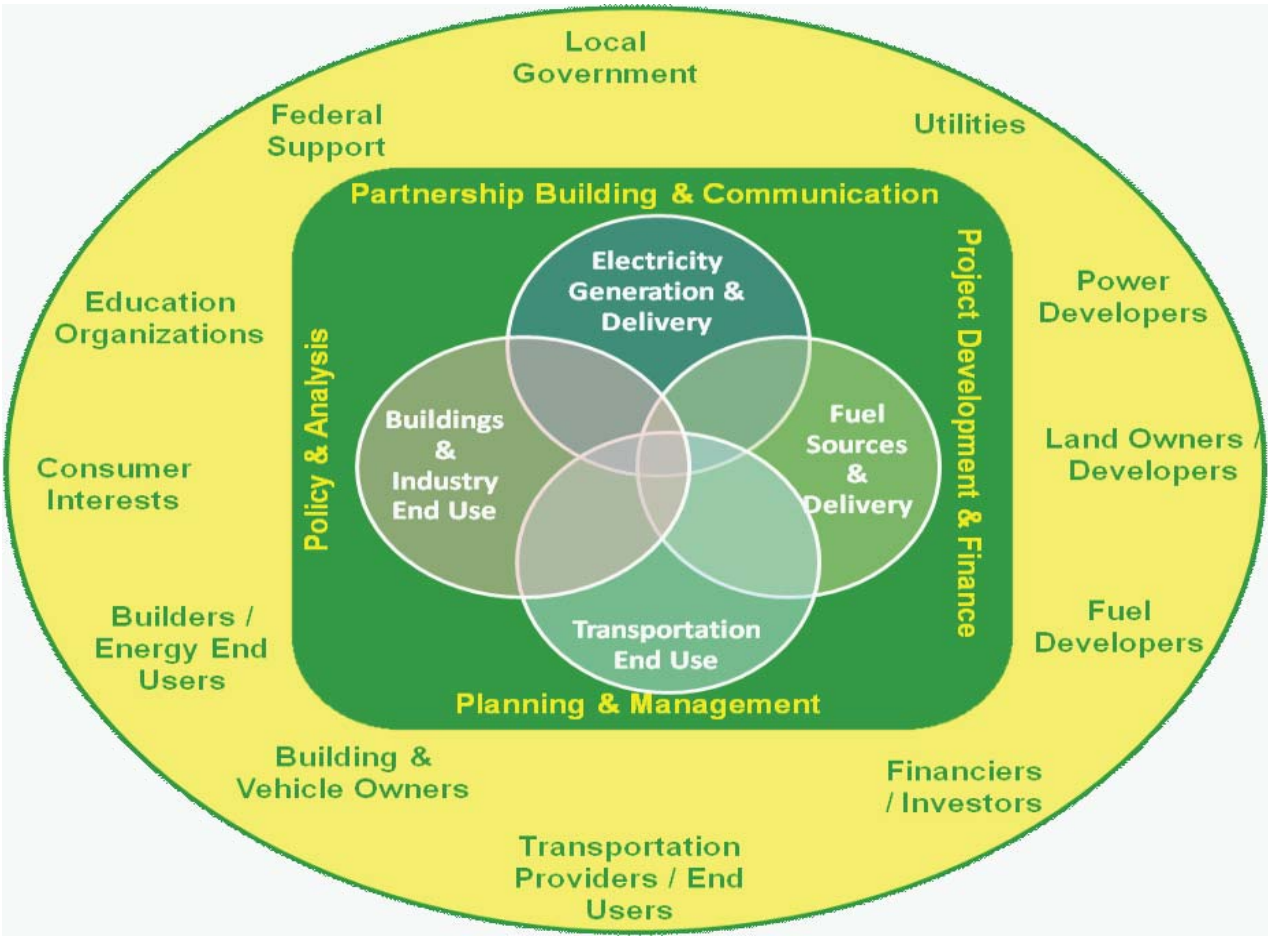
State of Hawaii
Energy Resources Coordinator's Annual Report
2010



State of Hawaii
Department of Business, Economic Development & Tourism

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CONTENTS

Introduction

Reporting the Accomplishments of the Hawaii Clean Energy Initiative

This report describes many of the activities of the State of Hawaii Energy Office during the calendar year 2010.

These projects and programs move the State of Hawaii toward the Hawaii Clean Energy Initiative (HCEI) goal of 70% clean energy by 2030. They are undertaken by a variety of partners; HCEI is a partnership between the U.S. Department of Energy (USDOE) and the State of Hawaii, but encompasses actions by energy industries, gas and electric utilities, the armed services, county governments, national laboratories, and many other players.

Compiled within this document are several reports required to be prepared for the Hawaii State Legislature. These include:

- The Energy Resources Coordinator's Annual Report;
- A report on HCEI—the status and progress of clean energy initiatives; and
- A spending plan for the Energy Security Special Fund.

Energy Resources Coordinator

The position of Energy Resources Coordinator was created in 1974 by the Hawaii State Legislature in response to the first "oil crisis." It is held by the Director of the Department of Business, Economic Development, and Tourism (DBEDT). The staff of the Hawaii State Energy Office (HSEO), also known as the Strategic Industries Division, implements programs as directed by the ERC.

The position of ERC and the requirement for an annual report are described in Hawaii Revised Statutes (HRS) §196-3 and -4.

Hawaii Clean Energy Initiative

Act 73, enacted in 2010, provides that DBEDT shall report to the Legislature on the status and progress of new and existing clean energy initiatives, including a spend plan for HCEI.

HCEI is established as a specific program within DBEDT by HRS §196. Reporting on existing and new activities is required by HRS §201-12.8.

Critical to the future of Hawaii's energy program, Act 73 represents the first time that significant state funds have been allocated for clean energy programs.

A percentage of the new Environmental Response, Energy, and Food Security Tax is directed to the Energy Security Special Fund. DBEDT is responsible for reporting on expenditures from this fund.

This tax, consisting of a $1.05 assessment on each barrel or fraction of a barrel of petroleum product imported into Hawaii (excepting aviation fuel), is allocated among five different funds. The allocations are outlined in HRS §243-3.5.

The distribution is as follows:

- 5 cents into the Environmental Response Revolving Fund;
- 15 cents into the Energy Security Special Fund;
- 10 cents into the Energy Systems Development Special Fund;
- 15 cents into the Agricultural Development and Food Security Special Fund; and
- 60 cents into the General Fund.

Monies from the Energy Security Special Fund may be expended to support HCEI and HSEO, the renewable energy facilitator, and, to the extent possible, the greenhouse gas task force, climate change task force, and the economic development boards and agencies of each county to meet the stated objectives of HCEI.

Related Programs

In addition, DBEDT is tasked with studying and analyzing the amount, allocation and effectiveness of the Environmental Response, Energy, and Food Security tax. Findings and recommendations are to be forwarded to the Legislature. A separate report has been prepared by the Hawaii Economic Development Task Force.

Monies from the Energy Systems Development Special Fund are to be expended by the Hawaii Natural Energy Institute (HNEI) of the University of Hawaii (U.H.).

The Dept. of Agriculture (DOA) manages the Agricultural Development and Food Security Special Fund and will report separately on its programs.

The HNEI and DOA initiatives are developed in cooperation with HSEO.

Energy is Critical to Hawaii

Hawaii is the most oil-dependent state in the nation. Approximately 85% of our total primary energy, 75% of our electricity, and 97% of our transportation fuels are produced from oil.

All of this oil, as well as the coal used for electricity generation, is imported, putting Hawaii at risk from interruptions in supply as well as from price dislocations in the world oil market.

It is to address this over dependency—to get off oil—that the state is implementing the Hawaii Clean Energy Initiative.

The volume of fuel imported and how efficiently it is used affect the security and economic well-being of every person in Hawaii. Prices for electricity, gasoline and other energy commodities are among the nation's highest.

Energy Trends

Hawaii's overall energy consumption decreased more sharply than in previous years and per capita energy use continued to shrink. This declining energy use was accompanied by an increase in the Gross State Product, demonstrating that energy efficiency and conservation can have a positive impact on the economy.

The contribution by renewable resources continued to grow and fossil fuel use declined in 2009.

Hawaii's primary energy consumption in 2009 was 287.2 trillion British thermal units (Btu), down 4.7% from 2008.

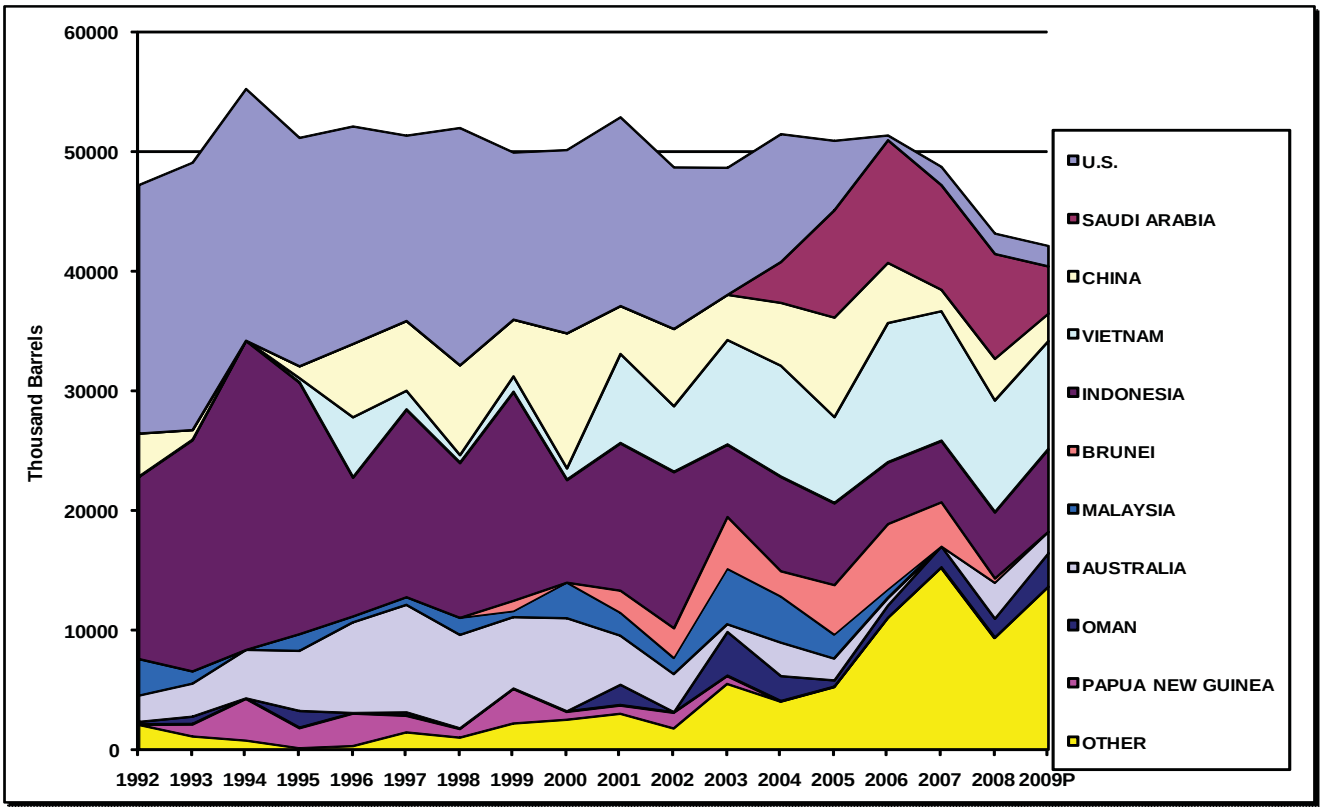
Petroleum use decreased 5.4% from 2008 to 2009. Petroleum consumption totaled 244.1 trillion Btu in 2009. A total of 42.6 million barrels of crude oil were imported, costing an estimated $2.6 billion.

