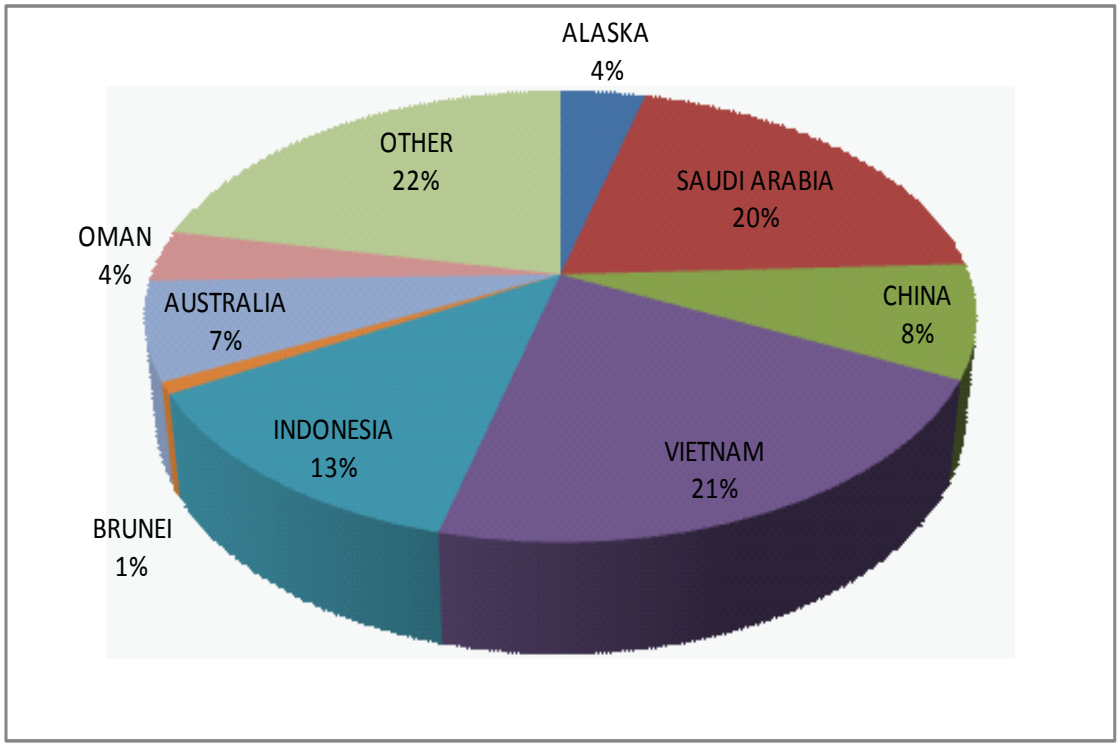
State of Hawaii
Energy Resources Coordinator
Annual Report
2009



State of Hawaii
Department of Business, Economic Development & Tourism

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Oil Dependence Threatens Energy Security

The economic security of the State of Hawaii is extremely vulnerable due to its over dependence on imported oil. In 2008, about 75% of the net megawatt-hours of electricity generated in Hawaii and slightly over 97% of its transportation fuels, as measured in Btu, are produced from oil.

The state is addressing this vulnerability through the Hawaii Clean Energy Initiative (HCEI), a partnership with the US Department of Energy (USDOE) aimed at providing 70% of Hawaii's energy from efficiency and renewables by 2030.

In 1974, the Legislature created the position of Energy Resources Coordinator. It is held by the Director of the Department of Business, Economic Development, and Tourism (DBEDT).

The Energy Resources Coordinator faces many challenges, including the following points:

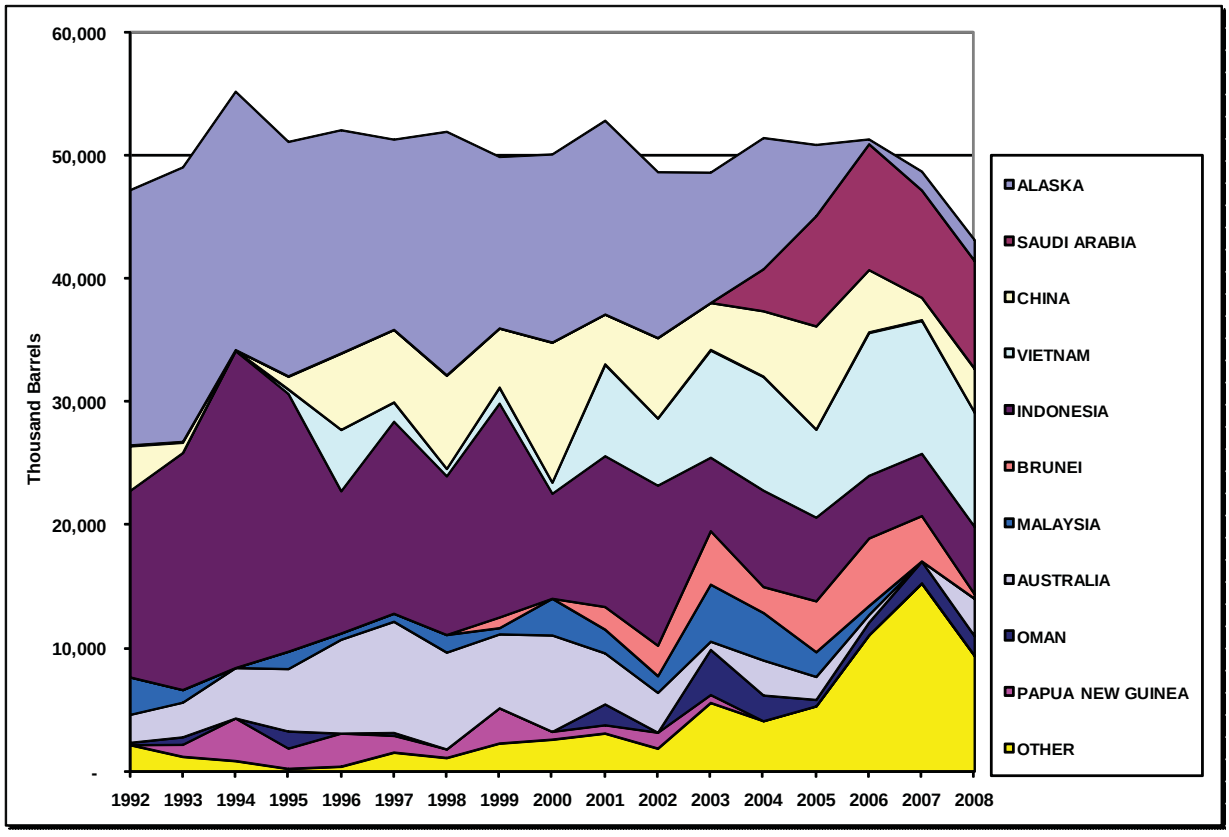
- Hawaii still relies on imported petroleum for about 86% of its primary energy.
- Most oil is from foreign nations, with a significant and growing percentage from politically unstable regions.
- The islands' electricity grids are not interconnected, so that utilities cannot rely on each other for help during outages.
- Hawaii residents pay among the nation's highest prices for electricity and fuel.

By law, the state's energy program considers these objectives:

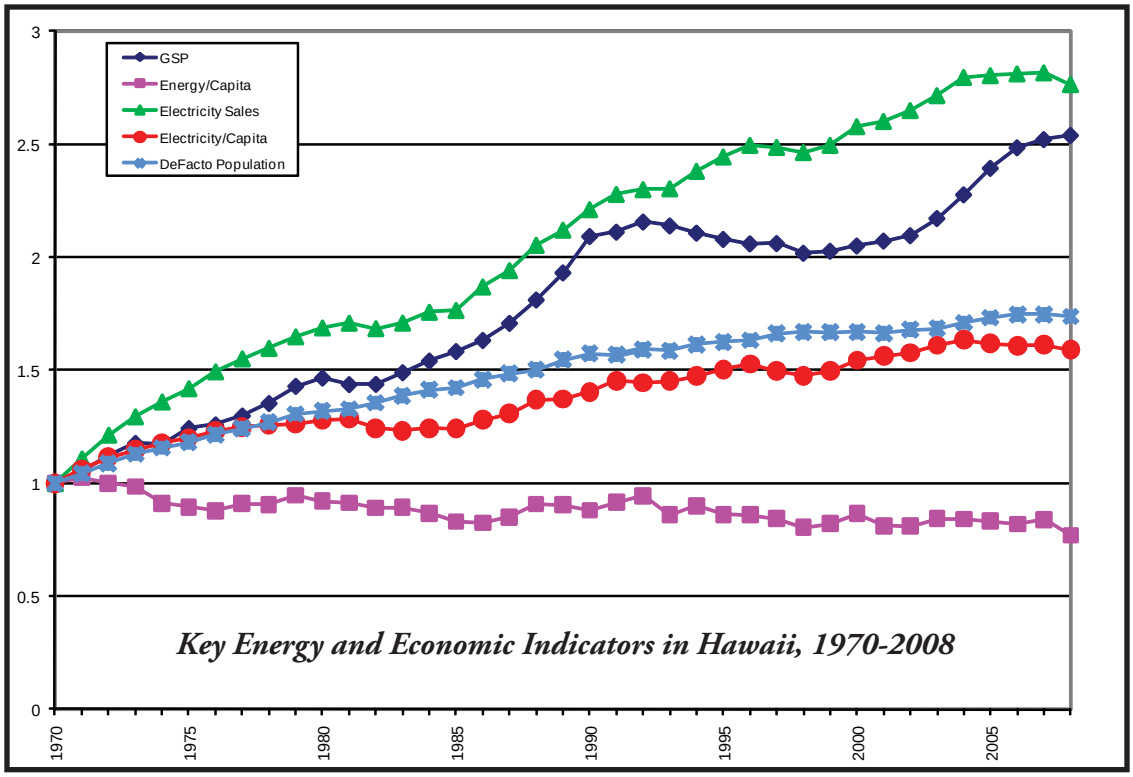
- ensuring dependable, efficient, and economical statewide energy systems;
- increasing energy self-sufficiency;
- attaining greater energy security; and
- reducing, avoiding, or sequestrating greenhouse gases.

The state's energy policy also requires that the total costs and benefits of all energy options be compared. Alternative transportation fuels and efficient transportation must also be promoted.

DBEDT's Strategic Industries Division, referred to as the Hawaii State Energy Office (HSEO), implements programs to meet these goals. Achievements for 2009 are detailed in the following pages.



Hawaii's Crude Oil Sources 1992-2008



Energy use dropped in 2008; GSP rose

Hawaii consumers spent a lot more money for energy in 2008, although overall energy consumption decreased.

Consumers spent an estimated $8.4 billion for energy in 2008, or about 37% more than 2007, reflecting record high petroleum prices. This was about 13% of Hawaii's $63.85 billion (current dollars) GSP.

Yet, Hawaii's primary energy consumption in 2008—301.2 trillion Btu—was down 8.3%.

Petroleum use decreased 11.1% from 2007 to 2008. Petroleum consumption totaled 258 trillion Btu in 2008. A total of 43.1 million barrels of crude oil were imported, costing about $4.1 billion.

Coal consumption increased 7.9% from 2007, however.

Together, the imported fossil fuels—coal and oil—represent almost 92% of Hawaii's energy consumption. Nearly 86% of Hawaii's total energy is imported petroleum.

Renewable energy production increased by 17.3% during 2008. This is attributed primarily to generation from biomass, municipal solid waste (MSW), geothermal and photovoltaics (PV).

While geothermal posted a modest gain of 2%, the growth in the other resources was more notable. MSW grew by 31%, while PV showed an impressive 85% increase over 2007. Biomass increased by 34%; ethanol used for blending in gasoline is being counted as biomass for the first time this year.

In total, renewables provided nearly 25 trillion Btu in 2008.

Hawaii's economy is also becoming more energy-efficient. Hawaii's energy intensity has been improving, meaning that less energy is used per dollar of gross state product (GSP).

In 2008, Hawaii residents used 23% less energy per capita (based on de facto population) than they did 38 years ago. Energy use per capita decreased by 8.3% in 2008 compared to 2007, the sharpest drop in recent years.

Electricity sales per capita were 59% more than 1970, but declined for the first time in a decade: in 2008, electricity sales decreased 1.8% from 2007, resulting in a modest 1.4% drop in electricity sales per capita.

De facto population grew 74% and real GSP increased 154% from 1970.

Clean Energy Achievements in 2009

The Hawaii Clean Energy Initiative (HCEI) marked its first anniversary in January 2009 and continued moving toward achieving its goal of attaining 70% clean energy by 2030.

This transformation from near total dependence on imported fossil fuels requires aggressive efficiency, extensive renewable energy development, and a major shift toward electric vehicles and biofuels for transportation.

The unique partnership between the State of Hawaii and the US Department of Energy (US-DOE) was announced on Jan. 28, 2007. With technical support from national laboratories and expertise from the private sector through four working groups, much has been accomplished.

Many of the achievements documented in the following pages are part of HCEI, including regulatory initiatives, establishment of an energy efficiency portfolio standard, and studies relating to an interisland cable.

A Voluntary Agreement between the state and the Hawaiian Electric Company (HECO) was signed in October 2008. This agreement highlighted HCEI actions which the parties agreed to work on together.

A few achievements from the first year of the Agreement are:

• Approximately 600 MW of renewables are in active negotiation for power purchase agreements with HECO.

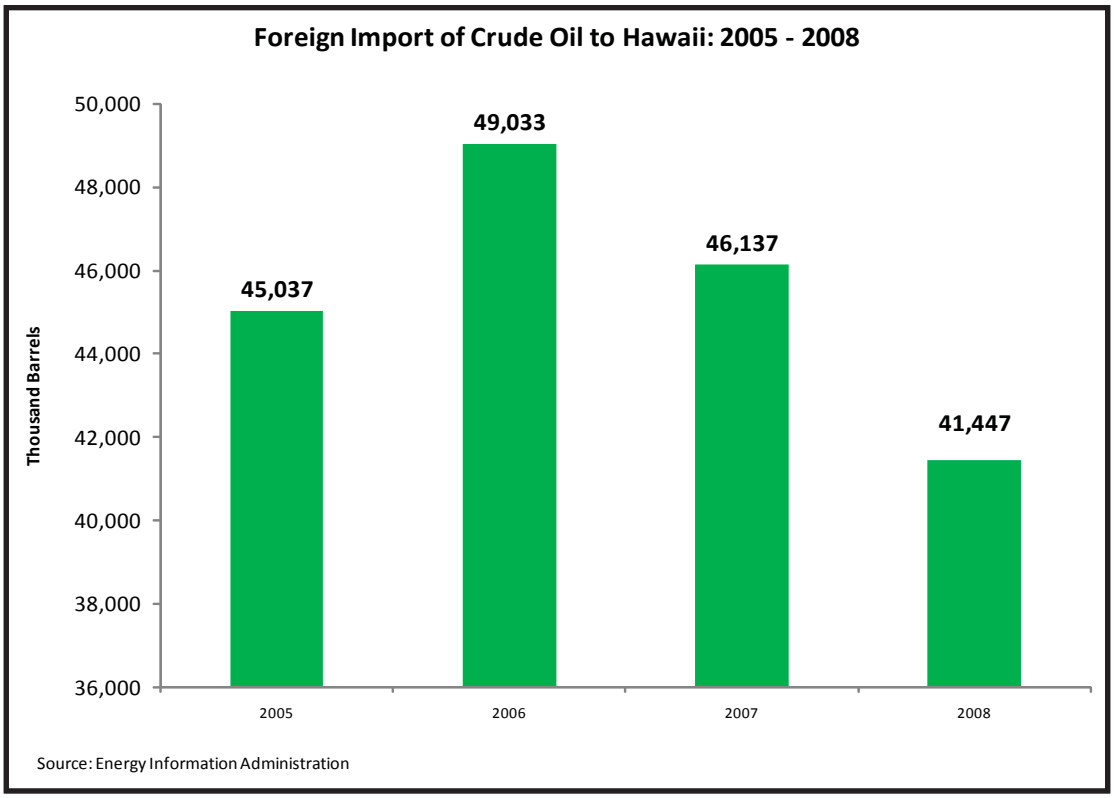
• HECO's unique Combustion Turbine-1, designed for biofuels, is in service.

• Utility testing of biofuels will continue with cold firing crude palm oil by Maui Electric Company (MECO) and HECO.

• A preference for locally-produced biofuels is included in HECO contracts.

• An existing contract for renewable energy, which was based on the avoided cost of oil, is being renegotiated to remove the link to the price of petroleum.

• A PUC decision on a clean energy infrastructure surcharge is pending.



Hawaii oil imports from foreign countries declined nearly 16% from 2006 to 2008. Part of that decline is due to less demand in the transportation sector because of high prices and slowing economic growth.

Efficiency Portfolio Standard one of Legislature's 2009 Accomplishments

A number of new laws are redirecting the state's energy programs.

Hawaii's Renewable Portfolio Standard (RPS) became more aggressive, bringing its objectives in line with HCEI; the goal is now 40% renewable electricity by 2030.

