State of Hawaii – Hawaii State Energy Office

STATUS AND PROGRESS OF CLEAN ENERGY INITIATIVES AND ANALYSIS OF THE ENVIRONMENTAL RESPONSE, ENERGY, AND FOOD SECURITY TAX

REPORT TO THE
GOVERNOR AND THE LEGISLATURE
OF THE
STATE OF HAWAII

Pursuant to

Act 73, Session Laws of Hawaii 2010

Hawai'i Powered
Hawai'i Clean Energy Initiative

Submitted By The State of Hawaii
Department of Business, Economic Development and Tourism

January 2, 2013

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Executive Summary

The State is working towards its 2030 clean energy goals and its progress continues to receive national recognition. Clean energy development is transforming the State into the test bed for Asia-Pacific clean energy research and innovation, bringing a number of clean energy investments, and contributing to economic development and green job creation.

Figure 1. Energy Savings Performance Contracting

Hawaii was ranked first in the nation for energy savings performance contracting by the Energy Services Coalition, with $132.25 per capita in energy savings performance contracts. This is almost 3.7 times the national average of $36.04 per capita.

First in Nation
Energy Savings Performance Contracting Per Capita

State	Dollars per Capita ($)	Total Performance Contracting ($)	Jobs Created (Job Year)
1. Hawaii	$132.25	$171,281,027	1,862
2. Ohio	$108.58	$1,252,683,627	13,616
3. Kansas	$90.81	$259,094,503	2,816
3. Idaho	$90.27	$129,000,000	1,402
4. Massachusetts	$71.53	$457,696,106	4,975
National Average	$36.04	$174,662,883	1,841

Source: Performance Contracting Impacts - State Comparison, October 2012 (Energy Services Coalition)

Figure 2. Installed Photovoltaic (PV) Capacity Per Capita

Hawaii was ranked third in the nation in cumulative installed photovoltaic capacity per capita in 2011 by the Interstate Renewable Energy Council (IREC), with 62.6 WDC per capita installed at the end of 2011. The cumulative installations were 4.8 times the national average of 13.0 WDC per capita.

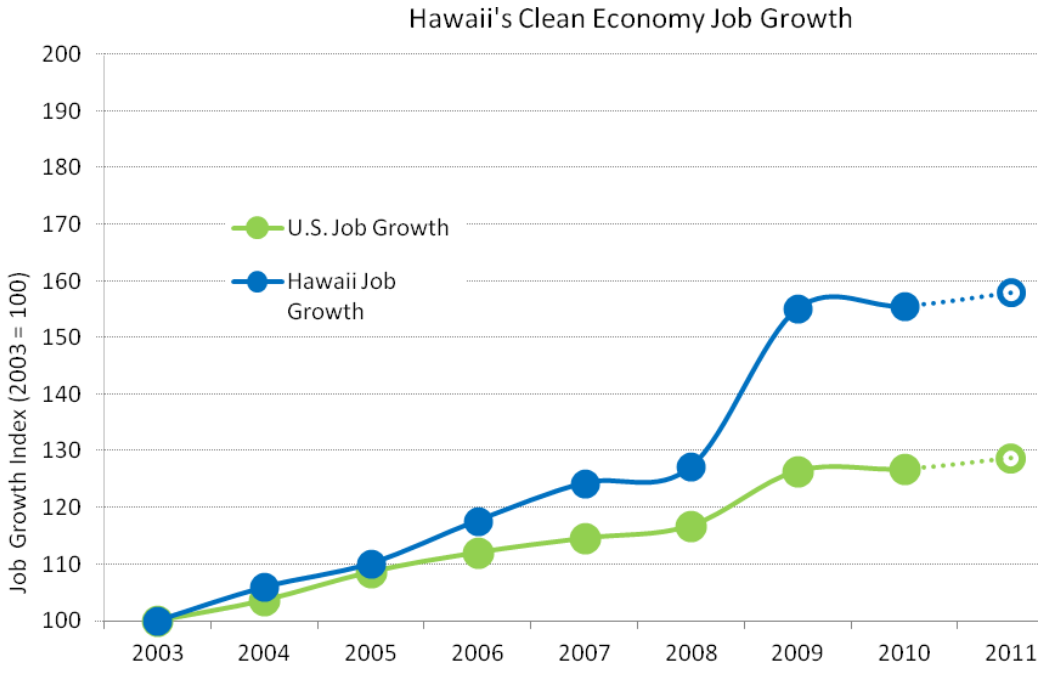
Third in the Nation in Cumulative Installed Photovoltaic Capacity per Capita

