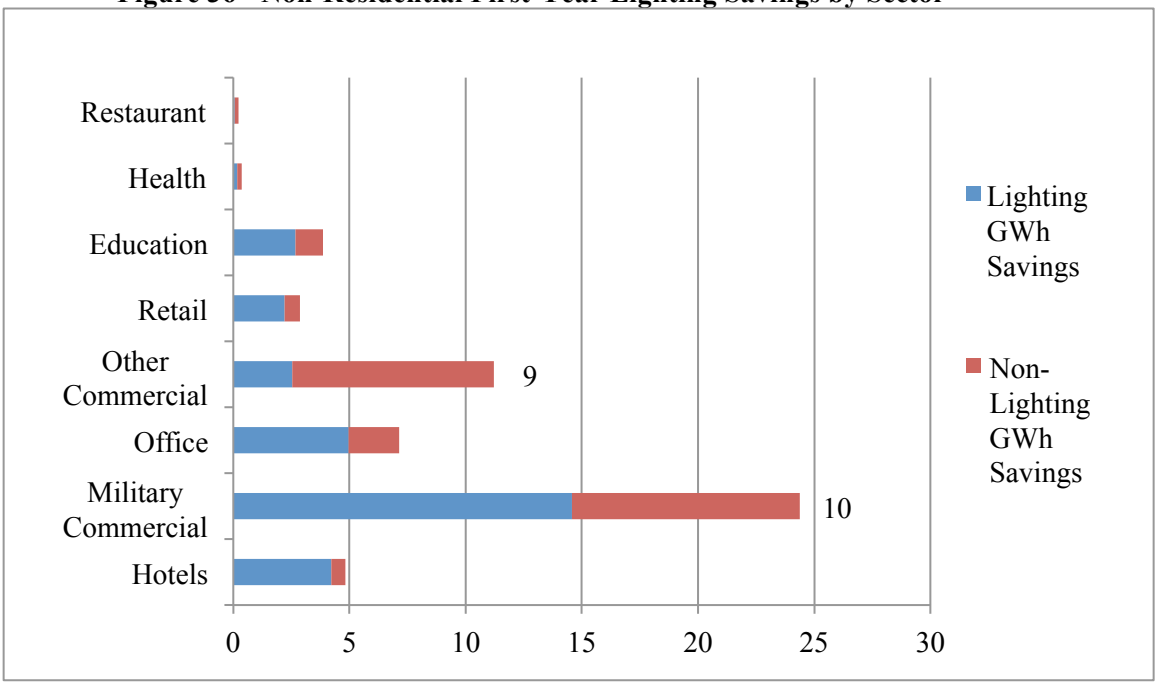


Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

6.3.1 Lighting

As with the residential market, lighting is the major contributor to first-year non-residential sector program savings, accounting for 66 percent of non-residential savings overall. Lighting savings were highly concentrated in a few sectors, with military non-residential accounting for 40 percent of the total, and hotels and offices contributing more than 10 percent each. As shown in Figure 36, savings from lighting exceeded those from non-lighting measures in all sectors except Other Commercial.

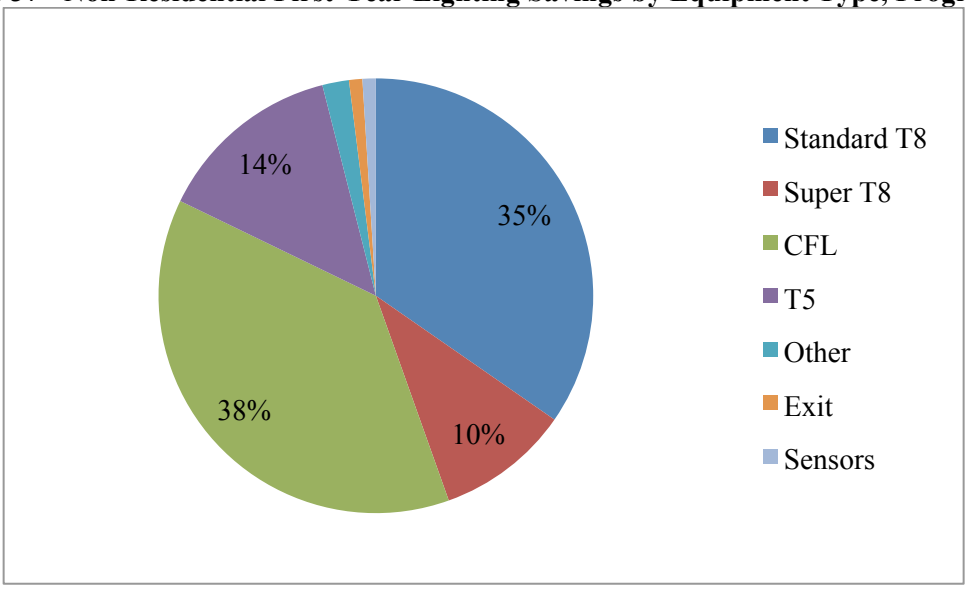
Figure 36 Non-Residential First-Year Lighting Savings by Sector



Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

One issue of interest is the mix of various kinds of lighting technologies installed by non-residential customers through the Hawaii Energy program, as shown in Figure 37. Together, T8s and CFLs accounted for more than 80 percent of lighting savings. While super T8s were 10 percent of total savings and another more advanced technology, T5 lighting, accounted for 14 percent, most of the lighting savings came from CFLs and standard T8s, both well-established, mainstream technologies. , We believe the program should focus on the more advanced lighting types rather than the standard T8s and CFLs.