Hawaii also has a new Energy Efficiency Portfolio Standard (EEPS) which mandates measures to save 4,300 gigawatt-hours of electricity by 2030.

The State Energy Resources Coordinator now has authority to designate Renewable Energy Zones, and the role of the energy permitting facilitator has been expanded and clarified.

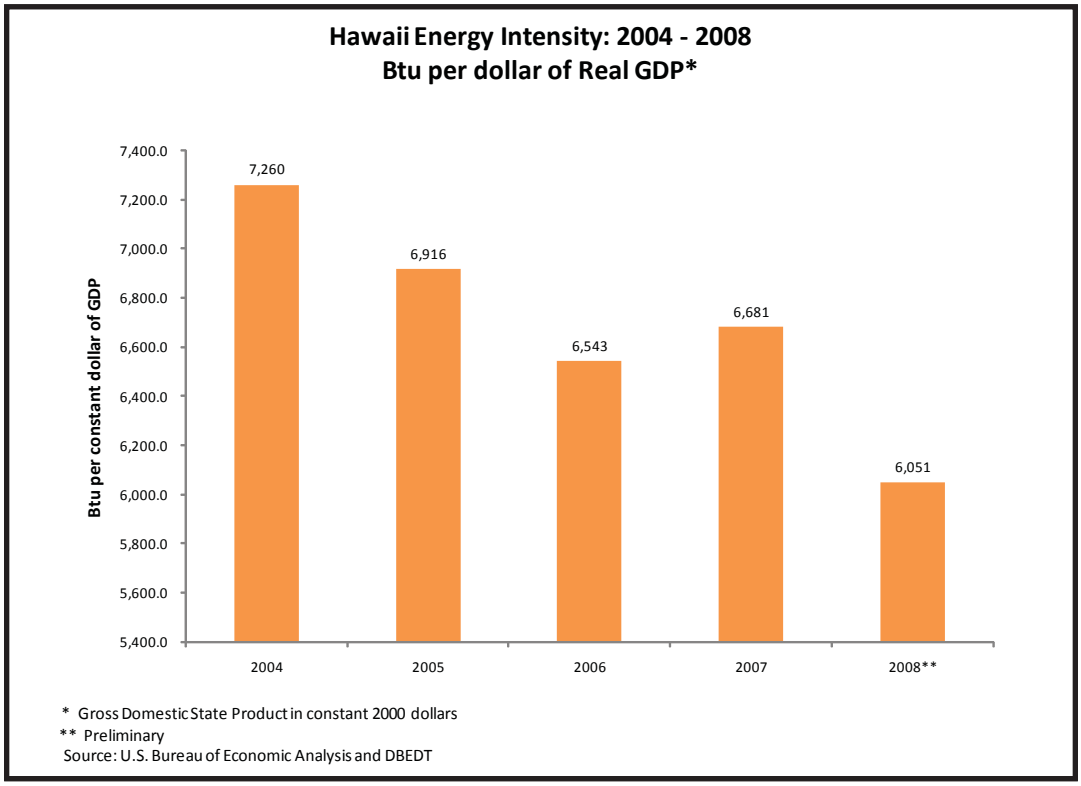
Another new law requires homeowners selling their residences to disclose the property's electricity costs for a recent three-month period to prospective buyers.

Hawaii is now one of only a few states to save parking space for electric vehicles—1% of the total spaces of any parking lot with at least 100 public stalls by December 31, 2011. The requirement will increase to 2% when at least 5,000 electric vehicles are registered in the state. There must also be at least one recharging station in the parking lot.

In other support of electric vehicles, Project Better Place, which is seeking to create a statewide charging network, was awarded up to $45 million in special purpose revenue bonds.

Changes were made to the renewable energy tax credit to attract more private investment. The changes also allow Hawaii residents who do not have a tax liability to receive a refund instead of a tax credit for the installation of renewable energy equipment.

The Legislature also eliminated a tax loophole in Hawaii's law mandating solar water heaters on new residential construction.



One of the signs of an energy-efficient economy is energy intensity, or how much energy is used for every dollar of product produced in the state. Hawaii's economy is steadily becoming more efficient.

Plan Prepared to Reduce Greenhouse Gas

Throughout 2009, the Greenhouse Gas Emissions Reduction Task Force met monthly to develop its work plan, which was submitted to the 2010 Legislature. As required by Act 234 (2007), the goal is to reduce Hawaii's greenhouse gas (GHG) emissions to 1990 levels by 2020.

As mandated by Act 234, the 1990 Hawaii Emissions Inventory, as updated in 2008, was used as the baseline.

The Task Force considered three scenarios, all of which meet and exceed Act 234 target GHG reductions. The three work plans were prepared by consultant ICF International under Task Force guidance and with DBEDT staff support.

The "reference case," which is based on plans made before HCEI, projects emissions on a "business-as-usual" trajectory. Incorporating existing laws and policies, it meets the target GHG reductions.

The Task Force recommends that the Legislature strongly support Work Plan #1, which would significantly surpass the GHG emissions reduction target by an estimated 39%. Work Plan #1 entails implementing the Hawaii Clean Energy Initiative (HCEI) plus some additional policies.

Work Plans #2 and #3 are based on Work Plan #1, but add a state carbon tax and a federal cap-and-trade law, respectively.

The full report is available at http://hawaii.gov/dbedt/info/energy/greenhouse.

While the reference case outlined in the report meets the 1990 target, Work Plan #1's greater reductions are likely to be required for later years by federal law. Also, there are advantages to early, aggressive reductions: greater energy security, retention of funds within the state, and greater benefits.

During November 2009, the draft work plans were presented at five public workshops in all four counties to garner public input.

The Task Force considered a variety of issues at its meetings, such as ocean acidification, cultural impacts, emission-reduction potential of native forest restoration, and the impacts of climate change on Hawaii's natural resources and habitat.

HSEO and the Department of Health (DOH) provided staff support to the Task Force, which was cochaired by the director of DBEDT and the deputy director of DOH.

Energy Efforts Staffed Up

The Hawaii Clean Energy Initiative received vital support in 2009 with the addition of a number of professional staff.

Two researchers from the National Renewable Energy Laboratory in Colorado were assigned to Hawaii to work on efficiency and electric issues in support of HCEI.

In addition, some federal stimulus funds received by DBEDT have been translated into a dozen temporary positions. These new staff, plus six more expected to be hired in 2010, will work on renewable energy permitting, public outreach, grants management and other tasks within HSEO.

Efficiency Team Honored

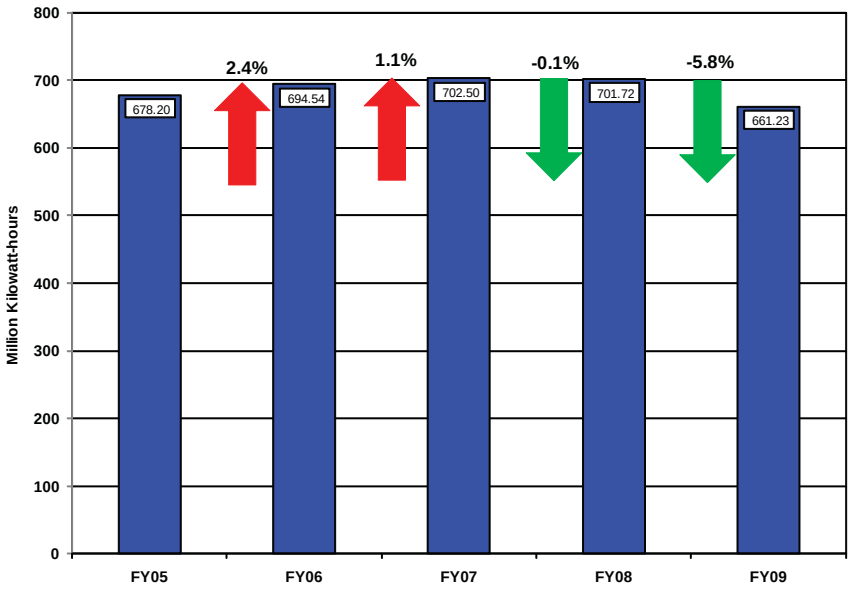
Acknowledging their outstanding work, HSEO staff members Karen Shishido and Gail Suzuki-Jones received a Special Service Award from DAGS and an Innovation Award from the Governor.

The DAGS award was shared with the State Procurement Office Training Team for conducting a green purchasing training session.

The Governor's Innovation Award was for participation in the Green Government Challenge Program and Developing and conducting Green Purchasing Training.

