Can Big Changes for the Role of Efficiency Support Energy Independence in the State of Hawaii?

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ABSTRACT

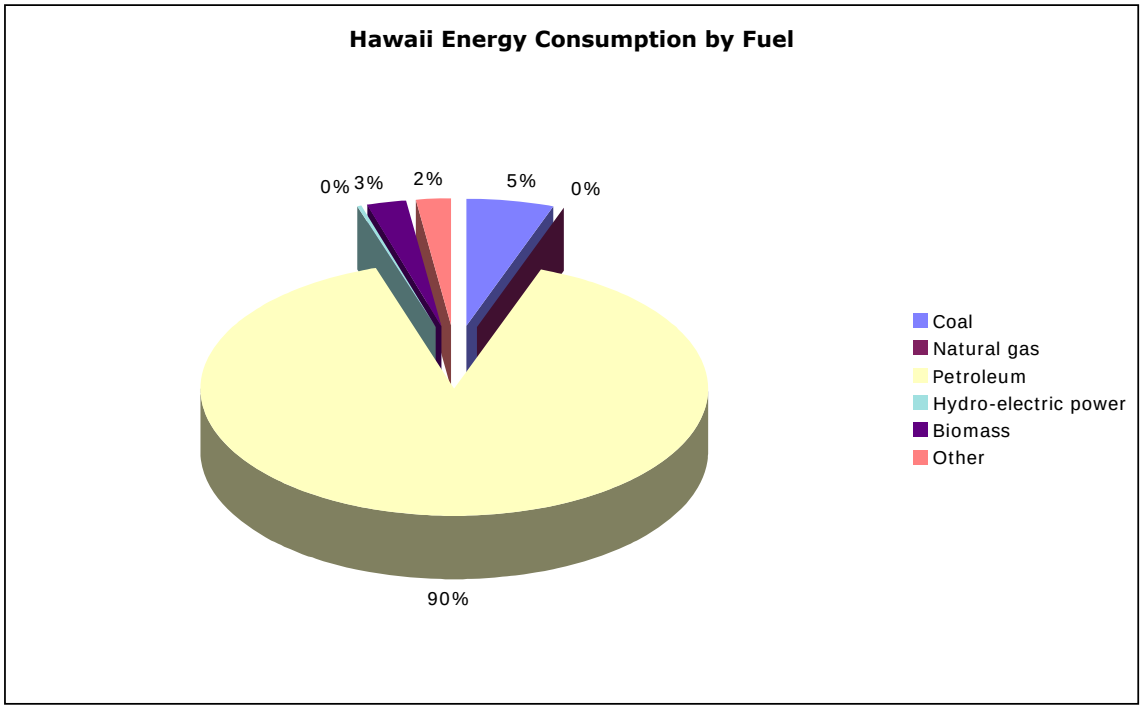
The State of Hawaii is rich in natural resources, yet relies on imported oil for almost 90% of its energy. It is, however, at a unique and opportune moment to steer its energy future and has recently committed to dramatic changes in its energy structure, both on the supply and demand side. The Hawaii Clean Energy Initiative put into place in late 2008 promotes aggressive goals for renewables, and efficiency as well as changes to transportation infrastructure. These changes are the result of strong interest and promotion on behalf of Federal, State and Local agencies and clean energy academic and special interest groups. The goal of the Hawai‘i Clean Energy Initiative is to meet 70% of State energy needs by 2030 through energy efficiency and renewables

This paper will examine the opportunities and challenges faced by the State associated with its energy efficiency programs that were recently transitioned from utility to third party administration on July 1, 2009. The new portfolio of ratepayer funded programs were put into place during a very dynamic time in which State officials are making numerous changes to utility infrastructure, building codes and tax incentives. At the same time, energy prices had reached peak levels due to oil price fluctuations and federal stimulus funding became available for a wide range of energy efficiency related programs. This paper examines the transition issues and development goals and budgets of the ratepayer-funded portfolio of efficiency programs and the role played by the wide range of contributors.

