

ENERGY EFFICIENCY IN LOW-INCOME COMMUNITIES ON HAWAI'I ISLAND

Analysis and Recommendations

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Executive Summary

Hawai'i experiences the highest electricity prices in America, due in part to its isolation and its aging utility infrastructure, but primarily as a result of the state's heavy reliance on oil, which accounts for 76% of electricity generation. Within the state, Hawai'i Island has electricity prices above the state average, creating a significant financial burden on the island's low-income population, who will continue to suffer as global oil prices push electricity costs even higher. Compared to Oahu (Table E-1), the state's most developed and populated island, low income households on Hawai'i Island make up a higher percentage of the overall population and spend a larger fraction of their income on electricity. Statewide, low-income households spend 14.2% of their income on electricity as compared to only 4.6% for moderate-income households.¹

	Hawai'i Island	Oahu	State
Median Income (2009)²	\$50,739	\$67,019	\$63,741
Low-income households (2009)¹	23.7%	15.4%	16.8%
Electricity price (2010)³	37¢/kWh	29¢/kWh	-
Income spent on electricity for low-income households⁴	15.2%	13.5%	14.2%

Table E-1. Income and electricity statistics comparison, Hawai'i Island, Oahu and the state

Despite Hawai'i Island's abundant renewable energy capacity, an important energy resource in the near-term is greatly improved energy efficiency across all sectors and demographics. This report focuses specifically on how to improve energy efficiency options for low-income households because they have the most to gain by reducing their energy costs. Spending less of their income on electricity use will allow these families to invest in improving their overall quality of life, a goal that goes hand-in-hand with the state's mandate to reduce its dependence on fossil fuels.

Even though high electricity costs should motivate customers to pursue energy efficiency measures, there are significant obstacles that prevent low-income households from successfully capitalizing on efficiency upgrades:

- **Financing:** There is limited access to affordable financing options that are well suited to low-income families.
- **Split Incentives:** Many families rent their homes, creating a situation where neither the landlord nor the tenant has adequate incentive to invest in efficiency upgrades.
- **Outreach & Education:** The lack of a centrally coordinated, community-focused effort makes achieving maximum efficiency gains across the island more difficult than it should be.
- **Misaligned Performance Indicators:** Hawaii Energy, the state's primary funding source for efficiency, does not have adequate incentives built into their contract with the Public Utilities Commission, to make reducing energy costs for low-income families a high priority.

¹ Low income: below 150% of the federal poverty level; moderate: 150-300%; consistent with Hawaii Energy

² USDA Economic Research Service, County-level Income Data Tables.

³ Hawaiian Electric Company Effective Rate Summaries 2011; rate is for lowest price tier

⁴ 2009 1-year American Community Survey (ACS) Public Use Microdata Sample

This report focuses on these key barriers and suggests a variety of opportunities to address them. Much of the report's data focuses on comparing Hawai'i Island with Oahu, which receives the bulk of efficiency funding. In addition, many of this report's recommendations focus on Hawaii Energy, which contracted with the Hawaii Public Utilities Commission (PUC) to lead efficiency efforts and oversee the state's Public Benefit Fund (PBF). In its first full program year (2009), Hawaii Energy received \$3,026,861 from Hawaii Island customers, but only spent \$950,321 for energy efficiency measures there.

It is important to recognize that there are a variety of organizations already working within the efficiency landscape that will continue to play an important role in targeting low-income households and helping them reduce their energy costs. In addition, this report outlines new policy and programming approaches and includes examples of how other states in the U.S. have addressed these barriers.

This report's primary recommendations are as follows:

- Redefine Hawaii Energy's performance indicators, especially with respect to island and income equity.
- Encourage the State Legislature and the state's utilities to lower the financial hurdle for efficiency and eliminate the split-incentives dilemma through the use of on-bill financing.
- Centralize and expand existing outreach and education efforts in close coordination with existing local organizations and include an education requirement for some programs.

The State of Hawai'i has already proven itself a leader with its commitment to renewable energy and energy efficiency as ways to reduce environmental harm and increase self-sufficiency. Improving existing efficiency programs and creating new, targeted programs in the near future to ensure that low-income families on Hawai'i Island share in these benefits is a critical next step.

1. Introduction

1.1. Electricity on Hawai'i Island

Residents of the State of Hawai'i pay the highest electricity rates in the U.S.¹ The average American paid 10.5¢/kWh in 2010.² Oahu currently has the lowest residential electricity rates on Hawai'i (29-30¢/kWh) while Lana'i has the highest (41-43¢/kWh). Residential rates on Hawai'i Island fall in between 37-40¢/kWh.³ As a remote island chain without any native fossil fuel resources, Hawai'i relies on imported oil for about 76% of its total electricity production as compared to less than 1% nationally (see Figure 1).⁴ The high and rising price of oil drives the drastic price difference between Hawai'i and the mainland. The price variation across islands is largely a result of differences in power plant efficiencies, power purchasing arrangements and other infrastructure.

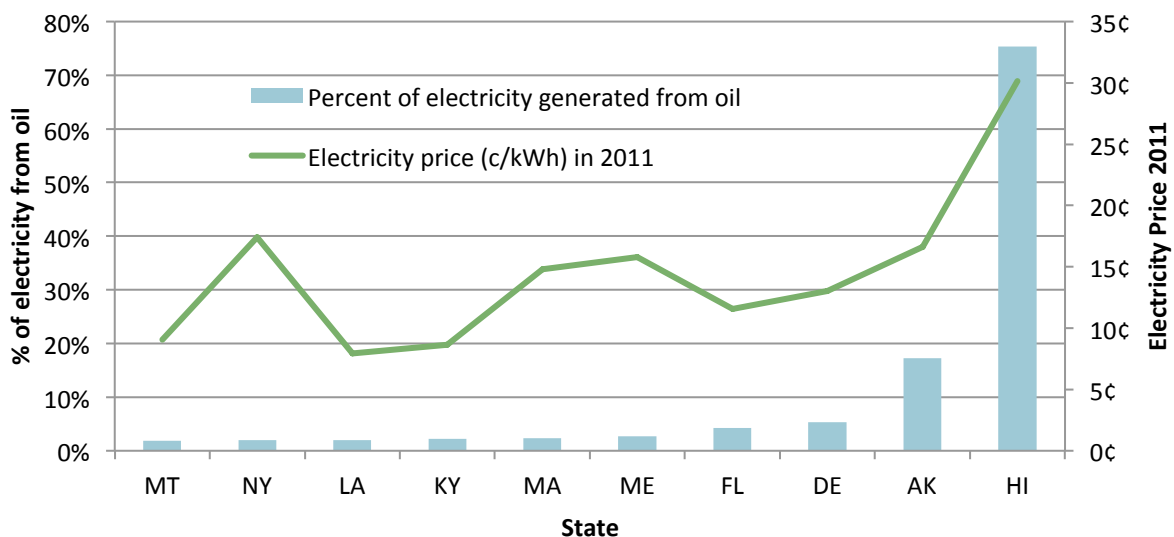


Figure 1. Selected state power generation from oil⁵ and electricity prices

The Hawaii Electric Light Company (“HELCO”) is the sole electric utility on Hawai'i Island. Its power grid is not connected with that of any other island but it is part of the Hawaiian Electric Company (HECO), which also owns the utilities on Oahu, Maui, Lana'i, and Moloka'i. HELCO provides electricity for 77,000 customers on the island (an estimated 5-6,000 households are “off-grid”⁶). Most of the system's electricity generation (69%) comes from fuel oil and naphtha.⁷

¹ U.S. Energy Information Administration (EIA), “Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector, by State,” http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html.

² EIA, “Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector,” http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html.

³ Hawaiian Electric Company Effective Rate Summaries for May, 2011; ranges reflect different tiers.

⁴ 2009 State of Hawai'i Hawai'i Data Book, Department of Business, Economic Development & Tourism.

⁵ Numbers from 2009, states with highest share of oil in electricity generation (excl. DC), EIA

⁶ Interview with Curt Beck, HELCO.

On March 1, 2011, HELCO began introducing a tiered rate structure that is mainly the sum of three charges. The base charge (16.7455¢) and Energy Cost Adjustment Factor (10.635¢)⁸ are the same for all tiers. The non-fuel charge is 12.3362¢ for the first 300 kWh, 14.4467¢ for the next 700 kWh and 15.2774¢ for consumption above 1000 kWh per month. The base charge and the non-fuel charge can only be changed through an extensive approval process with the Hawai'i Public Utilities Commission ("PUC"), known as a rate case, which occurs every few years. The Energy Cost Adjustment Factor can vary on a monthly basis and is calculated by the utility via a PUC-approved process. HELCO instituted this tiered rate system along with all HECO utilities in an effort to encourage energy conservation and to lower peak electricity load.

In August 2010, the PUC mandated that all HECO utilities begin developing a decoupling mechanism to remove the link between revenues and electricity sales.⁹ Traditional rates allow an electric utility to recover its fixed costs and generate a reasonable rate of return. Under decoupling, a rate adjustment mechanism would change the price paid by customers as total system electricity use changes to maintain a constant revenue stream. Only HECO has implemented decoupling on Oahu. HELCO is awaiting final approval from the PUC.¹⁰

A major change in the state's energy efficiency programs occurred in 2008 when the PUC contracted with a for-profit company, Hawaii Energy, to administer the state's energy efficiency programs on Hawai'i Island, Moloka'i, Maui, Lana'i, and Oahu. On Hawai'i Island, Hawaii Energy took over energy efficiency program administration responsibilities from HELCO. In 2009, the State Legislature codified the need for efficiency by enacting a statewide energy efficiency portfolio standard with a target of reducing energy consumption by 30% of forecasted energy consumption by 2030 (4,300 GWh), and beginning the process for separating efficiency from the existing renewable portfolio standard

1.2. Low Income Households on Hawai'i Island & Oahu

The burden of the State of Hawai'i's high electricity prices falls disproportionately on its low-income residents, who already face a high cost of living. This is especially true on Hawai'i Island, which has a higher proportion of low-income people than much of the state. Energy efficiency, therefore, is of the utmost importance on Hawai'i Island, as it saves residents and businesses money on their energy bills. Figure 2 shows that there is a higher percentage of households living under 150% of the federal poverty level. More of Oahu's population has an income level above 300% of poverty level than Hawai'i Island's. Similarly, the median income on Hawai'i Island in 2009 was \$50,739, compared to \$67,019 for Oahu and \$58,167 for Maui.¹¹

⁷ HELCO Electricity Production & Purchased Power Summary, 2010.