Improving Efficiency in State Buildings

Although state agencies reduced electricity consumption by nearly 6% in 2009, increasing oil prices resulted in electricity costs rising by 57%.



State executive agency electricity consumption declined nearly 6%. Also in 2009, state agencies received over $10 million in utility rebates for energy efficiency.

DAGS Phase 1

Construction on the DAGS Phase 1 project, which involves ten state office buildings within the downtown Honolulu Capitol District, began in September. The buildings encompass about 1.4 million gross square feet.

The $36.9 million contract uses a combination of bonds, third-party financing, stimulus funds for a photovoltaics (PV) system, and other money. NORESCO is the energy services provider.

The state is guaranteed to use at least 30% less utility services over the 20-year contract. Projected annual savings include 14.5 MW in electrical demand and 6,509 MWh in energy, including the PV system. Water use and sewage assessments will also be reduced.

Major energy conservation measures include air handling unit upgrades, chiller replacements and building control systems. An estimated 500 jobs will be created.

A pending DAGS Phase 2 project will involve about 30 buildings statewide with an estimated 1.2 million gross square feet of building space. DAGS is working on a solicitation notice.

Using data from walk-through audits and retrocommissioning investigations, HSEO staff determined that implementing energy efficiency measures at an additional eight state buildings, two buildings at the University of Hawaii at Hilo, and two buildings at the Halawa Correctional Facility could save 4,231 MWh of electricity annually. The cost savings would exceed $800,000 annually.

Public Housing

A $29.9 million Hawaii Public Housing Authority (HPHA) project covers 4,500 federally-funded units. Savings in water, sewer and electricity costs are estimated to be 20%; projected annual electrical savings are 5,059 MWh, while annual cost savings are $3.1 million.

Major conservation measures include water (toilets, showerheads and faucets), lighting, instant water heaters, solar water heaters, refrigerator replacement, PV, and transformers.

The 2-year construction period is expected to start in February 2010. AMERESCO is the energy services provider.

The Department of Hawaiian Home Lands (DHHL) is developing net zero energy homes for their 18-home Kaupuni village in Waianae. To support this effort, two DHHL staff members participated in the National Governors Association (NGA) Policy Academy on Advanced Energy Strategies for Buildings.

Two HSEO staff also attended the NGA Policy Academy. They received training and technical assistance which supported building code amendments, Energy Star for Waikiki hotels, and outreach efforts.

Using federal stimulus funds, DHHL will upgrade about 400 homestead residences with solar water heaters and compact fluorescent lamps.

Major Efficiency Initiatives Underway

Energy efficiency efforts in Hawaii got a big boost from federal stimulus funding, and notable progress was made in improving building codes, among other achievements for 2009.

Stimulus Funding

USDOE awarded DBEDT $9.5 million in Energy Efficiency and Conservation Block Grant funds. The grant includes funding for DAGS and DHHL, which will use the funds for photovoltaics, solar water heaters, and efficient lighting.

DBEDT will use the grant to augment current rebate programs to retrofit government and nonprofit buildings with energy-efficient appliances and lighting.

Additional stimulus money will be spent by community action agencies on efficient equipment for low-income residents.

Other stimulus funds will encourage consumers to replace old appliances with efficient Energy Star models.

Building Codes

Hawaii's expertise in building codes appropriate for tropical climates was shared with representatives from Guam, the Commonwealth of the Northern Mariana Islands (CNMI), the US Virgin Islands and Puerto Rico at a miniconference in Portland, OR.

HSEO chaired the conference, which was the culmination of a USDOE-funded project which also included intensive workshops in Guam and the CNMI.

HSEO is also head of the International Energy Conservation Code (IECC) investigative subcommittee of the Hawaii Building Code Council.

Testimony by HSEO experts in favor of the 2006 IECC resulted in adoption of updated codes in Hawaii County. The other three county councils are also considering the issue.

Public Benefits Fund

Efficiency and demand-side management programs which had been run by Hawaii's public electric utilities got a new manager in 2009. After considering a number of proposals, the Public Utilities Commission contracted with SAIC to operate the Hawaii Energy Efficiency Program.

The expanded program will continue to be funded by a surcharge on monthly electricity bills.

Lighting Awards

Two state projects received awards from the Illuminating Engineering Society (IES) in 2009.

Iolani Palace was recognized for exterior lighting which uses only 2.9 kW, less than a standard kitchen stove. This entry will also compete at the IES International level.

The Airports Division of the Department of Transportation was acknowledged for installing daylight-harvesting ballasts in perimeter fixtures of the interisland parking structure.

Green Hotels & Businesses

HSEO and the Department of Health (DOH) provide Green Business support to make local enterprises more sustainable. In 2009, Green Business enrollment applications and check lists were received from over 30 hotels, offices, retailers and restaurants.

Both agencies received the Governor's Innovation Award in March 2009 for their efforts.

Six Green Hotel forums, cosponsored by DBEDT, DOH, Chamber of Commerce of Hawaii, and the Hawaii Hotel and Lodging Association, were held on Oahu and Maui. The forums highlighted energy- and resource-efficient measures implemented by hotels.

Some properties are recycling over 50% of their recyclables, while others have installed LED lighting, new HVAC equipment, and occupancy sensors. Some hotels now have Energy Star building labels, while others are seeking LEED certification.

A pilot Green Restaurant and Food Service program was launched this year; it involves seven businesses on Oahu and Maui.

Twenty State LEED Professionals

Two years ago, a single HSEO staffer was the only state employee to become a LEED Accredited Professional.

Today there are 20 state employees who have passed the US Green Building Council's LEED AP exam.

HSEO continues to provide training for state personnel.

Leading by Example: Government Initiatives in Efficiency, Renewables

The Lingle Administration's Lead by Example (LBE) initiative, spearheaded by DBEDT, focused on improving data collection and analysis, acknowledging the energy efficiency achievements of executive departments and offering the tools and training necessary for the agencies to reduce electricity consumption and cost.

Between 2008 and 2009, state agencies' electricity consumption decreased by 5.8%, but costs still rose 1.2% due to the cost of imported oil.

At the request of the US Environmental Protection Agency, HSEO reviewed the draft *State Clean Energy Lead by Example Guide*. The Guide provides information on best practices for energy efficiency in state buildings.

Another useful document developed in 2009 is the *Best Practices Guide for Selected LEED for Existing Building Operations and Maintenance*. It was prepared at DAGS' request to provide a non-technical overview and help state agencies meet LEED building commissioning requirements.

The state has several buildings which are LEED certified and is pursuing projects at the State Capitol and other additional buildings to achieve LEED Silver ratings.

The Department of Transportation's Airports Division (DOT-Air) completed its LEED Commercial Interior Lounge Project at Honolulu International Airport. It is the state's first LEED-CI Silver and DOT-Air project.

DOT-Air is one of the most proactive state agencies regarding renewables. In addition to its photovoltaics installations (see p. 11), the division installed 16 small rooftop wind turbines on an airport building.

The US Pacific Command (PACOM), in a unique partnership with the state, released its strategy for reducing dependence on fossil fuels on Oct. 23. The strategy defines PACOM's commitment to help the state in its efforts to rely on 70% clean energy by 2030.

"Going green" will help PACOM reduce taxpayers' burden while developing renewable energy, minimizing greenhouse gases, emphasizing sustainability and exercising global leadership.

The Department of Defense (DOD) has a deep interest in energy, both for national security and to meet federal mandates.

DOD projects encompass photovoltaics, wave energy, wind, OTEC and hydrogen, as well as efficiency and grid improvement.

Hawaii Energy Administrator Elected an Officer of National Association

Theodore A. Peck has been named secretary of the National Association of State Energy Offices. He was voted onto the board by energy officials from around the nation in September.

"Being chosen to serve on the NASEO board is a reflection of the progress Hawaii is making in reducing our dependence on imported oil and developing renewable energy that capitalizes on Hawaii's abundant natural energy resources," Peck said.

Punahou's champion Science Bowl 2009 team enjoyed meeting President Obama during a White House Tour. HSEO cosponsors the Science Bowl as well as Hawaii's Science and Engineering Fair.

State Gets Ready for Energy Emergencies

The challenge facing the state's energy assurance and critical infrastructure protection program is to be prepared to effectively contend with energy emergencies and threats to Hawaii's energy security.

To this end, HSEO supports the State Civil Defense agency by coordinating energy security planning, response and mitigation.

HSEO is also the lead state agency for market-related energy emergency management and is spearheading the development of an inter-agency Energy Task Force which supports the Hawaii Catastrophic Hurricane Operations Plan.

HSEO chairs the State of Hawaii Energy Council, which coordinates the flow of information and facilitates response to energy disruptions.