State	Cumulative Through 2011 (W_{DC}/person)	2011 Installations (W_{DC}/person)
1. New Mexico	80.4	59.3
2. New Jersey	64.4	34.8
3. Hawaii	**62.6**	**29.7**
4. Arizona	62.2	45.0
5. Nevada	45.9	7.2
National Average	13.0	6.0

Source: 2011 U.S. Solar Market Trends, August 2012 (IREC)

Figure 3. Clean Economy Job Growth

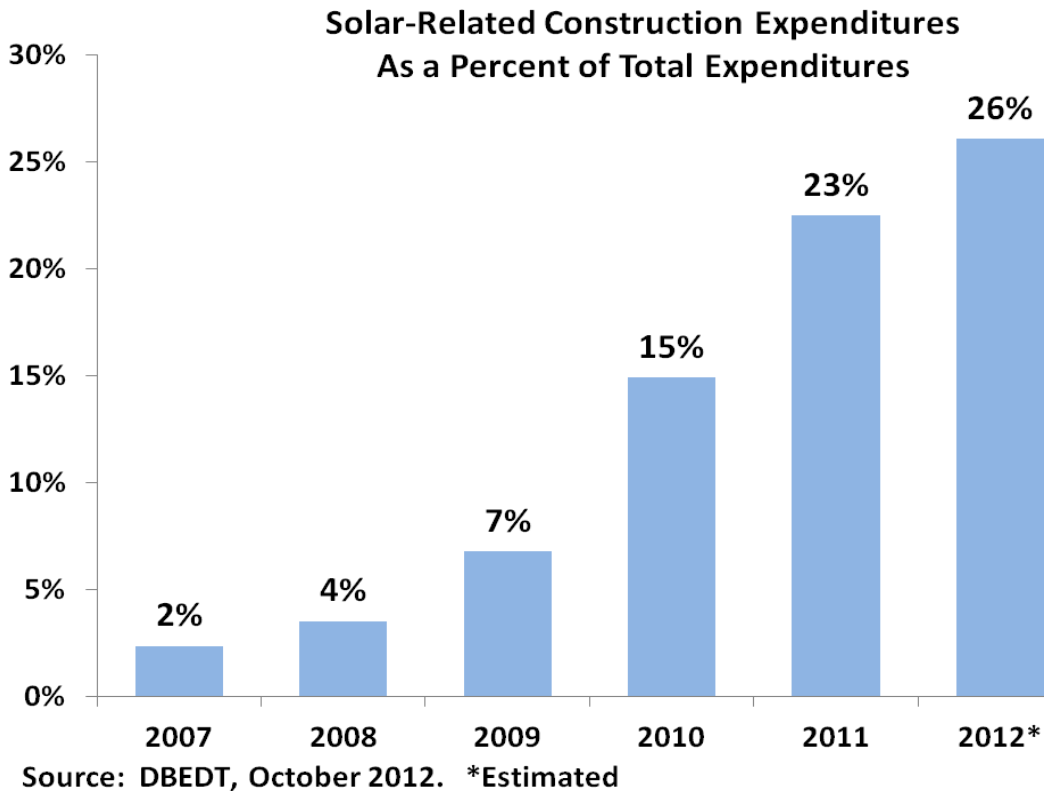
Hawaii is positioning clean energy as a catalyst for economic growth and job creation with 6.5% increase in green jobs between 2003 and 2010 with continuing gains in 2011.