⁸ For June, 2011

⁹ Press Release – Hawaii PUC, Aug 31, 2010.

¹⁰ PUC Docket 2009-0164, Dissenting Opinion of Leslie Kondo, Commissioner.

¹¹ USDA Economic Research Service, County-level Income Data Tables.

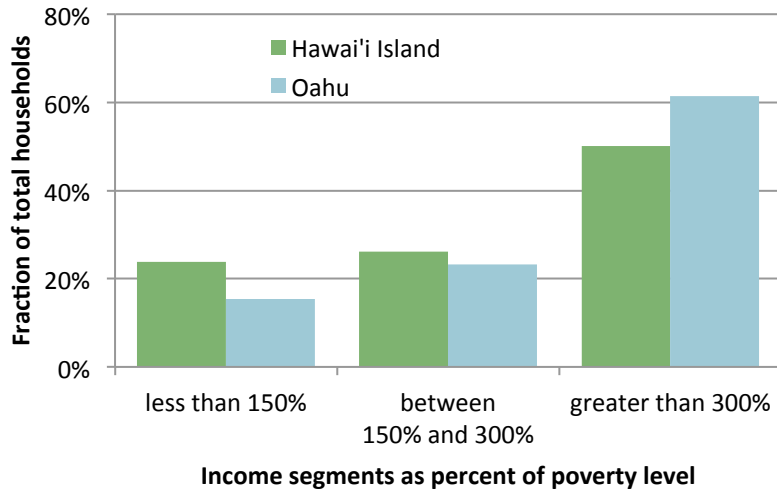


Figure 2. Distribution of total households by poverty level

The average household on Hawai'i Island spends \$191 per month on electricity, whereas an average Oahu household spends only \$157. These electricity expenditures represent 6.4% and 3.7% of household income, respectively.¹² Statewide, the proportion of income that the average household spends on electricity is 4.3%; nationwide, the percentage is 2.2%, almost three times less than that of Hawai'i Island.¹³

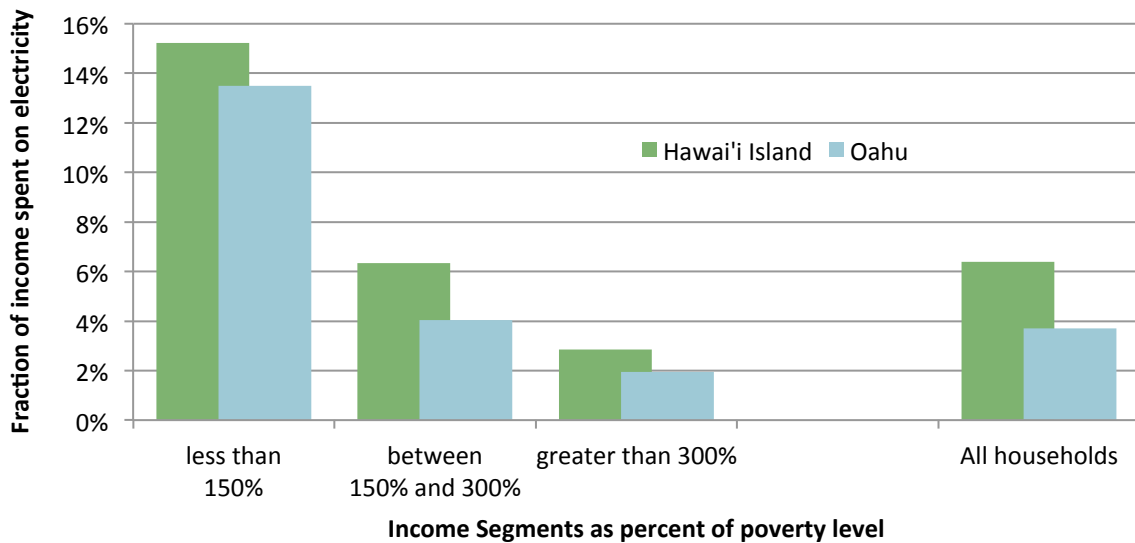


Figure 3. Fraction of household income spent on electricity

¹² From PUMS – 2009 1-year sample. Details of the calculations can be found in Appendix D: Calculation of Household Statistics. Data is self-reported and may include after-subsidy cost for some households.

¹³ USDL Bureau of Labor Statistics, Consumer Expenditure Survey, 2009

High electricity prices have a disparate impact on low-income households on Hawai'i Island, where those households spend more money on electricity than they do on Oahu, both in real terms and as a percentage of their income. As Figure 3 shows, the average household on Hawai'i Island with an income below 150% of the federal poverty level spends 14.8% of that low income on electricity, whereas the 150% to 300% segment spends only 6.3% (Figure 3). When compared to households on Oahu, households on Hawai'i Island spend a higher fraction of their income on electricity in every income segment.

As Figure 4 demonstrates, the fraction of households that rent their homes is larger for lower income household: more than half of the households below 150% of the poverty level . Within each income segment this rental proportion is also higher on Oahu than on Hawai'i Island. Because renting is more prevalent in lower income households, the average renter spends a higher fraction of income on electricity than the average homeowner (Figure 5).

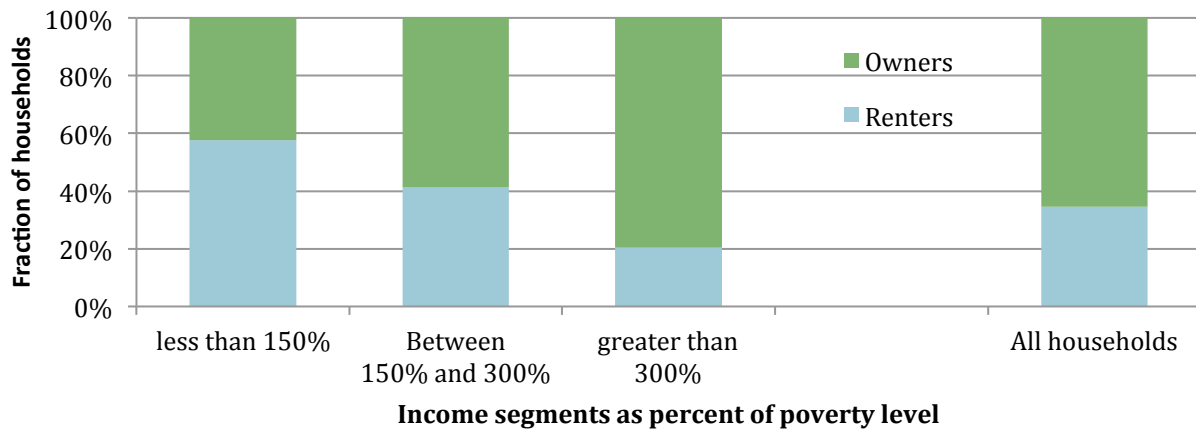


Figure 4. Fraction of renters and owners per income segment, Hawai'i Island

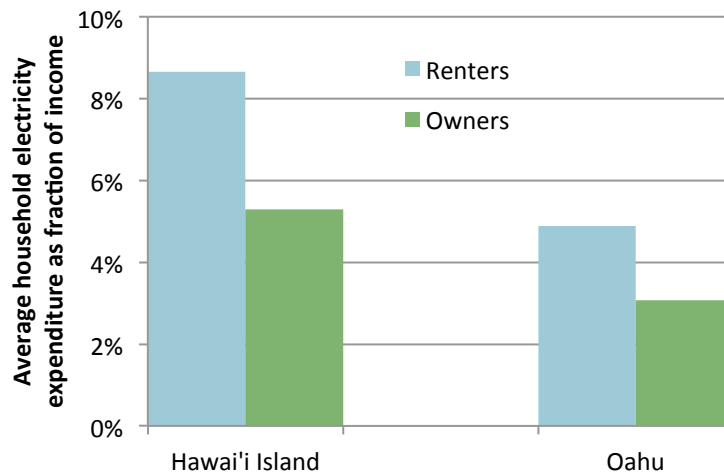


Figure 5. Average household electricity expenditure as fraction of income, renters vs. owners

2. Energy Efficiency in Low Income Communities

2.1. Obstacles to Energy Efficiency Deployment on Hawai'i Island

As the preceding section demonstrates, high electricity prices particularly affect low-income households on Hawai'i Island. While these households would benefit from cost-saving energy efficiency improvements, deploying energy efficiency measures to low-income households can be difficult for several reasons described below. The first three obstacles are common both inside and outside of Hawai'i, Hawai'i Island, and the low income demographic. The last, however, is a problem specific to the state and directly impacts Hawai'i Island.

Limited access to affordable financing

Although tax credits and rebates can considerably reduce the upfront cost of energy efficient appliances for low-income households, the remaining capital investment can still be prohibitive.¹⁴ Similarly, low-income households often have limited success with currently available financing programs, such as Hawaii Energy's Hot Water, Cool Rates program and First Hawaiian Bank's EnergySmartsm zero-interest solar loans, because of poor credit ratings.

Lack of coordinated community outreach and education programs

A number of non-profit groups have been actively engaged in educating communities about ways to improve efficiency in the home. Nevertheless, there is an absence of a strong, coordinated effort to increase penetration of energy efficiency and conservation measures. Because of its mandate, Hawaii Energy is the ideal actor to bring together these individual efforts, yet its current presence on Hawai'i Island is limited, with only one part-time employee. During interviews conducted on the island with groups and individuals working in the efficiency field, a number of local stakeholders were unaware of the rebates and programs offered by Hawaii Energy and several had never heard of Hawaii Energy.

