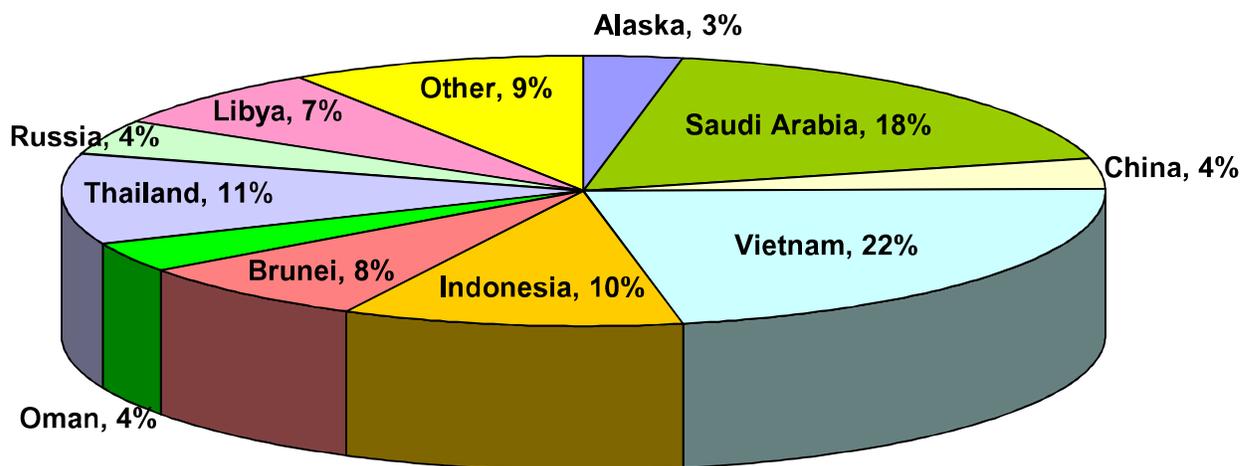


State of Hawaii Energy Resources Coordinator Annual Report 2008



Hawaii's Crude Oil Imports, 2007

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Hawaii's Energy Security Faces Challenges

Energy is critical to Hawaii's economy. How much fuel is imported and how efficiently it is used directly impacts each resident and business in the state.

The economic security and stability of the State of Hawaii continue to remain extremely vulnerable due to Hawaii's over dependence on imported oil. Nearly 77% of the state's electricity and about 95% of its transportation fuels are produced from petroleum.

The U.S. Energy Information Agency notes that, "Current trends in energy supply and consumption are patently unsustainable... and they can and must be altered. The era of cheap oil is over."

The Energy Resources Coordinator, whose staff works to en-

hance energy security, improve the state's economy, and reduce dependence on imported energy, faces many challenges, including:

- Hawaii still relies on imported petroleum for about 88% of its primary energy. Most oil is from foreign nations.
- The islands' electricity grids are not interconnected.
- Hawaii residents pay among the nation's highest prices for electricity and fuel.

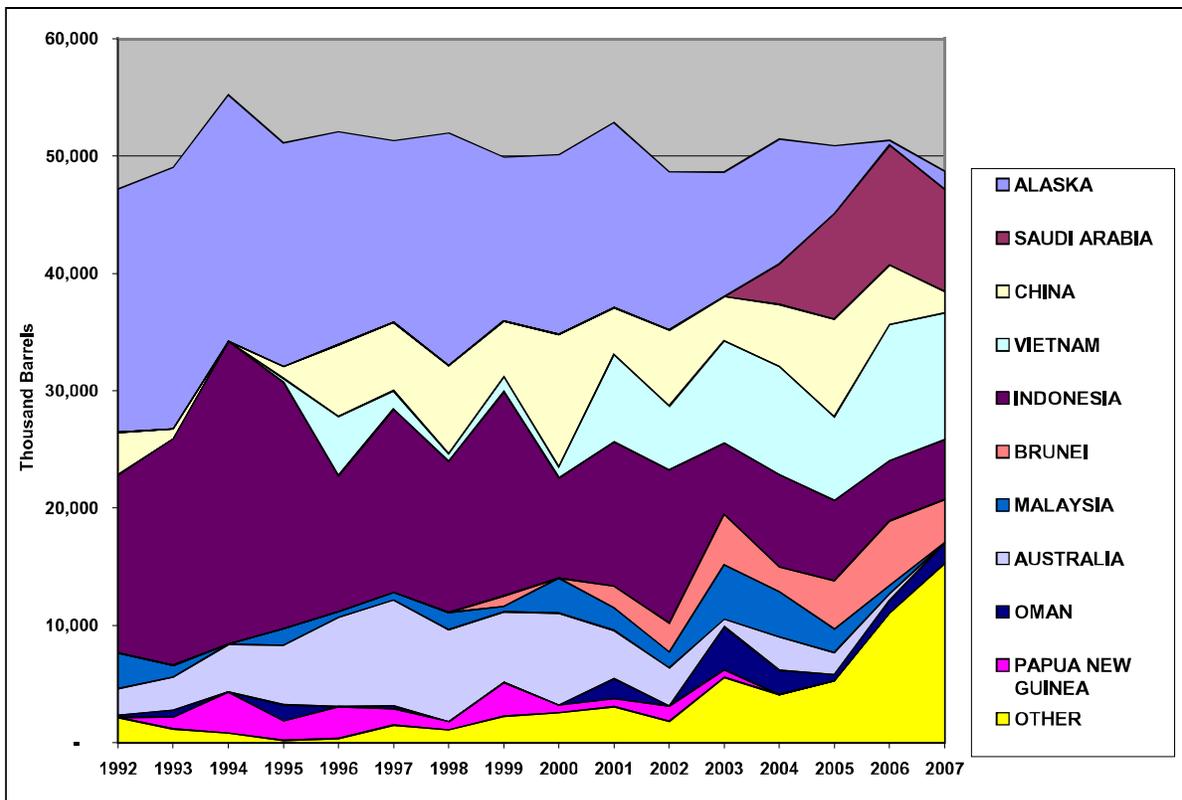
In 1974, the Legislature created the position of Energy Resources Coordinator. It is held by the Director of the Department of Business, Economic Development, and Tourism (DBEDT).