Coal consumption also decreased 7.3% from 2008.

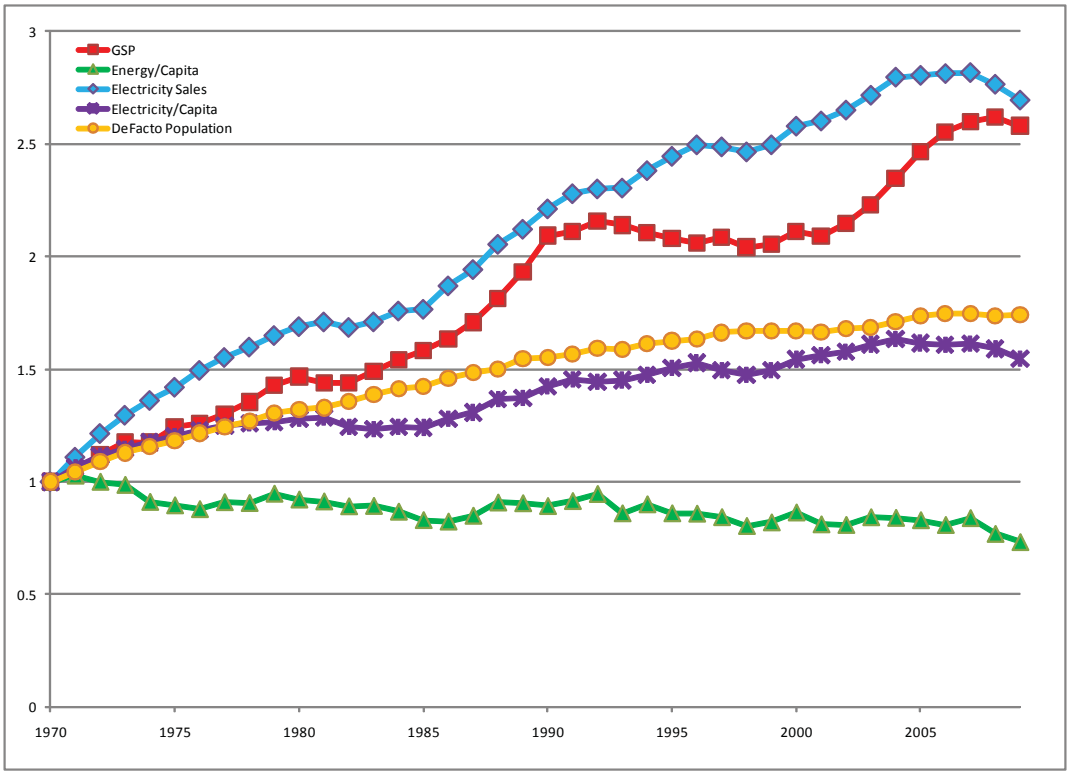
Together, the imported fossil fuels—coal and oil—represent almost 91% of Hawaii's energy consumption. Nearly 85% of Hawaii's total energy is imported petroleum.

Renewable energy production increased by 7.7% during 2009 compared to 2008. This can be attributed primarily to generation from hydroelectricity, wind and photovoltaics. Hydroelectricity

Hawaii's Crude Oil Sources 1992-2009 (preliminary)



Key Energy and Economic Indicators in Hawaii, 1970-2009



grew 15%, wind grew 39%, and photovoltaic output increased 140% over 2008 figures.

In total, renewables provided nearly 27 trillion Btu in 2009.

Consumers spent an estimated $6 billion for energy in 2009, or about 28% less than 2008. This was about 9% of Hawaii's $66.43 billion Gross State Product (GSP) as expressed in current dollars.

In 2009, Hawaii residents used 27% less energy per capita (based on de facto population and measured in Btu) than they did in 1970, the benchmark year prior to the inception of Hawaii's energy program.

Energy use per capita, measured in Btu, decreased by 4.7% in 2009 compared to 2008. This has been a consistent trend.

In 2009, electricity sales (kilowatt-hours) per capita were 55% more than 1970, the benchmark year, although de facto population grew 74% and real GSP increased 158% over the same period.

Electricity sales in 2009 decreased 2.5% from 2008. This resulted in a modest 2.8% decrease in electricity sales per capita.

RPS Effort on Track

Although 2010 data are not yet available, Hawaii appears to be on track to achieve its statutorily mandated Renewable Portfolio Standard (RPS) levels.

Presently, energy efficiency percentages as well as renewable energy production are included in the RPS. Starting in 2015, only renewables will be reported in the RPS, while efficiency will be reported separately in the Energy Efficiency Portfolio Standard.

In 2009, the state's RPS level was 18.8%, an increase of 1% over 2008 figures.

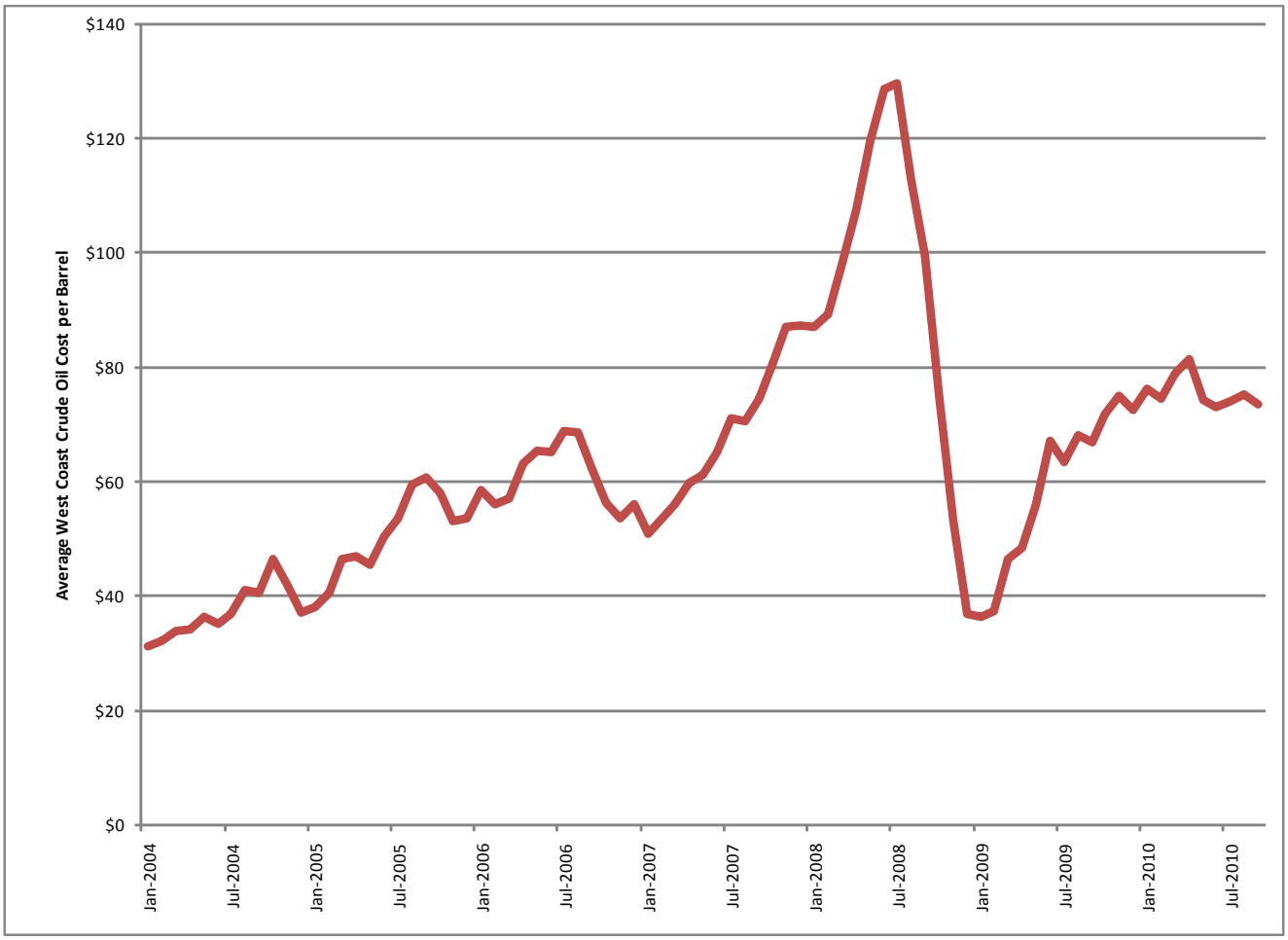
Required RPS levels for the utilities' net electricity sales are:

- 10% by 12/31/10;
- 15% by 12/31/15;
- 25% by 12/31/20; and
- 40% by 12/31/30.

Hawaii RPS Levels

Year	*HECO Cos.*	*KIUC*	*State Total*
2005	*11.7%*	*13.9%*	*11.8%*
2006	*13.8%*	*13.8%*	*13.8%*
2007	*16.1%*	*11.3%*	*15.8%*
2008	*18.0%*	*13.9%*	*17.8%*
2009	*19.0%*	*14.9%*	*18.8%*

West Coast (PADD 5) Crude Oil Composite Acquisition Cost by Refiners (Dollars per Barrel)



The Impact of Fluctuating Oil Prices

Hawaii is extremely susceptible to changes in the international petroleum market. As data from PADD 5 West Coast refiners show (above), the cost of a barrel of oil can fluctuate radically in a few months.

Both natural disasters and human actions have impacted the cost of oil: wars in the Persian Gulf, Hurricane Katrina, embargoes by the Organization of Petroleum Exporting Countries (OPEC), and other geopolitical actions have all influenced the price of crude oil.

Because Hawaii is so reliant on imported petroleum, these changes have rapid and significant impacts on the state's economy and energy security.

Achieving 70% Clean Energy by 2030

The Hawaii Clean Energy Initiative is approaching its third anniversary. Since its inception in January 2008, there has been solid progress in weaning Hawaii off the use of oil for electricity and transportation, the result of hard work by many stakeholders.

In addition to HSEO and US-DOE, partners such as the electric and gas utilities, state government agencies, the Department of Defense, county governments, renewable energy developers, national laboratories, vehicle manufacturers and many others have accomplished significant milestones which will contribute to attaining the HCEI goal of 70% clean energy by 2030.

HCEI's programs are developed in four key areas, each of which has a unique contribution to the state's clean energy goals: efficiency, electricity, transportation and fuels.

