DBEDT ENERGY UPDATE

HAWAII'S CATALYST FOR A CLEAN ENERGY FUTURE | Edition 1, February 2012

DEPARTMENT OF BUSINESS
ECONOMIC DEVELOPMENT & TOURISM

ENERGY INDUSTRY FACTS

Hawaii's clean energy industries brought $1.2 billion to our economy in 2011, according to projections.

The industries expended the following estimated amounts during 2010:

Biofuels/Bioenergy
$90.1 million

Electric Vehicles
$23.2 million

Ocean Energy
$6.2 million

Photovoltaics
$46.1 million

Solar water heating
$128.6 million

Wind
$135.1 million

Other (Geothermal, Hydroelectric, Hydrogen, Waste-to-Energy)
$39 million

The DBEDT Energy Update serves Hawaii's businesses and policy makers in making informed decisions about future investments, job creation, and policy decisions. The energy industry is a significant catalyst for economic development, now and in the future, to replace fossil fuel import expenditures with home-grown industries that pay business taxes and create jobs for Hawaii residents.

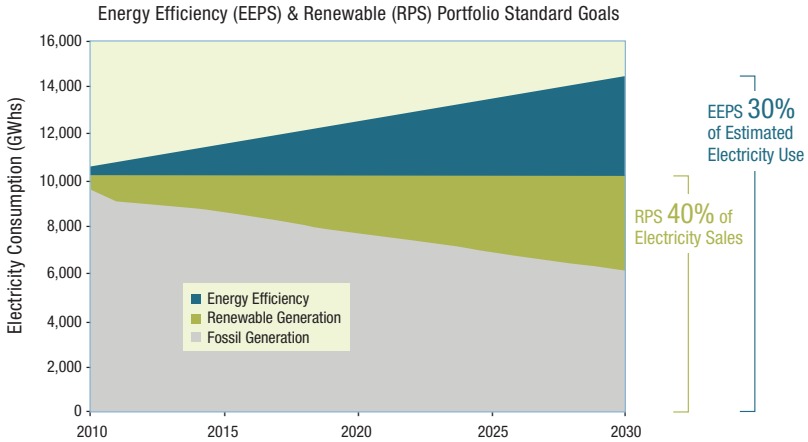
Richard Lim
Director, DBEDT

The momentum for locally produced renewable energy has been building ever since Hawaii adopted its mandate for 70% clean energy by 2030. Hawaii's clean energy goal is one of the most aggressive in the world, and has become a major catalyst for new business growth and innovation in the state. This, coupled with international forums such as the Asia Pacific Clean Energy Summit and Expo and APEC, has put Hawaii center stage and positioned the state as the lead player in the global clean energy economy. With memorandums of understanding signed with Japan, China, and soon with Korea, growth in foreign clean energy investment is growing by leaps and bounds.

Of Hawaii's 70% energy goal, 40% is mandated to come from locally developed renewable resources by 2030. It's an aggressive goal with several key milestones. This issue of the DBEDT Energy Update will address renewable energy; what we need to accomplish and how it will impact our state.

RENEWABLE PORTFOLIO STANDARD (RPS):