Figure 37 Non-Residential First-Year Lighting Savings by Equipment Type, Program Year 2009

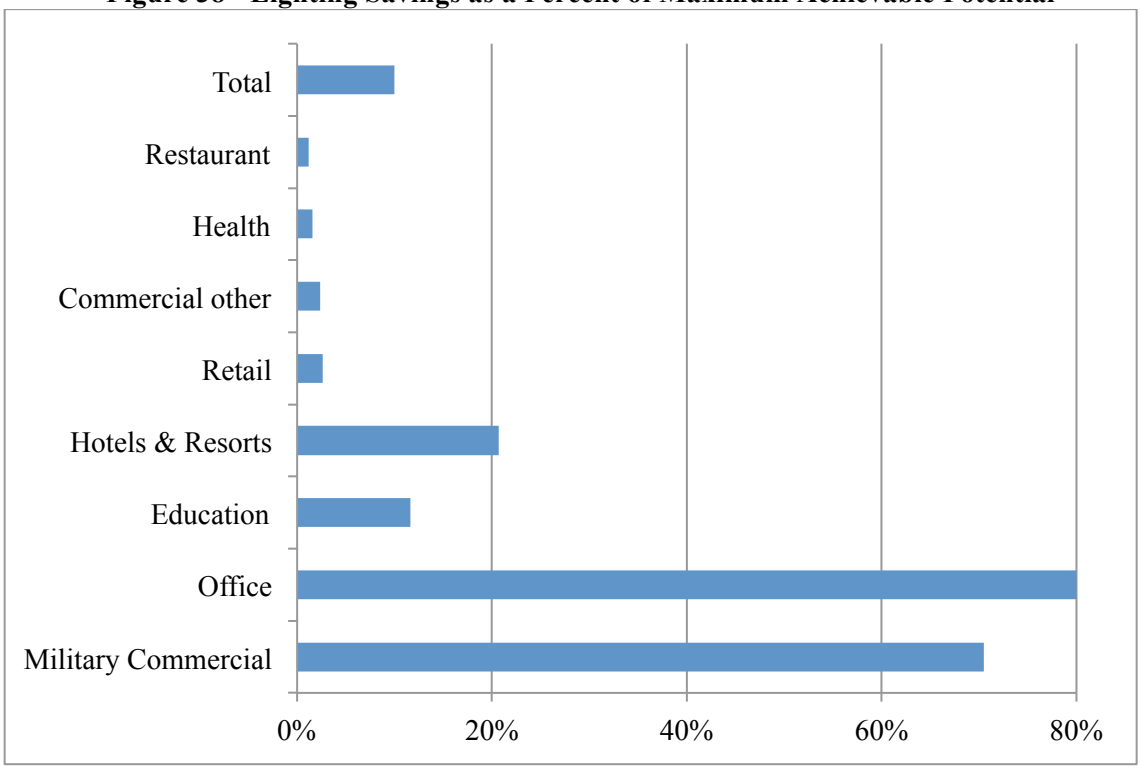


Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

In comparing the non-residential program savings from lighting to the potential identified in the two previously cited studies, we found that lighting savings overall were about 13 percent of the maximum achievable potential (MAP) calculated in the GEP study, but that these savings were, again, concentrated in a few sectors.[20] For example, in military non-residential sectors, 2009 lighting savings amounted to more than 70 percent of potential, whereas in the retail, restaurant, health, and other non-residential sectors, they were seven percent or less. Note that the sectors with high percentages of achieved potential typically tend to comprise fewer, larger customers. This focus enabled the program to effectively reach its 2009 goals, but it limits the contact with remaining potential customers in these sectors and suggests it will be more difficult to achieve similar levels of participation in other, more diverse sectors and it will cost more.

[20] The GEP study provided Economic Potential at an aggregate level and MAP by end use and sector. For this study, we used the MAP because of the detail available in the GEP study.

Figure 38 Lighting Savings as a Percent of Maximum Achievable Potential



Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

In comparing Hawaii Energy's results with current and past results elsewhere in the country, we found that reliance on non-residential lighting to achieve program goals is typical, particularly in newer programs. Relatively recently launched programs in Michigan, Illinois, Ohio, Pennsylvania, and Maryland rely on non-residential lighting for more than two thirds of their non-residential savings goals, with CFLs and T12 to T8 conversions often accounting for most of the savings. When it comes to generating significant savings right from the start of a new program, lighting applications offer an attractive, cost-effective option.

Even for more established programs, lighting plays a major role. For example, in Hawaii, the 2008 HECO Accomplishment and Surcharge (A&S) Report found that lighting measures accounted for 61 percent of the 58 GWh savings from its 2007 non-residential prescriptive, custom, and new construction program. In areas that have had energy efficiency programs for decades, such as California, the Pacific Northwest, and New England, lighting often still accounts for 35 to 45 percent of non-residential program savings. Note, however, that most of these programs have moved beyond accepting standard T8s and now require more efficient second- or third-generation T8s with advanced ballasts to qualify for program incentives.

In sum, although reliance on non-residential lighting to achieve program goals is not uncommon, we believe that there are problems associated with the high percentage of

savings accounted for by lighting, particularly the concentration of activity in a few business sectors. The primary concerns are:

- Reliance on sectors with relatively few, large customers (military, hotels/resorts, large offices) allows goals to be met without building infrastructure to reach other markets. Because direct program contact with targeted decision makers can yield significant savings, there is no urgent need to develop the infrastructure that would support a program driven by trade allies.

- Very high penetration of the non-residential military and office sectors relative to the total potential estimated by previous studies suggests that similar lighting savings will be more difficult to achieve in the future.

- While Hawaii Energy has reached out to contractors to help deliver its programs, relatively few trade allies deliver the bulk of lighting installations and savings, particularly for the military. In addition, it appears that the broader market of potential trade allies has little contact with Hawaii Energy, with half of the non-participating contractors surveyed reporting that they were unaware of the program.