Among the notable achievements since HCEI's inception are:

Efficiency

• Setting the Energy Efficiency Portfolio Standard (EEPS) goal of 4,300 gigawatt-hours (GWh) by 2030.

• Establishing a Public Benefit Funds Administrator to finance building energy efficiency technologies.

• Decoupling utility revenue stream from kilowatt-hour use.

• Adopting new, efficient building codes by all counties.

• Piloting highly efficient new homes through the Dept. of Hawaiian Home Lands (DHHL) and the Dept. of Defense (DOD).

• Evaluating potential efficiencies from improved transmission/distribution infrastructure.

Electricity

• Setting the Renewable Portfolio Standard (RPS) to 15% renewable energy by 2015, 25% by 2020, and 40% by 2030.

• Signing a voluntary Energy Agreement between the state and the Hawaiian Electric Co. (HECO).

• Completing feed-in tariffs for several variable renewables.

• Offering permitting coordination and facilitation for energy projects.

• Helping to site renewable energy projects on public and private lands.

• Achieving the fastest growth in photovoltaic (PV) installations in the nation.

• Completing solar and wind power grid impact and integration studies for all islands.

• Initiating solar resource potential and grid impact studies.

• Completing a technical review of the interisland cable project, and initiating an environmental impact assessment.

• Demonstrating smart grid technologies on three islands.

Transportation

• Initiating the Hawaii EV Ready program which will provide $4 million to support the installation of new electric vehicle (EV) charging stations and the purchase of new, commercially available, highway capable, plug-in EVs.

• Exceeding 6,500 in total hybrid electric vehicle (HEV) sales over the past decade while averaging 2% of annual vehicle sales during the last four years.

• Operating 80 HEV buses in routine service under Oahu Transit Services (TheBus).

• Using locally-produced B20 biodiesel in the City & County of Honolulu vehicle fleet.

• Partnering with automotive and infrastructure suppliers to roll out EVs in Hawaii.

• Launching the Hawaii Hydrogen Initiative partnership to develop hydrogen and fuel cells.

• Establishing renewable hydrogen production, refueling, and fleet demonstration at Joint Base Pearl Harbor-Hickam.

• Displacing 10% of gasoline fuel (about 50 million gallons per year, or mgy) with ethanol.

Fuels

• Completing the Hawaii Bioenergy Master Plan and Phase I of the Defense Advanced Research Projects Agency algae study.

• Pursuing small-scale biofuel crop trials.

• Testing biodiesel in HECO's CIP CT-1 biofuel generator.

• Piloting drop-in replacement fuel projects.

• Issuing a HECO request for proposals (RFP) for 210 mgy of locally-produced biofuels.

• Issuing a DOD request for information regarding biofuels to replace 25% of current aviation and diesel fuel demand.

• Completion of HCEI transportation analysis.

Accomplishments in 2010

Landmark Changes to Utility Regulations

The Hawaii Public Utilities Commission (PUC) issued decisions on two landmark issues—decoupling and feed-in tariffs—which will change the way the utilities operate and facilitate renewable energy development.

Other critical dockets remain under consideration.

Decoupling

In a February decision, the PUC approved a plan to delink the profits earned by the Hawaiian Electric Company (HECO) and its subsidiaries from their electricity sales. Similar measures have been taken by about a dozen other states.

This revenue decoupling is expected to stabilize HECO's revenue stream and encourage energy conservation, since it removes an incentive to sell increasing amounts of electricity.

Under decoupling, HECO will be guaranteed to recover its allowed revenue requirements to cover its costs of providing service. Any overearnings will be refunded to the customers.

Although rates may rise in the short term, decoupling will also decrease the frequency of rate case filings, the cost of which are borne by the taxpayers.

Decoupling should increase HECO's access to capital and accelerate adoption of efficiency measures and renewable technologies. The change is expected to take effect in 2011.

Feed-in Tariffs

The concept behind a feed-in tariff (FIT) is to provide preestablished rates and standardized contract terms for renewable energy-based power sold to the HECO companies, providing transparency and certainty in the utilities' renewable resource procurement..

In the fall of 2010, FITs for renewable technologies—photovoltaics, concentrated solar, hydropower and wind—took effect.

There are separate rates for projects of up to 20 kilowatts (kW), and for those generating more than 20 kW. Ceilings vary by technology and by island.

As an example, a family with a small rooftop PV system could sell electricity to the utility at 21.8 cents per kWh, while a larger, commercial system could get 18.9 cents per kWh.

A third tier of projects, larger in capacity, is also expected to receive FIT rates after further study.

Prospective participants may apply to each utility's FIT program online. The program is capped at 60 MW for Oahu and 10 MW each for Maui County and the Big Island.

Mililani Solar Park

HECO filed a petition seeking exemption from the PUC's Competitive Bidding Framework for Castle & Cooke's proposed 20 MW Mililani Solar Park, which would consist of four contiguous 5-MW facilities, separately owned. The Competitive Bidding Framework requires all renewable energy projects with capacities greater than 5 MW to submit competitive bids to HECO in response to a HECO request for bids.

In December 2010, the PUC ruled that the project was not exempt, but waived the requirement for competitive bidding based on factors specific to the project.

Hawaii's Feed-in Tariff Rates 2010
(cents per kWh)

	Tier 1	Tier 2
Photovoltaics	**21.8**	**18.9**
Concentrated Solar Power	**26.9**	**25.4**
Inline Hydroelectricity	**21.3**	**18.9**
Onshore Wind	**16.1`**	**13.8**

Tier 1 applies to all four technologies, from 0 to 20 kW in capacity.
Tier 2 applies to capacities over 20 kW, with the following ceilings:

- *Photovoltaics: 500 kW on Oahu; 250 kW on Maui & Hawaii; 100 kW on Lanai & Molokai.*
- *CSP: 500 kW on Oahu, Maui & Hawaii; 100 kW on Lanai & Molokai.*
- *Inline Hydro and Onshore Wind: 100 kW on all islands.*

Other Regulatory Issues Under Scrutiny by PUC and Stakeholders

In addition to the decisions and orders issued during 2010, other regulatory changes are under consideration. The PUC and other stakeholders, including HSEO, the utilities, the Consumer Advocate, the counties and a variety of public interest and renewable energy groups, are working on the following issues.

A PUC docket on intergovernmental wheeling, suspended in 2008, was reinstated in November. Wheeling would allow government agencies to generate renewable electricity at one site and use the utility lines to transmit the energy to a facility at a different site.

The HECO companies have requested PUC approval of guidelines which would allow the utilities to pay for infrastructure improvements related to renewable energy projects using a surcharge on rates.

A PUC docket on advanced metering infrastructure (AMI) was suspended pending the completion of HECO's proposed extended pilot testing of AMI.

A docket relating to the energy efficiency portfolio standard, including appropriate roles and funding to achieve its goals, was opened.

A docket evaluating the proposed amendments to the Integrated Resource Planning (IRP) framework established in 1992 has been completed and is awaiting the PUC's decision and order.

HECO suggested limiting their proposed PV Host program, which would consolidate small PV projects for third-party financing, to Oahu. Installations would demonstrate grid integration technologies.

The HECO companies' Tariff Rule 14H governs the interconnection standards and procedures for distributed generation facilities connecting to, and operating in parallel with, the utility grid. The PUC opened a docket in 2008 to examine proposed revisions to the tariff. A total of 20 interconnection issues have been identified, including the requirement for expensive technical studies by parties seeking to connect to the grid. Presently, such studies are triggered when distributed generation accounts for 15% of a feeder line's peak load.

Battery storage, such as this unit by XTreme Power, can mitigate the impact of intermittent renewables on the grid.

Grid Integration Issues Key to More Renewables

Hawaii's island grids have accepted such a high percentage of intermittent renewables that the utilities are evaluating cutting-edge solutions such as storage and smart grid technologies in order to maintain stability and quality of service.

Under current regulations, HECO utilities can limit the amount of intermittent generation on a single circuit to 15% of its load; the limit was raised from 10% in 2010. Circuits on several islands have already reached the new ceiling.

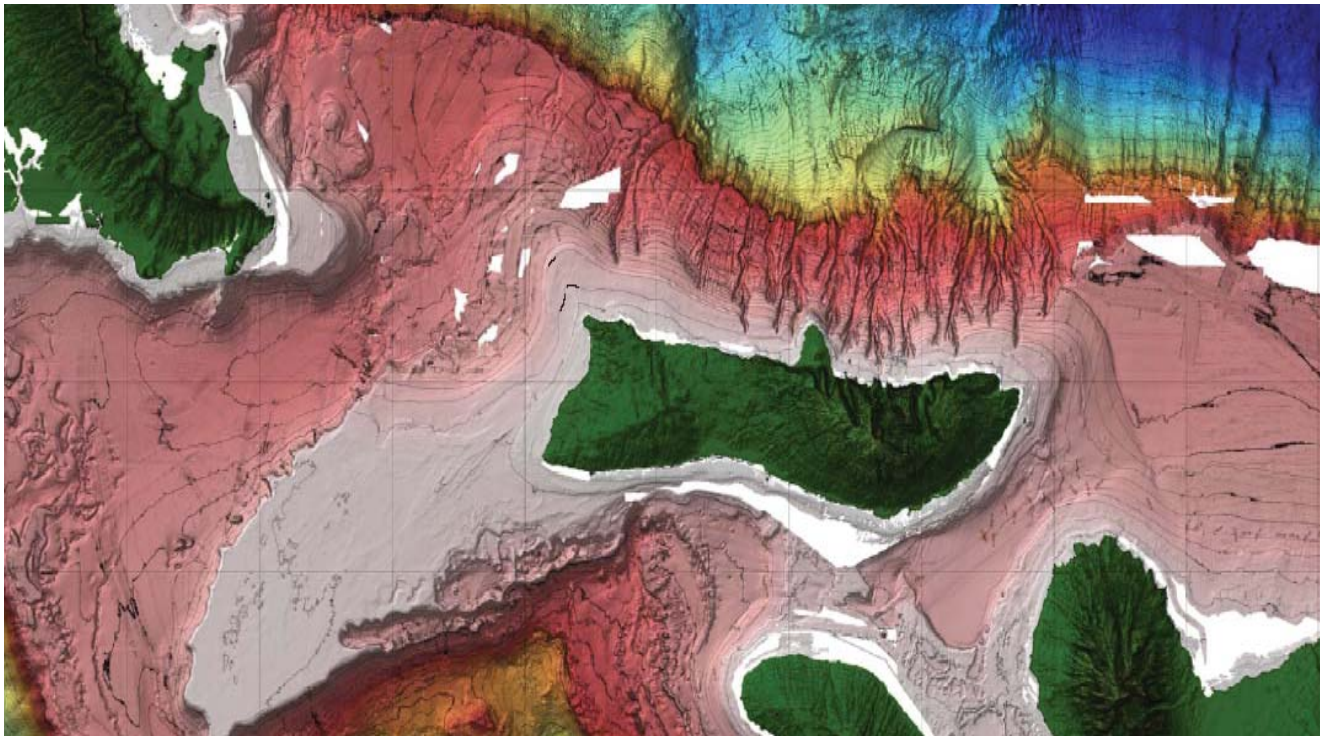
Both HECO and KIUC received ARRA funding to examine smart grid technologies, one approach to resolving the issue. Also, under HCEI, renewable energy grid integration studies have been completed for all islands.