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

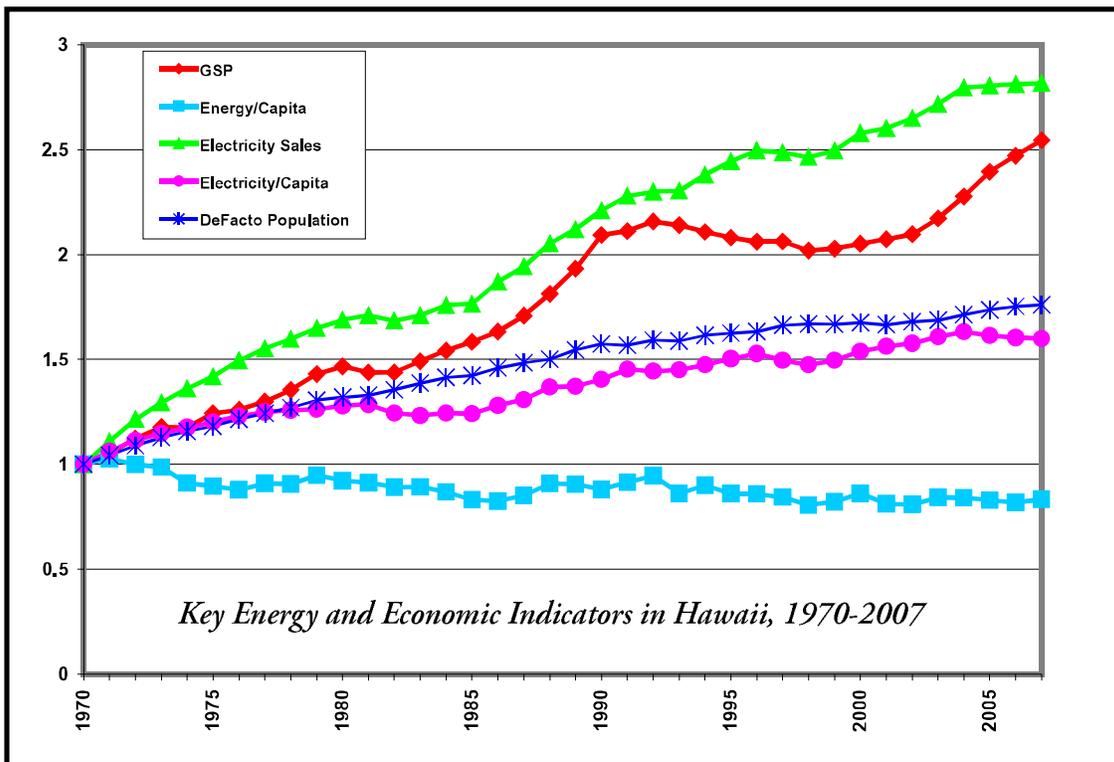
- dependable, efficient, and economical statewide energy systems capable of meeting the needs of the people;
- increased energy self-sufficiency;
- greater energy security; and
- reduction, avoidance, or sequestration of greenhouse gases.

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

The Strategic Industries Division (SID) of DBEDT implements programs to meet these goals. Achievements for 2008 are detailed in the following pages.



Hawaii's Crude Oil Sources 1992-2007



Energy consumption rose in 2007

Hawaii consumers spent more money for energy in 2007 as consumption of oil, coal and renewable electricity all increased.

Hawaii's primary energy consumption in 2007 was 330.2 trillion Btu, up 2.3% from 2006.

Petroleum use increased 2.9% from 2006 to 2007. Petroleum consumption totaled 291.9 trillion Btu in 2007. A total of 48.7 million barrels of crude oil were imported, costing an estimated \$3.6 billion.

Coal consumption increased 4.6% from 2006.

Together, the imported fossil fuels—coal and oil—represent almost 93% of Hawaii's energy consumption. Nearly 88% of Hawaii's total energy is imported petroleum.

Renewable energy produc-

tion increased by 13.1% during 2007. This increase can be attributed primarily to generation from biomass, geothermal and wind, which increased by about 19%, 8% and 195%, respectively, over 2006 figures.

Wind's increase is due in large part to Maui's Kaheawa Wind Power project, which in 2006 generated approximately 57 gigawatt-hours of electricity; in 2007 the company generated about 126 gigawatt-hours. Wind generated the equivalent of 846 billion Btu in 2006, rising to 2,500 billion Btu in 2007—which is still less than 1% of the state's total primary energy.

In total, renewables provided nearly 21 trillion Btu in 2007.

Consumers spent an estimated \$6.21 billion for energy in 2007,

slightly more than 2006. This was about 10% of Hawaii's \$61.53 billion (current dollars) Gross State Product (GSP).

Hawaii's economy is significantly more energy efficient than it was in 1970, but per capita efficiency has not improved in recent years. Hawaii residents use 17% less energy per capita (based on de facto population) than they did 37 years ago. However, energy use per capita increased by 1.8% in 2007 compared to 2006.

In 2007, electricity sales per capita were 60% more than 1970, while de facto population grew 76% and real GSP increased 154%.

2007 electricity sales increased 0.16% over 2006. This resulted in a modest 0.32% decrease in electricity sales per capita.

Attaining 70% clean energy within a generation

Transforming Hawaii's energy economy within a single generation: this is the goal of the Hawaii Clean Energy Initiative (HCEI), a partnership between Hawaii and the U.S. Department of Energy (USDOE).

HCEI will move Hawaii from near-total reliance on fossil fuels to attaining 70% of the state's energy from indigenous renewables and efficiency measures by 2030.