As part of its responsibilities to manage communications during an energy emergency, HSEO has been granted access to priority communications services through the National Communications System.

Working with the Department of Accounting and General Services, HSEO has been assigned space for an emergency operations center with access to backup electricity and telecommunications.

On a daily basis, HSEO tracks events such as storms, tsunami, and homeland security briefings which could impact energy supply and delivery.

In 2009, HSEO updated the state's Energy Emergency Preparedness Plan and Reference Book.

ARRA grant funds totaling $318,196 were awarded to HSEO to improve emergency preparedness planning and ensure grid resiliency, including staff training on smart grid technologies integration, interdependencies, and cyber-security.

A yearlong initiative focusing on developing a response plan for a major hurricane is assessing Hawaii's current response capabilities and identifying functions that the federal government may support.

As part of this initiative, staff participated in planning workshops on protecting water supply, fuel delivery and powering essential services.

Annually, state emergency preparedness personnel participate in the Makani Pahili statewide hurricane exercise. This year's exercise revealed that fuel distribution is a potential weak link in response to such a catastrophic event. A strategy for fuel delivery, defining the responsibilities of the cooperating agencies, will be developed, clearly prioritizing needs.

Other training activities included participation in the 2008-09 Winter Fuels Outlook Conference, National Incident Management System and Energy Assurance Training, Eagle V readiness exercise relating to drawdown of the Strategic Petroleum Reserve, and the State Emergency Response Team Workshop.

At the invitation of Hawaii State Civil Defense, HSEO has joined the Hawaii Emergency Preparedness Executive Consortium. The Consortium has over 80 public and private members and is the primary body in Hawaii for sharing information relating to homeland security matters.

Seawater EIS Filed

An innovative project to cool buildings in downtown Honolulu filed its final environmental impact statement in 2009.

The Honolulu Seawater Air Conditioning (SWAC) project will involve a network of pipes distributing cold water from the deep ocean to as many as 40 buildings, reducing conventional air conditioning costs. Six customers have signed non-binding contracts to participate.

Permits from state and federal agencies and additional funding are still needed. The company plans to work mostly at night, to minimize traffic congestion.

Other SWAC projects are being considered for Waikiki and Honolulu airport.

PUC Considers Transformative Changes to Hawaii's Electricity Regulations

The October 2008 HCEI Energy Agreement between the state and the HECO utility companies incorporated several policy issues which require regulatory decisions. As a result, the Public Utilities Commission (PUC) initiated a number of dockets.

DBEDT/HSEO is an intervenor in several of these dockets.

Decoupling

One major anticipated change to Hawaii utility regulation is a decoupling mechanism for HECO and its utility subsidiaries, MECO and HELCO.

Decoupling is an alternative form of utility rate making which de-links the utility's revenues from its kilowatt-hour sales.

The regulatory process to implement decoupling commenced with a PUC docket in October 2008 and followed an accelerated schedule which included technical workshops, information requests, position statements, panel hearings, and post-hearing briefs.

A PUC decision and order on the issues raised during the docket is pending.

Feed-in Tariffs

In October 2008, the PUC initiated another groundbreaking docket to examine the design and implementation of feed-in tariffs for the HECO companies.

Feed-in tariffs (FiTs) are designed to encourage increased renewable energy generation by providing certainty and stability to the purchased power rates (and therefore to the developer's revenue stream) as well as a more transparent and streamlined utility procurement and interconnection process.

In September 2009, the PUC issued an order on the general principles for the design of FiTs. The second phase of the docket is in progress and focuses on developing the actual tariffs in accordance with the PUC guidelines.

Technologies which can take advantage of the initial FiTs include photovoltaics, concentrated solar, on-shore wind, and in-line hydro; other technologies will be addressed in future action

The initial FiT program will be capped at 5% of the 2008 system peak load of the HECO companies. Five percent of this cap for each of the three companies will be reserved for projects under 20 kW.

PV Host

Pursuant to the Energy Agreement, the HECO companies filed a proposal with the PUC in April 2009 to implement a two-year PV Host Pilot Program.

PV Host's target would be the installation of 8 megawatts of photovoltaics on Oahu, 4 MW on Maui and 4 MW on the Big Island.

Under the program, the utilities will lease rooftops and other sites for PV installations. Government facilities—state, federal and county—will be targeted where appropriate.

The HECO companies envision the program as another mechanism for increasing the amount of renewable energy in their generation portfolio.

Clean Energy Scenario

Another initiative supported by the Energy Agreement is the implementation of Clean Energy Scenario Planning (CESP).

Since 1992, the utilities' long-term resource planning has been governed by the Integrated Resource Planning (IRP) Framework established by the PUC.

The Framework required the gas and electric utilities to identify a mix of supply-side and demand-side resources for meeting future energy needs at the lowest reasonable cost.

In May 2009, the PUC issued an order initiating the CESP docket which will examine proposed amendments to the 1992 IRP Framework to guide future utility resource planning.

Other Dockets

There are several other clean energy dockets before the PUC resulting from the Energy Agreement, including: the HECO companies' proposal relating to Advanced Metering Infrastructure (AMI); Lifeline Rates; Clean Energy Infrastructure Surcharge; several purchased power agreements; and biofuel testing at the HECO companies' generation units.

On Track to Achieve RPS Goals

The percentage of oil contributing to Hawaii's primary energy dropped to its lowest level in years during 2008, while renewables' contributions increased. This encouraging trend bodes well for HCEI as well as Hawaii's Renewable Portfolio Standard (RPS).

Hawaii's electric utilities are thus far meeting their RPS goals.

The legislated renewable energy goals for the state's Renewable Portfolio Standard (RPS) are 10% by 2010, 15% by 2015, 25% by 2020, and 40% by 2030.

Until 2015, certain efficiency and substitution technologies (such as solar water heating) can be counted toward the RPS goals. Subsequently, the goals must be met entirely with renewably-generated electricity. Efficiency gains are legislated as part of the Energy Efficiency Portfolio Standard (see p. 4).

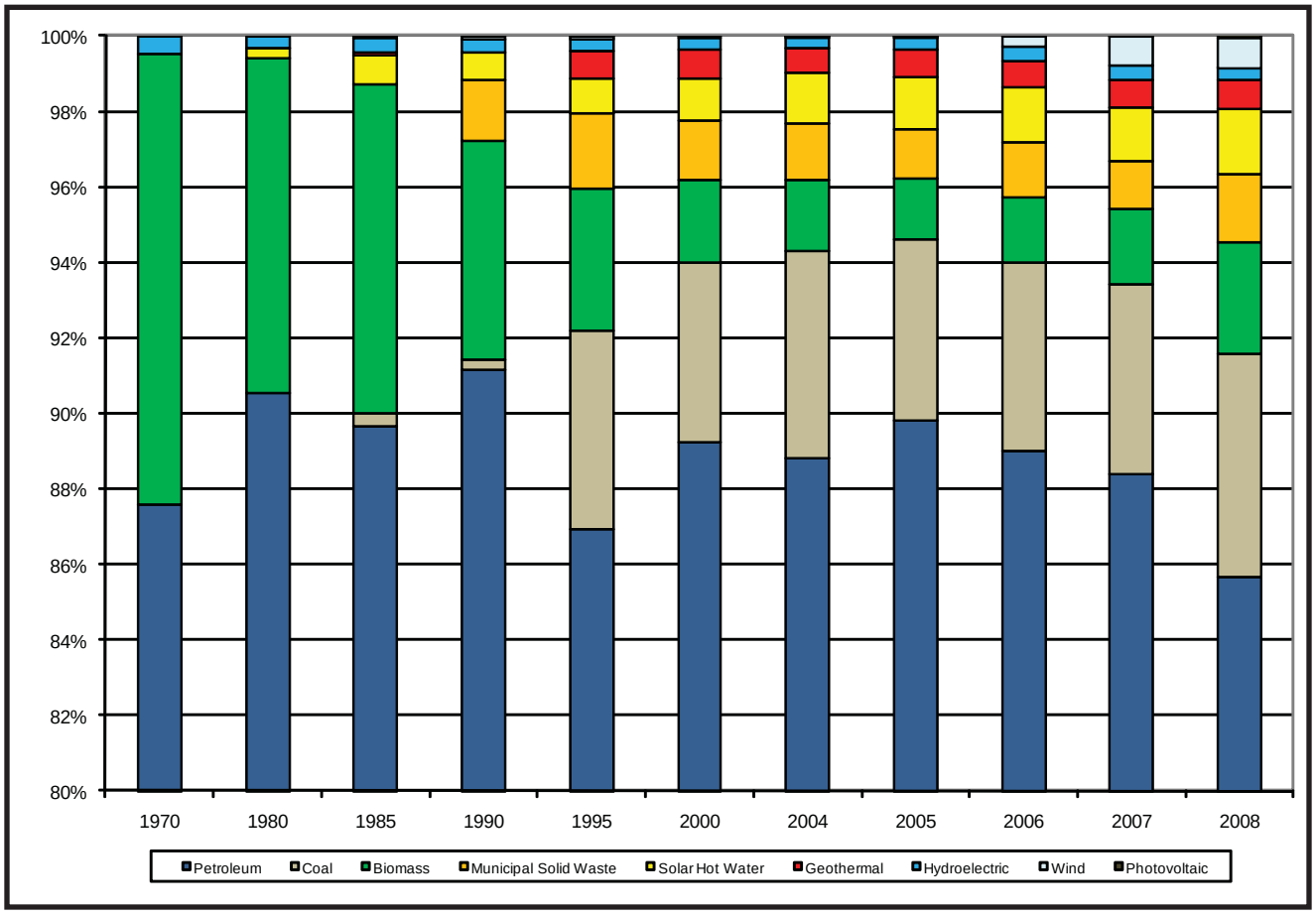
The three Hawaiian Electric (HECO) companies, which include HECO, Hawaii Electric Light Company (HELCO), and Maui Electric (MECO), documented increased use of both renewable energy and efficiency under the RPS between 2005 and 2008.