The Way It Was

The State of Hawaii consists of 8 major islands with approximately 1.3 million permanent residents and seven million visitors each year. A land of plenty with an abundance of solar, wind, geothermal and ocean power at its doorsteps, Hawaii imports roughly 51 million barrels of oil each year at a cost of nearly $7 billion dollars. Due to lack of conventional fuel resources such as natural gas, oil and coal, and no ability to rely on power from neighboring states, Hawaii must import all of its energy resources over great distances. Hawaii is the most oil dependent State in the Union, relying mostly on the declining availability of fuel oil shipped from Alaska and the remainder from Asia-Pacific countries. In addition to challenges faced shipping oil greater distances and through fragile marine ecosystems, Hawaii’s location allows limited access to US Strategic Petroleum Reserves in Louisiana and Texas. All told the State is one of the most vulnerable to oil price spikes and shortages. Figure one below shows 2006 energy consumption in trillion BTU by fuel type for the State of Hawaii.

Figure 1: Energy Consumption by Source



Source: DBEDT, 2008

While the majority of oil imports to the State support aviation, electricity production requirements are a close second with almost 30% of oil imports being used to produce electricity. About 84% of Hawaii's electricity is produced from oil, with about half the remainder coming from bio-mass and municipal waste plants and the other half from coal, hydro, wind and geothermal. Total generation for the State last year was 10.6 thousand gWh. (DBEDT 2010) Due to very mild weather conditions and not a large base of heavy industry, the State has a per capita consumption that is amongst the lowest in the country. Natural gas loads are even lower due to the relatively few heating degree-days on the Islands.

The Change

The existing situation worked for State residents willing to balance high transportation fuel costs with short travel distances afforded by the Island geography and mild weather conditions which kept monthly bills reasonably low in spite of residential rates of approximately $0.25/kwh. However, an oil price spike in 2008 and growing concerns regarding climate change led to a breaking point for state residents and legislature.

In October of 2008, Hawaii Governor Linda Lingle announced an agreement between several State departments and three (3) Hawaii electric utilities to move away from fossil fuels for electricity and transportation and towards locally produced renewable energy and increased development of energy efficiency resources. (State of Hawaii, HECO 2008) The agreement between the State of Hawaii, Department of Business Economic Development & Tourism, Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs and Hawaiian Electric Companies (HECO) included policy guidance and goals in the following key areas:

- Renewable Energy Commitments – As much as 1,000 MW of specific renewable project commitments were included in the document.
- Renewable Portfolio Standard (RPS) – Existing RPS goals were increased to 25% by 2020 and 40% by 2030 with energy efficiency no longer counting towards this goal after 2014 and limits to imported bio-fuels.
- 'Big Wind' – Commitments to integrate up to 400 MW of wind power into the Oahu grid with coordination by HECO and the State.
- Decoupling revenues from sales for utilities – The PUC to begin working on a new compensation mechanism for utilities that accommodates reduced energy sales.
- Feed-in tariffs – Parties agreed to develop feed-in tariffs that will encourage development of renewable energy.
- Net Energy Metering – Recommendations to eliminate caps and encourage customer site generated renewable projects relative to circuit demands.
- Energy Efficiency Portfolio Standard (EEPS) – Develop quantitative goals for reducing load through energy efficiency and work towards achieving this goal.
- Green Transportation – Support alternative fuel vehicles and efficient transportation alternatives.
- Lifeline Rates – Agree to provide rate caps for low or fixed income customers not able to pay full the full cost of electricity.
- 'Pay as you Save' Solar Water Heating – Encourage solar water heater system installations financed on utility bills.
- Photovoltaic Host Program – HECO to develop a PV program with equipment financed by utilities and located on host customer sites.
- Advanced Metering Infrastructure – Begin installation of advanced meters that accommodate distributed generation and time of use rates.

Needless to say, this very ambitious list of goals and tasks is dramatically changing infrastructure throughout the State. With marching orders in hand and a technical support from the Department of Energy, National Renewable Energy Laboratory (NREL) and various academic and non-profit groups, the State has set about to accomplish tasks outlined in the agreement. The State provides a unique environment for taking a role as a nationwide leader in energy self sufficiency. No other State is blessed with a similar abundance of solar, wind, tidal and geothermal energy resources found in Hawaii. In addition, mild weather found year round hold promise for development of net-zero buildings. Expensive fuel costs drive electricity rates that are among the highest in the nation, these prices provide the financial motive for both renewable development and demand side reductions. Some of the biggest remaining challenges are in coordination between a number of government and private agencies to cost-effectively deliver on these promises during an economic slowdown that has severely impacted State offices, businesses and residents.