Source: *Sizing the Clean Economy*, August 2011 (Brookings Institute)

Figure 4. Solar Construction Expenditures

Clean energy is good for businesses. It provides a critical boost to our economy by attracting investments from companies around the globe while benefiting local entrepreneurs. In 2012 compared to 2011, statewide construction spending by the solar energy industry is expected to continue to grow to 26% from 23%.



Source: DBEDT, October 2012. *Estimated

Figure 5. Hawaii's Process & Technical Screening Improvements

IREC reports in its September *2012 Annual Updates & Trends,* that Hawaii is vastly improving its process and technical screens for interconnecting PV. Also, that the State is working to integrate energy storage to facilitate higher PV penetrations. Hawaii's improvements in process and technical screens are reflected in the listing below:

Hawaii Permitting: Breaking Down Barriers

❖ **Legislative Actions (recent)**

- Act 97 (2012) – Designates geothermal resources exploration/resources development as permissible uses in all state land use districts/conservation zones, differentiates between 'exploration' and 'development' for leasing and permitting.
- Act 172 (2012) - Allows agencies to forego need for an environmental assessment and go straight to an environmental impact statement (EIS) if determined an EIS is required.
- Act 167 (2012) - Allows small-scale renewable energy systems for farming operations on agricultural lands.
- Act 217 (2011) – Allows solar on limited B and C agricultural lands.
- HRS 201N, Renewable Energy Facility Siting Process – State is now developing process to assist projects responding to utility 200MW request for proposals.

❖ **Regulatory/Policy Actions**

- Active consultation/coordination with agencies, developers, stakeholders by the Hawaii State Energy Office, Strategic Industries Division (SID), DBEDT.
- Priority processing for state and county permits for renewable energy projects (HRS 196-1.5, HRS 46-19.4).
- Focus on development of renewable energy projects on State-owned lands (DLNR, DHHL, DOA, HCDA).
- Guidance for utility-scale solar installations via 2012/INT-1 by City & County of Honolulu.
- Guidance on ground/roof mounted solar/wind via Procedure No. DSA 18.0, MCC 19.30A.050 by Maui County.
- Guidance for building permits for alternative energy projects (Hawaii County, Kauai County Ord. 929).
- Guidance on property taxation of alternative energy projects (C&CH Ord. 09-31, Kauai County Ord. 916).
- Development of geothermal resource permit regulations by Maui County in 2012.
- Bureau of Ocean Energy Management Outer Continental Shelf (OCS) Task Force established in 2012.
- Hawaii Office of Planning Coastal and Marine Spatial Planning efforts to aid siting of marine energy projects.
- U.S. Department of Energy Programmatic Environmental Impact Statement scoping meetings held in Fall 2012.

❖ **Electronic Processing**

- Online Project Permitting Assistance & Resources – Version 1 of SID online Permitting Wizard (ARRA) completed; creates electronic permit plan for individual projects, compliments SID permitting Guide. Wizard will be hosted at energy.hawaii.gov Developer & Investor Center website with other online development resources.
- Department of Health ePermitting Portal – As of October 2012, portal has processed over 700 permit applications and renewals totalling over $300,000 in permit application fees, and saving DOH staff approximately 2 hours per permit. Version 1 completed; refining tool after initial public testing period, uploading all DOH permit applications.
- Solar and Electric Vehicle Online Building Permits – Honolulu Department of Planning & Permitting recently expanded its online building permit program. DPP issued over 9,000 building permits for solar in 2011.
- Geographic Information System Renewable Energy Resource Mapping – Recently completed Renewable EnerGIS tool identifies site-specific energy resource and development/permitting information; developed by SID/State Office of Planning.
- Electric Vehicle (EV) Website/Application – development of website/mobile application to identify EV charging stations and relevant information; pending SID funding.

Source: Department of Business, Economic Development and Tourism

I. Overview

Critical to Hawaii's results in energy are the staff and program initiatives funded through the American Recovery and Reinvestment Act (**ARRA**), and the Environmental Response, Energy, and Food Security Tax (**EREFST**). This report provides an accounting of the progress achieved through the State's investment of EREFST funds. An analysis of the fund finds that a heavier reliance is being shifted to the fund as ARRA monies expire, and the criticality to support energy security goals progresses.