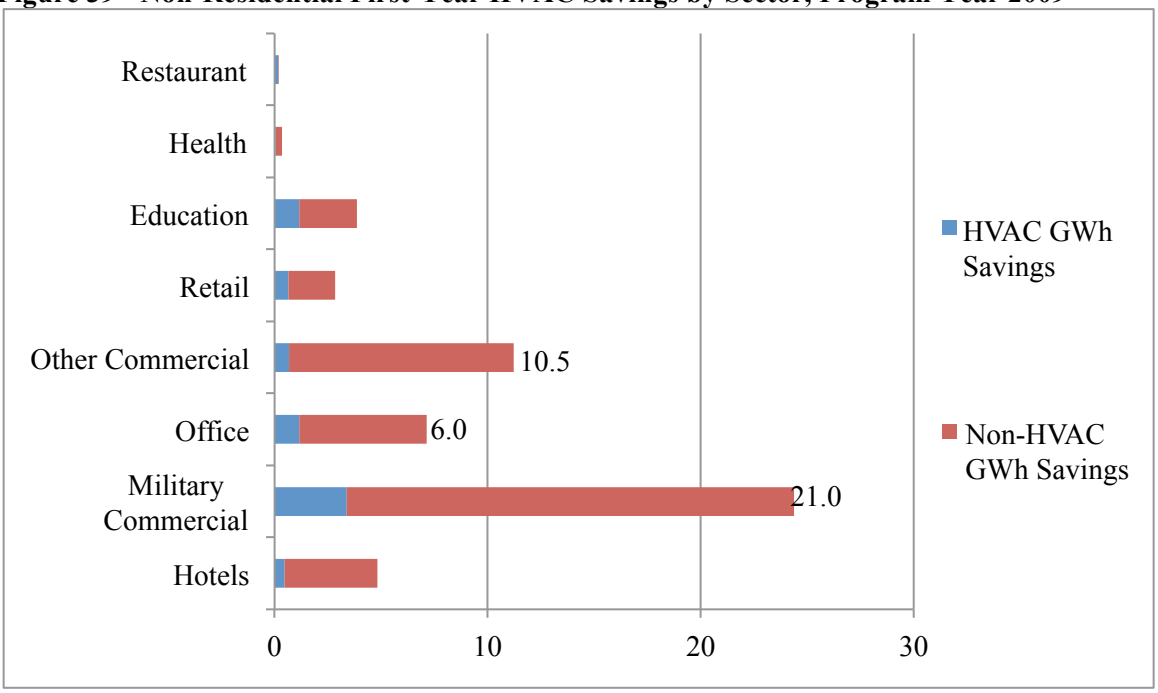
In addition to concerns regarding the mix of lighting participants by sector, we think that program savings are overly reliant on technologies that many customers would be installing anyway. Specifically, measures that account for more than 70 percent of savings – regular T8s and CFLs – are well on their way to becoming standard practice and may represent markets that have already transformed. CFLs, for example, are ubiquitous in the facilities of large users such as hotels/resorts and retailers. In fact, among respondents to our general population (non-participant) survey who reported buying CFLs, about half said that all of their fixtures now have CFLs.

A similar trend is seen for T8s. Among the 174 of 604 surveyed non-participants who made lighting changes, 45 reported installing T8s outside Hawaii Energy or any other program. And more than half of program participants who installed lighting indicated that they would have completed their lighting project even if they had not received the program incentive. Although these self-reported results are not definitive, they do provide evidence that CFL and T8 technologies may not represent a cost-effective source of net savings for the program.

6.3.2 Cooling

Non-Residential HVAC measures, including built-up systems, package units, and window air conditioners, as well as variable frequency drives (VFDs) for pumps and fans, accounted for estimated savings of 7.7 GWh. This represented 14 percent of the non-residential total, or less than one fourth of the share accounted for by lighting. Figure 39 compares the contribution to each sector's savings by HVAC and non-HVAC measures. Whereas non-HVAC savings were greater than those from HVAC in all sectors, HVAC's share was largest in the military non-residential, office, and education sectors. Other than these three, no sector delivered more than one GWh of HVAC savings.

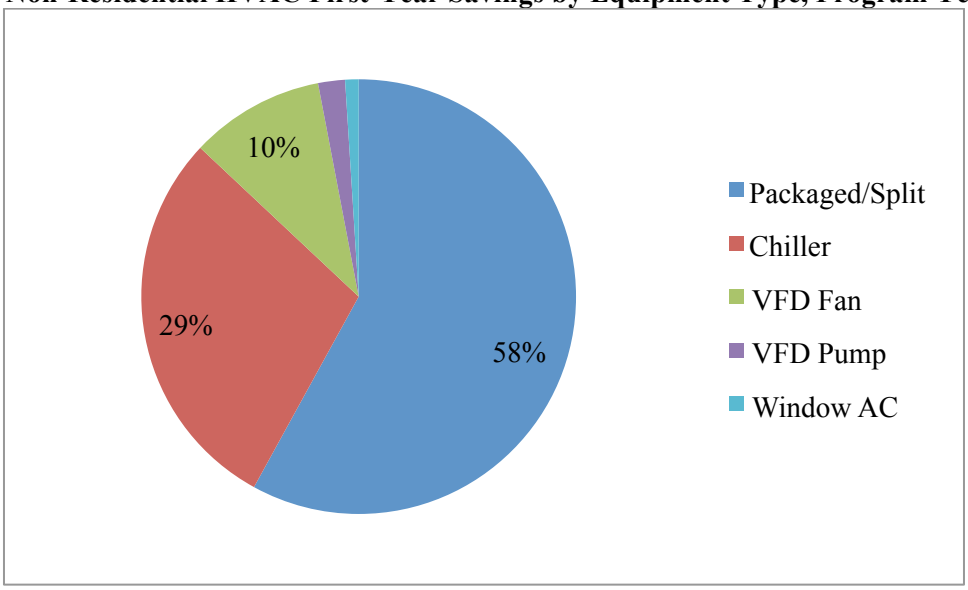
Figure 39 Non-Residential First-Year HVAC Savings by Sector, Program Year 2009



Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

Among the technologies covered by the Hawaii Energy business programs, packaged/split units accounted for 58 percent of non-residential HVAC savings, while chillers accounted for 29 percent, as shown in Figure 40.[21] Note that VFDs on fans accounted for 10 percent of savings – far more than the two percent for VFDs on pumps.