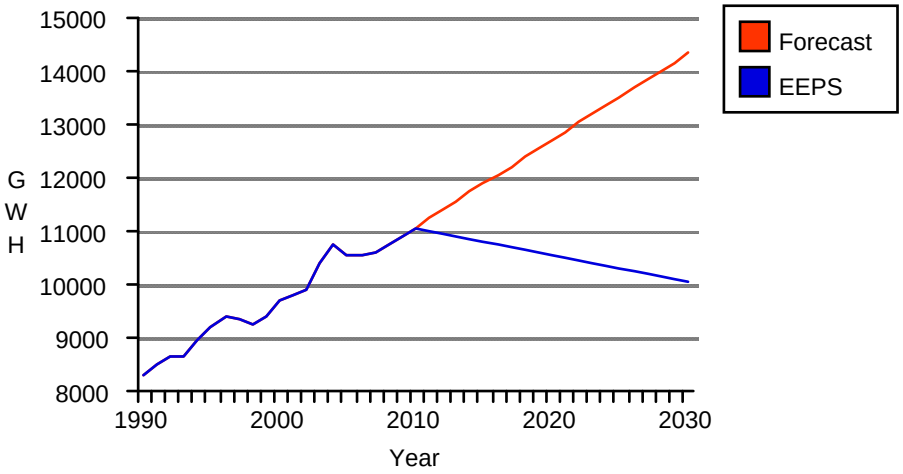
Goals and Accomplishments to Date and Key Players

Probably the most notable goal identified in the HCEI is the EEPS. The State had some utility goals in order to set incentive targets, but did not have comprehensive and integrated resource goals that set long-range targets. After studying past energy efficiency potential studies and load profiles, the legislature passed Hawaii Bill HB 1464 in June of 2009 with an energy

efficiency portfolio standard goal of reducing electricity use 4,300 gWh by the year 2030. This target equated to a calculated reduction of 500 MW of demand. A 500 MW power plant operating at 8,760 hours a year produces approximately 4,300 gWh of energy.

Hawaii's load growth is expected to grow to 14,333 gWh by 2030. The proposed 30% goal is very aggressive for a State that already maintains a per capita load that is in the bottom 20% of the nation and would require over 1.5% of permanent annual cumulative load reduction each year. Figure two below indicates load growth in thousands of gWH from 1990 to 2007 and the addition of the proposed EEPS goals from 2010 to 2030.

Figure 2: Hawaii Load Growth with EEPS



Source: Energy Information Administration, 2007

Various State agencies and private groups have set out to implement this goal through a host of strategies, programs and legislation. The following sections delineate the actions and progress made toward this goal for the groups central to its implementation as follows:

Hawaii Public Utilities Commission (PUC)

The PUC is a State agency administratively attached to the Department of Budget and Finance. The PUC regulates public service companies in four major areas: Energy, Telecommunications, Transportation and Water/Wastewater. Under this purview fall the State's electric utilities, specifically the HECO utilities and Kauai Island Utility Cooperative (KIUC).

HECO and its subsidiaries Maui Electric Company (MECO), Hawaii Electric Company (HELCO) serves 95% of the States residents on the islands of O'ahu, Maui, Hawai'I Island, Lana'I and Moloka'i. KIUC provides electric service for the island of Kauai. Historically these utilities have operated energy efficiency programs under the direction of the PUC for many years. The last reported energy efficiency savings figures from the HECO companies were in 2008 as shown in Table one below:

Table 1: 2008 HECO Energy Savings Impacts

Utility	Gross GWH	Net GWH
HECO	120.9	91.7
HELCO	4.8	2.8
MECO	10.3	7.0
Total	136	101.5

Source: HECO, 2008

In 2008, administration of the energy efficiency programs was changed. After a competitive solicitation, the HECO programs were transitioned to a third-party program administrator through a contract administered by the PUC and funded by a public benefits fee (PBF). The Hawaii Energy program is currently funded as a multi year program with first year goals and budget of 126 net GWH and $19.6M respectively. While this is a higher savings goal than reported by HECO for the previous year, it is well below the approximately 215 net GWH of cumulative savings necessary to achieve the EEPS goal of 4,300 GWH by 2030. There is also no guarantee that these savings will be cumulative year after year. Near term PBF goals and budgets for the 2009/10 program year and the 2010/11 program year are committed in existing contracts.