Analyses produced for HCEI indicate that 70% clean electricity is attainable if significant efficiency programs, major grid modifications and about 1500 MW of new renewable energy capacity are implemented. With new technologies, levels could be higher.

However, achieving the 70% goal for ground transportation may be harder, even with strong programs for biofuels and electric vehicles. Preliminary results indicate approximately two-thirds of ground transportation energy demand could be met with clean sources by 2030, given current technologies and fuel economy requirements.

Anticipated breakthrough technologies such as OTEC and algae-based fuels were not included in the models.

Publicly announced on Jan. 28, 2008, HCEI has produced an aggressive package of new legislation and regulatory policies to implement changes in electricity consumption, power generation, grid management and transportation.



Governor Lingle announces an historic agreement between the State of Hawaii and Hawaiian Electric Company, Inc. on Oct. 20, 2008, outlining voluntary steps the utility and its subsidiaries will take toward achieving the goal of 70% clean energy in Hawaii by 2030.

The package was developed by five working groups co-chaired by DBEDT and USDOE professionals, assisted by experts from national laboratories and the private sector. Utilities, renewable energy companies, legislators, and others have participated in the process.

Signaling agreement on key actions, the Hawaiian Electric Co. (HECO) family of utilities has voluntarily agreed to a number of actions after extensive discussions with USDOE and DBEDT.

HECO and the state agreed to move from central-station, oil-based power to a more renewable, distributed- and intermittent-powered system while preserving the stability of the grid, minimizing disruption, and keeping the utilities financially sound.

The agreement, which can be found in its entirety at www.hawaii.gov/dbedt/info/energy/

agreement, includes these points:

- Accelerated addition of clean energy resources on all islands.
- Increasing Renewable Portfolio Standard goals to 25% (from 20%) by 2020 and 40% by 2030.
- Laying an undersea cable linking Oahu and wind farms on Molokai and/or Lanai.
- Decoupling utility revenue from electricity sales.
- Establishing feed-in tariffs to standardize rates for utilities' purchase of renewable power.
- Removing systemwide caps on net energy metering.
- Developing an Energy Efficiency Portfolio Standard.
- Aggressively supporting alternative fuel and electric vehicles.
- New programs for solar water heating and photovoltaics.
- Installation of advanced meters for customers who request them.

Clean energy projects will initiate transformation

The Hawaii Clean Energy Initiative (HCEI) has already instigated a number of projects which will contribute to the transformation of Hawaii's energy economy by 2030.

Some of these projects are being undertaken by HCEI partners at national laboratories and within the private sector, in consultation with DBEDT and local utilities. Others are complementary efforts pursued by the University of Hawaii, cooperating federal agencies and other parties in both the public and private sectors.

The projects include:

- Modeling electricity grids on all islands
- Wind resource and storage testing
- Maui grid integration
- 100% renewable Lanai
- Forest City (Navy) highly efficient communities
- National Marine Renewable Energy Center at the Hawaii Natural Energy Institute (HNEI) of the University of Hawaii (UH)
- Bioenergy Master Plan
- Regulatory framework development
- Interisland cable feasibility and cost/benefit studies
- Economic modeling of energy system
- Technical and economic assessment of plug-in hybrid and electric vehicles
- Hawaii greenhouse gas carbon tax/abatement analysis
- 70% clean energy scenario analyses

A USDOE grant providing \$7 million over three years will allow HNEI, HECO and other partners to determine ways of maximizing the use of intermittent renewable electricity through grid improvements, focusing on the Maui Lani substation on Maui. An additional \$8 million in matching funds is committed by the private sector.

Innovative demand side management, electrical storage, smart grid technologies and electrical transmission and delivery technologies are among the policy options which will be applied to utility grid infrastructure under a \$500,000 grant to DBEDT from USDOE.

Developing product concepts for integrating commercial and residential photovoltaic generation with the electrical grid is the goal of another USDOE project involving Sandia National Laboratories, GE, Sentech and HECO. Improvements are expected to reduce homeowner utility bills as well as the utilities' peak loads.

DBEDT was also selected to participate in the National Governors Association's Policy Academy on Advanced Energy Strategies for Buildings, and will receive support to examine building codes, legislative initiatives and energy efficiency measures.

UH one of two national marine energy labs

The UH-Manoa's Hawaii Natural Energy Institute will establish one of two national marine renewable energy research centers with \$5 million in USDOE funding over five years. The other laboratory is located at Oregon State University.

HNEI envisions testing wave energy components and systems as well as ocean thermal energy conversion technologies at four sites throughout the state where ocean-related projects have already been initiated.

The locations include Kaneohe Bay, Makai Pier at Makapuu, Pauwela Point on Maui, and the Natural Energy Laboratory of Hawaii Authority at Keahole Point.

Island Nations energy partnership

The United States and New Zealand have launched the International Partnership for Energy Development in Island Nations which aims to further the development of energy efficiency and renewable energy technologies in island nations and territories.

Governor Linda Lingle attended the signing ceremony in The Bahamas during June 2008. Hawaii's clean energy initiative will serve as a model for other island entities.

Lead by Example

State agencies trim electricity use, but bills still skyrocket

State executive branch agencies have collectively managed to reduce their electricity use by 1.2% since 2007, but rising oil costs sent bills upwards 19.6% from 2007 and 56.8% since 2005.

Tracking electricity consumption and expenditures is one aspect of the state's Lead By Example initiative. Executive agencies are also tracking vehicle mileage, efficiency improvements and renewable energy projects, as dictated by Acts 96 and 160, SLH 2006, as well as Administrative Directive 06-01.

State agencies are also directed to design all new buildings to meet LEED Silver efficiency standards, if possible. As a result, the Department of Accounting and General Services (DAGS) expects the following new buildings to achieve LEED Silver rating:

- Manoa Public Library
- Kohala Public Library
- Keaukaha Military Reservation Joint Military Center
- Maui Regional Public Safety Complex

The University of Hawaii also has constructed several buildings which are expected to receive LEED certification at various levels, including the UHH Student Life Center which is pending LEED Gold. The John A. Burns School of Medicine recently received a LEED Certified rating.