Figure 40 Non-Residential HVAC First-Year Savings by Equipment Type, Program Year 2009

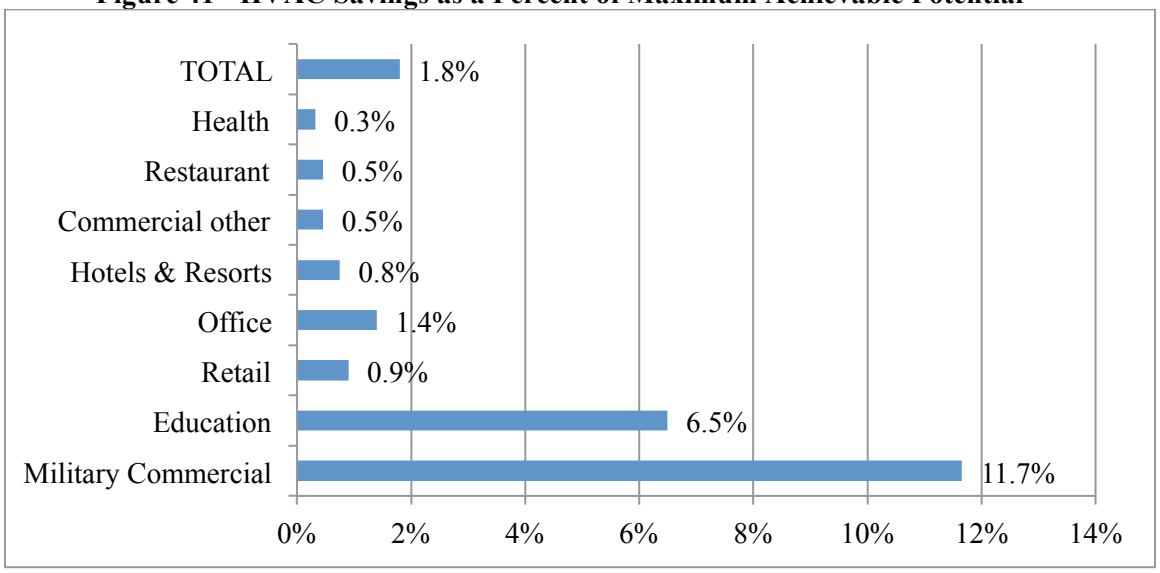


[21] Unlike the residential sector, there is no indication that the packaged units add cooling load rather than replacing existing equipment.

Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

As with lighting, we compared the savings realized from HVAC measures to the potential estimated by recent studies, with results summarized in Figure 41. The results show that HVAC savings were less than two percent of the 2019 HVAC maximum achievable potential overall, and less than one percent for all sectors but offices (1.4%), education (6.5%), and military non-residential (11.7%). The relatively high percentage for the education sector reflects an active HVAC retrofit effort by the Hawaii Department of Education. Although these results show clear success within the education sector, it must be noted that this was another example in which a single individual helped drive program participation, so that extensive marketing through contractors and other trade allies was not required in this case.

Figure 41 HVAC Savings as a Percent of Maximum Achievable Potential



Source: ECONorthwest team analysis of secondary potential study data and = Program Year 2009 program tracking database (customer-level savings)

The 14 percent HVAC share of savings is lower than that typically found with other programs, including the 27 percent for HECO's 2007 non-residential programs. The positive aspect of the lower percentage for HVAC savings is that there should be ample opportunities to expand, with more than 98 percent of potential untapped in key sectors such as offices, healthcare, the hospitality industry, and retail stores.

As suggested by the example of the education sector discussed above, low savings relative to potential in other sectors may reflect the program's focus where it is possible to achieve good results by working with relatively few customers and contractors. The sectors that accounted for almost 75 percent of HVAC savings — military non-residential, offices, and education — account for only 15 percent of usage but have relatively few customers. The office sector does have a large customer base (>10,000), but 64 percent of HVAC savings in this sector came from the 65 office customers classified as large. In the military sector there are very few customers, and a limited number of contractors specialize in military work, including two of the 12 participating HVAC contractors surveyed. Conversely, 12 of the 14

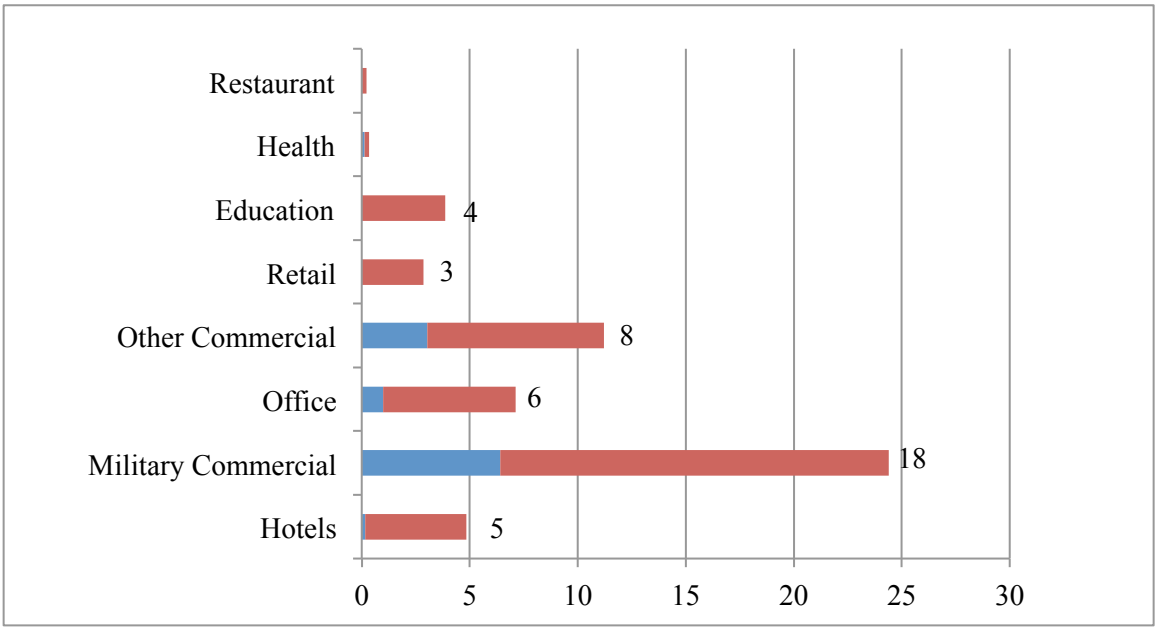
non-participating HVAC contractors surveyed were completely unaware of the program and most of those said that they spent at least half their time doing non-residential work.