For FY12, a total of $16,499,311 was spent on the State's Hawaii Clean Energy Initiative, funded by a combination of State Energy Program (**SEP**), the American Recovery and Reinvestment Act (ARRA), and Energy Security Special Funds (**ESSF**). ESSF spending for FY12 amounted to $2,355,300, or 14% of total HCEI expenditures. However, in FY13, ESSF funding at $3,822,842 will be expected to cover a substantially larger portion of HCEI spending. Federal funding will be less significant in FY13 due to the small amount of ARRA funding remaining to be expended.

II. Introduction

This report is submitted to fulfill the requirement to report on the status and progress of clean energy initiatives, and to study and analyze the environmental response, energy, and food security tax, pursuant to Act 73, Session Laws of Hawaii 2010. The report is respectfully submitted by the State of Hawaii Department of Business, Economic Development and Tourism (**DBEDT**).

III. DBEDT Reporting Pursuant to Act 73(10)

The Legislature in passing Act 73(10), determined that it is in the best interests of Hawaii's people to build the capacity needed to become self-sufficient in energy and food needs and to protect the health and function of the environment. Further, that Hawaii has all the necessary assets to significantly improve the State's energy and food sustainability and independence over the next twenty years if appropriate personnel resources and funding are wisely used. That to succeed the State must ensure a long-term strategy, which is well-resourced, coordinated, and focused.

The Act specifies that DBEDT shall:

1. Report the status and progress of new and existing clean energy initiatives, which includes:
    a. The spending plan of HCEI;
    b. All expenditures of the Energy Security Special Fund (**ESSF**) moneys; and
    c. The targeted markets of the expenditures, including
        - Reasons for selecting those markets,
        - The persons to be served,
        - Specific objectives of the program, and
        - Program expenditures, including measurable outcomes.

2. Study and analyze the environmental response, energy, and food security tax to include:
    a. Its amount and allocation; and
    b. Its effectiveness in accomplishing the goals and objectives of the Act.

IV. HCEI Program Objectives

The Hawaii Clean Energy Initiative (**HCEI**) was established to guide the State's transition to a clean energy economy. HCEI's objectives, as established by the Act, are to design, implement, and administer activities, to include:

1. Strategic partnerships for the research, development, testing, deployment, and permitting of clean and renewable technologies;
2. Engineering and economic evaluations of Hawaii's potential for near-term project opportunities for the state's renewable energy resources;
3. Electric grid reliability and security projects that will enable the integration of a substantial increase of electricity from renewable-energy resources;
4. A statewide clean energy public education and outreach plan to be developed in coordination with Hawaii's institutions of public education;
5. Promotion of Hawaii's clean and renewable resources to potential partners and investors; and
6. A plan, to be implemented from 2011 to 2030, to transition the state and each county to a clean energy economy.

These objectives were then used to refine an HCEI roadmap in which the overall mission of SID is to:

1. Deploy clean energy infrastructure as a catalyst for economic growth,
2. Facilitate innovation sector development, and
3. Enhance energy security advancement.

To achieve this mission the SID is undertaking the following tasks:

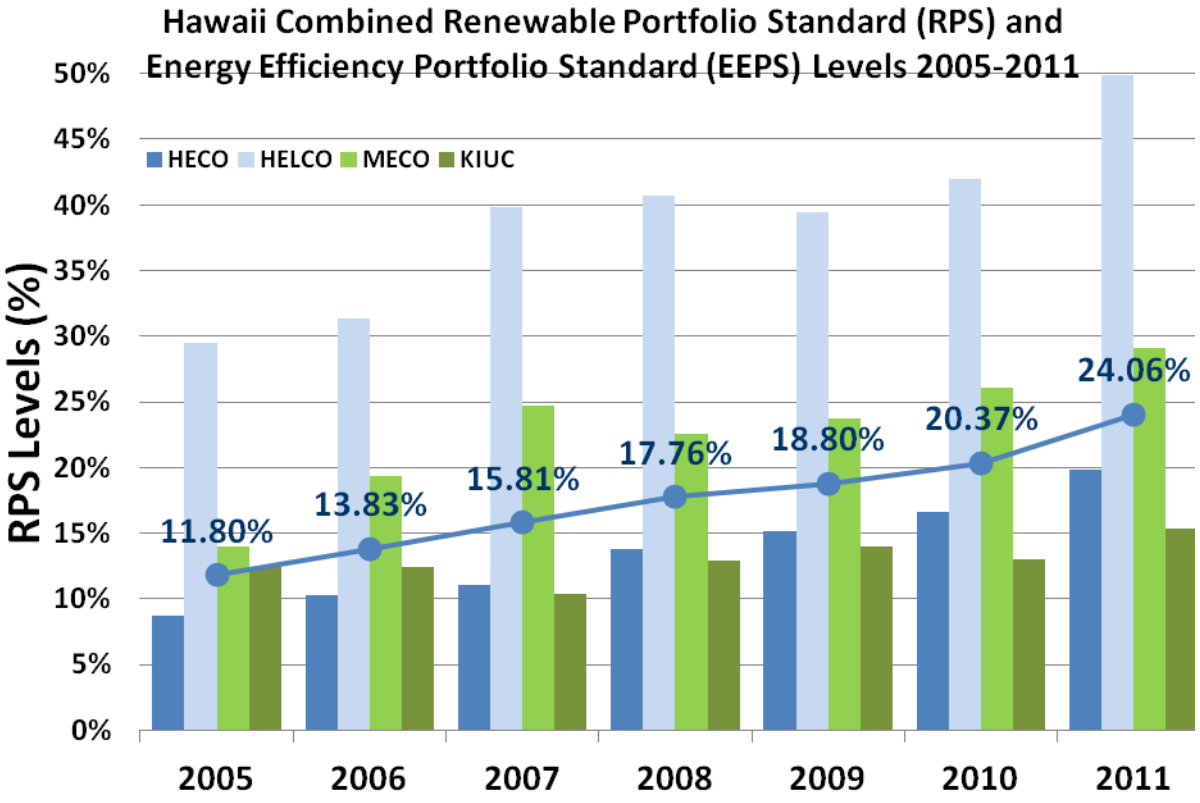
1. Facilitating implementation of the clean energy objectives articulated in the HCEI road map and concentrating on immediate and near-term opportunities to accelerate renewable energy and energy efficiency deployment:
    a. Meeting 15% Renewable Portfolio Standard (RPS) target for 2015,
    b. Meeting 2015 Energy Efficiency Portfolio Standard (EEPS) target to be set by the PUC, and
    c. Displacing 50 million gallons per year of oil in the transportation sector by 2015;
2. Growing Hawaii's clean energy innovation sector; and
3. Facilitate development of key infrastructure to harness Hawaii's rich portfolio of renewables.

V. Status & Progress of Clean Energy Initiatives

Key progress indicators and accomplishments for 2011- 2012 under HCEI are as follows:

Figure 6. Hawaii Renewable Portfolio Standard Levels

This chart shows Hawaii's Renewable Portfolio Standard (RPS) levels from 2005-2011. State law requires that Hawaii achieve 10% of its electrical needs from renewable generation and energy efficiency. In 2011, the statewide RPS level was 11.93% - on track to meeting the 15% goal by 2015.