Hawaii's 70% Clean Energy Goal For 2030



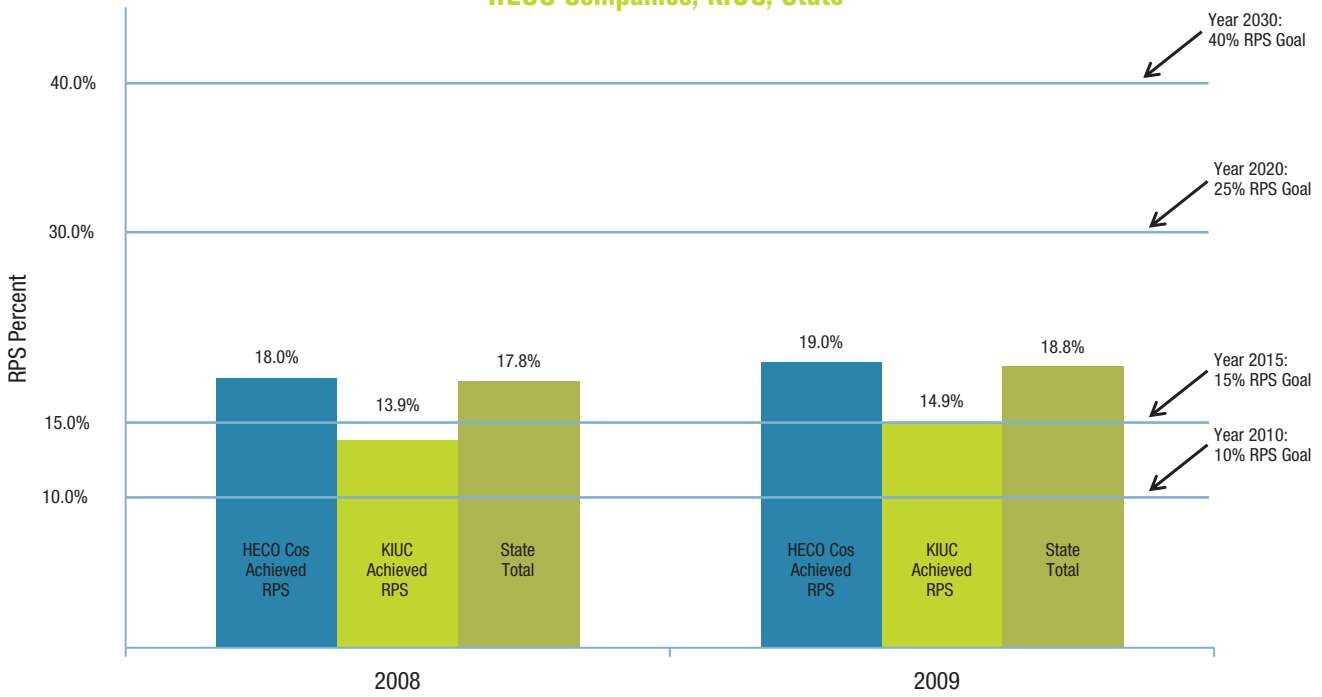
By law each electric utility company that sells electricity for consumption in the State shall establish a renewable portfolio standard of:

(1) 10% of its net electricity sales by December 31, 2010;
(2) 15% of its net electricity sales by December 31, 2015;
(3) 25% of its net electricity sales by December 31, 2020; and
(4) 40% of its net electricity sales by December 31, 2030.

Oversight of the RPS is under the auspices of the Public Utilities Commission.

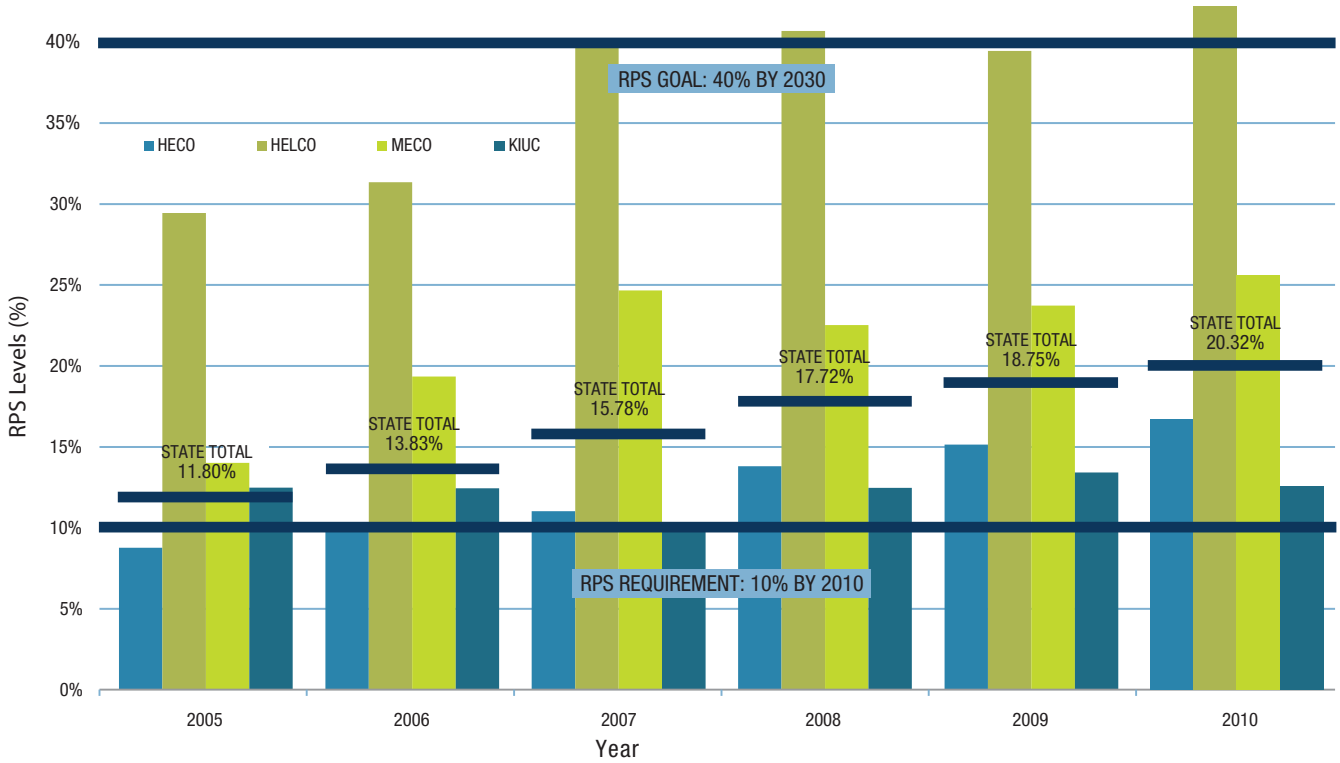
Federal tax credits, new policies and financial incentives at the state level have stimulated a Hawaii clean energy industry that's showing significant year-to-year growth. Net metering and feed-in tariff regulations, and DBEDT's GreenSun loan program, all made possible by $2.69 million in federal stimulus funds, are making individual solar and renewable energy investments more feasible.