The customers in sectors with high participation may include some who are committed to energy efficiency and would be undertaking these projects anyway. Responses to the participant survey indicate that many participating HVAC projects were not strongly influenced by the program. For example, more than half of surveyed participants who installed packaged HVAC systems said that their firm had planned the project before hearing about the program; of those, 69 percent indicated that money had been formally earmarked for the project. In addition, about two thirds (66%) of participants reported that they would have done their HVAC project with no changes without the program incentive, although there are limitations to such self-reported data.

6.3.3 Other

Custom and other measures generated an estimated savings of 10.8 GWh, representing about 20 percent of the non-residential total – almost 50 percent more than cooling savings. Figure 42, which shows the contribution of custom and non-custom measures to overall savings by sector, illustrates that custom savings were concentrated in the military non-residential and other non-residential sectors and also made a minor contribution (about 14%) to savings for the office sector. No other sector had more than 250,000 kWh in custom/other measure savings.

Figure 42 Non-Residential First-Year Custom and Other Measures Savings by Sector, Program Year 2009

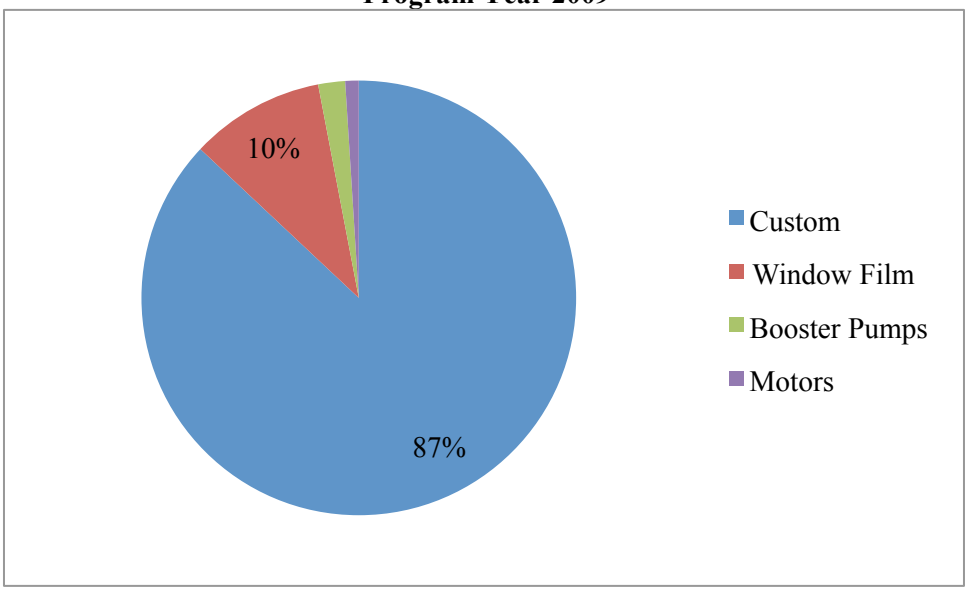


Source: ECONorthwest team analysis of Program Year 2009 program tracking database (customer-level savings)

Because the definitions of *custom measures* and *other measures* is rather vague, we attempted to analyze the breakdown of these savings by more specific technologies or equipment types. The results are shown in Figure 43. Overall, custom measures accounted

for 87 percent of other measure impacts, whereas window film accounted for 10 percent, booster pumps for two percent and motors for one percent.

Figure 43 Non-Residential First-Year Custom and Other Measures Savings by Equipment Type, Program Year 2009



Source: ECONorthwest team analysis of secondary potential study data and Program Year 2009 program tracking database (customer-level savings)

Custom can potentially cover a wide range of measures, but most custom projects appear to have the following characteristics:

- The military non-residential and other non-residential sectors accounted for almost 90 percent of custom measure savings.
- More than 85 percent of custom measure savings came from projects enrolled in the Commercial and Industrial New Construction program.
- A review of custom project descriptions in the tracking database indicated that low-e windows accounted for more than 80 percent of custom measure savings in the military non-residential sector, while the remaining military savings came from lighting.

Taking these findings together, it appears that low-e windows in military non-residential new construction projects represent most of the total savings from custom measures. There appears to be potential to broaden the range of custom projects initiated by customers and supported by Hawaii Energy by educating both customers and trade allies with descriptions of illustrative projects and the associated incentives available from the program.

Because savings from window film represent 10 percent of custom and other savings, we also investigated those savings in the context of the overall market. We found that program savings from window film were concentrated in the office sector, which accounted for 83

percent of the total. In contrast to lighting and cooling, medium-sized offices installed almost three times as much window film as large offices.