Fifteen buildings throughout the UH system, such as the new West Oahu campus and facilities

at several community colleges, are being designed with LEED Silver as a goal.

Other state buildings' efficiency achievements are being documented through the federal Energy Star® program, which acknowledges buildings that are among the top 25% in their class.

In 2008, the following state buildings qualified for Energy Star® certification:

- Keoni Ana Building
- Hilo State Office Building
- Abner Paki Hale Courthouse
- Kapolei State Building
- State Office Tower
- Waipahu Civic Center

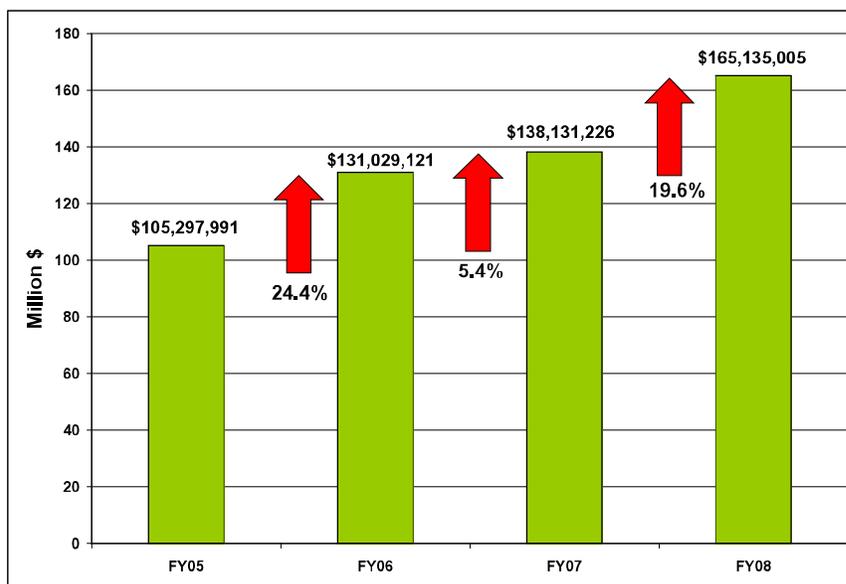
State agencies are also retro-commissioning a number of facilities statewide to ensure that their energy systems are functioning properly and efficiently. DAGS

is retrocommissioning 11 projects on four islands with DBEDT assistance.

In October 2008, Gov. Lingle released \$1.85 million to improve energy efficiency at the State Capitol and other state buildings on Oahu.

Improving efficiency is a continuing quest by state agencies. In 2008, the Hawaii Public Housing Authority sought proposals from energy service companies to achieve energy, water, operational and maintenance savings at more than 5,300 federally-subsidized housing units.

DBEDT assisted the Department of Hawaiian Home Lands (DHHL) with plans to integrate Hawaii BuiltGreen™ requirements into specifications for 350 housing units at East Kapolei.



State executive agency expenditures for purchased electricity.

Building Code improvements will achieve long-term savings

Two major projects involving building codes are underway at SID. Updating the energy efficiency provisions of building codes has a lasting effect on energy consumption since buildings are used for decades.

SID is participating in the Hawaii Code Council by chairing the International Energy Conservation Code (IECC) subcommittee. The committee is proposing “Hawaiianized” revisions to the IECC 2006 for application statewide. The Council includes representatives from each of the four counties since code compliance is a county function.

Among the amendments to the IECC which have been approved by the Council: offering five ways to achieve R-19 roof insulation or its equivalent, ensuring that non-air conditioned buildings comply with building envelope requirements, and requiring building commissioning to ensure proper operation of energy systems. Homes will be required to include wall insulation and high-performance windows.

In addition to the IECC work, SID is managing a Tropical Codes project which will improve the energy codes in Guam, Puerto Rico, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands. A 21-page Model Code adaptation of ASHRAE 90.1-2004 has been drafted and modifications made to accommodate situations unique to each territory and commonwealth.

Rebuilding Hawaii and America through energy partnerships

A consortium of public and private agencies is working to improve energy efficiency in buildings through the Hawaii Rebuild America Partnership. Technical assistance, alternative financing support and building surveys were provided to partners.

Among 2008’s accomplishments were:

- Replacement of an inefficient compressor used by the Hawaii Air National Guard at Hickam Air Force Base, saving \$37,000 in electricity and \$11,000 in water costs annually.

- Assistance to the Hawaii Public Housing Authority on energy performance contracting, includ-

ing staff training, savings analyses, and preparation of a request for proposals relating to an \$80 million project for energy and water improvements at 5,300 federally-funded housing units.

- Revision of the 1998 *Guide to Energy Performance Contracting*, updating it and making it easier to use.

The Rebuild Hawaii Consortium met quarterly to share information on a wide variety of projects, including the Sustainable Saunders effort at UH-Manoa, a restaurant benchmarking project, cold seawater agriculture, alternative-fuel vehicles, and the use of plastics for fuel.

Collaborating across the region

Through partnerships and teamwork, Hawaii provides assistance to other states and islands while accessing national technical resources.

EPA Partnership

Through the U.S. Environmental Protection Agency (EPA) Clean Energy-Environment Partnership, Hawaii has been focusing on green power purchasing, climate change, building efficiency, financing, biofuels and environmentally preferable purchasing.

In 2008, EPA provided technical assistance in identifying best practices for efficiency in low-income housing, greenhouse gas inventories and financing, among other topics.

Pacific Islands

Collaboration continues with U.S. Pacific Island territories, sharing successful energy project information at annual meetings.

DBEDT arranged a briefing for the American Samoa Power Authority on energy policies as well as renewable and efficiency projects of mutual interest.

Guidance was also provided to agencies offering assistance to non-U.S. Pacific island countries.