Renewable Portfolio Standard (RPS): Goal and Status
HECO Companies, KIUC, State



*Energy Efficiency is included in RPS until December 31, 2014.

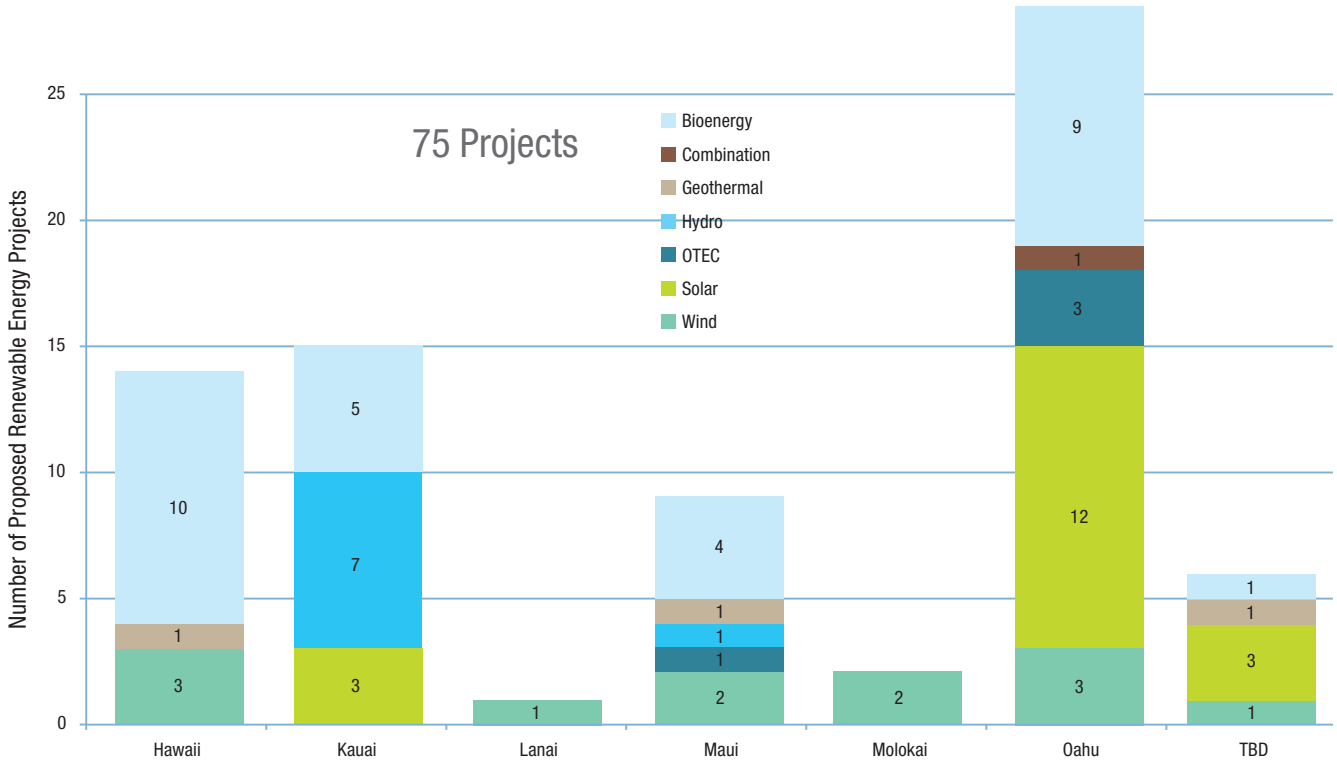
Hawaii Renewable Energy Portfolio Standard (RPS)
Levels (2005-2010) by Utility