The HECO companies, which can report their RPS achievements in aggregate, reached 18% in 2008, exceeding the 2010 goal of 10%.

Of this, over half was attributed to renewable generation.

HECO showed more gains in efficiency and substitution technologies, such as solar water heating, while MECO and HELCO were comparatively stronger in renewably-generated electricity.

In 2008, renewable energy resources and energy savings supplied 13.9% of net energy sales for the Kauai Island Utility Cooperative (KIUC), again above the 2010 target. Nearly three-fourths was due to renewable generation.



Primary Energy Sources in Hawaii, 1970-2008, Selected Years

Solar Thermal, Electric Growing Quickly

Hawaii is the nation's recognized leader in solar water heating, accounting for over one-third of all systems installed in 2008, according to a study by the Solar Energy Industries Association.

Photovoltaics have boomed in Hawaii, with most distributed renewable energy projects, including those under net-energy metering agreements, being PV.

Hawaii now has more than 15 MW of PV installed, and is reaching the maximum allowed penetration in some locales.

The Interstate Renewable Energy Council reports that Hawaii is third in the nation in terms of per-capita PV generation, following California and Nevada.

Like the rest of the nation, Hawaii's PV capacity is primarily grid-tied, non-residential arrays.

The state's largest solar electric project—1.2 MW of photovoltaics (PV) on Lanai—was dedicated in January 2009. When fully operational, the facility can produce up to 30% of the island's peak demand. MECO buys the power at prices below current rates.

The La Ola plant consists of 7,400 modules on single-axis trackers. It is presently generating up to 500 kW; full output is pending the installation of a battery storage system.

The state completed installation of nearly 1 MW of PV modules at seven Department of Transportation facilities statewide, including several airports.

DAGS will include 100-kW PV systems for state buildings as part of its statewide energy savings performance contract.

In September, the Department of Education issued a request for proposals (RFP) to design, install and operate PV systems at schools statewide, selling power to the department below utility prices.

HSEO helped the University of Hawaii at Hilo develop an RFP for a PV installation.

USDOE granted a Solar America Showcase Award to Forest City Hawaii, which will continue putting PV on military housing. This phase will install enough rooftop PV to service 2,317 homes.

An additional 3.6-MW solar farm is planned at the Forest City Hawaii Affordable Housing project on the Big Island.

The Navy installed PV on the roofs of 15 buildings at Pearl Harbor and Pacific Missile Range Facility, for a total capacity of 2.2 MW. The project used federal stimulus funds.

Marine Corps Base Hawaii unveiled a 60-kW building-integrated PV system in January. "Cool roofs" covered with thin-film PV were installed on two buildings. An educational kiosk reports the power being produced.

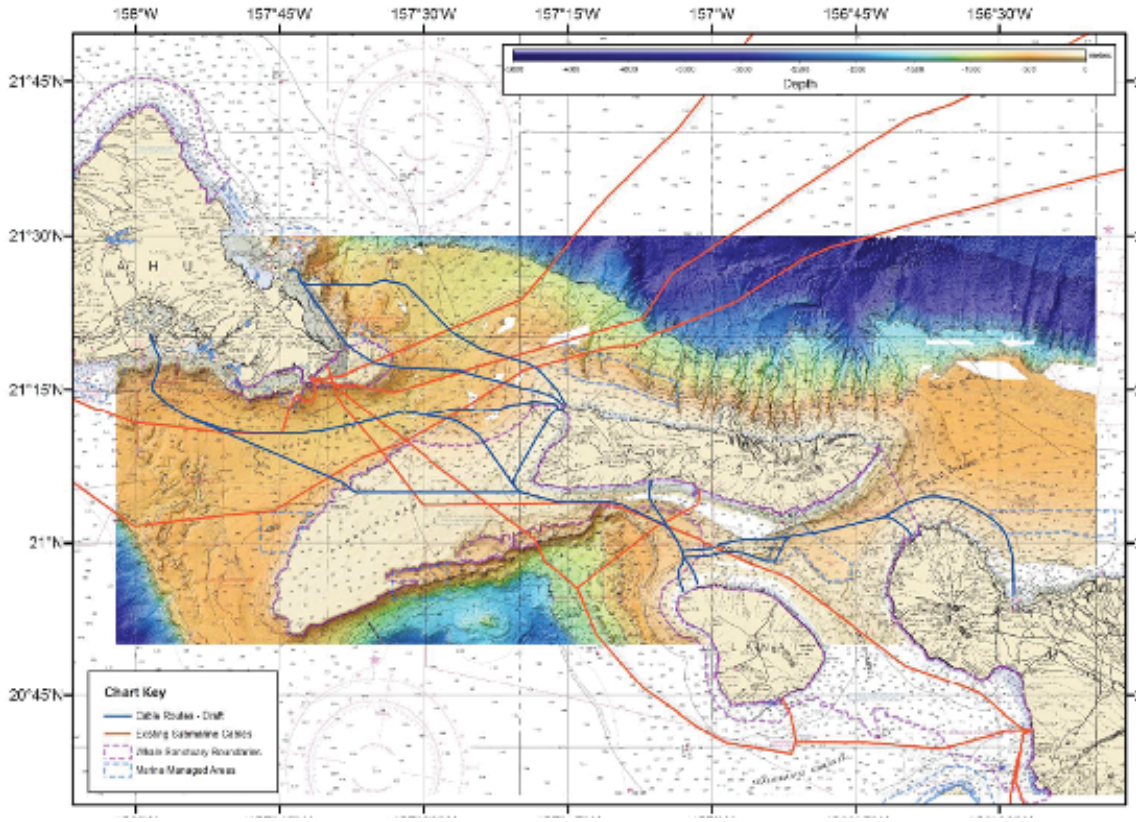
New private sector installations include: 12.6 kW on The Nature Conservancy's headquarters in Honolulu, and more than 200 modules spelling out the word "Recycle" on the roof of Business Services Hawaii in Keaau.

Additional installations included: 1,500 modules at the Pioneer Hi-Bred Waimea Research Center on Kauai; a 803-kW array at Kona Commons shopping center on the Big Island; and a 500-kW plant at Kauai's Wilcox Hospital.

Other PV installations include: two 143-kW building-integrated roof systems on Oahu Target stores; and three rooftop systems capable of generating 290 kW at Tony Group Autoplex in Waipio, Oahu.

HECO utilities' Sun Power for Schools program, which is cofunded by ratepayer donations, added a 3.96 kW array on Konawaena Middle School. Over two dozen schools have systems.

Lanai's 1.2-MW La Ola photovoltaic plant is the state's largest.



Possible routes for a subsea cable linking islands of Maui County with Oahu are under study.

High Hopes for Wind Power

Wind-generated electricity, one of the fastest growing renewable sources in Hawaii, is expected to expand much further.

Sites at Kahuku, on Oahu's north shore, are under consideration. A 30-MW facility has been proposed by First Wind in response to HECO's renewable energy RFP in 2008.

HECO believes that up to 100 MW could be developed in the area.

On Maui, the Auwahi Wind Energy LLC was acquired by Sempra Generation. The proposed Auwahi project consists of 22 MW of wind, plus battery storage, at Ulupalakua Ranch.

HECO received $750,000 in federal ARRA stimulus money to support grid integration initiatives which will help the utility accept additional wind energy.