Split incentives hinder the wider adoption of energy efficiency upgrades

The proportion of renters is of particular importance to energy efficiency because of a phenomenon known as split-incentives. A common example of split incentives is the landlord-tenant, or principal-agent, problem. Simply put, if the tenant pays the electricity bill for a property, the landlord has little reason to invest in energy efficiency, as he or she would incur only the cost and none of the energy savings benefits of the investment. With 58% of the low-income households living in rental housing on Hawai'i Island, the principal-agent problem is especially important here and should be addressed with targeted policies and innovative financing solutions

¹⁴In the case of solar water heaters, the enhanced Hawaii Energy solar water heater rebate (\$1,500), combined with a 35% state tax credit and a 30% federal tax credit, will reduce the cost of a typical system from about \$6,600 to \$1,785. This remaining cost is still prohibitively high for many low-income households.

Hawaii Energy’s misaligned performance incentives

The performance incentives in Hawaii Energy’s contract with the state PUC do not encourage sufficient outreach to and targeted programs for low-income households on Hawai’i Island. In the 2009 program year, Hawaii Energy did not meet its target to achieve equitable distribution of program funds among islands, although the PUC incentivized it to do so. In addition, Hawaii Energy did not spend the total amount it had budgeted for residential low-income programs.

2.2. Current Efficiency Options for Low-Income Families

Rebates & Appliances

- **CFL Swap:** Coordinated by the Kohala Center and funded by Hawaii Energy and the Blue Planet Foundation, this program helps local community groups (mostly student-run) raise money by paying them 40¢ for each compact fluorescent lightbulb (“CFL”) successfully exchanged with an incandescent bulb. To date, 23 community groups have participated and over 30,000 bulbs have been distributed.
- **High Efficiency Water Heaters:** Offered by Hawaii Energy, this program provides a \$40-\$70 rebate (depending on tank size) for high-efficiency water heaters. Hawaii Energy also offers a \$175 rebate for heat pumps.
- **ENERGY STAR Appliances:** Offered by Hawaii Energy, this program provides varying levels of rebates for qualifying purchases, summarized below.

Appliance	Rebate
Ceiling Fan	\$40
Clothes Washer	\$50
Dishwasher	\$50
Window A/C Unit	\$50
Refrigerator	\$50
Ductless Split A/C Unit	\$110

Table 1. ENERGY STAR Appliance Rebates Offered by Hawaii Energy¹⁵

- **Hot Water, Cool Rates:** This is a \$750 (briefly \$1,500) rebate program offered by Hawaii Energy for the installation of a solar water heater. It can be combined with a 30% federal tax credit and 35% state tax credit to reduce the installation cost from over \$6,600 to about \$2,000. Additional financing options from this program are also available, as described below.
- **Central Air Maintenance:** Offered by Hawaii Energy, this program offers a \$50 rebate for maintenance performed by a certified contractor on a central A/C unit.
- **Trade Up for Cool Cash:** Coordinated by Hawaii Energy, this is a federal stimulus-funded \$250 rebate for ENERGY STAR refrigerators. Hawaii Energy also worked directly with the Council for Native Hawaiian Advancement to offer \$250 rebates for refrigerators and washing machines for homeowners on eligible Hawaiian Homelands. Both programs existed for a limited time in until funds were exhausted.

¹⁵ Hawaii Energy “Rebates for Your Home,” <http://www.hawaiienergy.com/58/for-your-home>.

Home Retrofits & Upgrades

- **Weatherization Assistance Program (WAP):** Coordinated by the Hawai'i County Economic Opportunity Council (HCEOC), this program offers federal assistance for a range of efficiency upgrades, including low flow showerheads, ENERGY STAR refrigerators, CFLs, and solar water heaters. HCEOC chooses participants based on need, but qualified recipients must have a household of at least four people and monthly electricity use of at least 500 kWh. WAP upgrades include an initial energy audit and subsequent follow-up assessments after installation.
- **West Hawaii Sustainable Energy Project (WHSEP):** Coordinated by the One Island organization and funded by the USDA Office of Rural and Community Development, this program provides for up to \$5,000 in grants for solar energy retrofits and new installations, both off-grid and grid-tied. Recipients must reside in a distinct geographic area on the southwest part of Hawai'i Island. Households must be at or below 200% of the poverty level on Hawai'i (e.g. \$50,720 for a family of four) to be eligible for a full grant; households outside of that range must be willing to make a matching cash commitment.
- **Homestead Energy Program:** Coordinated by the Council for Native Hawaiian Advancement, this program provides grants and loans of up to \$6,500 for solar water heaters and PV systems. Homeowners must be on qualified Hawaiian Homelands.¹⁶ These grants and loans are funded by Hawaii Energy, the Department of Hawaiian Homelands, the U.S. Department of Transportation, and U.S. Department of Agriculture, and include pre-and post installation energy assessments.

Loans & Subsidies

- **Low-Income Housing Energy Assistance Program (LIHEAP):** Coordinated by the Hawai'i County Economic Opportunity Council (HCEOC), LIHEAP offers a direct federal subsidy for families at or below 150% of the poverty level set for Hawai'i. The qualifying income for a family of four cannot exceed \$38,565. This subsidy, which applies directly to electricity bills, is offered from June 1-30 of each year, with the average subsidy for the State of Hawai'i at \$717 and the maximum at \$1,143.¹⁷
- **Hot Water, Cool Rates:** Coordinated by Hawaii Energy, this program offers low interest loans from a variety of lenders to help finance the cost of installing a solar water heater. These loans do not have an income cut-off, but require income verification and other credit approvals. This is in addition to the rebate supplied by this program.

Organization	Term	Interest Rate	Amount
First Hawaiian Bank	5 years	0%	\$5,000-\$7,000
First Hawaiian Bank	10 years	1.99%	\$7,000+
Hawaii First Bank	5 years	0%	\$5,000-\$8,000
Council for Native Hawaiian Advancement	10 years	3%	\$5,000-\$6,000

Table 2. Loan Terms offered for Solar Water Heaters

¹⁶ Hawaiian Homelands are areas reserved by federal law for settlement by native Hawaiians

¹⁷ U.S. Department of Health & Human Services, Hawai'i Hawai'i LIHEAP Guidelines, <http://liheap.ncat.org/profiles/Hawaii.htm>.

Education

- **Home Energy Use Workshops:** The Kohala Center and Hawaii Energy together sponsor a series of workshops that have taken place throughout Hawai'i Island to educate homeowners about how to understand their electric bills and how to conserve energy around the home. The workshops, led by a community leader with a background in the utility sector, teach residents how to: understand their electricity bill, measure their showerhead flow rate and conduct a basic cost-benefit analysis to determine whether it is worth the money to buy newer, more efficient appliances.
- **One Island WHSEP Small Group Technical Assistance Workshops:** Homes, farms, non-profits, and small businesses eligible for One Island's West Hawaii Sustainable Energy Project participate in small group discussions on home energy use with other residents who have made or are making similar efficiency improvements. These groups focus on evaluating home energy consumption and understanding and implementing options for decreasing costs.

Current Efficiency Options Do Not Adequately Address Obstacles

As noted above, there are a number of options for low-income households to undertake efficiency upgrades and lower their energy costs. While the majority of the current programs have achieved high utilization rates, there are still significant opportunities for improvement. Overall, the current programs available offer a scattered approach and do not adequately address the three primary obstacles that low-income families face in adopting energy efficiency practices. First, financing programs like Hawaii Energy's Hot Water, Cool Rates that offer zero or low-interest rate loans are underutilized, as many low-income families are either reluctant or unable to apply for these loans. The administrative process can be cumbersome and many families may not have the sound credit necessary to qualify or the ability to pay.

Second, education and outreach efforts have thus far been able to target only a very small portion of the overall population. The current workshops, which empower residents by giving them simple tools to understand their energy use and decrease it if they choose, represent an excellent educational approach, but ultimately have an extremely limited reach. As a result, many homeowners are still unaware of the rebates and other options available to them. Lastly, achieving significant home upgrades and purchasing large appliances (washer/dryers & refrigerators) will remain a problem for those families living in rental properties that face the problem of split incentives.

3. A Closer Look at Hawaii Energy

Hawaii Energy is the most important and well-funded provider of energy efficiency programs and services in the State of Hawai'i. It is, therefore, the organization best positioned to address the key obstacles that prevent increased deployment of energy efficiency on Hawai'i Island.

Funding for state-sponsored energy efficiency programs comes from Hawai'i's Public Benefits Fund (PBF), collected by the different utilities from their ratepayers. For the 2009 and 2010 program years, the PBF was 1% of the total revenues of each of the utilities, rising to 1.5% in 2011 and 2012 and 2% from 2013 onward. The PUC contracted R.W. Beck, a subsidiary of Science Applications International Corporation (SAIC), to serve as the Public Benefits Fund Administrator (PBFA) with the new moniker "Hawaii Energy." Under the terms of this agreement, Hawaii Energy leads energy efficiency efforts across the state and uses the PBF to fund programs and incentives on each of the islands, as well as cover its operation and management expenses.

Before Hawaii Energy, efficiency efforts had been coordinated by each island's own utility: HECO for Oahu, Maui Electric Company (MECO) for Maui, Moloka'i, and Lana'i, and HELCO for Hawai'i Island. In 2006, the Hawai'i state legislature authorized the PUC to transfer the existing demand side management surcharge from the HECO Companies to Hawaii Energy. Although it no longer has responsibility for initiating or implementing energy efficiency programs, HELCO still maintains some basic educational outreach efforts on energy conservation and efficiency and also helps its large commercial users manage their energy demand.

Hawaii Energy's contract will run until the end of 2013, with the possibility of a 3-year extension. The initial two-year budget (2009-10) is \$38.4M, of which 70% is designated for direct incentives to ratepayers in the form of rebates or other services. An additional \$7M from the 2009 American Recovery & Reinvestment Act was included in the budget to fund Hawaii Energy's programs. The program years commence on July 1, so only one full year (2009) has passed thus far.