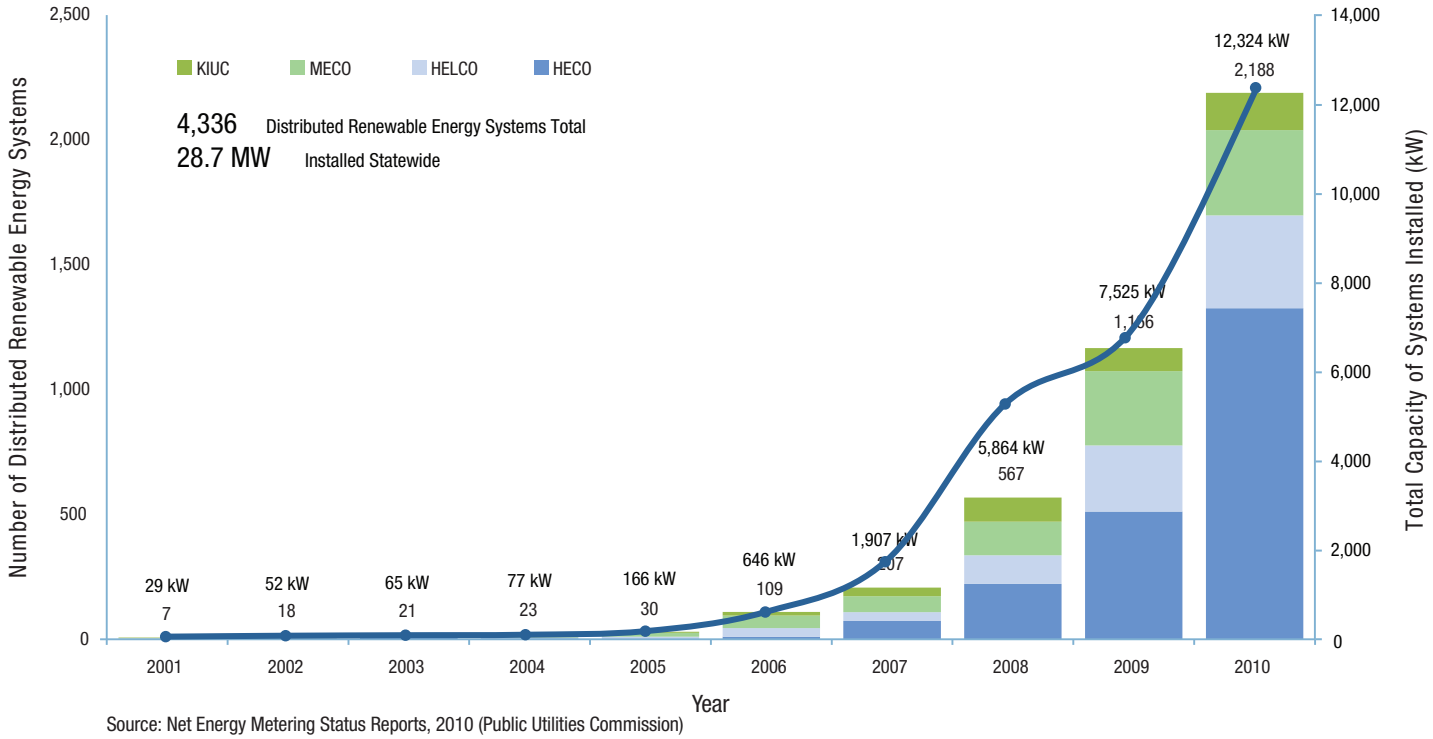
Source: 2005-2010 Renewable Portfolio Standards Status Reports

Renewable energy investments in Hawaii are on the upswing. To date there are 75 renewable energy projects in various stages of development, ranging from sea water air conditioning for downtown Honolulu, which will generate over $200 million in construction project spending and more than 900 new jobs, to hydroelectric projects on Kauai. Together, these projects have the potential to add 800 MW of clean energy and create hundreds of construction and technical jobs, while infusing millions of dollars into our economy.