We also interviewed window film contractors to learn their perspective on the program. Although there are only a few window film contractors operating in the non-residential market, most are aware of the Hawaii Energy program and promote it to their customers. Several noted, however, that incentives for window film in Hawaii are lower than those elsewhere in the country ($0.35/sq. ft. vs. up to $1.00/sq. ft. in Florida and $1.35/sq. ft. in California). Emphasizing the lack of interest in the program, two participating contractors interviewed said that only 15 to 20 percent of their window film sales received rebates through Hawaii Energy , perhaps because a popular brand of film does not qualify for the program. Therefore, it seems that an opportunity exists to increase the savings from this measure through a combination of marketing outreach and an increase in incentives to levels consistent with those of other solar film programs.

7 Conclusions and Recommendations

This report summarizes the results of the evaluation of Hawaii Energy's first year in delivering energy efficiency services (from July 1, 2009 to June 30, 2010). The program year included the period during which programs previously run by the HECO utilities were switched to the independent consultant R.W. Beck.

Hawaii Energy, with the cooperation of the HECO utilities, has done a commendable job transitioning the program. The data transfer was accomplished quickly with little interruption, and programs underway were effectively absorbed into the new organization and were administered as they had been under the old management with little disruption. Hawaii Energy did make one significant change in the program, lowering the rebate amount for a solar water heater from $1,000 to $750, a move that was needed to ensure that funds for other residential measures with higher benefit/cost ratios would be available.

The previous sections of this report have highlighted the nature of the portfolio of programs and have indicated that both the residential and non-residential programs are heavily dependent on lighting measures. To meet the long-term goals set forth by the state in the Hawaii Clean Energy Initiative, Hawaii Energy needs to build its portfolio to include more non-lighting measures and expand its outreach and support to get these measures adopted on a wider scale. The report also finds that program activity is concentrated such that a minority of firms and households are participating and a few sectors, particularly the military, account for a disproportionate share of all activity. To reach long-term goals, the program must soon develop strategies to reach firms and households that have not traditionally participated.

Moving into Program Year 2010, R.W. Beck has proposed a number of program changes and new initiatives that should help expand the program offering. These changes are positive steps that reflect a recognition of R.W. Beck's role in expanding the portfolio. The changes for Program Year 2010 include:

- A refrigerator recycling program
- A direct install lighting program
- A policy change that limits rebates for air conditioners to replacement units only
- The addition of solar attic fans and whole house fans as rebated measures
- Tiered incentives for custom non-residential projects

The impact of these initiatives will be closely monitored over the next year. At the same time, Hawaii Energy should consider implementing other programs, actions, and policies that are used successfully in other states. In the sections below, we provide detailed recommendations for residential and non-residential sectors.

7.1 Residential Sector

The current residential portfolio is dominated by CFL lighting, accounting for 20 percent of the rebates and 78 percent of the first-year energy saving estimates. Solar water heating accounts for another 57 percent of the rebate dollars and 11 percent of first-year energy savings.

Dependence on these two technologies is understandable. Lighting is the dominant technology in every residential program across the United States. The previous utility-based efforts emphasized these two technologies, and their emphasis is logical policy in this year of transition.

As the program matures, Hawaii Energy will need to expand its portfolio of measures and the share assumed by these other measures in reaching overall program goals. Dependence on lighting and solar water heating will not continue indefinitely, as some sub-sectors of the residential market are reaching the saturation point. In addition, federal legislation to eliminate standard incandescent lamps or to require higher efficiency levels will reduce potential energy savings from CFL installations.

7.1.1 Residential Lighting Recommendations

Even as it works to expand its portfolio beyond lighting, the program should continue its upstream lighting program.

- Hawaii Energy pays a $1 upstream rebate per standard CFL. This has resulted in a retail sale price of less than $1.50 per lamp at the national big box retailers that dominate program lighting activity (96 percent of all rebates). At these prices, most of the first cost difference between CFLs and incandescents is eliminated.

- Most states continue to support standard CFL technologies. Although the Northwest Energy Efficiency Alliance (NEEA) has stopped incentivizing standard CFLs, Bonneville continues to support standard CFLs in areas it serves.

- The program needs to continue supporting standard CFLs because loopholes in new federal regulations will allow manufacturers to claim some incandescent bulbs (which are one third as efficient as CFLs) as green alternatives.

Continue efforts to expand sales of CFLs in other retail outlets.

- The program has been successful in broadening the availability of CFLs. CFLs are found throughout the islands in grocery, drug, non-chain hardware stores, and other outlets that have traditionally sold light bulbs. These outlets do not sell a large volume of light bulbs, so prices are normally much higher for incandescent bulbs here than at big box stores. The $1 upstream rebate does not lower the costs of CFLs as much, and retail prices are significantly higher at these locations than they are at big box stores. More importantly, the price differential between incandescent bulbs and CFLs is more pronounced at these low volume stores. The

program may want to consider a different rebate structure for these retail outlet types.

Expand efforts to broaden awareness, availability, and purchase of specialty CFLs.

- The program offers $3 and $5 upstream rebates for specialty and dimmable CFLs, respectively. As a result, 22 percent of CFLs sold in the study period were specialty CFLs. The program should continue to support these types of rebates because a large portion of remaining screw-in fixtures require specialty CFLs.

- The program should consider marketing efforts that increase awareness of the broader range of CFLs available.

Consider greater support of pin-based CFLs and LED fixtures.

- Lighting fixtures that use pin-based CFLs or LEDs provide a permanent efficiency solution because savings cannot be undone by re-replacement of an incandescent bulb. The program should work with the retail lighting industry to incentivize these types of fixtures.

- As LED lights become more available, the program should consider adding proven brands to its portfolio.

Consider adding educational support on lighting.

- CFLs are different from incandescent lamps and long-term acceptance of the technology requires some understanding of their use. Education is needed in choosing the right kind and intensity of lamp, choosing reliable brands and returning faulty products, and recycling used lamps.