Performance Indicator	% of 2009 Performance Award	% of 2010 Performance Award
Cumulative Energy Savings (kWh)	40%	40%
Peak Demand (kW)	15%	10%
Total Resource Benefits (\$)	30%	30%
Market Transformation	10%	10%
Island Equity	5%	10%

Table 3. Hawaii Energy Performance Indicators and Awards

Hawaii Energy is unusual in that there are very few PBFs nationwide that are managed by a for-profit company. The success of the program is measure by five performance indicators (summarized Figure 3 and Table 4): Cumulative Annual Electric Energy Savings, Total Resource Benefits, Summer Peak Demand Savings, Market Transformation, and Island Equity. According to its contract, Hawaii Energy can receive a \$700,000 award for meeting the performance targets, and up to \$833,000 for exceeding them. This is in addition to its operations and management costs in the program budget. In its first full operating year (2009), Hawaii Energy claimed 93% (\$653,792) of the target contract reward. It met or exceeded all of the indicators, with the exception of island

equity (which is also the metric with the lowest weight). Specifically, Hawaii Energy received \$3,026,861 from Hawaii Island customers, but only spent \$950,321 for energy efficiency measures there. Hawaii Energy is headquartered in Honolulu, but also has outreach programs across all islands (with the exception of Kauai, which operates its own utility cooperative). For Program year 2010, it employed one half-time staff member to assist in coordinating its outreach efforts on Hawai'i Island, who became full-time as of May 2011.

	Target	2009 Results	% of Target
Residential Energy	68,722,000 kWh	66,486,914 kWh	97%
Commercial Energy	57,301,000 kWh	46,672,459 kWh	81%
Peak Demand	20,097 kW	22,767 kW	113%
TRB	\$140,079,739	\$126,547,369	90%
Market Transformation			
Emerging Technologies	20	21	105%
Trade Ally	40	423	1058%
Island Equity			
Oahu	\$8,043,361	10,086,557	+25%
Hawai'i Island	\$1403,448	950,321	-32%
Maui	\$2,405,320	815,251	-66%

Table 4. Hawaii Energy performance indicator summary for 2009

3.1. Performance Indicators

Annual (Cumulative) Energy Savings

This performance indicator measures the annualized energy savings achieved in the current program year. Residential and commercial programs are tracked and awarded separately for a total of \$280,000 or 40% of the contract award. Hawaii Energy calculates savings separately based on a documented engineering estimate for each efficiency measure implemented (e.g. a CFL or a solar water heater). As shown in Table 5, the actual savings are reported at the generation level, taking into account transmission and distribution losses for each island as well as a realization rate, which adjusts the calculated savings to a “claimable” savings, called “PBFA Net Level Savings.” This includes estimates of free-ridership, or the number of people who received an incentive but would still have purchased the efficiency technology without it. There is no real-time data-driven verification of these savings.

	Customer Savings	System Losses	Gross Level Savings	Net-to-Gross Ratio	PBFA Net Level Savings
Oahu	116,985,432	11.17%	130,052,704	73%	94,938,474
Hawai'i	12,855,492	9.00%	14,012,487	73%	10,229,115
Maui	9,808,510	9.96%	10,785,438	73%	7,873,370
Lana'i	61,937	9.96%	68,106	73%	49,718
Moloka'i	85,581	9.96%	94,105	73%	68,697
Total	139,796,953	10.88%	155,012,840	73%	113,159,373

Table 5. Energy (kWh) Reduction by Impact Level and by Island.

Peak Demand

Reducing peak load is intended to reduce the cost of energy for customers because it helps avoid the need to acquire more generating resources or rely on the least efficient plants currently in the generation mix. The peak demand reduction target for 2009 was 20,097 kW, which Hawaii Energy exceeded. The target for 2010 is 23,126 kW. Originally this indicator represented 15% (\$105,000) of the total contract award but this was decreased to 10% (\$70,000) for the 2010 program year. As with annual energy savings, the annual peak demand reduction calculation is based on the incentives distributed and not a measured change in peak demand.

Total Resource Benefits

The total resource benefits (TRB) are calculated in a similar way as the annual energy savings and peak demand indicators. This indicator goes further to convert kWh and kW saved to economic value by taking the net present value of the lifetime avoided resource acquisition cost to the utility. For discounting, Hawaii Energy uses a rate of 6%. Each measure has a distinct assumed lifetime for calculation purposes. The target TRB for 2009 and 2010 is \$140,079,739 and \$148,596,954, respectively. This accounts for 40% (\$210,000) of the total contract award.

Market Transformation

The market transformation performance indicator is not based directly on energy savings. It constitutes 10% of the total contract award, or \$70,000. Hawaii Energy's success depends on its meeting discrete milestones in five categories (it was only required to meet the first two milestones in 2009):

- Complete twenty or more projects that make use of emerging technologies.
- Verify 40 program applications from trade allies who contract with Hawaii Energy.
- Complete ten retrofits of state buildings.
- Launch a commercial retrocommissioning program.
- Sign partnership agreements with at least four community organizations.

Island Equity

Each island (with the exception of Kauai) has a separate utility whose ratepayers contribute to the state's PBF. The PUC decided the program benefits for each island should be proportional (within 20%) to their contribution to the fund. For 2009, success in this performance indicator depended on the value of the direct incentives distributed to each island. For 2010, it is calculated based on energy savings per island. The award weight was 5% (\$35,000) for 2009, but increased to 10% (\$70,000) for 2010. This is the only metric that resulted in no award money being distributed to Hawaii Energy for the 2009 program year.

Program Year 2009	PBF Contribution		PBFA Expenditures	
Oahu (HECO)	\$18,024,928	74%	\$10,086,557	85%
Hawaii (HELCO)	\$3,026,861	13%	\$950,321	8%
Maui (MECO)	\$3,155,1056	13%	\$815,251	7%

Table 6. Financial flows between customers and Hawaii Energy

A Note on Low-Income Contributions to the PBF

On Hawai'i Island, low-income households¹⁸ contributed an estimated \$250,000 to the PBF, about 17.8% of Hawai'i Island's total residential customer contribution. For program year 2010 the total residential Hawaii Energy program budget is \$8,581,758, of which \$350,750 or 4.1% is designated for low-income programs. The total residential program budget in 2009 was \$10,181,315 of which \$271,119 or 2.7% was designated for low-income programs. The overall program in 2009 spent 88.7% of the budgeted funds. Hawaii Energy spent 51.4% of its residential low-income budget. All other incentive programs also had unspent funds, but were closer to 100%.

	Budget	% Spent	Unspent
Operations and Management			
Efficient Water Heater	\$1,207,347.00	99.6%	\$4,833.24
New Construction	\$84,912.00	96.6%	\$2,903.42
Energy Solutions for the Home	\$889,125.00	83.6%	\$145,754.98
Residential Low-income	\$33,344.00	95.0%	\$1,662.97
<i>Total Operations and Mgmt.</i>	<i>\$2,214,728.00</i>	<i>93.0%</i>	<i>\$155,154.61</i>
Education & Training			
	\$63,450.00	61.0%	\$24,776.98
Advertising/Marketing			
	\$341,729.00	51.5%	\$165,776.54
<i>Total Non Incentive</i>	<i>\$2,619,907.00</i>	<i>86.8%</i>	<i>\$345,708.12</i>
Residential Incentives			
Efficient Water Heater	\$3,093,610.00	97.4%	\$79,965.00
New Construction	\$1,001,080.00	95.8%	\$41,750.00
Energy Solutions for the Home	\$3,228,943.00	82.6%	\$563,144.45
Residential Low-income	\$237,775.00	51.4%	\$115,477.79
<i>Total Residential Incentives</i>	<i>\$7,561,408.00</i>	<i>89.4%</i>	<i>\$800,337.24</i>
<i>Total Residential Programs</i>	<i>\$10,181,315.00</i>	<i>88.7%</i>	<i>\$1,146,045.36</i>

Table 7. Program year 2009 residential budget and expenditures for Hawaii Energy¹⁹

¹⁸ Defined as households with an income below 150% of the poverty level used by the American Community Survey.

¹⁹ Hawaii Energy, Annual Report Program Year 2009. Submitted to Hawaii Public Utilities Commission, September 10, 2010.

4. Energy Efficiency Programs in Other States

Most states require gas and electric utilities to administer energy efficiency programs for the benefit of their ratepayers. In many cases, the same state agency or contractor that administers utility bill assistance programs like LIHEAP runs the low-income programs separately from the primary efficiency programs. Few states such as Hawai'i have taken the path of contracting the management of state energy efficiency programs to third-party organizations (Table 8).²⁰

In the U.S., an average of 23% of program expenditures go to residential programs and 8% to low-income specific programs. The Consortium for Energy Efficiency data analyzed for this report revealed no relationship between state poverty rate and low-income energy efficiency program budgets. In the proportion of residential spending dedicated to low-income households, Hawai'i ranked 32nd of the 35 states reporting, with eight additional states reporting no low-income spending.

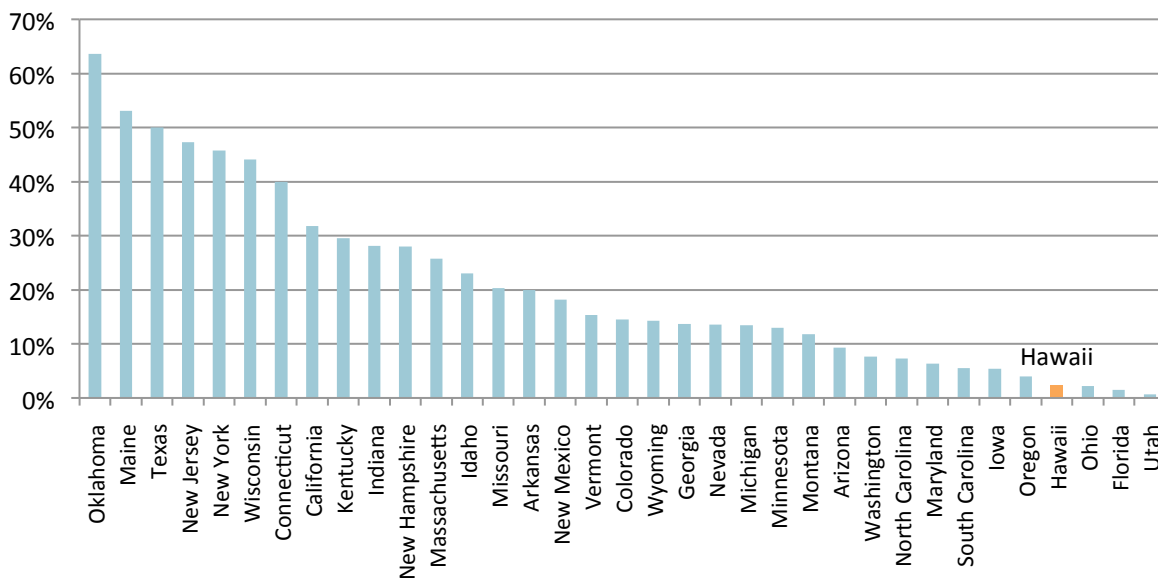


Figure 6. State ratepayer-funded low-income program spending, as % of residential programs²¹

Many states pay performance incentives to investor-owned utilities for their programs to make energy efficiency an attractive investment. Some states such as California and Arizona allow utilities to recoup a percentage of the calculated electricity savings through customer bills. Others may simply offer a flat fee or percentage of program costs. In almost all cases, a charge on customer bills provides the funding source.