Currently Proposed Renewable Energy Projects in Hawaii



New Distributed Renewable Energy Systems Installed in Hawaii (2001-2010)



Source: Net Energy Metering Status Reports, 2010 (Public Utilities Commission)

40 LEADING RENEWABLE ENERGY PROJECTS IN HAWAII

DBEDT has identified 40 renewable energy projects it views will lead the way and provide significant growth towards our 40% renewable energy goals. The projects listed are demonstrating progress in becoming commercial enterprises. These renewable energy leaders have been identified based on their project size, status of permitting, status of fuel off-take agreement, and overall site control. These criteria were selected because they demonstrate an ability to significantly contribute to the State's 40% renewable energy goal, and they are strong indicators that the project is on a strong and timely path for commercialization and launch. We anticipate that this list will continue to evolve, and we invite you to visit www.energy.hawaii.gov for further updates.

	Project Developer	Island	Resource	Project Description	Proposed Projection Capacity
1	First Wind	Oahu	Wind	First Wind plans its fourth wind farm in Hawaii with a capacity of up to 70 MW on former sugar cane land owned by Kamehameha Schools northeast of Haleiwa. It would produce enough energy to supply 14,500 homes, based on estimated wind output figures. Owner: First Wind	70 MW
2	Puna Geothermal Venture / Ormat	Hawaii	Geothermal	Expansion of existing 30-MW facility, in operation since 1993, would add 8 MW of always-available power. Currently PGV supplies up to 31% of the state's renewable energy resources and 20% of the electricity used on the Big Island. Owner operator: Ormat	8 MW
3	HPOWER Expansion	Oahu	Waste-to-Energy	The City & County of Honolulu's garbage-to energy plant, in operation since 1990, is adding a third boiler to increase its capacity to burn garbage from 600,000 to 900,000 tons per year. H-Power's 46-MW facility at Campbell Industrial Park can increase production from 4.5% to 6% of Oahu's electricity. Currently, the plant reduces the volume of refuse going to landfill by 90%; an estimated 500 acres have been saved from landfill use. Owner: City & County of Honolulu. Operator: Covanta Energy	30 MW
4	Sempra (Auwahi Project)	Maui	Wind	Integrated wind 21-MW and 12-MW battery energy storage project to be built at Ulupalakua Ranch can produce enough power for 10,000 homes. Owner: Sempra Generation	21 MW
5	First Wind	Maui	Wind	Phase 2 of Kaheawa Wind will add 21 MW to the existing 30-MW wind facility which has been operating above Maalaea since 2006 and is the largest commercially scaled wind project in Hawaii. Currently, Kaheawa Wind I's 20 turbines can produce 9% of Maui's electricity needs, enough power for 11,000 homes. In five years of operation, it has saved some 900,000 barrels of oil. The 14-turbine expansion will power 20,000 homes and will include 10 MW of battery storage. Owner: First Wind	21 MW
6	Honua Technologies	Oahu	Waste-to-Energy	Biomass combustion system that will burn construction debris, creating a synthetic gas to turn a turbine to generate electricity. For its first phase, Honua plans to convert 350+ tons/day of construction debris, saving 100,000 tons of waste from landfill. Owner: Honua Technologies	6 MW
7	Green Energy Hawaii	Kauai	Biomass	Biomass fired generation anticipated to provide power to 8500 homes on Kauai.	7 MW
8	Honeywell UOP	Oahu	Biofuel	Honeywell UOP is conducting a pilot project to convert various bio-mass resources for green gasoline for transportation. The Integrated Biorefinery, funded by a $25 million US Department of Energy grant, is a project by UOP, a subsidiary of Honeywell. If successful, a 50-million gallon facility could be built with the potential to create 1,000 jobs in production and refinery operations. Owner: Honeywell UOP. Operator: Honeywell UOP	50M gallons by 2014
9	Hu Honua Bioenergy	Hawaii	Biomass	The Hilo Coast Power Company in Pepe'ekeo will be upgraded to run on 100% locally grown eucalyptus trees and other biomass that would normally be thrown into landfills. What was once an old sugar planta-tion power plant will be transformed into a modern biofuel facility that will provide enough power for 18,000 homes, about 7 to 10% of the Big Island's total electricity needs. Owner: MMA Renewable Ventures	25 MW