Other States

Working with a collaborative of other Western States, Hawaii is gaining a voice in regional projects.

Hawaii has also assisted the University of Washington and the Minnesota Dept. of Commerce on building efficiency matters.

Green Government Challenge

DBEDT has issued a Green Government Challenge to other state agencies; the first applications were accepted in November.

Recognition is valid for one year. Agencies can enroll repeatedly to achieve recognition as part of the Lead By Example program.

Participating agencies complete a checklist to document their "green" actions, and may receive a site check to verify responses.

Green Government recognition acknowledges agencies that go beyond compliance with energy, water and resource-efficient operations, resulting in lower costs.

Green Business Program Expands to Retail, Offices

The Hawaii Green Business Program, cosponsored by DBEDT, the Dept. of Health, the Chamber of Commerce of Hawaii and other local government agencies, is expanding its program to include offices and retail businesses.

Previously, the program focused on hotels and resorts, offering recognition to businesses which have applied environmentally responsible measures.

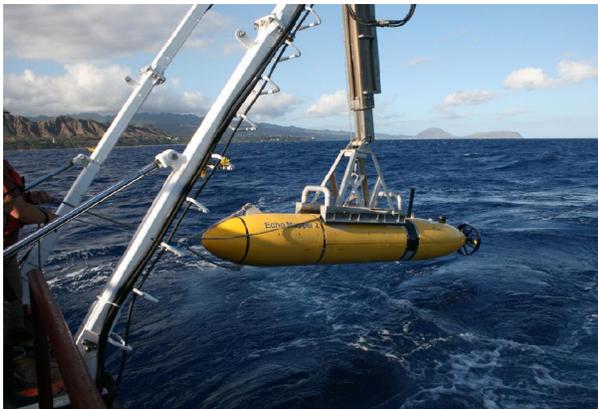
The Green Office and Retail Program Pilot is cosponsored by the Building Owners and Manag-

ers Association and the International Facility Management Association Hawaii.

In both the hotel/resort program and the new retail/office pilot, the objectives are to reduce energy and water consumption, promote recycling, prevent pollution, reduce emissions, and to educate employees and customers about environmental practices.

Meetings are held periodically to update participating businesses. The Green Hotel Forum was held Oct. 29, 2008, at the Hyatt Regency Waikiki Resort and Spa.

Seawater air conditioning project expects construction to begin in 2009



Fugro Seafloor Surveys, Inc. used its proprietary autonomous underwater vehicle to provide a detailed bathymetric survey of the sea floor for the seawater air conditioning system.

Honolulu Seawater Air Conditioning LLC has received \$10.75 million in private equity financing, signed up half a dozen customers, drafted an environmental impact statement, and expects to start construction in 2009 for a system which promises to cut energy expenditures for participating buildings in downtown Honolulu.

Seawater will be drawn from a depth of approximately 1,600 feet, four miles off Kakaako, at a temperature of about 45° F. The ocean water will be pumped onshore to heat exchangers which will enable it to chill fresh water that circulates in a closed loop to customers.

Sea floor and topographical surveys, plus ocean current and temperature monitoring, have been completed; engineering design work is underway. The entire project is expected to cost \$150 million.

Counties plan for sustainability

County administrations are planning for energy sustainability with a variety of initiatives.

The County of Hawaii developed a sustainability plan which was presented to the Mayor in 2008. An advisory group prepared recommendations for implementation.

Five working groups under the Maui County Energy Alliance are focusing on ways to realize the vision of a green energy future for Maui County.

The City and County of Honolulu's energy sustainability plan is achieving significant savings from retrofits and improved equipment.

Kauai County solicited proposals to develop a sustainability plan and will select a contractor who will begin work in early 2009.

State, utilities set the stage for more renewable energy

Wanted: more renewable energy production in Hawaii.

Renewables currently supply about 6.6% of Hawaii's primary energy. Much of this is electricity from sources such as geothermal, wind, hydro and municipal waste, but a significant amount is thermal energy from rooftop solar water heaters.

Additional projects already under consideration include wind farms on Maui, Oahu and the Big Island, additional geothermal electricity, and ocean thermal energy conversion off Oahu.

Proposals Received

In June 2008, HECO issued a request for proposals seeking de-

velopers to supply up to 100 MW of power to Oahu's grid. Nine proposals are under review; the solicitation closed September 25. This was the first time HECO has used a bidding process for new renewable capacity.

Agricultural Loans

Encouraging both renewable energy and agriculture, the 2008 legislature created a new loan program which was signed into law by Governor Lingle as Act 209.

Full-time farmers, ranchers and aquaculturalists can reduce their dependence on fossil fuels by generating renewable electricity or fuel for their farms. Funds can be used for infrastructure, equip-