Interisland Cable

Oahu, with its dense population, has comparatively few renewable energy resources. On the other hand, Lanai and Molokai have vast wind resources, far more than can be used locally.

In order to achieve the goals of HCEI, the state, HECO, landowners and renewable energy developers envision developing 200 MW of wind on each of the smaller islands and transporting it via undersea cable to Oahu.

Initial steps are being taken to define the project, and numerous meetings were held in 2009 with the potentially affected communities. Community concerns include aesthetics and access for hunting and other purposes.

To better understand the challenges posed by the undersea terrain and biota, the UH School of Ocean and Earth Science and Technology has completed an ocean floor survey which will support analyses of possible routes and landing sites.

DBEDT has issued a Request for Proposals for an environmental impact statement, to be prepared beginning in 2010.

The cable could save Hawaii taxpayers some $5.7 billion over 20 years by avoiding purchase of 2 million barrels of imported oil annually.

Renewable Energy Projects Advance

Rules for coordinating permitting of renewable energy projects, as called for by Act 207, Hawaii Revised Statutes (HRS) 201N, have been drafted. The rules will also allow DBEDT to collect fees from renewable energy developers in order to expedite permits.

HSEO permitting staff are identifying the permits necessary for renewable energy projects. Working with HSEO, the Department of Health will create an on-line system to shorten and simplify the permitting process for projects.

Geothermal

Hawaii's only geothermal power plant operator, Puna Geothermal Venture (PGV), is wrapping up negotiations with HELCO to add another 8 MW of capacity. The new equipment will be fully dispatchable, following the load as needed by the utility.

PGV is owned by Ormat, which has received $4.9 million in federal stimulus funds to locate fault zones within geothermal reservoirs, using a combination of advanced technologies. Initial exploration will be in the geothermal subzone on Maui, along the southwestern rift of Haleakala.

PGV currently provides approximately 20% of Hawaii County's electricity. Its 30-MW plant has been in operation for 15 years. They are also interested in exploring the geothermal potential of Hualalai, closer to Kona, where most of the Big Island's energy is used.

A company focused on the use of low-temperature heat visited Hawaii in 2009 to discuss potential projects. The company, Raser, has developed a power plant in Utah.

Ocean Energy

Ocean Power Technologies (OPT), which has been testing wave energy buoys off the Marine Corps base in Kaneohe with support from the US Navy, has received an additional $1.1 million in funding to support the research and continuing upgrades of its PowerBuoys.

OPT has demonstrated three buoys at Kaneohe. The third buoy, which was briefly deployed in late 2008, was removed for repair and by fall 2009 was awaiting redeployment.

Oceanlinx, an Australian wave energy company with plans for a 2.7-MW plant off the north coast of Maui, became the first Hawaii project to receive a preliminary permit from the Federal Energy Regulatory Commission in 2009.

OPT's PowerBuoy #3 as deployed off Kaneohe Bay in 2008.

It is expected that environmental and permitting work will commence shortly.

Lockheed Martin Corporation is proceeding with plans to build a pilot 10-MW ocean thermal energy conversion (OTEC) plant off Kahe Point, Oahu, in 2013.

Using its own funds as well as contracts from USDOE and DOD, Lockheed is researching heat exchanger technologies and methods of engineering the 3,000-foot long, 12-foot diameter pipe needed to draw cold water from the deep ocean for its electrical generation process.

DOD has indicated an interest in developing OTEC at military bases worldwide, including Diego Garcia and Guam.

Bioenergy Master Plan

The state's Bioenergy Master Plan was completed in 2009, as required by the legislature. The work was orchestrated by HNEI under contract to DBEDT.

The issues and outcomes were studied in the context of four major industry components: feedstock production, conversion, distribution, and end use.

Recommendations from nine separate studies were used to form a roadmap for bioenergy in Hawaii. The plan outlines priority actions, including policy development, providing incentives for early implementation, developing an evaluation methodology based on life cycle principles, and performing a cost/benefit analysis of the reuse of treated water.

Counties Address Sustainability

Kauai County continued to pursue a 64 kW (AC) PV system on the roof of the Lihue Civic Center. The county will use part of a $1.5 million CIP fund dedicated to renewable energy support to purchase the PV system..

The county also donated a device which captures humidity from the air for Niihau School, powered by the school's PV system. The WaterMaker device produces five gallons of water daily which is used by the school cafeteria and to replenish water for the PV battery storage bank.

Federal stimulus money is proposed for a PV power system at the new Kealia Fire Station.

Kauai County and the Navy continue efforts to develop the methane resource at Kekaha Landfill to power generators at the Pacific Missile Range Facility. Discussions include the possibility of issuing a joint procurement solicitation as the Navy determines how to best proceed with project implementation.

The City and County of Honolulu exempted renewable energy projects from property taxes for 25 years. The exemption, which passed the City Council unanimously, applies to alternative energy property installed on a building, property or land.

Eligible sources include solar, wind, hydropower, tidal, wave, solid waste and increased efficiency in fossil-fuel burning facilities. Energy sources based on fossil fuels, nuclear fuels or geothermal energy are not eligible.

In October, the City Council kicked off its new Building Sustainability Working Group, which will assist the Council in its efforts to increase the private sector's use of sustainable planning, design and construction practices.

Hawaii County completed the installation of a 100-kW PV system on the roof of its renovated County Building; another 400 kW are planned for the new West Hawaii Civic Center. The County Public Works' new policy includes the installation of PV systems on all new construction and roof replacement bid specifications where applicable.

Electric vehicle charging will be available at both the Hilo and Kona buildings: 21 stalls in Hilo and 14 at the West Hawaii Civic Center. Conduit to accommodate the wiring has been laid.

Maui County continued its drive toward sustainability, hosting the Maui County Energy Expo in September.

The Expo featured exhibits, progress reports, and presentations on overcoming regulatory barriers to clean energy.

Local Algae Research Focused on Developing Biofuels

Algae is among Hawaii's most exciting fuel alternatives.

HR BioPetroleum leveraged a state contract for algae research with federal funding to identify algae strains that can be used to make fuel for military aircraft. The company is using its facilities at the Natural Energy Laboratory of Hawaii Authority (NELHA) at Keahole Point to grow algae strains for the research projects. In a separate project located on six acres at NELHA, HR BioPetroleum, in partnership with Royal Dutch Shell, is growing algae for transportation fuel.

A planned Maui project, a partnership between HR BioPetroleum, MECO and Alexander & Baldwin, Inc., would involve up to 1,000 acres next to MECO's Maalaea power plant. This would be Hawaii's first commercial algae-production facility.

Local companies Hawaii BioEnergy—a consortium of major Hawaii landowners—and Kuehnle AgroSystems are part of a team which won a $20 million contract with the Defence Advanced Research Projects Administration (DARPA) supporting a separate effort to develop algae jet fuel.

The Gas Company is also pursuing technologies which will increase the renewable components in its gas supply. Production facilities at the Gas Company's synthetic natural gas plant will process agricultural products and landfill gas into bio-methane, renewable diesel, or similar products while improving the efficiency of the plant operations.

Test Vehicles Run on Electricity, Hydrogen

As part of a federal test of plug-in hybrid electric vehicles, six Toyota Prius sedans were delivered to Hawaii, converted, and driven around Oahu and Maui.

HECO and MECO were partners in the effort, part of research undertaken by USDOE and the Idaho National Laboratory, working with HCATT (see sidebar.) Other partners were Maui County, the U.S. Air Force, and the University of Hawaii at Manoa.

In January 2009, six vehicles were outfitted with batteries plus charging equipment allowing them to be plugged into a standard wall outlet. Each car also received onboard data loggers.

The vehicle driven by Maui Mayor Charmaine Tavares averaged 64 miles per gallon in April.

Mayor Tavares reportedly spent nearly $87 driving 1,175 miles that month. Going the same distance in a gasoline-powered car which gets 25 miles per gallon would have cost about $126.

In November, DBEDT concluded an analysis of smart electric vehicle (EV) infrastructure requirements for the NGA.

Maui Mayor Charmaine Tavares tested plug-in electric vehicles in a national demonstration.

The report examines the issues associated with large-scale grid-connected EV adoption. EVs use petroleum for transportation more efficiently than gas-fired internal combustion engines do and have the potential to provide energy storage for intermittent energy sources as well as to increase the demand for off-peak electricity.

DBEDT is working with the Hawaii Auto Dealer's Association and automobile manufacturers to promote EVs and develop EV charging infrastructure compatible with industry standards.

HCATT is also instrumental in the production and testing of hydrogen fuel in vehicles at Hickam Air Force Base.