10	Castle & Cooke	Oahu	Photovoltaic	Four 5-MW solar farms built an approximately 120 acres at Mililani Agricultural Park will generate up to 20 MW, enough to power 6,000 homes. Land owner: Castle & Cooke, developers/operators to be determined.	20 MW (4 x 5 MW)
11	Phycal Pilot Facility	Oahu	Biofuel (algae)	Phycal will supply up to 150,000 gallons of algae-base biofuel to HECO's Kahe Generating Station. This is part of a pilot project based in a 34-acre facility near Wahiawa, to be followed with a demonstration project that aims to produce up to 3 million gallons of algae biofuel. Owner: Phycal Inc.	150,000 Gallons per year up to 3M GPY
12	Pacific Biodiesel	Hawaii	Biofuel	The Big Island Biodiesel refinery plant, Hawaii's newest and most advanced biodiesel processing facility by the state's first commercial biofuel producer, will process used cooking oil, trap grease, and locally grown crops into fuel for vehicles and equipment with diesel engines. Owner: Pacific Biodiesel, Inc.	2.6 MGY
13	Kalaeloa Solar Two (KSP) / SunPower / Dept of Hawaiian Homelands (DHHL)	Oahu	PV	Kalaeloa Solar Two is a 5-MW photovoltaic power plant being developed by SunPower on a DHHL parcel adjacent to Kalaeloa Solar One (Keahole Solar Power). The two power plants – Kalaeloa Solar One and Two – will provide 10 MW of energy; enough to power 2,500 homes.	5 MW
14	Aina Koa Pono	Hawaii	Biomass; Biofuel	Aina Koa Pono will produce between 3,000 and 5,000 gallons of liquid fuel per acre per year suitable as a substitute for petroleum fuels in power plants or transportation.	2.7 MW; 24 MGY
15	Castle & Cooke	Lanai	Wind	The planned 200-MW wind farm will utilize some of the best wind in the world blowing over 12,800 acres in northwest Lanai. Power will be transmitted to Oahu via a proposed undersea interisland cable. Owner: Castle & Cooke	200 MW
16	A&B/ McBryde, Port Allen Solar Facility	Kauai	Solar	This 6-MW facility is to be built on 20 acres of industrial land next to KIUC's Port Allen Station Power plant. Construction is expected to be completed at the end of 2012 pending permitting and regulatory approvals.	6 MW
17	Honolulu Sea Water Air Conditioning (HSWAC)	Oahu	Sea Water A/C	Cold, deep seawater will provide cooling for about 12.5 million square feet in some 40 buildings in downtown Honolulu. The 25,000-ton system is estimated to cut electricity consumption for air conditioning by 75% (air conditioning represents 35%-45% of a building's energy use), and reduce potable water and chemical use. Owner: Renewable Energy Innovations/Ever-Green Energy LLC	25,000 ton cooling load
18	Scatec / Hunt Development	Oahu	Solar	Proposed 21,000 panel system on a Marine Corps WW2 battlefield. Scatec Solar North America and Hunt ELP are partnering on the solar farm, which would use 20 acres of land. A 5-MW array would provide enough power for up to 5,000 homes.	5.9 MW
19	Gen-X (Northern Power)	Hawaii	Wind	Big Island Beef. Gen-X Energy Development, LLC is a Hawaii based energy development firm.	100-200 kW
20	Gen-X (Northern Power)	Hawaii	Wind	Hawaii Water Service Co. (Waikoloa Village). Gen-X Energy Development, LLC is a Hawaii based energy development firm.	100-200 kW
21	West Wind Works - Na Pua Makani	Oahu	Wind	Oregon-based company plans a 10-turbine wind farm near the Kahuku Agricultural Park, east of the existing First Wind wind farm. Owner: West Wind Works	25 MW
22	BioEnergy Hawaii	Hawaii	WTE	Proposed solid waste conversion facility at NELHA would also create biofuel from algae. Solid waste diverted from the Puuanalulu landfill will be used to generate electricity and the carbon dioxide created at the plant will feed algae beds; the algae will be converted into biofuel for transportation. Owner: BioEnergy Hawaii	11 MW
23	AES (Cogeneration)	Oahu	Biomass-Coal Cogeneration	AES plans to add an additional 5 MW of renewable energy per year, with the potential to increase up to 20-MW per year by burning eucalyptus if final testing is successful. This would augment the existing 180-MW operation that produces 18 % of Oahu's electricity.	5 MW
24	Clean River Power 16, LLC (Free Flow Power Corp.) (Kitano Water Power Project)	Kauai	Hydro	Project plans to use Kokee irrigation systems existing Puu Lua reservoir.	7.7 MW