Methods of storing intermittent renewable electricity can also help. Battery storage has been demonstrated at the Kaheawa I wind farm, and is planned for other wind farms as well as the La Ola photovoltaic facility on Lanai.

HNEI expects to test a 1 MW battery with rapid charge and discharge capabilities to smooth the output of the Hawi wind farm with funding from the Navy.

HSEO is working with HELCO and MECO to site two utility-scale battery demonstrations, using ARRA funds.

Sandia National Laboratories sponsored a well-attended energy storage seminar on Maui in June.



Bathymetry data will help guide selection of undersea power cable routes.

Environmental, Business Studies for Undersea Cable Initiated

The Hawaii Interisland Renewable Energy Program (HIREP) proposes bringing 400 MW of wind power from within Maui County, where the wind resource is abundant, to Oahu. Oahu's own renewable energy resources are expected to be insufficient to meet clean energy goals for its dense population.

The cable could also carry electricity from other renewable projects, such as ocean, geothermal or solar. It is a key element of the Hawaii Clean Energy Initiative.

Following the completion in 2009 of an ocean floor survey between Oahu and the islands of Maui County, prepared by the University of Hawaii (U.H.) to illustrate possible routes for the proposed undersea power cable, studies on HIREP's environmental and economic impact were initiated.

In June, a $2.9 million contract was awarded to AECOM to prepare a programmatic environmental impact statement (PEIS) for HIREP. The study, which is financed with ARRA stimulus funds, is expected to be completed by April 2012.

There will be additional EIS studies relating specifically to the development of wind facilities in Maui County, the cable itself, and the related upgrades to Oahu's grid.

The estimated cost of the cable is between $800 million and $1 billion. To weigh the benefits of this project against the continued importation of oil and to compare it with other renewable alternatives, the National Renewable Energy Laboratory (NREL) has undertaken an economic analysis.

Preliminary results indicate that solar and other renewable energy generated on Oahu will complement the 400 MW of wind proposed for Molokai and Lanai. Efficiency measures, especially in buildings, will also make a significant contribution. However, the wind project is necessary to attain HCEI goals.

Furthermore, the cost of the cable is expected to be significantly less than continued payments for imported oil to generate equivalent amounts of electricity.

Discussions continue on the proper ownership and financial structure of the cable.

State Agency Electricity Use Declines

The State's Lead By Example (LBE) program, initiated in 2006, has resulted in increased awareness and significant electricity savings within state executive agencies.

During fiscal year 2010, state agencies' energy consumption dropped 2.8% below that of 2009, and the state paid $20 million for electricity, which is 12.1% less than in fiscal year 2009.

When comparing 2010 against the 2005 baseline year, energy use dropped 5.1%. However, due to the increased cost of electricity, expenses rose 38.5%.

HSEO coordinates the LBE initiative and facilitates several related working groups.

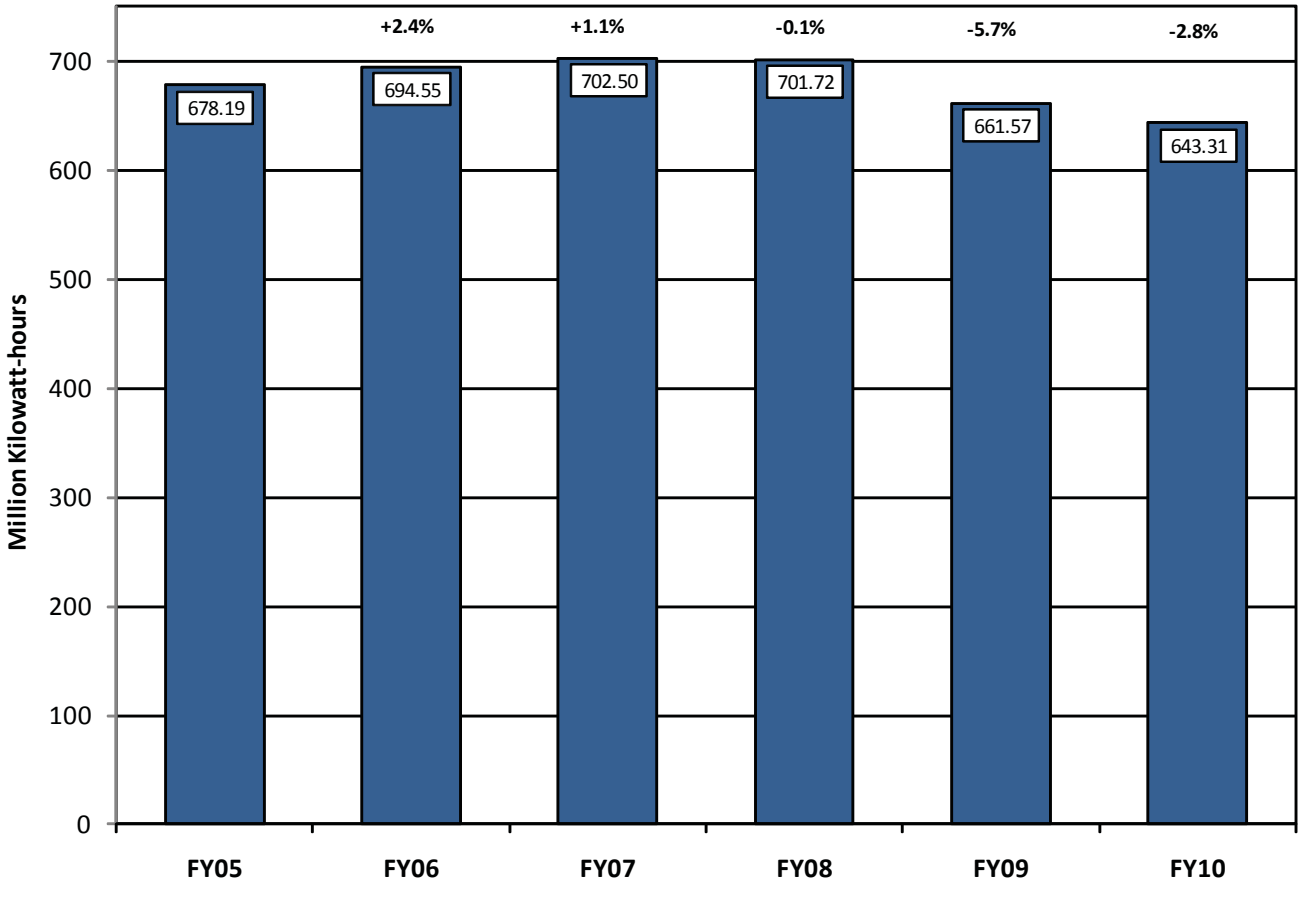
As a member of the Green Building Council, DBEDT sponsors a variety of Leadership in Energy and Environmental Design (LEED) training and other events. DBEDT also participates in other committees and forums to encourage efficient buildings in the public and private sectors.

HSEO contractor Green Building Services prepared a LEED operations and maintenance manual for existing buildings to help state agencies track progress toward achieving LEED Silver status.

The state's first LEED Commercial Interior project, a lounge at Honolulu International Airport, was completed in late 2010 and is expected to receive a Silver rating.

With support from the National Governor's Association (NGA), representatives from HSEO and the Dept. of Accounting and General Services (DAGS), Dept. of Transportation Airports Division (DOT-A), and University of Hawaii community colleges participated in the 2010 Energy Policy Academy on Building Efficiency Retrofit Programs. The state focused on workforce training, financing models and performance contracting.

State Executive Agency Electricity Consumption



Building Codes Updated Statewide

A new statewide building energy code, developed with input from HSEO, incorporates Hawaii-specific amendments. The code was based on International Energy Conservation Code (IECC) 2006 and was adopted by the state in June 2010.

It is estimated that the amendments made the 2006 model energy code 15% more efficient.

The City and County of Honolulu and Maui County adopted IECC 2006 in the fall of 2009; Hawaii County followed in October 2010. Kauai adopted the updated IECC 2009 in May 2010.

Counties Commit to Increased Efficiency

Hawaii's county governments received ARRA funds through the Energy Efficiency and Conservation Block Grant which were used to reduce energy consumption.

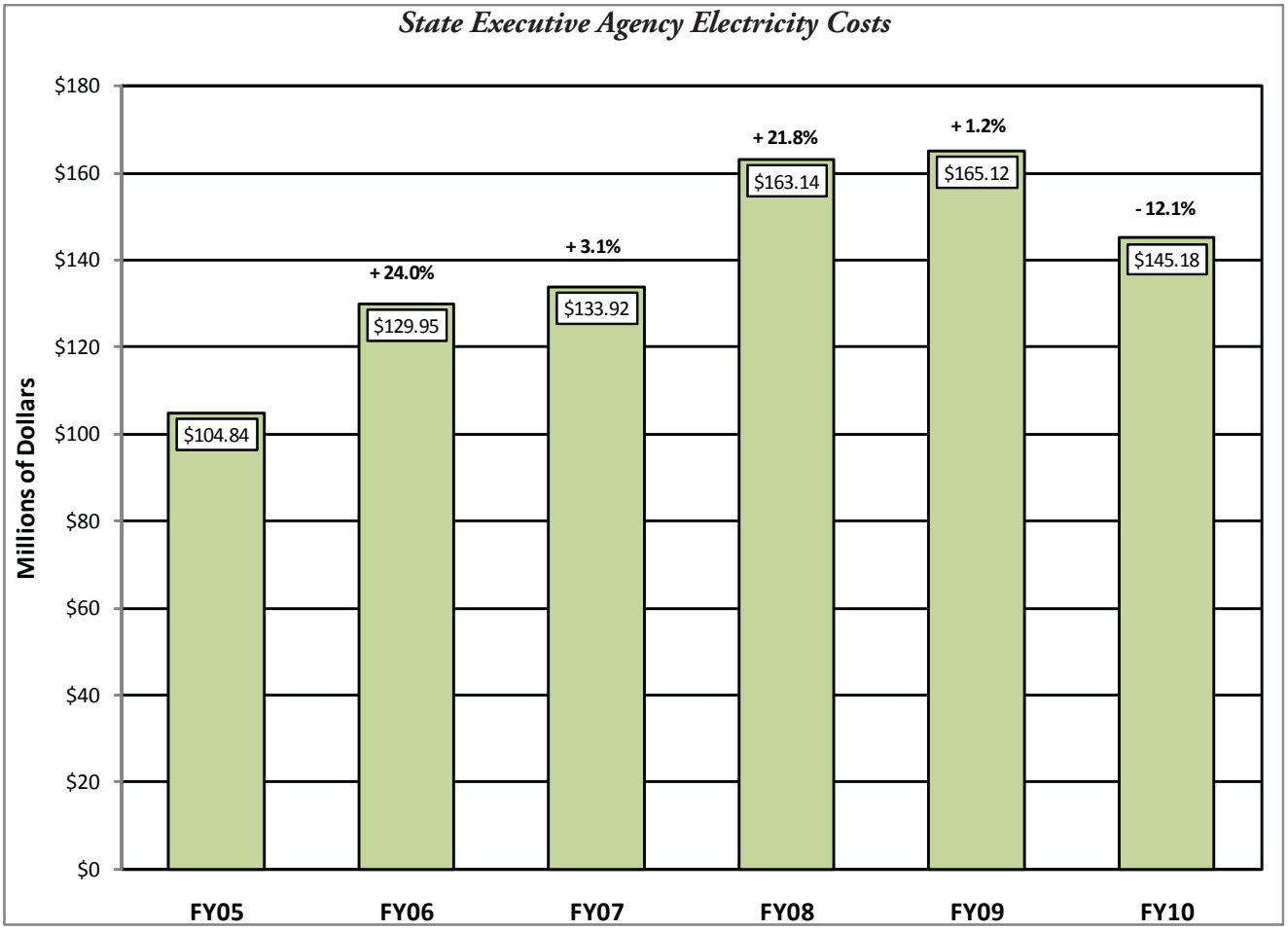
On Maui, for instance, the county completed investment-grade audits of 12 county facilities and is moving to implement the recommendations.