- The program should include retail signage that alerts buyers to bring in burned-out lamps. Based on the general population survey, only 31 percent of owners and 25 percent of renters recycle or return their bulbs to the store.

7.1.2 Residential Appliance Recommendations

Consider higher rebates for higher tiers and lower rebates for lowest tier Energy Star products.

- The current program gives rebates for refrigerators, clothes washers, dishwashers, water heaters, and air conditioners. For each of these, the rebate is the same regardless of the efficiency of the unit. Many of the lowest tier Energy Star products are almost standard equipment. The national data do not seem to show that differences in rebate levels affect the percentages of Energy Star appliances sold. Providing large rebates for the least efficient products may not result in a large amount of additional energy saved.

- On the other hand, offering higher rebates for the highest efficiency products helps create a market for these products. Prices for higher efficiency units may be high because they are stocked in low volumes. Providing a high rebate for such an item will encourage retail units to stock the product, which may make them even more affordable down the road.

Expand the programs by mining for replacement opportunities.

- The decision to limit AC rebates to replacement only was an extremely sound policy move. The program needs to be conscious of encouraging energy growth by encouraging purchase of efficient products.

- The program should continue to aggressively replace aging AC units with new Energy Star units.

- Similar opportunities probably exist for replacing old working refrigerators and freezers. In all cases, the program must make the old unit inoperable and recycle the materials for the savings to be realized.

- The program's success rests more in communicating the energy waste of an old unit than in advertising rebates. Most households are unaware of how much an old refrigerator or air conditioner costs them. Given high electric rates, many of these households will realize rapid paybacks for replacement. The survey found that 20 percent of households who would not turn in their second refrigerator for a $100 rebate were very willing to do so when they found out how much it cost to run each year.

Develop initiatives that reach low-income and renter households.

- The results show that the program is reaching wealthier households. There is much lower program penetration among renters and low-income residents. The lighting giveaways have had some success, and the program should develop more initiatives targeted to these households.

- The replacement of old working refrigerators, freezers, and air conditioners with new efficient ones will likely prove cost-effective even if the program pays for the entire cost. The program may want to charge landlords 25 percent of costs if the occupant is not low income. Again, the program must make the old unit inoperable and recycle the materials for the savings to be realized.

7.1.3 Residential Solar Water Heating Recommendations

The solar water heating program remains the most active in the country. Sales continue despite the drop of the rebate from $1000 to $750. It is important to recognize that the rebate is only one aspect of program success. The solar water heating program marketed the program, encouraged the development of reliable products, developed a group of qualified installers, and inspected the installations to reassure buyers. These elements

created the program. When considering other initiatives, Hawaii Energy should consider the role of each of these elements.

As penetration continues, reaching less wealthy households and renters will become more difficult. Program financing will be a larger consideration if the program is going to reach lower income households and landlords.

7.2 Non-Residential Sector

Lighting was the major contributor to non-residential sector program savings, which were highly concentrated by sector (military non-residential, hotels, offices) and technology (T8s and CFLs). Although reliance on non-residential lighting to achieve program goals is common, there are problems associated with concentrating in a few business sectors and technologies:

- Reliance on sectors with relatively few, large customers (military, hotels/resorts, large offices) allows goals to be met without building infrastructure to reach other markets. Because direct program contact with targeted decision makers can yield significant savings, there is no urgent need to develop the infrastructure that would support a trade ally driven program.

- Very high penetration of the non-residential military and office sectors relative to the total potential estimated by previous studies suggests that similar lighting savings will be more difficult to achieve in the future.

- Although Hawaii Energy has reached out to contractors to help deliver its programs, relatively few trade allies deliver the bulk of lighting installations and the broader market of potential trade allies has only limited involvement with the program.

- Measures that account for 67 percent of savings – regular T8s and CFLs – are well on their way to becoming standard practice and may represent already transformed markets.

HVAC savings were about one fourth those from lighting, and were less than two percent of the 2019 HVAC maximum achievable potential, ranging from less than one percent for most sectors to 6.5 percent for education and 11.7 percent for military non-residential. HVAC savings appear to have been achieved by working with a limited number of customers and trade allies in the military, education, and large office sectors, making such savings more difficult to replicate in sectors with less concentrated decision making.

Savings from custom and other measures were concentrated in the military non-residential and other non-residential sectors, with low-e windows in military non-residential new construction projects representing a significant share of these savings. Window film projects, which accounted for about 10 percent of custom and other savings, were concentrated in the medium office sector. Window film contractors are generally aware of the program but say there is little interest because incentives are relatively low.

7.2.1 Non-Residential Lighting Recommendations

Recommendations with regard to non-residential lighting are designed to address the current over-reliance on lighting measures and large end users. We recommend the following:

- Hawaii Energy should target sectors that are currently underserved by the program, such as retail, healthcare, and small offices. We note that the Program Year 2010 program is addressing some of these markets – the approximately 50,000 schedule-G small non-residential customers – through the direct install program, but there are many mid-size customers who fall outside the market targeted by the direct install program and will need to be reached through a network of trade allies.

- A related recommendation, therefore, is that Hawaii Energy conduct more aggressive outreach to lighting and electrical contractors, with training, promotional materials, and frequent communication on program updates. Extending the program's reach beyond the large military, office, and hospitality sectors will require leveraging Hawaii Energy resources through its network of trade allies.

- One of the benefits of the program should be that it helps to move the market by providing incentives for energy efficient technologies that are not being adopted by the broader market. To that end, we recommend that the program both investigate other lighting technologies or applications and more aggressively promote proven but not widely accepted technologies such as non-exit LEDs, high-bay T5s, third-generation T8s, and various controls.