One of the benefits associated with the recent changeover to PBF funded programs is the introduction of new pilot programs that focus on implementing and measuring behavioral changes. During the transition year, most of the existing utility programs were offered. Programs proposed for the second program year include several pilot programs from residential bill comparison and education programs to incentive programs for military homes without individual meters and sub meters for master metered high rise dwellings. Operating programs such as these are essential to change fundamental user behavior required for meeting the State's aggressive goals.

The PUC is implementing these changes while facing budget constraints for both its own operations and those of the ratepayers it serves and must weigh the benefits and risks of increasing efficiency portfolio goals. Much of the heavy lifting described in the HCEI falls on the PUC's shoulders including everything from decoupling sales and rates and feed-in tariff design, to increasing renewable portfolios. And, all of these activities must be done during challenging economic times with already heightened sensitivity to high electricity rates. The agency is studying how to meet aggressive state efficiency goals while balancing cost and incorporating structural changes in administration and funding.

Department of Business, Economic Development and Tourism (DBEDT)

DBEDT helps to guide and promote business development and tourism throughout the State. One of its key stated operational functions is to address issues stated in the HCEI. Much of the planning activities for the HCEI have taken place under the auspices of DBEDT.

In January of 2008, the State signed a Memorandum of Understanding (MOU) with the DOE to establish a partnership that will "result in a fundamental and sustained transformation in the way in which renewable energy efficiency resources are planned and used in the State." This

agreement further stated: “Successful development and execution of the objectives contemplated in this partnership will provide a replicable global model for achieving similar results.”
Key goals of the agreement were stated as follows:

- To define the structural transformation that will need to occur to transition the State to a clean energy dominated economy
- To demonstrate and foster innovation in the use of clean energy technologies, financing methodologies, and enabling policies designed to accelerate social, economic and political acceptance of a clean energy dominated economy
- To create opportunity at all levels of society that ensures wide-spread distribution of the benefits resulting from the transition to a clean, sustainable energy State
- To establish an “open source” learning model for others seeking to achieve similar goals
- To build the workforce with crosscutting skills to enable and support a clean energy economy.

Since the signing of this agreement, DBEDT has developed working groups, collaborative goals and proposed outcomes to meet MOU objectives. They have also provided technical assistance and supported a diverse constituency of potential partners including businesses, consumer groups, public and private agencies and organizations. This effort was organized chiefly through the establishment of four primary working groups addressing these key areas:

- End-Use Efficiency
- Electricity
- Fuels
- Transportation.

These four groups are tasked with

- Benchmarking the current state of clean energy in Hawai‘i
- Identifying information gaps
- Identifying structural and technical barriers to reaching the 70% clean energy goal
- Developing strategies for overcoming the barriers

While the goal is to integrate the goals and outcomes for all of these groups, much of the efficiency plans are being addressed in the End-Use Efficiency Working Group (EEUWG). This group has studied the issues unique to the State and identified the improvement of buildings codes, promotion of retrofit strategies by working with the Hawaii Energy Program, promotion of solar water heating and establishment of new state and local policies as key areas to help meet the EEPS.

The EEUWG recently presented a plan for meeting the EEPS, however, costs estimates for meeting the goals may be as high as $196 million per year. This study includes a number of optimistic scenarios that would need to occur to meet such a goal and require measure adoption rates of as high as 80%. This presentation also includes the adoption of emerging technologies such as advanced high efficacy LED lighting the proposed Sea Water Air Conditioning plan.

The SWAC system is a proposal to build and implement a central district system that uses deep ocean water to provide cooling for the downtown business district and possibly Waikiki hotel zone.

In addition to its planning role, DBEDT is serving as the State Energy Office responsible for applying for and distributing federal ARRA stimulus funds. Under these grants, the Department is responsible for the implementation of programs including $15 million in block grants and $26 million in State Energy Program grants. DBEDT has been busy designing programs and applying for grants to place these funds. Some of the proposed programs include:

- Providing technical assistance to hotels statewide to enhance energy efficiency in the tourism industry by attaining or renewing an Energy Star building label.
- Provide technical assistance to building owners, developers and design professionals and county building code officials to ensure that new and renovated buildings are designed and built as efficiently as possible.
- Aggressive retrofits for State buildings to identify and install measures meeting the maximum economic potential for energy savings.
- Incentives and technical assistance to complement existing ratepayer funded programs.