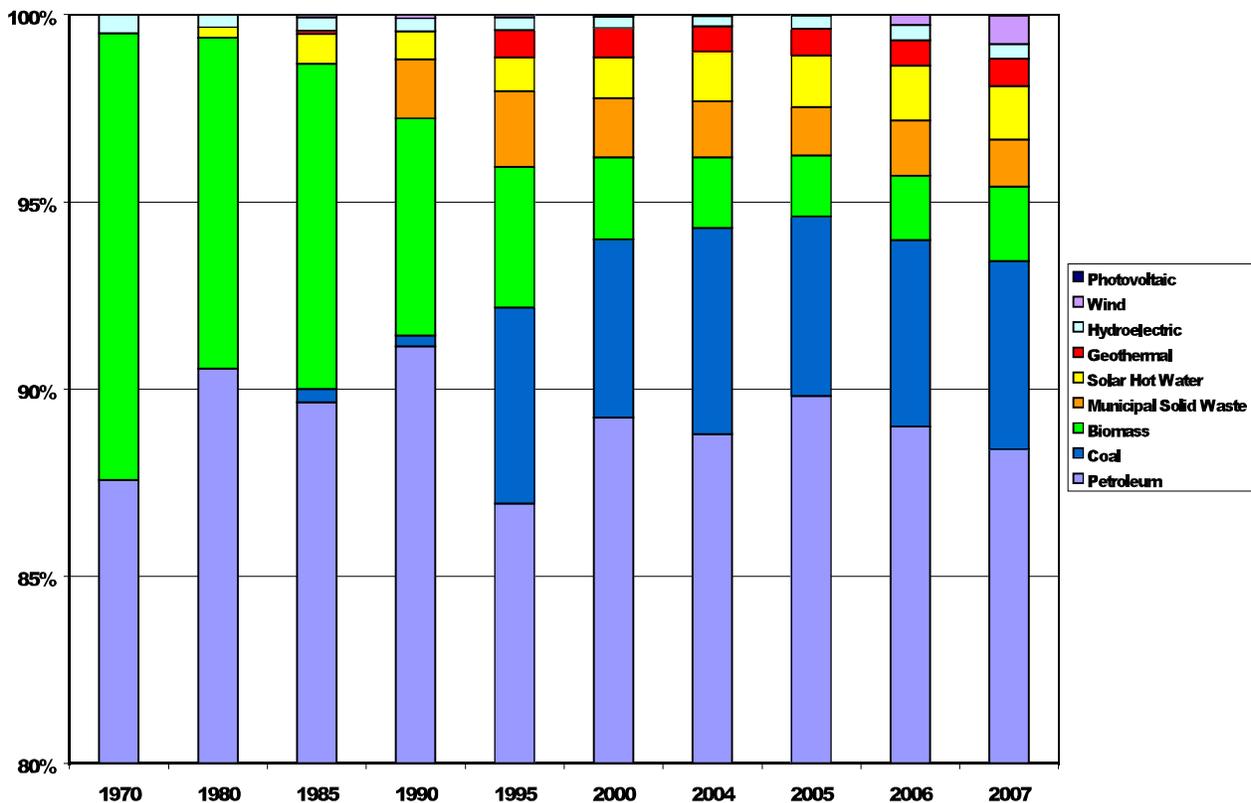
ment, land improvement and operating costs.

Streamlining Permits

Recognizing that obtaining permits for renewable energy projects is a major barrier, the Governor also signed two bills intended to help reduce the complexity.

Act 207 assigns responsibility for designing a streamlined permitting process to DBEDT's director.

A new renewable energy facilitator position within DBEDT was created by Act 208. The facilitator, who was hired in August, will coordinate energy projects and propose changes to the permitting process.



Primary Energy Sources in Hawaii, 1970-2007, Selected Years

A wealth of renewable electricity

According to analyses completed for the Hawaii Clean Energy Initiative (HCEI), renewable energy resources could provide at least 150% of the state's current electrical generation capacity.

Geothermal

Puna Geothermal Venture's 30-MW power plant provides Big Islanders with some 200,000 megawatt-hours of electricity annually. The company continues to negotiate expansion by another eight megawatts, which could be accomplished without drilling additional wells.

Under the agreement between the state and HECO, the utilities commit to pursue as much as 30 MW of additional geothermal power by 2030.

Wind

Proposed additional wind plants could make wind energy Hawaii's most prolific renewable.

Private companies have proposed up to 400 MW of wind on both Lanai and Molokai. An undersea cable would connect the islands to Oahu, the major market for the electricity.

In addition, two 21-MW wind farm proposals are competing for contracts on Maui—an expansion of the First Wind plant at Kaheawa and a new operation on the slopes of Haleakala which might include pumped storage.

Pumped storage, which can "smooth out" the intermittent electricity generated by wind turbines, is also a feature of the Na Makani wind plant proposed for



107 kW of photovoltaic modules on the Forest City military community center are part of a Solar America Showcase partnership.

Kahua Ranch on the Big Island.

Two companies are pursuing 25-30 MW wind plants for Kahuku, Oahu, and other wind developers are considering additional locations, including offshore.

Hydro

Upgrades and expansions of small hydroelectric facilities on Maui and, especially, Kauai could nearly double the statewide capacity, presently more than 24 MW.

Solar

Two different concentrating solar technologies are being demonstrated at the Natural Energy Laboratory of Hawaii Authority.

A "microCSP" device by Sopygy, Inc., which concentrates light onto a working fluid with parabolic troughs, can produce high temperatures for commercial processes as well as electricity.

In contrast, the SolFocus device consists of tiny, high-efficiency photovoltaic (PV) cells on a dual-axis tracker, upon which intense light is concentrated.

Most solar electric activity in 2008 was in photovoltaics. It's estimated that over 12 MW of PV have been installed statewide on commercial and residential roof-

tops. Hundreds are net metered, but some of the largest arrays, 600-800 kW, are located at businesses such as Sam's Club, Paradise Beverages, Costco, and Wal-Mart and constitute only part of the stores' consumption.

Hawaii's first "utility scale" PV installation, 1.5 MW on Lanai, was completed in late 2008. Maui Electric will distribute the electricity, equivalent to about 10% of the island's demand.

PV plants of similar capacity are proposed for Oahu and Maui.

The state government is also seeking PV arrays for airports and other facilities, including a total of 1.1 MW at sites in Lihue, Kahului, Hilo, and Kailua-Kona.

Ocean

A 2.7-MW wave energy plant was announced for the north coast of Maui. Several Oceanlinx devices could be operating by 2010.

In November, Taiwan and Lockheed Martin Corp. agreed to cooperate in developing a 10 MW pilot ocean thermal energy conversion (OTEC) plant for Hawaii. Another OTEC developer has been negotiating with HECO for up to 100 MW of capacity.

Vehicles using electricity, fuel cells in our future?

A \$50,000 grant to support HCEI by analyzing the costs and benefits of electric vehicles was received in 2008 from the National Governors Association Center for Best Practices.

Infrastructure improvements needed for electric vehicles will also be studied. Hawaii was one of 12 states to receive the grant.