25	Clean River Power 15, LLC (Wailua River Hydroelectric Project)	Kauai	Hydro	This project plans to use intake 1,000 ft. above Wailua Falls. The diversion will create a new reservoir of approx 35 acres.	6.6 MW
26	Kahawai Power 2, LLC (Free Flow Power Corp.) (Makaweli River Water Power Project)	Kauai	Hydro	Proposed project plans to use several diversions and intakes on tributaries to Makaweli River.	6.6 MW
27	Konohiki Hydro Power, LLC (Pacific Light & Power) (Puu Lua Project)	Kauai	Hydro	The Kokee Ditch will serve as the source for a modern, efficient pressurized irrigation system that will service over 6,000 acres of agricultural lands. The power generated at hydro facilities in Upper and Lower Puu Lua will be sold to the Kekaha Agricultural Association (KAA) and its members; the excess electricity will be made available to the island of Kauai. Owner: Konohiki Hydro Power, LLC/Pacific Light & Power	5.3 MW
28	Kahawai Power 1, LLC (Hanalei River Hydroelectric Project)	Kauai	Hydro	Proposed project plans to use weirs and intakes on several tributaries on Hanalei River.	3.5 MW
29	Cellana / ClearFuels / Alexander & Baldwin	Kauai	Biofuel (Algae)	From its six-acre demonstration facility on the Big Island's Natural Energy Laboratory (NELHA), Cellana (formerly HR BioPetroleum) is developing microalgae strains in preparation for a planned commercial-scale algae biomass plant that will help fuel Maui Electric's Maalaea Power Plant. Owner: Cellana LLC	1.26 MGY
30	Kalaeloa Solar One, LLC (Keahole Solar Power)/Dept. of Hawaiian Home Lands	Oahu	Concentrated Solar Power (CSP)	Kalaeloa Solar One is a 5-MW micro-CSP (Concentrated Solar Power) power plant being developed by Keahole Solar Power on a DHHL parcel adjacent to Kalaeloa Solar Two (SunPower). The two power plants – Kalaeloa Solar One and Two – will provide 10 MW of energy; enough to power 2,500 homes.	5 MW
31	IC Sunshine / Sun Edison	Oahu	Photovoltaic	This fixed-tilt, utility-scale project, the largest to achieve a power purchase agreement in Hawaii, will be built on a 20-acre solar farm in Campbell Industrial Park. Owner: Axio Power Holdings, LLC.	5 MW
32	Kikialoa Solar (Pacific Energy Partners	Kauai	Photovoltaic	PhotovoltaicA solar farm is planned on 20 acres of former sugar land in Kekaha. When completed it is expected power up to 1000 homes Kauai homes. Owner: Pacific Energy Partners	5 MW
33	KIUC / Poipu Solar, LLC / AES Solar Power, LLC / Knudsen Trust Land	Kauai	Photovoltaic	Renewable energy to power more than 850 homes. The 3-MW polycrystalline panel facility will be integrated with a Battery Energy Storage System (BESS) installed by KIUC at the point of interconnection to the grid.	3 MW
34	Big Island Carbon	Hawaii	Biomass (Macadamia Nut Shell)	Macadamia nut shells discarded by Big Island growers will be transformed into granulated activated carbon used for air, water, and chemical purification. The shells can also be converted into biofuels that can be mixed with diesel to power the company's facility, located in four-acres of Hawaiian Home Lands in Kawaihae. Owner: Big Island Carbon; Denham Capital Management	1,000 tons granular activated carbon
35	KIUC/ KRS One LLC, Anaholoa Solar	Kauai	Solar	Developed by California based REC solar, the project is being undertaken by the Homestead Community development corporation in Partnership with the Kauai Island Utility Cooperative. The $50 million dollar project which is expects to create 100 jobs and be completed by the end of 2013.	12 MW
36	Molokai Renewables	Molokai	Wind	Molokai Renewables is exploring the opportunity of installing 200 MW of wind on Molokai, with the electricity generation to be transmitted to Oahu via an undersea interisland cable. Owner: Pattern Energy and Bio-Logical Capital	200 MW
37	Pacific West Energy	Kauai	Biofuel	Pacific West Energy will convert existing and former sugar cane lands and woody biomass lands on the island of Kauai into an energy plantation by first constructing an approximately 20-MW capacity biomass power plant (Phase 1). In a subsequent phase, the Company intends to integrate biofuel (including ethanol) production (Phase 2).	20 MW