In the County of Hawaii, the funds are being applied to street lamp retrofits, residential energy audits and energy education. Also, the county is developing a financial package for efficiency retrofits.

Hawaii County is seeking funds for energy audits in its top ten facilities. Rapid payback of lighting retrofits and improvements to operations are expected.

The City and County of Honolulu also received a $499,000 Climate Showcase Communities grant from the U.S. Environmental Protection Agency. Funds will be used to install efficient lighting and develop a Hawaii-specific residential energy audit.

Kauai County is actively pursuing a variety of energy initiatives and is also participating in the Sustainability Action Team, which is focused on resource recovery.



Efficiency Programs Target Varied Markets

To achieve its goal of reducing electricity use by 4,300 gigawatt-hours by 2030, the state is aggressively pursuing efficiency measures. Achieving efficiency in both new and retrofit buildings will have a significant impact.

Hawaii already invests strongly in efficiency. The Energy Services Coalition ranked Hawaii second in the nation for per capita spending on energy savings in the construction and renovation of state buildings and other facilities.

Hawaii was credited with qualifying performance contracts exceeding $102 million.

To help get the word out about building efficiency, DBEDT coordinated the 10th annual Build & Buy Green Conference and Expo which attracted 300 participants and 50 exhibitors. Topics included greening affordable housing, green schools, and net-zero energy homes and communities.

Green Business Program

The Green Business Program recognizes hotels, resorts, offices, retail establishments, restaurants and government entities which have implemented measures to reduce energy use, water consumption and waste in their operations.

In 2010, nine hotels, three restaurants, two offices and two government agencies were honored.

Participants in a related program, the Green Government Challenge, are also lauded for their conservation achievements.

In 2010, HSEO was awarded $74,000 in support of a Green Internship Development Program to mentor and train five to 10 students to help expand the Hawaii Green Business and Green Government Challenge programs.

Energy Star

Among the most popular efficiency initiatives in 2010 was a rebate program for Energy Star refrigerators under the Hawaii Energy Efficiency Program using ARRA funds.

Hawaii also encourages procurement of Energy Star products and certifies state buildings as Energy Star compliant. To date, 13 state buildings have been certified under Energy Star.

Workshops, training and technical assistance are offered under DBEDT auspices. Assistance is provided to hotels and hospitality facilities seeking Energy Star status. The label has become a marketing advantage.

The City and County of Honolulu received two Energy Star building awards, for Honolulu Hale and the Fasi Municipal Building. Energy performance, thermal comfort, indoor air quality and lighting levels were among the criteria.

Residential Savings

Although Hawaii's homes are the most energy-efficient in the nation, there is room for improvement.

The state applied $3.4 million in ARRA funds toward residential efficiency. Most of the money, $2.9 million, will be spent by DHHL (see p. 17).

An additional $500,000 will be spent by the Dept. of Labor and Industrial Relations in its low-income weatherization program for more efficient refrigerators, heat pumps, and showerheads.

Outdoor Lighting

HSEO staff actively participates in the Starlight Reserve Committee which aims to establish light-free areas so that stars can be viewed. The committee's goal will be accomplished by converting outdoor lighting sources to fixtures which reduce both energy use by a minimum of 50% and minimize light pollution.

Hawaii Lauded for Efficiency Efforts

Hawaii was named as one of the top four energy-saving states in the nation by the American Council for an Energy-Efficient Economy (ACEEE) when it announced the winners of its inaugural Energy-Efficiency Award.

ACEEE, a Washington, D.C.-based nonprofit, cited the state's Lead by Example program, administered by HSEO. Among the notable accomplishments are achieving Energy Star designations for 13 state buildings, completion of energy audits and retrofitting for other buildings, and the construction of the Waipahu Intermediate School cafeteria to LEED standards.

Agencies Cooperate on Energy Initiatives

A multitude of energy efficiency and renewable energy projects are being undertaken by state agencies. Often, HSEO provides support through consultation, training, and collaboration.

Efficiency Efforts

In the efficiency arena, HSEO has supported DHHL's efforts to install compact fluorescents and solar water heaters on 400 homes using $2.9 million from ARRA.

The improvements should reduce electric bills by 30-40%.

This is not DHHL's first effort at efficient buildings. The 18-home Kaupuni Village subdivision in Waianae, an affordable housing project, will have solar water heating, photovoltaics, and a variety of efficiency measures. More than 300 families have applied for homes in the Village.

DHHL was awarded a $10.2 million ARRA block grant to cover hard costs for Kaupuni as well as another master-planned community in Kapolei.

HSEO staff have also participated as subject-matter experts in DHHL beneficiaries' consultation hearings relating to energy.

The State Land Use Commission held hearings regarding a proposed requirement for LEED Silver and Energy Star ratings in new large-scale residential and mixed-use developments that request a land use reclassification from agriculture to urban. HSEO testified in favor.

Renewable Energy

Other agencies are also engaged. The Dept. of Transportation (DOT) accepted bids for renewable energy generation at DOT, DBEDT and U.H. facilities statewide. The North Kohala Library is expected to receive LEED Gold, if not Platinum, certification. DAGS has applied ARRA funds to a 200 kW PV system on the Kalanimoku Building, installed in August.

Also, the Dept. of Land and Natural Resources (DLNR) will include renewable energy on state park facilities such as water system pumps and rental cabins.

Hawaii State Energy Office staff often serve as subject-matter experts in support of other agencies' energy initiatives and assist in negotiating lease agreements

HSEO works closely with DHHL, DLNR, and DOA to secure renewable energy tenants on lands suitable for renewable energy development and will continue to work with these and other agencies to lease state and county lands for energy uses, provided certain lease benchmarks are met.

This partnership has the potential to generate long-term income for state landowners while advancing the HCEI agenda.

HSEO staff advise their colleagues in other agencies on renewable energy matters and assist in negotiating lease and easement agreements. Staff also participate in public hearings and meetings.

Habitat Conservation

In order to facilitate wind power development statewide, HSEO is working on habitat conservation planning with DLNR and the U.S. Fish and Wildlife Service. This will address concerns related to the Incidental Take License/ Permit required when endangered species may be impacted.

Collaborating with federal agencies on renewable energy projects, HSEO also provides legal guidance to renewable energy grant applicants, primarily with the U.S. Dept. of Agriculture. Consultations with federal agencies on energy matters have resulted in improved communication and collaboration.

Performance Contracting

In cooperation with other state agencies, DAGS is planning a second Energy Savings Performance Contracting (ESPC) request for proposals (RFP) for 28 buildings; an investment-grade audit for two prisons and one jail; an RFP for ESPC at 15 airports, five harbors and some highway facilities; and ESPCs for six community college campuses.

HSEO advises and provides technical assistance for these efforts.

In 2009, total performance contracting investments exceeded $99 million, generating savings of 172.6 GWh in energy use and $271 million in electricity cost.

Kahuku Wind Farm Completed

Oahu's first modern wind farm, a 30-MW installation by First Wind, is expected to begin providing electricity in 2011. Ground was broken in July and the final turbine erected in October.

The power purchase agreement with HECO was approved by the PUC in early May. The predetermined price for wind electricity will be more predictable than the fluctuating price of oil.

The facility is one of several projects which won approval to provide renewable electricity to HECO as the result of a 100-MW request for proposals released in 2008. The project also received a $117 million loan guarantee from USDOE.

In addition to the dozen large turbines, the installation includes battery storage to smooth fluctuations in power output caused by changes in wind speed. Such batteries will probably be a required component of future utility-scale wind installations.

First Wind already operates the 30-MW Kaheawa I Wind Farm on Maui, and is working toward an additional 22-MW facility in the same location on state land. They have also proposed a 70-MW wind farm at the former Kawailoa Plantation on Oahu's North Shore; a preparation notice for an environmental impact statement was filed in September with the state's Office of Environmental Quality Control. The landowner is Kamehameha Schools.

Electricity generation from the wind increased 39% from 2008 to 2009, among the fastest growth rates in Hawaii's renewable energy portfolio

On Maui, Sempra Generation continues its pursuit of a 22-MW wind project.

On the Island of Hawaii, the utility-owned Lalamilo Wind Farm has been decommissioned. The 2-MW installation, which had been in operation since the mid-1980s, consisted of small turbines which didn't reflect advances in technology.

The Kahuku wind farm consists of twelve 2.5-MW Clipper Liberty wind turbines and a 10-MWh Xtreme Power battery storage system.

The County of Hawaii Department of Water Supply, working with the National Renewable Energy Laboratory (NREL), hopes to develop a modern wind plant at the site. The electricity would be used to pump several nearby water wells.

The currently operational Hawi and South Point wind farms on the Big Island have a combined generating capacity of about 30 MW.

HSEO is also encouraging the use of distributed wind machines, generally smaller and used for residential or off-grid locations. Given the number of protected avian species in Hawaii, small scale wind has faced difficulty establishing itself in Hawaii. HSEO is working with DLNR's Division of Forestry and Wildlife (DOFAW) and the U.S. Fish and Wildlife Service to create island-wide habitat conservation planning to facilitate distributed wind development statewide.

First Grid-Connected Wave Device in U.S.

In September, Ocean Power Technologies (OPT) announced the grid connection of its PowerBuoy off Kaneohe, Oahu, which the company cited as the first such connection in the nation.

The PowerBuoy, offshore of Marine Corps Base Hawaii, is part of a U.S. Navy project to test OPT's device. The buoy, the third to be deployed at Kaneohe since 2004, has been in the water since December 2009.

In other wave energy news, Oceanlinx has decided to pursue a 500-kW project off Pauwela Point, Maui, somewhat smaller than the 2.7 MW originally envisioned.

Oceanlinx, based in Australia, holds the sole preliminary permit, issued by the Federal Energy Regulatory Commission, for wave energy development in Hawaii and also a Memorandum of Understanding with HECO.