A 146-kW PV array, which provides electricity for hydrogen production, became operational in May. Soon after, five 10-kW vertical axis wind turbines were added to the site.

The station's hydrogen production capability exceeds current demand, but the Air Force and Army envision expanding their small fleets of fuel cell vehicles.

Iolani School A Winner in Aviation Design

Iolani School won the USDOE's 2009 Real World Design Challenge, a new competition which applies academic lessons to energy and environmental technical problems.

Students were asked to redesign an existing aircraft to maximize its fuel efficiency while meeting specific performance capabilities.

Transportation Innovation

The Hawaii Center for Advanced Transportation Technologies (HCATT) was one of the recipients of the Governor's Innovation Awards in 2009. HCATT received the honor in recognition of its role in helping Hawaii create an innovation-based economy and a stronger future.

HCATT focuses on finding alternative fuel transportation solutions. Along with local and mainland partners in both the private and public sectors, the Center is demonstrating battery-powered electric vehicles, hybrid electric vehicles, and vehicle charging infrastructure.

In partnership with the U.S. Air Force Advanced Power Technology Office at Robins Air Force Base, GA, HCATT managers the National Demonstration Center for Alternative Fuel Vehicles at Hickam Air Force Base. As a result of this partnership, fuel cell vehicles and a hydrogen production and fueling station were introduced—a first for Hawaii and for the Air Force.

Training and Outreach Opportunities

DBEDT participated in a wide variety of events during 2009, including energy conferences, seminars, training sessions, radio and TV programs, and community meetings. In many cases, DBEDT was the sponsor or co-sponsor, while in others HSEO staff were invited presenters.

Among the 2009's events are:

• Renewable Energy Grid Integration Systems Workshop, Jan. 12-15; Lanai.

• Home Building & Remodeling Show, conducted by the Building Industry Association of Hawaii, Jan. 22-25.

• Pearl City Neighborhood Board, Jan. 27.

• How to Conduct a LEED for Existing Building Assessment, Feb. 24-25.

• Rebuild Hawaii Consortium quarterly meeting, Mar. 5.

• Renewable Energy World, Las Vegas, Mar. 10-12.

• LEEDing by Example in Hawaii: Success Stories in Hawaii's Green Building Initiatives, at Hawaii Buildings, Facilities & Property Management Expo, Mar. 11.

• Western States Energy Program Meeting, April 15-17.

• LEED Design for Homes, May 19-21, Oahu & Maui.

• FEMP Training on Building Assessment for five state facilities personnel, April 21-24.

• How to Save Energy & Money with the Hawaii BuiltGreen Program, April 28.

• 9th Annual Build and Buy Green Conference and Expo, May 19-20.

Hawai'i Powered
Hawai'i Clean Energy Initiative

A website and printed materials describing the Hawaii Clean Energy Initiative were created in 2009. More information is available at www.hawaiicleanenergyinitiative.org

• Sustainability and Saving Energy in Hawaii, May 31.

• Rebuild Hawaii Consortium quarterly meeting; technical seminar on battery storage, June 3.

• Green Homes, HCEI and Legislative Update at Honolulu Board of Realtors, June 5.

• UH Clean Energy Day, June 6.

• Green Hotel Forum, June 25; Maui.

• Photovoltaics Inspection Seminars, July 13-15; Oahu, Kauai and Maui.

• Hawaii Powered Clean Energy Festival, July 18.

• PACOM Energy Security Joint Capability Technology Demonstration Workshops, July 23, Aug. 26 and Oct. 27.

• Hawaii Green Business and Energy Star presentations to Hawaii Hotel Engineer's Council quarterly meeting, Aug. 12.

• Hawaii's Energy Future: The Next 50 Years, 50th Statehood Day Commemoration, Aug. 21.

• Presentation on HCEI to Hawaii Transportation Association annual Leadership Conference, Aug. 27.

• Asia Pacific Clean Energy Summit, Aug. 31-Sept. 3.

• Kauai Farm Fair, Aug. 28-29.

• State Purchasing Office Training Session: Green Purchasing, Sept. 1.

• Rebuild Hawaii Consortium quarterly meeting; technical workshop on advanced lighting, Sept. 9.

• Green Building and LEED Training, Sept. 2-3.

• Presentation on energy efficiency at 2009 Hawaii Healthcare Pollution Prevention Workshop; Sept. 8-9.

• Maui County Energy Expo 2009, Sept. 10-11.

• Hawaii Green Schools Symposium, Sept. 12.

• Hawaii County Fair, Sept. 20.

• Military, Motorcycles, and Manoa: A Green Building, Green Community Design Site Tour, Sept. 23.

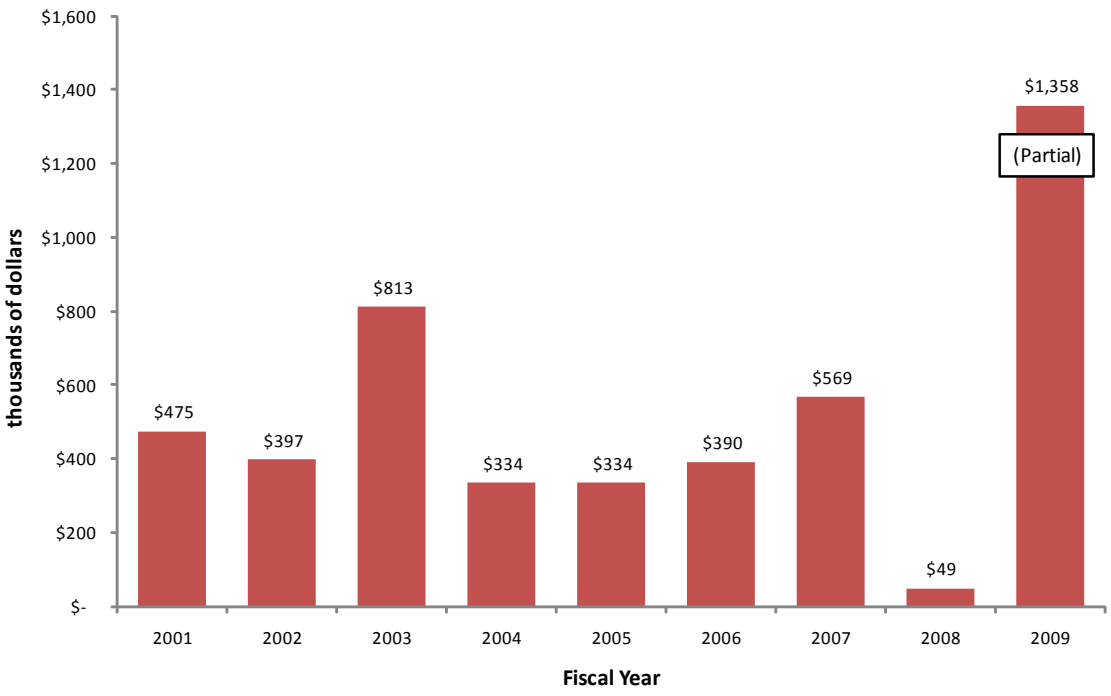
• LEED for Neighborhood Development and Net Zero Energy Homes, Sept. 24.

• Pacific Coast Electrical Association Conference & Expo, Oct. 7.

• LEED Green Building Design & Construction and Green Building Operations & Maintenance workshops, Oct. 20-23.

• Sustainable Tourism Education Program, Oct. 23.

• Rebuild Hawaii Consortium quarterly meeting, Dec. 2.



Source: DBEDT records, compiled from DOE, EPA and NGA sources by Strategic Industries Division.
*Data may reflect multi-year awards

Federal Stimulus Funds Expand Hawaii's 2009 Energy Budget

The core of Hawaii's energy program has for decades been a set of projects delineated under the U.S. Department of Energy (USDOE) State Energy Program. Annual funding for these projects supports a wide range of efforts, from promoting alternative fuels to strengthening building codes and preparing for energy emergencies.

In 2009, federal stimulus programs significantly increased the amount of energy-related funding in Hawaii.

In addition to DBEDT, funding was directed to the individual counties and to other state agencies such as the Department of Labor and Industrial Relations and the Public Utilities Commission.

The result was a higher than normal influx of federal funding for SEP and other programs.

A number of competitive solicitations were also offered by USDOE outside of the State Energy Program. While some were intended to supplement state activities, others were aimed specifically at the private sector.

DBEDT distributed announcements of federal funding opportunities and, where appropriate and requested, provided letters of support.

As a result, stimulus funds were gained for a number of Hawaii projects, including smart grid development at HECO, geothermal exploration by Ormat, ocean thermal energy conversion research by Lockheed Martin Corporation, and several awards for biorefinery projects.