38	Wailua Reservoir	Kauai	Hydro	Project plans to use flow from existing 1400 ft earthfill dam on Wailua reservoir, owned and operated by the Department of Land and Natural Resources.	2 MW
39	Ocean Thermal Energy Conversion	Oahu	Ocean	Makai Ocean Engineering has been deeply involved with Lockheed Martin and the US Navy in focusing on the commercial development of 100MW OTEC plants for island communities like Hawaii and Guam. They have significant programs in heat exchanger design and testing, plume modeling, power module design, plant layout, cold water pipe handling and deployment, a pilot plant design, analyzing the power cable to shore, and bioplume modeling.	100 MW
40	Oceanlinx	Maui	Wave	Australia-based high-tech company, formally announced plans to provide electricity to Maui Electric Company from Hawaii's first wave energy project. The project aims to provide up to 2.7 MW from two to three floating platforms located one-half to three-quarters of a mile due north of Pauwela Point on the northeast coast of Maui.	500 kW

Last updated: January 13, 2012

Collection of Data, Disclaimers and Descriptions

Energy leaders have been identified based on public information about (a) their projected size, (b) status of permitting, (c) status of power or fuel off-take agreement, and (d) site control.* Pertinent data comes from a variety of media including company press releases, company websites, newspaper articles, Internet publications, agency notices, and filings with the Hawaii Public Utilities Commission.

This project list is not all inclusive – nor is it complete. In fact, we expect it will change continuously as additional public information becomes available and project status changes. The data we gather from public resources is assumed to be correct. Financial information is not included as part of the listing criteria as this information is often closely held and not readily available utilizing public resources. Attempts have been made by the Hawaii State Energy Office to call the respective project personnel and verify that the information has been publically reported, but the Energy Office cannot guarantee the accuracy or completeness of all data. This list does not represent an endorsement of any specific project or company. Finally, we are aware that some proposed renewable energy projects in Hawaii may be missing from the list simply because little or no public information is available at this time.

1) Size is an important component as it indicates a projects overall potential renewable energy/fuel contribution to the State of Hawaii's aggressive goals set forth by the Hawaii Clean Energy Initiative of 70% clean energy by 2030. Despite its importance, however, size is just one of the four categories considered in this listing as smaller scale projects are also demonstrating that they are advancing towards commercialization. Projected size is reported in megawatts (MW), kilowatts (kW) or gallons of fuel produced, based on the production capacity of each facility.
2) A power purchase agreement or contract to purchase an energy resource represents a future revenue stream for the specific project as well as validation that the energy resource is acceptable to the respective utility. The stages of the off-take agreement process range from ongoing negotiations with the utilities to executed terms sheets between utilities and projects, and finally, approval of the contract by the Hawaii Public Utilities Commission.
3) Permitting for projects is a necessary component before construction of a project can commence. This is a long and often arduous process, but is very indicative of a project's progress towards commercialization.
4) A project's control over the site of operations either through a long term lease or land acquisition demonstrates an important component to long term commercial sustainability and production.

STATE ENERGY-EFFICIENCY PORTFOLIO STANDARDS (EEPS) AND SHORT-TERM GOALS

There is no doubt that Hawaii has made great progress in reaching its renewable energy goals through 2011; however, we have significant work to do to reach our next set of milestones. Our 70% goal will now be split into two separate measures, of which 40% is renewable energy generation and 30% is from energy efficiency measures (currently efficiency is reported as a part of the Renewable Portfolio Standard).

Under state law the Public Utilities Commission:

- Will establish an Energy Efficiency portfolio standard (EEPS) that will maximize cost-effective energy-efficiency programs to reduce electricity usage by 4,300 gigawatt hours statewide by 2030.
- Sets short-term goals for reductions by 2015, 2020, and 2025.
- Establishes incentives and penalties based on performance in achieving the EEPS.
- May revise the standard to ensure the EEPS remains effective and achievable.
- Will report its findings and revisions to the legislature in 2014 and every five years thereafter.

MOVING FORWARD

What this means is that our goals have become more aggressive, and there is now greater emphasis being placed on generating energy from renewable sources. Renewable energy is critical for the health of our economy, because we now have the opportunity to redirect the $4 billion we spend on imported foreign oil back into our own economy.

As we progress, we look forward to providing ongoing updates regarding the state's progress towards its clean energy goals.

Please visit www.energy.hawaii.gov for more information on Hawaii's progress and plans in developing a strong clean energy economy.

Hawai'i Powered
Hawai'i Clean Energy Initiative