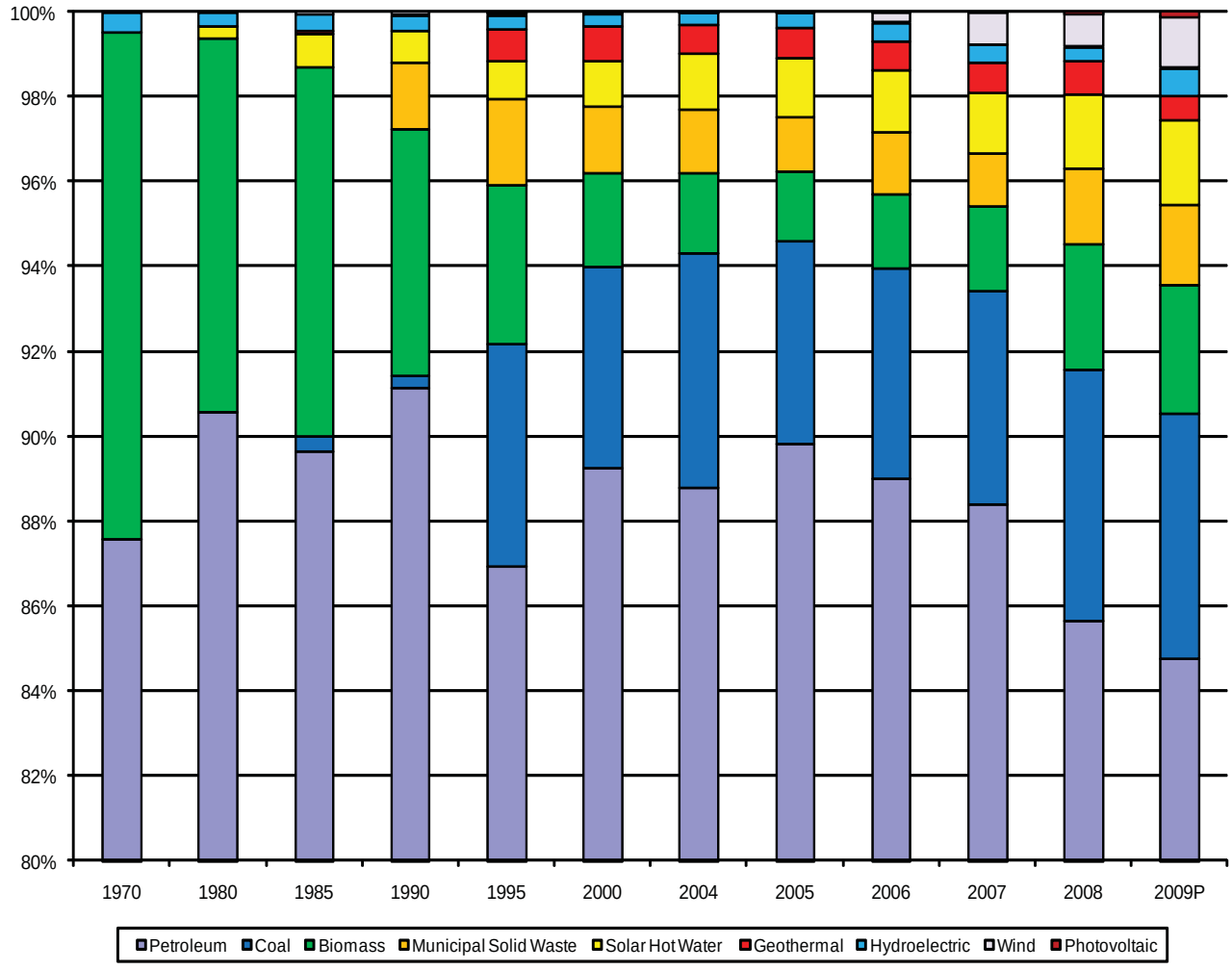
There has also been activity in ocean thermal energy conversion (OTEC).

With Navy funding, Lockheed Martin and partners such as Makai Ocean Engineering are developing a 5- to 10-MW pilot OTEC plant to be deployed off Oahu. Heat exchanger tests are underway at NELHA, and Makai is working on pipe fabrication issues.

Makai was honored by the U.S. Small Business Administration for its research and development work on OTEC; it was nominated by the Naval Facilities Engineering Command.

Lockheed Martin also received several grants from the USDOE and the Navy to advance the commercialization of OTEC.

Primary Energy Sources in Hawaii, 1970-2009, Selected Years



Public School Campuses Becoming Energized

Public schools across the state are becoming more energy-efficient, building to "green" standards, and incorporating renewable energy. Similar initiatives are apparent at private campuses.

Solar Schools

Four Oahu high schools were approved to receive photovoltaic systems in 2010. A later phase of the project will include other schools statewide.

Kaimuki, Waianae, Aiea and Kahuku high schools were selected because they needed roof repairs and are in sunny areas.

Electricity will be provided to the campuses through a power purchase agreement. The Department of Education (DOE) will purchase electricity at $0.20 per kilowatt-hour (kWh), saving money compared to utility rates. The cost will rise to $0.33 per kWh over the 20-year contract.

DOE expects to save a minimum of $1 million over the life of the project.

In October, Gov. Lingle released funds for a PV system at Lanikai Elementary Public Charter School. The installation should be completed in 2011 and is expected to save the campus approximately $45,000 per year.

Other schools have also gone solar. For instance, Kualapuu Elementary on Molokai completed the third phase of its solar electric project, bringing the PV system to 50 kilowatts. The school typically paid $0.33 per kWh.

The U.H. College of Tropical Agriculture and Human Resources is also evaluating the installation of renewable energy equipment at various campuses and laboratories statewide. U.H. West Oahu is considering a 1 MW PV installation for its new campus near Kapolei.

LEED Platinum

A new building, part of the Kanu o ka Aina New Century Public Charter School, is one of only three LEED Platinum certified projects in Hawaii and the first school building in the state to receive a Platinum rating.

Located on DHHL land in Waimea on the Big Island, the building features natural ventilation and lighting and uses recycled materials. Other green features are light tubes, solar energy, and waterless urinals.

U.H. Team Selected

Team Hawaii will be one of 20 teams to compete in the 2011 Solar Decathlon, scheduled for the fall of 2011 on the National Mall in Washington, D.C.

The team will consist of students from U.H.-Manoa and Honolulu Community College.

The entry is expected to feature advanced composite materials, building-integrated photovoltaics, and an affordable tropical home design.

PROVISION SOLAR

This 105-kW photovoltaic array on Molokai General Hospital is among the hundreds of PV systems installed statewide in 2010. Hawaii has more PV installations per capita than any other state, and ranked 6th in total MW installed during 2009.

Transforming Transportation: Electric Vehicles and Clean Fuels

Hawaii will not be able to get off oil unless its transportation sector converts to alternative vehicles and clean fuels.

To accelerate the early deployment and adoption of electric drive vehicles and related charging equipment, HSEO is working with parking lot owners, fleet managers, plug-in vehicle manufacturers, auto dealers, apartment associations, the hotel industry, utilities, government agencies, EV enthusiasts, nonprofits, Hawaii drivers and other stakeholders.

Toyota provided several plug-in Prius hybrid vehicles to Hawaii organizations, including DBEDT, for test drives in 2010.

Acquiring Alternative Vehicles

Starting in 2010, state and county agencies buying new vehicles are required to give priority to electric vehicles (EVs), alternatively-fueled vehicles, and hybrid electric vehicles.

Using ARRA funds, the Dept. of Accounting and General Services (DAGS) will be able to acquire vehicles and charging infrastructure to meet this mandate.

The funds may also be used by state agencies to comply with the law requiring designated EV parking spaces and chargers in large public lots by the end of 2011.

Rebates and Grants

The Hawaii EV Ready Rebate and Grant program is intended to help establish the EV infrastructure market in Hawaii and support the adoption of EVs over the next two years.

DBEDT has approximately $4 million from ARRA available for grants and rebates to make Hawaii EV ready. Vehicles and equipment funded under the rebate program are not eligible for the grant program, and vice versa.

The rebate program provides funds to Hawaii residents, businesses, nonprofits, and state and county agencies for the initial purchase of new, commercially-available EVs for use in Hawaii. Rebates for the purchase and installation of commercially-available charging equipment in Hawaii are also eligible.

Vehicle rebates are up to 20% of the purchase price with a maximum of $4,500 per vehicle. Charging equipment rebates are up to 30% of the cost, with a ceiling of $500 per charger.

A combined rebate, for both a new electric vehicle and a charger, is capped at $5,000.

Rebates will be on a first-come, first-served basis, and can be combined with federal tax incentives.

Hawaii's EV-Ready Rebates became available in August and have recently been increased to a total amount available of $1.4 million.

The EV Ready Grant Program will competitively award grant funds to accelerate the creation of a comprehensive system of EV charging stations on all major islands, as well as introducing EVs to public and private vehicle fleets.

Anticipated projects, to be selected from 19 applications, include purchasing and installing hundreds of charging stations, introducing EVs to several fleets, data collection and analysis of utility integration and power management, streamlining the permitting process for charger installation, and providing education and outreach for the public.

Successful proposals will be announced in early 2011.

In January, the SAE J1772 charge coupler standard was approved by the Society of Automobile Engineers International. Public chargers funded under Hawaii's program must comply with this standard.

Hydrogen Initiative Launched

The Hawaii Hydrogen Initiative (H2I) aims to integrate hydrogen as an essential building block for Hawaii's sustainable energy ecosystem and to support infrastructure for hydrogen-powered vehicles. It was launched in December to make hydrogen-powered vehicles and fueling infrastructure a reality on Oahu by 2015.

The collaboration involves a dozen entities, including DBEDT, General Motors (GM), The Gas Company (TGC), USDOE, the military, the County of Hawaii, and federal and academic research organizations including the University of Hawaii.

GM brought its first shipment of hydrogen fuel cell vehicles to Hawaii and expected to bring in 20 vehicles by the end of 2010.

TGC plans to build up to 25 fueling stations in the next few years. The first nonmilitary station will be at its Kakaako location, which will separate hydrogen from the synthetic natural gas it already carries in over 1,000 miles of pipeline.

TGC presently produces enough hydrogen to power up to 10,000 fuel cell vehicles, and has the capacity to produce much more. Although most synthetic gas is manufactured from petroleum, TGC is actively pursuing local resources, such as animal fats, to be used in its refineries. Currently 5% of its gas is derived from wastewater.

Rates for the hydrogen fuel will need to be approved by the PUC.

At least 15 hydrogen-powered vehicles are already in use by Hawaii's military. The hydrogen fueling station on Hickam Air Force Base is powered in part by photovoltaic energy, serving as a model of maximum renewable energy productivity. Hydrogen buses are proposed for use in a pilot project on the Big Island, with the hydrogen being generated with off-peak geothermal electricity.

The Hawaii Hydrogen Initiative seeks to fuel vehicles with hydrogen manufactured from locally available resources.

EVs and Charging Stations Arriving in Hawaii

Public interest in electric vehicles was high in 2010 and manufacturers responded, offering early roll-outs of commercial EVs in Hawaii and showing off their new models at exhibitions.

Hawaii's biggest new car show, the First Hawaiian International Auto Show, highlighted EVs and charging stations.

EVs were also prominently displayed at the Asia Pacific Clean Energy Summit in September.