²⁰ For a more detailed description of state programs outside of Hawai'i, see Appendix B: .

²¹ The Consortium for Energy Efficiency, State of the Efficiency Program Industry 2010. Figures are reported not by organization but by state so they may differ from individual organization budgets. Four states did not report energy efficiency budgets and eight states did not include separate RLI budgets.

	Administrator Type	Performance Incentives
New Jersey Clean Energy Program	<ul style="list-style-type: none"> ▪ For-profit. Residential and commercial contracts separate. ▪ Utilities handle low-income separately. ▪ Independent evaluation 	<ul style="list-style-type: none"> ▪ Financial ▪ Annual totals ▪ Energy Savings ▪ Program milestones
Focus on Energy (Wisconsin)	<ul style="list-style-type: none"> ▪ For-profit. ▪ State agency handles low income. ▪ Independent evaluation 	<ul style="list-style-type: none"> ▪ Financial (pending) ▪ 4-year totals ▪ Energy savings ▪ Cost per kWh ▪ Customer satisfaction
Oregon Energy Trust	<ul style="list-style-type: none"> ▪ Non-profit, government created ▪ State agency handles low income. ▪ Contracted assessment 	<ul style="list-style-type: none"> ▪ Not financial ▪ Annual totals ▪ Demand reduction ▪ Levelized cost per kWh ▪ Budget management
Efficiency Vermont	<ul style="list-style-type: none"> ▪ Non-profit, government contracted ▪ Shares low-income with as state agency ▪ Independent evaluation 	<ul style="list-style-type: none"> ▪ Financial ▪ 3-year totals ▪ Energy Savings ▪ Demand reduction ▪ Avoided costs ▪ Separate penalties: <i>Benefit-cost test</i> <i>Low income spending</i> <i>Residential spending</i> <i>Geographic equity</i> <i>Small business savings</i>

Table 8. Example state programs with third-party administrators.

5. Recommendations

5.1. Reexamine Hawaii Energy's Performance Incentives

Nowhere else in the U.S. is there an intrastate energy system with such geographically isolated grid systems. Equitable distribution of program funds to each island is, therefore, an issue of particular importance to Hawai'i's energy efficiency program administration. It is suboptimal for funds from one discrete island system to pay for programs on another. Hawaii Energy's incentive structure should be reevaluated to better reflect the importance of equitable distribution of funds to each island.

During the last program year, only 5% (\$35,000) of Hawaii Energy's performance compensation was devoted to achieving island equity. As previously mentioned, Hawaii Energy did not meet this island equity goal in 2009. For the current program year, the incentive was increased to 10% (\$70,000) of the performance pool. This is a step in the right direction. Still, it is not enough to ensure island equity, especially since the island equity target is not for perfect equity, but rather for energy savings to be achieved within 20% of each island's proportional contribution to the PBF.

There are a number of options discussed below for improving Hawaii Energy's contract to emphasize both island equity and overall benefit to ratepayers. Since the contract is an existing legal agreement between the PUC and Hawaii Energy, it may not be possible to make these changes immediately. The most important options are as follows:

- Adjust the way that the total resource benefits (TRB) indicator is calculated and emphasize its importance.
- Eliminate the peak demand indicator as a separate metric and address its importance in the TRB or cumulative annual savings indicators.
- Remove island equity from the performance indicators and make it a requirement under the contract or significantly increase its share of the performance pool.

Changing the TRB Calculation

(1) This figure reflects both the present value of avoided energy and avoided capacity. However, the avoided cost estimates used in the calculation are not island specific, but rather based on an interpolated projection of HECO's avoided cost figures for 2009 and the few following years, derived from a now defunct resource planning process. Since the individual islands are isolated systems with different infrastructure, plant efficiencies and marginal costs of production, avoided costs should be calculated on an island-by-island basis, and incorporated into the TRB calculation as such. The result of this change would mean that the resource benefit of a kWh saved on Hawai'i Island would be unique to Hawai'i Island, and would more accurately reflect reality while also encouraging investment in initiatives on islands with higher avoided costs.

(2) Because the avoided costs figure reflects savings from avoided future infrastructure, it does not reflect the current price of energy, which varies greatly among islands. The fact that one kWh saved on Hawai'i Island in program year 2009 saved an average of 33¢ in household energy costs, whereas that same kWh saved on Oahu saved an average of 22¢ is not reflected in any of the performance indicators. In other words, the TRB calculation currently concerns itself with system level benefits, without considering the impact of energy savings on consumers under today's prices.

A consumer impact adjustment could be added in to the TRB calculation to reflect the yearly household savings aspect of energy efficiency since the benefits of energy efficiency improvements are greater and more nuanced than simply the avoided future costs from reduced load. While this calculation will become more difficult under HECO's new, tiered rate structure, it is no less important. Using a simple scaling calculation, the statewide net present value of lifetime customer bill savings from 2009 programs could have been 9% (\$9 million) greater if the funds were distributed according to strict island equity.²²

Eliminate the Peak Demand Indicator

It is important to reduce peak load, as electricity is most costly to the system at the peak. Efficiency measures that reduce peak load should be encouraged. However, devoting a separate indicator to peak demand reduction is largely redundant, especially if TRB is calculated precisely enough to include peak savings, which have a greater avoided cost per kWh than off-peak savings.

Hawaii Energy calculates peak savings per efficient technology, based on a coincidence factor, which estimates the fraction of the time a technology is expected to be using electricity during the peak period. This calculation helps Hawaii Energy identify technologies that shed peak load.²³ These technologies, nevertheless, are likely to be the very same technologies that would be implemented under an incentive structure that lacks the peak demand reduction indicator. Air conditioners are currently the biggest winners, but similar results could be achieved from a TRB calculation that reflected peak reduction priorities. Assigning a greater avoided cost estimate to peak savings would more accurately reflect the true temporal effects of avoided costs while still providing Hawaii Energy an incentive to encourage peak savings. Rolling the peak demand indicator into the TRB indicator would also allow 10% (already reduced from 15% in 2009) of the performance pool to be put towards other indicators or to boost the relative weight of TRB.

Mandate Island Equity or Increase its Share of the Performance Pool

In Hawai'i's past energy efficiency programs, island equity was a requirement simply because each was administered by the individual island utilities. The current program's structure is a progressive and encouraging first attempt to solve the utility efficiency disincentive, but island equity is an important program goal that should be more robustly incentivized, especially given the discrete nature of individual island energy systems and their respective utilities.

(1) Mandating that island equity be achieved is an obvious way to make sure that it is achieved. It may be less efficient at first, but as this report has demonstrated with respect to Hawai'i Island, capacity for energy efficiency improvement exists in places where Hawaii Energy has not been focusing its efforts as strongly. Building out capacity on Hawai'i Island, for example, coupled with

²²Calculated incentive distribution assumed to be proportional to actual 2009 distribution; constant 2009 electricity rates; discount rate of 6%, consistent with Hawaii Energy.

²³The peak demand (kW) saved by each residential technology was estimated using their respective coincidence factors is as follows: solar water heater (0.57), CFL (0.012), Energy Star clothes washers (0.26), Energy Star dishwasher (0.05), Energy Star refrigerator (0.04), Energy Star air conditioner [single family (0.224); multifamily (0.167)].

the importance of equitably distributing funding back to those who paid for it, should be weighed at least as heavily as concerns over the ease of returns. This is especially true given that cost-effective returns can be had on Hawai'i Island, and new targets for TRB and/or cumulative energy savings could be negotiated to reflect potential inconsistencies arising from mandated island equity. In the Efficiency Vermont contract on which the Hawaii Energy contract is based, geographic equity is a requirement, not part of a performance indicator award calculation. Failure to achieve the set goals results in a penalty on the total contract revenue.

(2) Alternatively, increasing the island equity indicator's share of the performance pool could also be an effective option if mandatory equity proves unfeasible in contractual negotiations. The island equity indicator's target requires returning savings to each island within 20% of its relative PBF contribution. This target should also be reexamined, as its rationale is opaque and a lower percentage might be equally effective.

Create an Income Equity Indicator

Currently, there is no indicator to promote equity between contributions to the PBF from individual income classes and the incentives they receive. Low income households on Hawai'i Island alone pay into the PBF an amount comparable to the amount budgeted for "residential low income" projects on all islands.²⁴ It is difficult to track whether a given initiative reaches a low income or a non low-income household, and it would probably be impossible to track every initiative as such.²⁵ Similarly, low-income households certainly take advantage of any number of initiatives outside of the RLI program. Still, directing a proportional amount of funding from low-income households to the RLI program could be a useful target to help Hawaii Energy reach the low-income segment and ensure that money contributed to the PBF by low-income households returns to low-income communities.

Create or Modify an Indicator to Encourage Behavioral/Conservation Programs

Energy conservation is different from energy efficiency. Conservation implies that a consumer changes his or her behavior to avoid consuming energy that he or she would have otherwise consumed. Savings from conservation measures are notoriously difficult to quantify. Encouraging conservation measures should still be prioritized, however, especially since the most cost-effective way for a consumer to save energy is to avoid using energy. This point is especially salient for low-income people for whom the upfront cost of energy efficiency investments is a large barrier.