All of these federally funded program efforts will complement and support existing goals and programs and help to get Hawaii closer to its goal of energy independence. Identifying and benchmarking large commercial buildings supports the educational and behavioral changes necessary for continued lasting energy efficiency improvements.

Hawaii State Legislature

The final leg supporting the State's clean energy platform is the State legislature. The State is currently considering a whopping 153 energy related bills in its 2010 legislative session. Many of these bills are directly supporting goals outlined in the HCEI and the MOU with the DOE. Some of the bills most directly related to energy efficiency include:

- HB2521 - Requires all new single-family residential construction be designed to be "net zero energy capable" as of January 1, 2015. (deferred)
- HB2048 - Requires the Public Utilities Commission to develop standards for the sale of solar energy systems manufactured and sold in the State. (introduced, but not heard)
- HB2299 - Authorizes the Public Utilities Commission to provide incentives to electric utilities that purchase and install dynamic voltage regulation technologies that reduce energy consumption, improve grid efficiency, and are at least 99% efficient across at least 90% of the load curve. (introduced, but not heard)
- HB2531 - Establishes a Hawaii Clean Energy Investment Bond Program for renewable energy system and energy efficiency improvements on residential and commercial properties, and authorizes the issuance of general obligation bonds to finance the program. (not heard; Senate bill deferred)
- HB2628 - Extends the authorization to issue special purpose revenue bonds for Honolulu Seawater Air Conditioning LLC. ($) (Senate bill passed; Act 80)

The State legislative and executive offices have been unified in offering bi-partisan support for many of the goals described in the HCEI and the MOU.

Challenges Ahead

Efforts by the DOE, DBEDT, the PUC and the State legislative branches have launched the State in the right direction to meet its stated energy goals. There are some hurdles that most be overcome to help assure their success.

- Grid Stability – Incorporating so much new renewable resources into a very small electric grid poses serious stability and cost problems. Without an effective electric storage system, large amounts of non-firm power cannot be cost effectively incorporated. The State is currently investigating the construction of an undersea cable to transmit electricity between the islands of O'ahu, Moloka'i, Lana'i and possibly Maui. The interisland cable would increase access to renewable projects statewide. The DBEDT is coordinating engineering and design for the cable project. They are also responsible for securing all offshore and onshore land rights, permits and approvals including feasibility and environmental impact studies.
- Integrating Renewables – As discussed above, Hawaii's small and aging grids, with no access to load or generation from neighboring states, yet alone neighboring islands, are not ready to accept large amounts of non-firm generation without significant upgrades. Even roof-top PV poses a threat to voltage stabilization due to the density of housing in population areas. A large cloud over Honolulu could cause voltage sags and trip circuits. In order to accommodate any significant renewable generation, smart grid circuits, large-scale storage and a comprehensive and clear tariff structure must be put in place as soon as possible.
- Behavioral Changes – The obvious question must be asked, with the highest rates in the country, why haven't all efficiency options already been exploited? While there is no simple answer, it is likely that low average usage per customer due to mild weather results in manageable size bills, and with a way of life envied by many, there may be an understandable reluctance to any kind of change. New education and media campaigns must identify and address these issues to empower residents and businesses to take advantage of all opportunities.
- Building Codes – Existing building codes vary by county/island and do not contain the latest energy efficiency technologies and design requirements. The EEUWG has proposed a unified building code for residential and commercial buildings and is working to adopt IECC 2006 codes for the Hawaii climate. This code is currently in place for state buildings but is in various stages of adoption in each county. The EEUWG is also proposing a series of demonstration buildings to help implement the zero energy building goals. They are also hoping to move building codes to adopt IECC 2009 and those that support zero energy buildings.
- Increased funding for PBF programs – The EEUWG has proposed increased funding for PBF funded statewide programs. It is their belief that rate increases associated with this increased funding are cost effective from the rate-payers viewpoint and should be investigated by the PUC.

Summary

The State has developed a clear blueprint for meeting its goals and has secured technical support from organizations around the country as well as in-State technical experience that is familiar with the unique challenges and opportunities afforded Hawaii State businesses and residents. High energy prices have produced an incubator of new resource and energy companies looking to prove their technologies on Oahu and the Big Island. A unique awareness and respect for the natural environment make Hawaii residents ripe for instituting behavioral changes that will be an important element in containing its load growth.

With the synergies on both the supply and demand side, Hawaii may well meet its goal before the proposed 20 year time frame.

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