Operating an EV is generally significantly cheaper than fueling a gasoline car. To encourage EV use during off-peak hours, HECO will discount electricity for EVs charged between 9:00 p.m. and 7:00 a.m. This pilot program will be available for three years.

The first public 240-volt EV charging station in Hawaii was installed in Kakaako by retailer Green Energy Outlet.

CT&T, a Korean-based EV manufacturer, committed itself to establishing an EV assembly and sales facility in Kapolei which could employ 400 people. A cooperation agreement with the state was signed in May.

A state agreement with Nissan North America will result in the all-electric Leaf vehicle being launched in Hawaii in 2011. About 300 residents quickly put down reservation deposits. Nissan will also work with the state to promote charging stations.

Coda Automotive announced plans to sell its electric sedan in Hawaii in late 2011.

Biofuels Explored for Power & Transport

To facilitate the development of a local and sustainable biofuels industry, HSEO is working with landowners, biomass growers, conversion technology proprietors, refiners, distributors and end users to revitalize local agriculture and agribusinesses and reduce our dependency on both imported food and fuel.

Along with other federal, state and county agencies, HSEO's goal is to ensure that a successful Hawaii biofuels industry does not come at the expense of our agricultural and natural resources.

HSEO hosted two intergovernmental biofuels planning workshops to discuss critical issues and avoid unintended consequences in the development of a biofuels economy in Hawaii. Scenario planning techniques were used to elicit input from key government stakeholders, to find consensus and identify next steps.

In the private sector, HECO is seeking a long-term supply of biofuels from feedstocks produced and processed in Hawaii.

HECO issued a request for proposals for fuels that use land or water-based crops, waste fats or yellow grease. At least ten companies responded. The selected contractors are expected to be announced in early 2011.

Tests at Power Plants

The PUC approved HECO's plan to test biofuel blends made from palm oil in a 90-MW generating unit at its Kahe Power Plant as well as the acquisition of palm oil-derived biodiesel for an ongoing demonstration at MECO's Maalaea power plant.

Sugarcane waste used to be an important fuel in Hawaii. New energy crops may contribute liquid fuels in the future.

Also approved was a competitive two-year contract to supply up to seven million gallons of renewable biodiesel annually to HECO's new 110-MW combustion turbine at Campbell Industrial Park. The biodiesel, imported from the U.S. mainland, is made from waste animal fats.

Independent power producer Kalaeloa Partners has also tested biodiesel successfully in its twin combustion turbines. Early results indicate biofuels can produce as much power as fossil fuels, with less residual material.

Transportation Fuel

UOP LLC will build a demonstration plant at the Tesoro refinery in Kapolei to convert biomass into transportation fuels, supported by $25 million from USDOE.

Feedstock, including cellulosic materials such as forestry waste, will be provided by six mainland companies and by HR BioPetroleum, a Hawaii company.

Aiea-based ClearFuels Technology won a USDOE grant for a biomass gasifier in Colorado. The project will integrate technologies for low-cost production of diesel and jet fuel and will lead to the final design of commercial plants in Hawaii and elsewhere.

On the Big Island, Pacific Biodiesel broke ground for its $10 million plant near Keaau. The facility will be capable of producing up to 8,000 gallons of biofuel a day from a variety of feedstocks.

Pacific Biodiesel won the Deal of the Year award from the Hawaii Venture Capital Association for its fundraising efforts relating to the Big Island plant. Runner-up was ClearFuels Technology.

Near the Big Island Biodiesel plant, Hawaii Pure Plant Oil is growing jatropha experimentally on about 250 acres. A small test crop has been processed.

The nonprofit Hawaii Agricultural Research Center (HARC) recently filed an application to construct a biofuel processing facility in Kunia, using locally grown crops and green (yard) waste as feedstock. Expansion anticipates growing crops specifically for this facility.

Strong DOD Interest in Biofuels

HSEO and other key agencies, including DOD and the state and federal Departments of Agriculture, meet monthly to develop a strategy to transition to biofuels for DOD needs in Hawaii. The Defense Logistics Agency Energy, which is the procurement agency for DOD fuels, issued a request for information to determine market interest, feasibility, and strategies for biofuel production.

In January, the Navy and the U.S. Dept. of Agriculture (USDA) signed an agreement to encourage the development of advanced biofuels and other renewable energy sources for military use. Hawaii was chosen for the initial collaboration site to model types of crops and biofuels that can be produced. The Navy and USDA held an industry forum during April.

The Navy has announced its intention to convert half of its fuel needs to biofuels by 2020. The Navy in Hawaii has planned for three E85 fueling stations. By 2016 it hopes to float a battle group of biofueled ships, dubbed the "Great Green Fleet." The Air Force has already flown an FA-18 Super Hornet jet on a 50/50 blend of camelina (a hardy crop grown in the U.S.) and petroleum-based jet fuel. The "Green Hornet" broke the sound barrier without incident. The military has also successfully tested other combat vehicles using blends of renewable and fossil fuels.

The Office of Naval Research and USDOE are supporting five years of studies on producing biofuels, including diesel and jet fuel, from sugarcane grown on Maui.

As part of the project, U.H. will conduct research on energy crop development and energy conversion techniques.

At the Marine Corps Base Hawaii, two tactical vehicles are running on B20 biodiesel made from used cooking oil. B20 is also being used in two visitor ferries at the Arizona Memorial in Pearl Harbor.

Pacific Biodiesel, which is providing the fuel to the Marines, is also helping the Army design a system to grow its own fuel.

This hydrogen fueling station, partially powered by PV at Hickam Air Force Base, exemplifies DOD's interest in renewable fuels

Algae Investigated as Feedstock for Future Fuels

Although much research is still needed, algae shows potential as a future source of liquid fuels.

An algae-to-fuel facility near Wahiawa has been proposed by Phycal, which completed an Environmental Assessment and now awaits final confirmation from the Dept. of Agriculture (DOA) on whether all strains of algae are approved for importation to Hawaii.

Once approved, Phycal hopes to break ground in early 2011. The $65 million pilot project will entail developing shallow algae ponds on 34 acres of former pineapple land using reclaimed water. Processing will occur at Kalaeloa. Phycal intends to create approximately 100,000 gallons of biofuel per year, with commercial-scale expansion now being planned. Phycal plans to produce algal oil for electricity generation as well as algae biomass co-product for animal feed.

Tesoro will provide carbon dioxide, a feedstock for the algae, and evaluate the fuel products.

Phycal has received a $24 million USDOE grant, private capital, and $1 million from the Hawaii Hydrogen Fund.

A separate project, Cellana, received $9 million from USDOE to continue its algae research at NELHA. All algae strains being tested already grow in Hawaii.

The results of Cellana's research are expected to be put into commercial use on Maui by HR BioPetroleum.

Facilitating Permitting Will Speed Renewable Energy Development

Working with the National Renewable Energy Laboratory (NREL) and two contractors, HSEO has amassed a collection of federal, state and county permits which could potentially be required for renewable energy development in Hawaii. Available through the project permitting link on the HCEI website, http://hawaiicleanenergyinitiative.org/permitting/, the list is categorized by renewable energy technology and by county.

HSEO is creating a website with interactive tools to guide companies through the permitting process, including a "Self-Evaluation Permitting Wizard" to help all users, from homeowners to utility-scale developers, identify the permits needed for a given project. The permit applications themselves are also available through the HCEI website, as are links to and contact information for the relevant permitting agencies.

The site should be completed in early 2011 and will include an informative guidebook.

HSEO staff have also actively served on the City and County of Honolulu's Task Force on Sustainability, focusing on streamlining the permitting process for renewable energy projects.

Also, HSEO is working with the Dept. of Health (DOH) to bring DOH's environmental permitting process online. Often, permitting delays are caused by incomplete applications. Using the website, applicants will be able to avoid errors by posting permit applications, supporting documents and related materials. They will also be able to track the progress of their applications.

The ePermitting tool will enable DOH staff to fully manage all requisite permitting applications and forms, in addition to providing a forum for direct applicant interaction. Applicants will be able to create user accounts in which all permit-related documents will be stored.

Developed with extensive input from DOH permitting professionals, HSEO and DOH believe this project will significantly streamline the DOH permitting process. If successful, this project will serve as a model for other state and county permitting agencies.

DBEDT has the authority to coordinate and facilitate permitting for renewable energy projects with capacity to generate 5 MW or more or one million gallons of biofuel per year. Through the HRS §201N Renewable Energy Facility Siting Process (REFSP), DBEDT has authority to collect fees from permit applicants to be used towards permit processing. Fees can be used by HSEO to administer the REFSP and may be distributed to state and county permitting agencies for their direct and indirect costs in issuing permits for an REFSP participant. Third-party contractors may also be retained under HRS §201N.

Under the REFSP, HSEO creates a permit plan, coordinates with permitting agencies to address hurdles, and serves as accepting authority for HRS §343 environmental review documents. REFSP requires all permits to be issued within 12 months after final acceptance of an HRS §343 document, with a six-month extension available at DBEDT discretion.

More than five developers have entered into the HRS §201N siting process. HSEO has assisted countless other renewable energy developers through the permitting and site acquisition processes.

HSEO itself does not issue permits; its role is as a facilitator and liaison between other federal, state and county agencies and the private sector. HSEO has been supported by other state and county agencies mandated to reach certain clean energy goals.

OCEANLINX

Constructing renewable energy facilities such as this wave plant requires multiple permits.

Advances in Geothermal and Biomass

Geothermal and biomass projects are expected to contribute significantly to energy supply.

Geothermal

Looking at opportunities to increase generation, geothermal developer Ormat began surface exploration within the Haleakala Southwest Rift subzone, supported by an ARRA grant. Ormat is the parent company of Puna Geothermal Venture (PGV), the state's only geothermal power plant.

Ormat has also expressed interest in developing the expected resource under Hualalai on the Kona side of the Big Island, but a number of steps are necessary first, including designation of a geothermal subzone.

Meanwhile, PGV and HELCO have negotiated a contract to provide an additional 8 MW of geothermal electricity from the existing 30-MW power plant. The PUC still needs to approve a power purchase agreement. The new equipment will enable HELCO to dispatch geothermal electricity as needed to match changes in demand. Presently, PGV, like geothermal plants worldwide, provides baseload power; it is also curtailed during off-peak periods.

Blockages in existing wells restricted PGV's output to 17 MW, instigating penalties and lost revenue. A new well, KS14, was drilled to alleviate the situation.

Evincing strong interest in the potential of geothermal energy, the County of Hawaii established a geothermal working group to analyze the potential development of geothermal energy as the primary energy source for baseload power. The group will submit a report to the 2011 Legislature.

Other areas of the State are also being considered for geothermal development.

Biomass

HECO has signed a power-purchase agreement with Honua Power LLC, a 6-MW operation to turn construction and demolition waste, as well as other biomass, into a synthetic fuel gas. If successful, the project could double in capacity in a second phase. The contract still needs approval from the PUC and the project faces other hurdles, including acquisition of the waste feedstock.

Honua has a feedstock agreement in place with PVT Landfill, conditioned upon PVT's acquisition of all necessary permits and approvals.