Hawaii Energy's contract already has performance indicators, like market transformation and island equity, which do not translate easily into kWh or kW savings figures, so incorporating a robust conservation education component into the contract could be included in the market transformation indicator, for example, relatively seamlessly. Setting a required participation rate for classes sponsored by Hawaii Energy and/or tracking the number of participants who later pursue efficiency measures could be useful ways to set targets for contract purposes.

²⁴ See section: A Note on Low-Income Contributions to the PBF.

²⁵ For example, asking every person who took advantage of a CFL incentive what his or her household income level is would be impractical.

A Note on the Realization Rate

In order to determine how many kWh savings it can claim (i.e. going from “gross” to “net” savings), Hawaii Energy applies a realization rate to its gross savings figure. This rate, which is 73%, lowers the gross kWh savings based on an assumed free-ridership rate, which reflects the number of people who would have made a specific efficiency improvement regardless of Hawaii Energy’s program or service. The realization rate is assumed to be the same across all islands. Whether this is actually the case is uncertain. For example, free ridership in populations with a higher percentage of low-income households may be lower, since low-income households face a higher relative upfront cost barrier to adoption.²⁶ This dynamic implies that a higher realization rate should be applied to islands with higher percentages of low-income households.

5.2. Implement Better Financing Options for Low-Income Households

There is a broad set of financing options available for overcoming barriers to consumer investment in energy efficiency. Some of the most commonly cited approaches include third-party loans, revolving loan funds, property-assessed clean energy models (PACE), and on-bill financing. These programs can complement rebate or tax credit programs to help further eliminate cost barriers. From the customer standpoint, on-bill financing (particularly the on-bill tariffs model) is the most effective tool among them to tackle the problem of high upfront costs for low-income households.

In an on-bill financing mechanism, a utility typically incurs the costs of an energy efficiency improvement (i.e. installing a residential solar water heater) while the customer repays the investment through a charge on his monthly utility bill. This model eliminates the upfront costs to the consumer by providing financing for all costs not covered through rebates and tax credits. Financing costs are then amortized over a sufficiently long period so that the monthly payments are less than the monthly savings.

There are two types of on-bill financing programs: on-bill loans and on-bill tariffs. On-bill loans function like personal loans so the obligation stays with the customer.²⁷ With on-bill tariffs, the obligation to pay stays with the meter.²⁸ The latter approach addresses the split incentives problem between landlord and tenants, as either entity can initiate the process, but neither has to pay for the upfront cost. Both models allow for a streamlined credit risk screening process as utilities already have both a billing relationship with their customers and access to information about their energy usage patterns and payment histories. On-bill tariffs are often a more accessible financing mechanism, as the credit requirements for on-bill loans tend to be more stringent.

²⁶ According to Hawaii Energy’s 2009 Annual Report, lighting vendors reported that on many of “these [non-Oahu] islands, unless the incentive is 100% of project cost, the customers are not going to make the capital investment” (p. 64).

²⁷Manitoba Hydro runs one of the most successful on-bill loan programs that serves the residential market in North America. For more details see Appendix B.

²⁸Midwest Energy’s How\$mart program is a good example of on-bill tariffs. For more details see Appendix B.

On-bill financing models have been used in residential energy efficiency programs in various states,²⁹ and there are legitimate concerns with the administrative complexities of setting up such a system. In Hawai'i, HECO deemed the model too costly to administer after completing a two-year pilot program called SolarSaver, which installed over 500 solar water-heating systems. In March 2011, the State Legislature stalled SB 182 – a bill that intended to direct the PUC to devise an on-bill financing program that would be backed by the PBF. However, given the unique advantages of the on-bill financing mechanism to address a major impediment in achieving energy efficiency, the State Legislature and the PUC should reassess this model as a viable option to help achieve Hawai'i's energy efficiency targets.

5.3. Perform Better-Coordinated and More Effective Outreach

Despite the current programs and options available to pursue energy efficiency upgrades, the remaining efficiency potential on Hawai'i Island remains high. As such, a more comprehensive, centrally coordinated outreach effort to achieve the remaining efficiency gains will be critical and should focus on two primary areas. First, to educate households on how to better manage their home energy use, with a focus on undertaking behavioral-based efficiency gains that require no upfront capital costs. And second, to increase participation in existing incentive and rebate programs, particularly for those that require some upfront investment from the household.

Increase Education on Household Energy Use and Achieve Behavior-Based Energy Savings

Residents are well aware of high electricity costs, but still may not fully understand the best avenues to pursue in reducing their bill, or what programs are available to help them undertake these actions. In order to overcome this hurdle, Hawai'i Island should focus on providing basic energy education in a similar approach to that currently utilized by the Kohala Center's workshops. These workshops emphasize helping households to first understand their energy use, and then provide them with the appropriate tools and knowledge to make their own decisions on how to adjust their energy use. Attendees learn how to: analyze their electric bill, compare their current appliances to newer models (in order to determine whether an upgrade is worth the added cost), and measure showerhead flow rate. These tools empower a family to take control of its energy use without solely relying on third party expertise. This empowerment approach also includes a strong emphasis on teaching families how to achieve behavior-based energy savings, such as better managing plug load or adjusting settings on water heaters or A/C units. Behavior-based practices require little or no capital investment, yet can yield noteworthy savings, ranging from 2-12% in pilot programs across the U.S.³⁰

It is important to recognize that while the Kohala Center's current workshops utilize the right educational approach, they have a relatively limited reach. Without additional manpower and

²⁹Recent examples of residential on-bill financing programs include, but are not limited to, the Super Bowl Legacy BetterBuildings Project (IN), the New York State Partnership for Innovative Financing of Energy Efficiency Retrofits (NY), the Greater Cincinnati Energy Alliance (OH), Community Power Works (WA), and the Wisconsin Energy Efficiency Project (WI).

³⁰ American Council for an Energy Efficiency Economy, "Visible and Concrete Savings: Case Studies of Effective Behavioral Approaches to Improving Customer Energy Efficiency," October 2010.

significant expansion, they will not reach their potential as effective mechanisms for educating a large portion of the island's population. In addition to expanding these workshops (perhaps by making their attendance mandatory prior to awarding grants or other assistance), additional venues for educating the public should also be explored. For example, community energy advisors (see below for more detailed explanation) can help reach more difficult to reach population segments. Energy efficiency can be integrated into existing education curriculum or after school programs. Kill-A-Watt meters, used to measure plug load, could be distributed to schools for students to use at home, or purchased for local libraries, with residents able to borrow them.

For existing programs, it is important to examine and learn from the model used by One Island, the Weatherization Assistance Program (WAP), and the Council for Native Hawaiian Advancement, which combine grants with a strong educational component. This approach is far more effective in creating a long-term improvement for households when compared to programs like the Low Income Home Energy Assistance Program (LIHEAP), which merely subsidizes energy costs without making an effort to educate the end user.

Increase Access and Participation for Existing Programs

While education and behavior-based efficiency gains hold significant potential, continued installation of capital efficiency upgrades will still account for the bulk of the total potential energy savings on Hawai'i Island. Lighting retrofits, efficient appliances, and solar water heaters are the most common and effective options, and all are currently available at reduced or no cost through existing programs. WAP and One Island, which offer full grants and eliminate the upfront cost to the homeowner, have to date been the most highly subscribed programs, but are limited in their reach due to funding constraints. Programs like Hawaii Energy's "Hot Water, Cool Rates," that are able to successfully promote efficiency upgrades while requiring some upfront investment on behalf of the homeowner, will have a larger impact in the long run. Still, the barriers remain high for this approach: households that are less informed on how to better manage their current energy use are also unlikely to commit to more costly efficiency upgrades that will benefit them in the long run. So, some incentives and rebates should have an education requirement to maximize the impact of each program dollar.

In addition, the island culture that prides itself on self-sufficiency and independence also must be addressed, as some residents may be reluctant to open their doors to unfamiliar third party efficiency specialists. To overcome these barriers and successfully educate residents and increase participation in existing programs, it will be necessary to coordinate closely with established neighborhood groups and community leaders. Community "energy advisors" could be recruited to help households first understand the potential cost savings available, and then help them walk through the entire application process if they choose to proceed with a capital upgrade. It would be preferable if at least some of these advisors were already well-recognized community members, who would be more welcome to go from home to home to schedule an energy assessment, explain recommended energy upgrades, and assist with securing tax credits, financing, and rebates if the homeowners want to enroll in one of the programs offered. They could also assist with installation of basic upgrades, such as CFLs, or low-flow showerheads and teach residents how to conduct a

basic cost-benefit analysis on whether to invest in efficiency upgrades as with the Kohala Center workshops.

Elsewhere in the U.S., The EnergySmart Program in Boulder, Colorado adopted the use of personal energy advisors, while the city of Seattle has just initiated a program that pays local community organizations for each household they are able to recruit and successfully guide through a retrofit.

Recommendation for Hawaii Energy

Given the diverse set of actors in the efficiency landscape on Hawai'i Island, it is critical that an island-wide education and outreach program be developed in close coordination with existing groups. A variety of groups already exist that can both serve as a means to access households, such as homeowner associations, or others that can provide extra manpower, such as after school and summer job programs. Given its knowledge base and mandate, Hawaii Energy is the ideal organization to fulfill the role of leading an improved education and outreach program. By establishing a small office or hiring additional staff on the island, Hawaii Energy will be in a better position to establish personal connections with local stakeholders, understand the needs of local residents, and carry out tailored programs that serve the unique local communities of Hawai'i Island. The success of all current and future efficiency programs will rely on creating a winning formula that leverages existing community networks and combines funding opportunities with improved education.

6. Conclusion

There is a pressing need for energy efficiency in low-income households on Hawai'i Island because:

- Hawai'i Island faces some of the highest electricity rates in a state which itself has the highest electricity rates in the U.S.
- Hawai'i Island has a high proportion of low-income households.
- Low-income households on Hawai'i Island spend a large portion of their income on electricity relative to low-income households on Oahu.

Hawaii Energy is the principal organization in the State of Hawai'i that addresses energy efficiency. It should do more to reach low-income households on Hawai'i Island, focusing specifically on overcoming three major barriers:

- Limited access to affordable financing for efficiency improvements for low-income households.
- Largely uncoordinated community outreach and education programs across various existing organizations.
- Split incentives which hinder the wider adoption of energy efficiency upgrades.