7.2.2 Non-Residential HVAC Recommendations

Given the huge mismatch between actual savings and potential, the non-residential HVAC market should offer ample opportunities for Hawaii Energy to diversify its sources of savings beyond tried and true HVAC measures. We recommend the following actions as steps Hawaii Energy can take to realize more of these opportunities:

- Target sectors with significant cooling savings potential that are currently underserved by the program, notably small offices, hotels, retail/grocery stores, and healthcare facilities – the larger ones through built-up systems, the smaller ones through package units.

- To reach these markets, identify and select leading vendors for each sector and technology, then train them and provide them with the tools needed to deliver efficient cooling solutions through the program. For packaged HVAC, that would mean working with trade allies – both individuals and trade associations – to develop more contractor-driven marketing approaches that leverage limited program resources. For chillers, work with engineering firms, individual mechanical engineers and organizations such as the American Society of Heating, Refrigeration and Air-Conditioning Engineers to spread awareness of the program

and make it easier for designers to incorporate qualifying models into their projects.

7.2.3 Non-Residential Custom and Other Measure Recommendations

We offer two recommendations related to custom and other measures:

- We recommend that Hawaii Energy more actively promote the custom aspects of the program with specific examples of custom projects based on past experience, together with step-by-step training for trade allies on how to complete the necessary application forms.

- For window film, consider increasing incentives and provide trade allies with support in the form of unbiased information on the savings potential from window film. In addition, make it clear to both trade allies and customers that the application process is straightforward and can reduce the payback associated with window film installations.

7.3 Overarching Recommendations

Cross-cutting recommendations are provided below, grouped according to near-, mid-, and longer-term considerations. Following that, we highlight several policy-related issues that also warrant attention.

7.3.1 Near-Term (2010)

In both the residential and non-residential sectors, the most important near-term recommendation is to maximize the marketing impact of existing channels and relationships and leverage the existing market infrastructure as much as possible. Most importantly, retailers and trade allies are central to the success of the existing programs.

- The program should continue to work with current participating retailers to maximize the visibility of promotional materials and consumer information and should continue to recruit additional stores that are not yet participating.

- Bolstering trade ally participation, in both residential and non-residential sectors, is important for those programs in which participation and purchase-related decision-making is heavily influenced by these entities. Outreach to HVAC contractors, for example, is needed to ensure that all trade allies have accurate information about the program and sufficient information to market the financial incentives to customers at the time of sale. For AC units, for which rebates are offered on a replacement basis only, timing is critical and trade allies are in the best position to influence decision making.

7.3.2 Mid-Term (2011-12)

A theme that has been highlighted throughout this evaluation is the fact that the program will need to evolve away from lighting and move deeper into markets that have not yet been tapped.

- Much of the most cost-effective lighting potential in both the residential and the non-residential markets will likely be captured within the next two to three years of program operation. During this time, it will be important to begin focusing on other end uses, such as HVAC and motors, so that on-going progress toward statewide goals is not interrupted.

- Additional marketing expenditures are likely needed to increase market awareness and support the efforts of trade allies to leverage the program in their sales cycles. Social media campaigns are potentially useful in this regard, depending upon the target audience, and should be incorporated into a broader marketing strategy.

- Moving beyond lighting is likely to require additional attention on building infrastructure that is not yet in place. Training of trade allies, engineers, and other equipment specifiers, for example, is likely needed in addition to straight financial incentives.

- Much of the participation to date has been from larger customers, including military facilities. The program will need to transition toward ways of reaching smaller users as well. Accomplishing this in a manner that is cost effective is likely to be a challenge and will require continued support from market actors to leverage limited program funding.

- New approaches and increased focus is needed in the mid-term to increase participation among low-income customers and renters. These markets overlap considerably in the residential sector and are challenged by split incentives among tenants and property owners.

7.3.3 Long-Term (2013 and beyond)

In the longer term, the initiatives highlighted for mid-term focus will become essential.

- Efforts to move beyond lighting and deeper into other end uses will be imperative as the programs move beyond 2013.

- The ability of the portfolio to meet aggressive statewide goals may require whole new programs that supplement rather than simply augment the current programs. Business and consumer electronics initiatives, for example, are growing in several states and are key to addressing growing energy use associated with plug loads.

- Utilities in California and the Pacific Northwest are placing considerable emphasis on the support of initiatives to commercialize emerging technologies. The State of

Hawaii may need to assess the role of emerging technologies in achieving its goals and either conduct its own commercialization efforts or join in with other states.

7.3.4 Policy and Planning

During the course of conducting this evaluation of the PY2009 Hawaii Energy programs, several policy-related issues were highlighted.

- A more direct link between the Hawaii Energy action plans and the technical potential work conducted by BAH would be extremely useful. This link would help strengthen the analytic rationale for program activities and enable program implementers to focus more clearly on longer-term implementation strategies that will be essential to the attainment of the state's energy efficiency goals.

- The current two-year contracting cycle may not provide a sufficient timeframe to synch the current programs with the long-term strategy. Many of the programs currently in place are in need of a 2-4 year action plan, along with the development of new programs outside of the current program window.

- Because the benefits derived from developing infrastructure initiatives are not likely to manifest in actual kWh savings until the mid-longer term, the TRC is quite high on such investments. As such, a restructuring of performance incentives may need to be considered to provide the implementation contractor with sufficient motivation to develop long-term infrastructure.

Market-based approaches, leveraging trade allies and retailers, may need to be supplemented very aggressively by non-market-based infrastructure. Training to develop an educated workforce of contractors, engineers, and specifiers will be essential to the long-run success of these programs.

8 Appendices

Appendix A: Verification Memo

Appendix B: Technical Reference Manual Review

Appendix C: Sample Design Detail

Appendix D: Research Instruments

Appendix E: Interview Summary Results

Appendix F: Quantitative Survey Results- Banner Tables

Appendix G: Glossary of Acronyms

Appendix H: References