The City and County of Honolulu's HPower expansion should be operational in 2011/2012. The new facility will enable HPower to burn more waste materials than Waimanalo Gulch Landfill can accept in a given day. At this time, significant mining of Waimanalo Gulch is not contemplated as it is uncertain what impact mining will have upon the landfill cells and there is presently no facility in Hawaii that can process the wet, sludgy feedstock found in the bottom of the landfill cells.

On the Big Island, NELHA is considering a 6-8 MW waste conversion facility to be operated by BioEnergy Hawaii using feedstock from the local landfill and other sources.

On Kauai, numerous biomass developers are in the process of signing leases to secure lands for feedstock crops.

Green Energy has a power purchase agreement in place with KIUC, as well as thousands of acres of feedstock land. Pacific Light & Power and Pacific West Energy are also in the process of securing land for biomass-to-energy projects.

Other developers are considering the use of human and agricultural effluent to generate power.

PUNA GEOTHERMAL VENTURE

Puna Geothermal Venture's 30-MW power plant may be expanded soon by 8 MW using unique load-following technology.

Study Team Focuses on Energy Issues in Hawaii and Okinawa

A joint US-Japan/Hawaii-Okinawa study team has been formed to examine ways to collaborate on sustainable energy technologies in the two island jurisdictions.

Building off an agreement between President Obama and then-Prime Minister Hatoyama in 2009, members of government and research organizations from both nations toured energy facilities in both Okinawa and Hawaii and held extensive discussions on common interests in efficiency and renewables.

Areas meriting future cooperation include smart grid technologies, net zero energy buildings, and ocean thermal energy conversion (OTEC), to be enhanced by joint education and peer communication.

The US-Japan/Hawaii-Okinawa study team visited key energy sites such as the Gateway Center at NELHA.

Hawaii team members visited waste-to-energy facilities, ethanol plants, flywheel storage, and uniquely designed municipal buildings with PV during research on Okinawa during August.

Subsequently, the Okinawan team investigated projects at NELHA, military housing constructed by Forest City, wind farms, photovoltaic installations, and other sites of interest on several Hawaiian islands.

Following the initial site visits, Hawaii representatives participated in workshops on building efficiency and OTEC held in Okinawa. Japanese and Okinawan representatives attended a Japan/US event and smart grid discussion in Hawaii.

Follow-up meetings in 2011, including a Big Island scientific site visit and a second OTEC workshop to be held at NELHA, are planned.

Outreach Efforts Reach Thousands

Headlining HSEO's energy outreach and communications efforts in 2010 was the second Asia-Pacific Clean Energy Summit, held at the Hawaii Convention Center in August. Internationally recognized speakers and extensive displays attracted nearly 1,200 attendees from around the region.

Networking, training, workshops and seminars were held throughout the year. Long-standing consortia such as Rebuild Hawaii held regular quarterly meetings, while other sessions were tightly focused on topics such as EVs, efficient lighting, smart grid, and opportunities for biofuels in the military.

As they have done annually, energy staff from the U.S. Pacific Island territories traveled to Honolulu for peer training and briefings by USDOE.

HSEO staff made numerous presentations on energy topics at conferences, community meetings, and to the news media.

Each year, HSEO helps to fund the Hawaii Science Bowl, which brings together 24 high schools to compete in a USDOE-sponsored competition culminating in a trip to Washington, D.C. for the winners. Energy-related topics are included in the array of questions.

HSEO also actively participates in and funds the annual State Science Fair, with staff serving as judges and awarding prizes to top entries in the energy efficiency and renewable energy categories.

Leadership in Solar Electric & Thermal Systems

Hawaii maintained a leadership position among all 50 states in terms of photovoltaic and solar water heating installations.

Photovoltaics

Hawaii more than doubled the number of grid-tied solar electric installations in 2009, according to the Solar Energy Industries Association. Nationally, Hawaii is ranked sixth in the number of megawatts installed in 2009, and eighth in total cumulative PV capacity.

Also, for the second consecutive year, Hawaii utilities are among the top ten in national rankings for the use of solar power, according to the Solar Electric Power Association. MECO ranked second in the nation in total solar watts per customer, HELCO ranked third, KIUC ranked sixth, and HECO was ninth.

In 2009, Hawaii installed about 14 MW of PV. While many of the arrays were net energy metered, there were also dozens of larger systems, including a number exceeding 500 kW, installed on commercial rooftops.

A 20-MW PV facility was announced by Castle and Cooke for a site near Mililani in central Oahu. Consisting of four adjacent 5-MW plants, the installation would become the state's largest PV power plant. PUC approval was granted in December 2010 to waive the project from the PUC's Competitive Bidding Framework.

KIUC has signed a contract with Poipu Solar to build a 3-MW PV project incorporating battery storage, which will be the island's largest. In a separate project, a 1.21-MW PV facility is being built in Kapaa by REC Solar.

This experimental concentrated solar installation at NELHA has been undergoing testing since 2009. Similar technology is proposed for a 5 MW plant on Oahu.

Hawaii's military community has big plans for solar power and other renewables, in line with its goal of exceeding the HCEI target of 70% clean energy by 2030. Contractors are being sought to install and operate PV arrays at most major military installations in the state, a move which could add as many as 60 MW of solar electric capacity.

A research project to test the viability of concentrated PV was installed at the Maui High Performance Computing Center by the Air Force, using ARRA funds. The 100-kW tracked demonstration array will evaluate the technology's performance in the tropics and how it compares to conventional PV.

In other research, both Sandia National Laboratories and the National Renewable Energy Laboratory (NREL) are monitoring solar irradiance and cloud cover to help predict the impact of weather changes on large PV arrays.

Sandia's monitors are associated with the La Ola utility-scale PV system on Lanai. NREL has installed a field of monitors in Kalaeloa.

Concentrated Solar

Although photovoltaics are more widespread, concentrated solar power (CSP) plants are also being developed.

A 5-MW CSP plant in Kalaeloa broke ground in October. Keahole Solar Power is leasing land from DHHL. CSP plants have been proposed for other islands.

Solar Water Heating

Hawaii has more solar water heaters per capita than any other state. Solar water heating became mandatory in 2010 for new residences, although variances can be requested for certain circumstances. For existing homes being retrofit with solar water heating, $750 rebates are available.

Low-income residents received solar heaters and other assistance through ARRA grants to community action agencies. Qualified applicants also received energy audits of their homes to improve efficiency.

Energy Assurance & Emergency Planning

Hawaii's energy emergency team responded to an actual tsunami during 2010 and also participated in exercises and training to ensure its capability to respond to hurricanes and other disasters.

In response to the Feb. 27 tsunami, HSEO activated its Emergency Response Team (ERT) in coordination with State Civil Defense. The ERT maintained energy industry situational awareness and information exchange by coordinating with Hawaii State Energy Council and Governor's Energy Emergency Preparedness Advisory Committee member agencies.

HSEO Energy Assurance Program staff coordinated critical energy infrastructure assessments for emergency power with the U.S. Army Corps of Engineers and the 249th Engineer Battalion, identifying key facility information such as critical loads, generator sizing, connections and fuel needs.

In the event of a prolonged power outage, the GIS-enabled database will help emergency managers prioritize emergency generator deployments and aid fuel resupply planning.

Hawaii's Emergency Response Team ensured that communications and coordination within the energy industry were smooth during the February 2010 tsunami.

Staff also participated in numerous emergency management training opportunities, including four days of advanced Incident Command System training, a two-day Federal Emergency Management Agency (FEMA) Emergency Operations Center management course and the annual statewide Makani Pahili hurricane exercise.

HSEO, as the lead state agency for energy emergency preparedness, coordinated meetings and workshops for the Energy Task Force under the Hawaii Catastrophic Planning Initiative.

The Task Force is developing response plans for fuel distribution and power restoration.

HSEO was awarded a $318,196 grant to enhance Hawaii's energy assurance capabilities and planning for Smart Grid resiliency.

As part of this project, HSEO is refining its existing state energy emergency preparedness plan to integrate critical infrastructure protection planning, hazard mitigation, cybersecurity, and new energy portfolios (renewables, biofuels, etc.) into a more comprehensive energy assurance plan and program.

Under this grant, HSEO staff also developed an energy disruption tracking system.

The information is gathered from the regulated electrical and gas utilities as well as from petroleum facilities upon notification of disruptions, and monitored.

Better planning efforts will help contribute to the resiliency of Hawaii's energy sector by focusing on the entire energy supply system.

Disasters such as hurricanes can severely impact Hawaii's energy supply and distribution infrastructure.

Expenditure Plan

Future Program Funds Will Come From Act 73

ARRA Supported State Energy Program

While Act 73 provided for significant state funding of energy programs, actual expenditures from the Energy Security Special Fund will not be made until 2011. As of the end of 2010, this expenditure plan was still under discussion with incoming Governor Abercrombie.

During 2010, Hawaii's broad range of energy programs was funded primarily by USDOE through a variety of competitive and non-competitive grants.

In 2010, HSEO was awarded $429,000 from USDOE under the federal State Energy Program (SEP). This was augmented by stimulus monies from the American Recovery and Reinvestment Act (ARRA) of 2009.

ARRA allowed HSEO to pursue a number of HCEI priorities, including environmental studies relating to the proposed interisland cable, grid improvements, permitting facilitation and support of alternative vehicles.

ARRA also enabled HSEO to expand its staff in order to manage the many programs necessary to implement HCEI.

Expenditures from four 2009 ARRA grants began in 2010 and will continue, in some cases, into 2012. The grants include:

- $25,930,000, State Energy Program;
- $9,953,500, Energy Efficiency and Conservation Block Grant;
- $1,236,000, State Energy Efficient Appliance Rebate Program; and
- $318,196, Enhancing State Government Energy Assurance Capabilities and Planning for Smart Grid Resiliency Initiative.

For 2011 and beyond, the State energy program will be based significantly on funds allocated according to Act 73, HRS §196.

HSEO anticipates spending nearly $20 million from the Energy Security Special Fund during the next two years.

However, due to the aggressive goals set by HCEI and the amount of investment needed to affect the transformation of Hawaii's energy economy, this may not be sufficient.

The table below outlines DBEDT's operating budget request for HCEI during the fiscal biennium 2011-2013. The budget proposes expansion of HSEO staff and major expenditures for efficiency, bioenergy, renewable energy, and transportation.

It should also be noted that HCEI has resulted in significant additional federal investment in Hawaii. DBEDT is receiving $5.5 million of technical assistance and support from USDOE's National Renewable Energy Laboratory and Sandia National Laboratories for HCEI.

DBEDT's Proposed Expenditure Plan for the Hawaii Clean Energy Initiative

DESCRIPTION	FY 2012	FY 2013
Personnel	$2,500,000	$4,200,000
Education	500,000	400,000
Energy Efficiency	500,000	1,400,000
Transportation Energy	300,000	300,000
Acceleration of Renewable Energy	1,800,000	1,800,000
Cost Match for Projects	1,800,000	1,200,000
Clean Energy Policy	500,000	400,000
County and EDB Grants, Act 73 Activity	640,000	590,000
Other Administrative Expenses	42,700	250,000
TOTAL	$8,581,700	$10,540,000