To ensure that Hawaii Energy adequately addresses these barriers and places more emphasis on equity issues, this report recommends that the PUC realign Hawaii Energy's performance incentives, as discussed in depth in the body of this paper, by:

- Changing the TRB calculation to better reflect the real cost of electricity to end-users.
- Eliminating the Peak Demand Indicator and incorporating its effect into the TRB calculation.
- Mandating Island Equity or increasing its share of the Performance Pool.
- Creating an Income Equity Indicator to reflect the low-income contribution to the PBF.
- Creating an indicator or modifying an existing indicator to encourage behavioral/conservation programs.

Hawai'i Energy should also take the lead in ensuring better-coordinated and more effective outreach by engaging existing organizations and building on current successful program models; this includes emphasizing behavioral and conservation-focused education approaches and tying rebates or other incentives to education.

Finally, the State of Hawai'i should implement an on-bill financing program to address both the barriers to affordable financing options for low-income households and the split incentives issue.

Appendix A: Organizations Working on Efficiency on Hawai'i Island

There are a number of organizations working to improve energy efficiency on Hawai'i Island. However, their approaches are segmented, and as a whole the efficiency landscape is composed of a fairly complex system of individual actors. Hawai'i County Economic Opportunity Council (HCEOC) distributes federal funding from the Weatherization Assistance Program (WAP) and the Low-Income Home Energy Assistance Program (LIHEAP). PBF and stimulus funding is distributed directly by Hawaii Energy. Non-profit organizations, such as the Council for Native Hawaiian Advancement (CNHA) and the One Island organization provide additional funding to specific demographic groups. Additional non-profit organizations, such as the Kohala Center and Blue Planet, work to increase education and community understanding of household energy use. This diverse group of actors works in parallel, but direct coordination between these organizations is small.

On the whole, residents on Hawai'i Island are cognizant of their energy use as a result of the island's high energy prices. It is not clear, however, that residents are generally aware of what actions and opportunities are available to help reduce their energy costs and many residents are wary about opening their doors to auditors or other unknown people to perform energy assessments. Despite this, the programs that are currently offered to residents generally achieve high utilization rates and in some cases are over-subscribed.

One Island

Founded in 2004, One Island is a small non-profit headquartered in Honaunau, Hawai'i. Its primary objective is building "learning communities" on the island that reinforce a sustainable lifestyle. Its primary areas of interest include energy, health and wellness, local agriculture, and natural history. One Island operates out of an organic farm and sustainable living center and places a strong emphasis on education and community interaction. The organization administers a USDA Rural and Community Development grant that provides up to \$5,000 grants to eligible households for grants to eligible households, farms, non-profits and small businesses for renewable solar energy retrofits and new installations, including PV, refrigeration and water pumping. Recipients are limited to a distinct geographic area on the southwest side of Hawai'i Island. Households at or below 200% of Hawai'i's poverty level are eligible for a full grant, and households outside of that range must be willing to make a matching cash commitment.

The aspect of One Island's program that is most notable is its emphasis on "learning designs" that support behavioral change resulting in lower energy consumption during the grant process. Grant applicants are organized into groups of 12 individuals and attend two workshops held at One Island's farm-based learning center. The first workshop focuses on educating the participants on how to assess their energy efficiency savings at their homes. In the second workshop, participants share their findings and discuss whether their initial proposed plan for the grant changed. Participants may shift their grant proposal emphasis between on grid or grid-tied PV, solar hot water, solar refrigeration or solar water pumping as they analyze and identify their energy needs and energy efficiency options. The workshops have a strong focus on building friendship, awareness, and leadership among the participants.

Hawai'i County Economic Opportunity Council (HCEOC)

Established in 1966, the Hawai'i County Economic Opportunity Council is one of the oldest non-profit organizations on the island. HCEOC provides a wide range of community services, ranging from funding after school programs to providing transportation for disabled and elderly persons. It began working on energy issues in 1986 and oversees two large federally funded programs, the Weatherization Assistance Program (WAP) and the Low-Income Housing Energy Assistance Program (LIHEAP).

LIHEAP is a direct subsidy provided by the U.S. Department of Health and Human Services for qualified low-income households to receive a one-time payment to lower their electricity bill. In 2009, HCEOC distributed LIHEAP funding to 2,784 households, more than any other island in the state³⁵. WAP is funded by the U.S. Department of Energy and unlike LIHEAP requires that the residents work with certified contractors to conduct an energy audit of their home before they can receive assistance. In addition to completing the audit, the residents must also provide documentation on their income, utility bill data, and attend an educational workshop before they can qualify. WAP provides a range of efficiency upgrades, including low flow showerheads, ENERGY STAR refrigerators, CFLs, and solar water heaters. WAP regulations also require additional follow-up at six and 12 months after the initial installation. Historically, the program provides enough funding to install 10-12 solar water heaters each year, but in 2009, with the additional stimulus funding, a total of 95 systems were installed with approximately 300 qualified families left on the waiting list.

The Kohala Center

Founded in 2001, the Kohala Center is an independent non-profit based on Hawai'i Island that focuses on energy, food, and environmental self-reliance. Much of their efforts around these areas are in partnership with leading academic institutions. The Kohala Center has published a variety of reports on energy sustainability, including a comprehensive baseline analysis in 2007 (with Yale University) and the 2007 Hawaii County Energy Sustainability Plan Recommendations. In addition, the Kohala Center has contributed support and funding (in addition to Hawaii Energy and Blue Planet) for a CFL bulb exchange. The Kohala Center has also sponsored educational workshops in different communities around the island. These workshops, run by a former utility employee, place a strong focus on empowering residents to understand their energy use and take available reductions before investing in new appliances or more significant capital upgrades.

Blue Planet

Founded in 2007 and headquartered in Honolulu, the Blue Planet Foundation's goal is to help the State of Hawai'i completely reduce its dependence on fossil fuels. Blue Planet is active on a variety of fronts, from funding its own clean energy projects to lobbying the state legislature on energy policy. While many of its efforts have been focused on Oahu, Blue Planet has also begun expanding its work with the neighbor islands, with efforts to distribute CFLs and ENERGY STAR appliances

³⁵ Interview – Bettie Wagstaff

(currently being undertaken on Kauai and Moloka'i). Blue Planet has partnered with both the Kohala Center and Hawaii Energy to leverage their funds and increase their reach across the state.

Council for Native Hawaiian Advancement (CNHA)

Founded in 2001, the Council for Native Hawaiian Advancement is a statewide network of over 100 communities that pursues a broad agenda for improving the well-being of native Hawaiians. It operates a variety of loan programs available to families and local communities. CNHA operates the Homestead Energy Program, which provides grants and loans of up to \$6,500 for solar water heaters and PV systems. Similar to the WAP funding, the Homestead Energy Program requires households to work with qualified contractors to perform an energy assessment prior to the installation and a post-installation review. As of March 2011, CNHA had completed or begun installation on 42 homes, with the funding coming from a variety of sources, including Hawaii Energy, the Department of Hawaiian Homelands, the U.S. Department of Transportation, and U.S. Department of Agriculture. In addition, CNHA has partnered directly with Hawaii Energy to promote rebates for solar water heaters and ENERGY STAR refrigerators, washers, and dryers.

HCEI

Many of the energy goals for the state are embodied in the Hawaii Clean Energy Initiative (HCEI). The HCEI began with an agreement signed in 2008 between the Governor, DBEDT, the Consumer Advocate, and the utilities that sets the goals for moving from large oil-fired power plants towards renewables and more distributed generation. They have set a Renewable Portfolio Standard of 25% renewable electricity generation by 2020 and 40% by 2030. Also included in the agreement are plans to introduce a number of other important measures including:

- Electricity rate decoupling; recently approved by the Public Utilities Commission.
- Feed-in Tariffs
- Net energy metering
- "Pay as you save" on-bill financing
- Capped electricity rates for low income groups
- Advanced metering infrastructure

Appendix B: Example Third-party Administered State Efficiency Programs

The New Jersey Clean Energy Program

The NJCEP is one of the only examples besides Hawaii Energy where a state has contracted with a for-profit third party program administrator. The Office of Clean Energy of the Board of Public Utilities provides program oversight. The program administrators are:

- **Applied Energy Group, Inc.:** acts as Program Coordinator; oversees the day to day activities of the contractors
- **Honeywell International Inc.:** acts as the residential programs Market Manager
- **TRC Energy Services:** acts the commercial and industrial Market Manager
- **Individual Utilities:** administer the residential low-income program efficiency program, Comfort Partners.
- **The Center for Energy, Economic & Environmental Policy (CEEPP):** a part of Rutgers, it develops program evaluation plans and energy studies.

A Societal Benefits Charge on every ratepayer’s utility bill funds the NJCEP as well as some other state programs providing direct bill subsidies.

Low-Income Programs

Households are eligible for low-income programs if their income is below 225% of the federal poverty line. All low-income services are free and include weatherization, efficient appliances, and energy counseling. In the 2010 NJCEP budget, \$32,206,497 was allocated for RLI, or 21.5% of the residential energy efficiency budget and 11.7% of the total EE programs.

Program Reporting

The Office of Clean Energy provides extensive reporting on program performance including: demand reduction, customer bill savings and emissions reductions. The OCE is working to include environmental externalities and demand reduction price impacts into program cost benefit analysis. Honeywell’s current residential programs performance incentives are more limited. The Comfort Partners program does not have performance incentives.

Program	Performance Indicator	Target	Incentive
All	Lifetime Electric MWh avoided	1,900,000	\$131,078
All	Lifetime Gas DTh avoided	7,000,000	\$56,176
HVAC	HVAC inspection & maintenance participants	800	\$23,175
New Construction	Enrollments as % of new permits	23%	\$11,588
New Construction	Completions as % of Certificates of Occupancy	22%	\$11,588
Products	Washer rebates	17,000	\$23,175
Home performance	Completed jobs	800	\$23,175
		Total:	\$279,955

Table 9. 2008 performance indicators and incentives for NJCEP residential programs

Wisconsin: Focus on Energy

Focus on Energy is the other known example of a for-profit third party state energy efficiency program administrator. Until very recently, a third-party non-profit corporation filled this role. The contract is currently being transitioned to Shaw Environmental & Infrastructure, Inc., but because the program year is already underway, performance incentives have not been set. Like NJCEP, the structure is somewhat complex.