In other electric vehicle news, Phoenix Motors announced its interest in a Hawaii project in December 2008.

Better Place, a California-based company, also announced an agreement with HECO to power Better Place's unique network of public charging spots and battery swapping stations with renewable energy.

The Better Place business model makes electric vehicle use convenient by allowing the consumer to

buy miles while Better Place owns the batteries. The company also has projects in Israel, Denmark, Australia and California.

It's possible that electric vehicle batteries could be used to provide peak power to the electric grid and recharged during off-peak hours.

Demonstrations of hydrogen fuel cells for transportation are also proceeding. The Hawaii Center for Advanced Transportation Technologies and the U.S. Department of Defense have established a hydrogen production and fueling station at Hickam Air Force Base.

Using renewable energy to produce hydrogen is emphasized at Hickam; a photovoltaic array was installed in late 2008 and a wind generator is also planned. A fuel cell has been proposed to power a building adjacent to the station.

Updated greenhouse gas inventory drafted

As part of Act 234, SLH 2007, Hawaii's inventory of greenhouse gas emissions, originally published in 1997, has been updated to serve as a baseline for establishing emissions limits. DBEDT and the Department of Health are leading the effort.

The draft inventory document was presented for public comment on November 13, 2008.

The updated inventory found that total emissions for sources covered in the act (excluding aviation) were 16.30 MMTCO₂E

(million metric tons of carbon dioxide equivalent) in 1990 and rose to 19.36 MMTCO₂E in 2007. About 90% of emissions came from the energy sector, including transportation and electricity generation; approximately three-fourths were emitted on Oahu.

Alternative work plans for reaching the 1990 baseline levels, which state law requires by Jan. 1, 2020, will be developed.

Up to date information is available at <http://hawaii.gov/dbedt/info/energy/greenhouse/>.

Preparing for emergencies

One of Hawaii's challenges is preparing to effectively contend with energy emergencies and threats to energy security.

SID facilitates interagency energy-focused support consistent with State Civil Defense's leadership. An exercise to simulate this role included a statewide local earthquake and tsunami exercise, *Kai Mimiki*.

To encourage members of Hawaii's energy and critical infrastructure sectors to plan collaboratively, SID staff organized sessions focused on energy security and resiliency for the 2008 Asia-Pacific Homeland Security Summit.

Other energy assurance initiatives included participation in the 2008-09 Winter Fuels Outlook Conference, energy leadership in the development of the Hawaii Catastrophic Hurricane Readiness Response Plan, implementation of Hawaii's Energy Emergency Preparedness Plan, and development of updated statutory measures to address inadequate emergency data reporting requirements

Working with the Department of Homeland Security, SID is coordinating a vulnerability assessment of Hawaii's fuel transportation system. Honolulu Harbor and other ports which play a role in energy product distribution are included.

SID is also collaborating with FEMA and other agencies to speed the delivery of emergency backup generators to critical facilities in the event of a disaster.

Bioenergy plan to examine production of liquid and solid fuels statewide

A comprehensive planning effort is examining the potential production and use of bioenergy to displace some of Hawaii's \$5 billion per year fuel imports.

The Bioenergy Master Plan program was kicked off in May and will be completed in 2009.

Liquid and solid fuels from biomass are similar in portability and energy density to fossil fuels. There may also be synergies between bioenergy and producing food, feed, fiber or pharmaceuticals.

Land use, water use and crop selection are being discussed, as are conversion technologies, costs, incentives, and risks.

A statewide multi-fuel biofuels production assessment is in progress and will be completed in 2009. The analysis has identified 990,000 tons per year (tpy) of biomass and biomass residue used statewide. The projected potential future amount is just over 3 million tpy.

The report estimates that 90 million gallons per year (gpy) of ethanol, up to 2.5 million gpy of biodiesel and 19,000 cubic meters annually of hydrogen (from land-fill gas) could be produced from unused existing in-state waste, assuming no waste is diverted from the H-Power plant.

Crops could be used to produce hundreds of millions of additional gallons of fuel, subject to availability of land, water and processing facilities.

To encourage local bioenergy

production, a law was passed to make it easier to lease public lands to grow energy crops.

Imperium Renewables, which was selected last October to supply biodiesel to HECO's new generating facility, no longer plans to build a biodiesel plant in Hawaii. Imperium operates a biodiesel facility near Seattle.

Interest in biofuels remains high statewide. HR BioPetroleum is developing an algae-to-biodiesel plant on Maui and is also working with Royal Dutch Shell on a pilot facility at NELHA. Other algae fuel developers have expressed interest in Hawaii, and two algae-to-jet-fuel projects funded by the U.S. Department of Defense have links to Hawaii.

On the Big Island, wood has been proposed as a fuel for several

projects, including Hu Honua Bioenergy, Hamakua Biomass, Haina Mill, and Tradewinds Forest Products. SunFuels proposes producing synthetic liquid fuel from wood.

Pacific West Energy is seeking permits for an ethanol plant on Kauai; a demonstration cellulose-to-ethanol facility being proposed in concert with this venture would also generate electricity.

Also on Kauai, Green Energy Hawaii plans a facility to generate electricity from wood chips.

Trials conducted by the Hawaii Agriculture Research Center aim to determine the local yield of oil-producing crops such as jatropha.

UH researchers are studying whether a waste product from ethanol production can replace imported animal feed.



Pacific Biodiesel, Inc. received the inaugural Innovation by an Organization Award from Governor Lingle in 2008. The company established one of the first commercially viable biodiesel plants in the U.S. on Maui, and now also operates a facility on Oahu. The two facilities process over 1 million gallons of waste cooking oil per year, including nearly 100% of Maui's commercial cooking oil. An additional plant is planned for Hilo.

Energy information reaches more than 14,000

Outreach, information dissemination and training continued as a major function of the state's energy program in 2008.