- The utilities own the contract with Shaw through a consortium organization, which is mandated by the Public Service Commission.
- The non-profit Energy Center of Wisconsin provides supporting research.
- Three other for-profit firms provide fiscal oversight, evaluation, and compliance.

Low-Income programs

The funding for all programs comes from separate surcharges on customer bills of investor-owned utilities. The Wisconsin Department of Administration administers low-income energy efficiency programs separately through counties and community organizations. This funding includes both bill payment assistance and weatherization assistance. The Commission is also investigating distributing energy efficiency funds by customer class to improve equitability.

Program Reporting

The Public Service Commission intends to base performance incentive awards on four-year program achievements with annual targets. This approach is meant to allow the program administrator to try new programs that may not be successful in their first year. Possible performance indicators might be based on energy savings, cost per kWh saved, and customer satisfaction.

Oregon Energy Trust

The Oregon Public Utilities Commission created the Oregon Energy Trust under the mandate of a law passed by the State Senate. The Trust is an independent non-profit that receives program funding from a 3% ratepayer bill charge. It does not receive performance incentives but is evaluated on a predetermined set of criteria.

Low income programs

The Oregon Energy Trust only has moderate-income programs, which provide bonuses for its existing rebate programs. Oregon Housing and Community Services, a state agency, administers the low-income energy efficiency programs through local community organizations. All services are provided free of charge. Households must be at or below 60 percent of Oregon's median income to qualify.

Program Reporting

Oregon Energy Trust's performance indicators have changed since the program was first created. After 2007, the indicators became more stringent due to the targets being consistently surpassed. Notably, the most recent indicators measure savings on a 3-year rolling average and use the levelized cost of energy when calculating economic value. The Trust is also expected to keep administration costs to a specified minimum. The penalty for not meeting an indicator goal is a notice of concern from the Public Utilities Commission.

Performance Indicator	Target
Electricity efficiency savings (3-year rolling average)	31 MW
Average lifecycle levelized cost	<\$0.035 per kWh
Gas efficiency savings (3-year rolling average)	1.8 Mtherms
Average lifecycle levelized cost	<\$0.035 per kWh
Program delivery efficiency (admin costs)	<11%

Table 10. Oregon Energy Trust 2008-2009 performance indicators.

Efficiency Vermont

The Vermont Energy Investment Corporation (VEIC) is a non-profit organization that oversees the state Energy Efficiency Utility, Efficiency Vermont. It existed independently before entering into the current contract directly with the state Public Services Board. Despite being a non-profit, VEIC is awarded both an operations fee and performance incentives. A utility customer bill charge provides most funding and is supplemented with income from heating fuel market regulation.

Low-Income Programs

VEIC must spend a portion of its budget on low-income programs. The minimum set by the Public Services board for 2009-2011 program period was \$6,307,000. All services are provided at no cost through five local Community Action Agencies. These services include lighting, appliances, and heating equipment. Eligibility is based on household income below 60% of state median. VEIC is also conducting a low-income Smart Grid pilot project. There are separate state agencies also providing low-income bill payment assistance and weatherization from different funding sources.

Program Reporting

The Public Service Board uses third-party organizations to evaluate program performance and decide on performance incentive awards. The basic contract structure is extremely similar to Hawaii Energy's, with some portions being directly sourced from VEIC. A significant difference is that VEIC can be penalized for not meeting a second set of minimum requirements. If it fails a basic benefit-cost test, no incentives are awarded. It must also spend specified amounts on residential programs and low-income programs or lose up to a total of 36% of its award. A similar 18% target is set for energy savings for small non-residential customers. Finally, VEIC can be penalized another 6% if it does not provide minimum funding to each county in Vermont.

Performance Indicator	Award Amount	Target
Cumulative Annual Electricity Savings ³⁶	33%	360,000 MWh
Total Resource Benefits ³⁷	25%	\$342,386,000
Summer Peak Demand Savings	12%	51,200 kW
<i>Certain Geographic Areas</i>	13%	8,100 kW
Winter Peak Demand Savings	5%	54,000 kW
<i>Geographic Areas</i> ³⁸	7%	2,400 kW
Business End Uses (non lighting)	5%	3,500 MWh

Table 11. Efficiency Vermont performance indicators and awards 2009-2011.

Appendix C: On-bill Financing Examples

On-bill Loans Model

Manitoba Hydro, the Canadian utility, runs a successful on-bill loan programs that serves the residential market. The utility offers unsecured loans at 6.5% for a term of up to 5 years to cover insulation, lighting, HVAC, windows, and others measures, with a maximum loan size of \$7,500. Customers can work with a contractor or do the improvements themselves as long as the measures meet the utility's standards. This program has a fast turnaround time for loan approvals; typically the same business day for most approvals and within seconds using a web-based system for their network of contractors and retailers. To assess credit worthiness, Manitoba Hydro uses bill payment history and/or a credit review. The loan approval rate is high, at 94% of applications. The default rate in 2007 was less than 0.2%.

On-bill Tariffs Model

Midwest Energy's How\$mart program is a good example of an on-bill tariff model. The program provides free audits, which recommend specific efficiency improvements, and generate estimated savings levels. The customer then selects a contractor to perform the work as specified by Midwest Energy. The How\$mart program charges must be less than 90% of the estimated monthly savings. To qualify, customers are required only to be current on their utility bills; they do not undergo a formal credit check. Midwest Energy has the right to disconnect power for nonpayment if necessary, which they believe gives them enough security to make the program widely available.

³⁶ Annual electricity savings are calculated at generation and net of free riders.

³⁷ Total Resource Benefits are net present values of savings in electricity, fuel, and water. Fuel costs are related to end use and not generation. Electricity is valued at current projections of avoided resource costs with a 5.7% discount rate

³⁸ Certain Geographic Areas are chosen for high grid load and not income or need.

Appendix D: Calculation of Household Statistics

To calculate household statistics, the 2009 1-year American Community Survey (ACS) Public Use Microdata Sample (PUMS) Data are used. They are publicly available via the website of the U.S. Census Bureau. This database contains the result of individual surveys. The surveys are not explicitly identified per political unit, but per Public Use Microdata Area (PUMA). The PUMA coded 200 corresponds with Hawai'i Island. The PUMAs coded 302 through 307 are contained within Oahu. The PUMA coded 301 covers part of Oahu and a number of small islands whose household figures are considered to be negligibly small for the analysis.

Calculation of Household Poverty Status

In the PUMS data, the percent of poverty status is a number assigned to each person in each household individually and is not assigned to a household. To come to a percentage of poverty status per household, the weighted average of the poverty status of each of the members is taken, in which the weights used are the persons' weights (used by ACS to calculate personal statistics such as average age). Each household in the survey has a weight assigned to it, to be used to generate statistics on households (such as average household income).

Calculation of Household Distribution in Function of Poverty Status

Households are categorized into poverty level segments. Households in the survey with a number of persons equal to zero are not included. For all households in a particular poverty level segment, the household weights are added and divided by the sum of all household weights to determine the fraction of households falling within a certain poverty status interval.

Calculation of Average Monthly Electricity Expenditure per Household

The household survey data contain the monthly electricity expenditure. In each poverty status interval, the weighted average of the monthly electricity expenditure is determined. Households for which the electric bill was not paid (e.g. because it is included in the rent) are excluded. Households that reported a household income less than the estimated annual electricity expenditure (12 times the reported monthly electricity expenditure) are also excluded. The latter also excludes households with zero persons.

Calculation of Average Fraction of Income Spent on Electricity per Household

The households included for the calculation of the fraction of income spent on electricity were the same as for the calculation of the average monthly electricity expenditure. For each included household surveyed, the reported electricity expenditure is divided by the income and multiplied by 12 (months in a year). Then, within each poverty status segment, the weighted average is made over the surveys, using each survey's household weight.

Calculation of the Estimate of the Contribution of Hawai'i Island Households to the PBF

Since the PUMS data only contain the expenditure on electricity and the PBF contribution is determined on a per kWh basis, the PBF contribution of each household in the survey has to be estimated from the utility (HELCO) rates. The HELCO effective rates summary for 2009 was used

for the base rates because the effective period coincides with program year 2009 of Hawaii Energy. The residential PBF surcharge however differs from 2009 to 2010. Since Hawaii Energy’s program year 2009 spans half of 2009 and half of 2010, the mean of the 2009 and 2010 residential PBF surcharges is used in the calculations. One-sixth of residential customers are assumed to have a three-phase connection. The parameters that were used in the calculations of the estimated PBF contribution from monthly electricity expenditure are shown in Table 12.

	Effective rates
Single phase fee (\$)	11.08
Three phase fee (\$)	16.07
Fraction of 3-phase customers	1/6
Base fee (\$) - A	11.91
Energy charge (\$/kWh) - B	0.306384
Minimum charge (\$)	22.16
Residential PBF surcharge 2nd half 2009 (\$/kWh)	0.001986
Residential PBF surcharge 1st half 2010 (\$/kWh)	0.00476
Residential PBF surcharge PY2009 (\$/kWh) - C	0.003373

Table 12. HELCO 2009 rates for residential customers (7/1/2009 to 7/1/2010)

If the electricity expenditure reported is higher than the minimum fee, no PBF contribution was counted. If the reported electricity expenditure exceeds the minimum charge, the PBF contribution (over Hawaii Energy’s program year 2009) is calculated as follows (with ELEP the monthly electricity expenditure and A, B, C from Table 12):

$$PBF = 12 \cdot \frac{ELEP - A}{\frac{BC}{+ 1}}$$

Calculation of Tenure-Related Statistics

Renting households are defined as those that reported they are renting in the ACS individual survey. Household owners are those who reported owning their homes, with or without outstanding mortgages. A fraction of householders reported not paying for occupation of their homes, and those householders were not taken into account. Again, households were weighted according to the weight given in the individual survey in the PUMS.