SID staff appeared in several radio, TV and interactive internet programs. In addition, more than 14,000 people attended DBEDT-cosponsored energy events in 2008, some of which were:

- Hawaii Sustainable Design seminar, Jan. 17
- BIA Home Building & Remodeling Show, Jan. 24-27
- Power-Gen, Feb. 19-21
- Hawaii Sustainability and Pollution Prevention Partnership, Mar. 4
- U.S. Dept. of Defense energy management forums, Mar. 17-18
- Hawaii BuiltGreen™, Honolulu Board of Realtors, Mar. 19
- Houses That Work, Mar. 19
- Commissioning and LEED, April 4
- Kauai Conservation Conference, April 11
- Hawaii BuiltGreen™, Iolani School Family Fair, April 18-19
- Motor Fuel Taxes, May 5
- Making Your Building and Operations More Sustainable, May 6
- Build & Buy Green Conference and Expo, May 20-21
- Hawaii Island Energy Forum, June 6
- EnergyOcean conference in Galveston, June 24-26
- West Coast Collaborative Hawaii Partners Meeting, June 25
- Sustainability workshop, June 27
- Conservation Conference, July 29

- BIA Remodel It Right Expo, Aug. 1-3
- GovEnergy 2008, Phoenix, Aug. 3-6
- Renewable Energy panel, US Coral Reef Task Force, Aug. 25
- Zero Waste Conference, Sept. 11-13
- 2008 Efficient Electro-Technology Expo, Sept. 18
- Internat'l Energy Code Council, Minneapolis, Sept. 20-22
- Sustainability for Business Forum, Sept. 24
- Clean Energy at 7th Native Hawaiian Convention, Oct. 1
- Green Hospitality Conference, Oct. 3
- AIA Northwest & Pacific Regional Conference, Oct. 7-10

- How to Save Energy & Money Right Now!, Oct. 8
- Asia-Pacific Homeland Security Summit, Oct. 8-10
- HECO's Live Energy Lite Expo, Oct. 11
- A New Energy Code for Hawaii, AIA Kauai, Oct. 11
- Statewide Building Codes Council, Oct. 14
- LEED and green building, Maui Planning Comm., Oct. 14
- Green Industries panel at Air Cargo Day, Oct. 14
- LEED workshops series, Oct. 20-24
- Hawaii Brownfields Forum #4, Oct. 22-23
- Green Hotel Forum, Oct. 29
- Green Purchasing, Nov. 6

Actions encourage solar energy

Hawaii adopted the nation's first mandate for solar water heating in new single-family homes, beginning in 2010. The law addresses some 7,000 new homes built annually.

Exemptions are allowed for homes with insufficient sun, those that use a different renewable energy or an instantaneous gas heater for water heating, and other special cases. Existing tax credits and other incentives would not apply to the mandated systems.

Another new law allows solar energy facilities to be built on less-productive agricultural lands.

Another law allows the Hawaii Public Utilities Commission (PUC) to establish a rebate for photovoltaic systems.

In separate action, the Public

Utilities Commission doubled the allowable size of net energy metered systems, to 100 kilowatts, on all islands except Kauai. Kauai's limit remains 50 kilowatts.

Net metered systems are now allowed to generate up to 1% of the HECO utilities' peak power.

The energy agreement signed by HECO in October proposes that there should be no system-wide caps on net energy metering. Instead, distributed generation interconnection will be limited to no more than 15% of peak circuit demand for distribution-level circuits of 12kV or lower.

The County of Hawaii implemented a \$300 property tax credit for solar water heaters, starting in 2008. Solar water heating was installed on three fire stations.

\$1.7 million in state & federal funds support State Energy Program

The core of Hawaii's energy program has for decades been a set of projects delineated under the US-DOE's State Energy Program (SEP). Funding for these projects is provided annually and covers such diverse efforts as providing information on alternative fuels, modernizing building codes and planning for energy emergencies.

In addition, other federal grants, often part of competitive solicitations, are received.

In 2008, some of these were part of the SEP while other awards—particularly those relating to the Hawaii Clean Energy Initiative, reported elsewhere in this document—originated in other USDOE programs.

HCEI and other energy awards from non-SEP federal sources exceed \$12.5 million over several years. These significant funds will advance Hawaii's goal of achieving 70% clean energy by 2030.

This page summarizes the federal funding provided under the State Energy Program as well as Hawaii state general funds which support SEP efforts.

SEP-related federal funds received by Hawaii totaled \$815,098 in fiscal year 2008. Another \$850,000 in state general funds advanced SEP projects.

The greatest amount of funding went to Electric Power and Renewable Energy programs. Of the to-

tal of \$961,100 for this sector, the federal SEP provided \$411,100 for energy emergency planning and hazard mitigation, state energy planning and policy activities, technology innovation and wind energy.

The renewables and electric power sector also received the bulk of state funding, with \$500,000 allocated for the Greenhouse Gas Emissions Reduction Task Force and another \$50,000 to support DBEDT's participation in a PUC docket on wheeling electricity for government agencies.

The Buildings program was the second largest component of the SEP in 2008, with \$356,048 underwriting a broad collection of energy efficiency efforts, such as SID's work on building guidelines, the Rebuild Hawaii partnership, and building codes.

Within the Education sector, \$300,000 in general funds were appropriated to create the Bioenergy Master Plan, while \$7,950 in federal monies were received on behalf of the Science Bowl and the State Science and Engineering Fair.

Transportation programs focusing on alternative fuel information, evaluation and outreach received \$20,000 in federal funds.

Activities in resource efficiency such as recycling were supported by \$20,000 in federal funds under the Industrial component of the SEP.

Description	State Funds	Federal Grants	Total
Education	\$ 300,000	\$ 7,950	\$ 307,950
Transportation	0	20,000	20,000
Buildings	0	356,048	356,048
Industrial	0	20,000	20,000
Power/Renewables	550,000	411,100	961,100
Totals	\$ 850,000	\$ 815,098	\$ 1,665,098