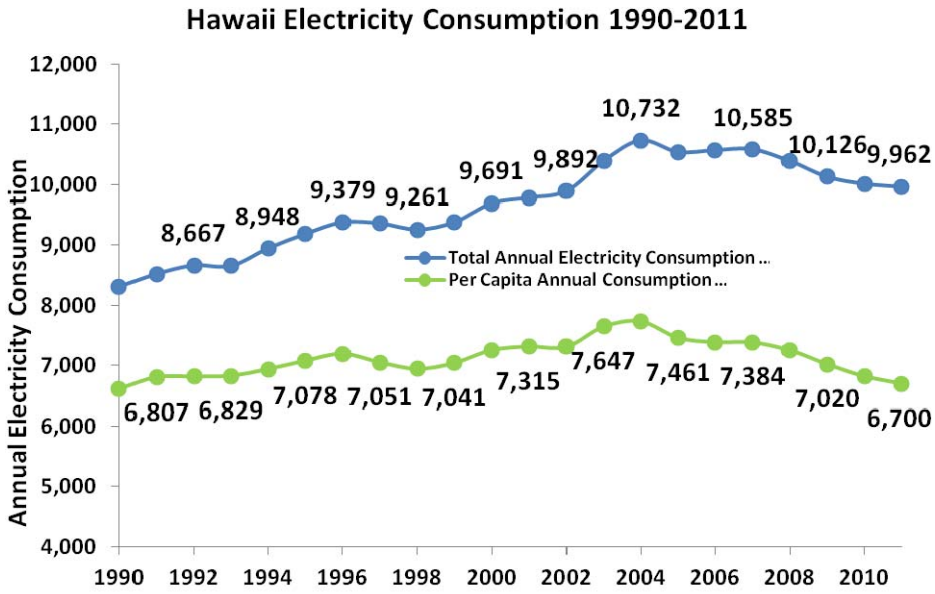
Source: *Renewable Portfolio Standards Status Reports,* 2005-2011 (Hawaii Public Utilities Commission)

Energy Efficiency Accomplishments & Indicators

Energy efficiency measures will account for 30% of Hawaii's 70% clean energy objective. To reach this goal, the state supports retrofitting residential and commercial buildings, strengthening new construction policies and building codes, and identifying non-building related energy efficiency measures. Energy efficiency progress is included as part of RPS results until 2015.

Figure 7. Hawaii Electricity Consumption Trend Down

Hawaii's 2011 annual electricity consumption per capita of 6,700 kWhs is below consumption levels reached since 1990, when per capita consumption was 6,807 kWhs. Per capita consumption of electricity has maintained a downward trend since 2004.



Source: *State Energy Data System: Hawaii*, December 2011 (Energy Information Administration)

Energy Test-bed Agreements & Alliances

With the evolving energy environment in Hawaii, the State is also focused on expanding the current clean energy momentum to spur economic development and diversification with sustainable job and business growth through the creation of an innovation ecosystem. The State Energy Office has a new focus on Innovation, Planning and Policy to help shape the State's energy future through core policy and planning activities and by attracting innovation and investment opportunities, including positioning Hawaii as the clean energy "test bed," of the Asia-Pacific.

High energy costs, a rich diversity of renewables and progressive clean energy policies have positioned Hawaii as a unique test bed for renewables on a remote grid. In 2011-2012, International agreements were signed with:

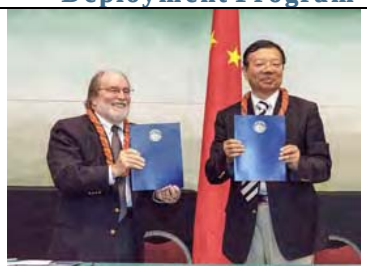
- Japan's New Energy and Industrial Technology Development Organization (NEDO) for a smart grid demonstration on Maui.

- China Council for the Promotion of International Trade (CCPIT) to facilitate Chinese investment and deployment of clean energy projects in Hawaii.

Additionally, there are plans to sign an agreement with South Korea's Smart Grid Institute (KSGI) Economy for a micro-smart grid demonstration with an electric vehicle sharing program involving resort hotels.

The annual Asia Pacific Clean Energy Summit and Expo attracted companies and representatives from 12 nations in 2011 and 19 nations in 2012 furthering Hawaii's energy testbed positioning. The ultimate goal is to foster the development of an innovation economy as the key to creating a sustainable clean energy industry. A number of State and private sector organizations and entities are collaborating on developing this innovation sector, including: High Technology Development Corporation, Hawaii Strategic Development Corporation, Hawaii Renewable Energy Development Venture, the National Energy Laboratory of Hawaii Authority and the University of Hawaii's Hawaii Natural Energy Institute.

Figure 8. Partnerships Cementing Hawaii's Credibility as an Innovation Test-bed

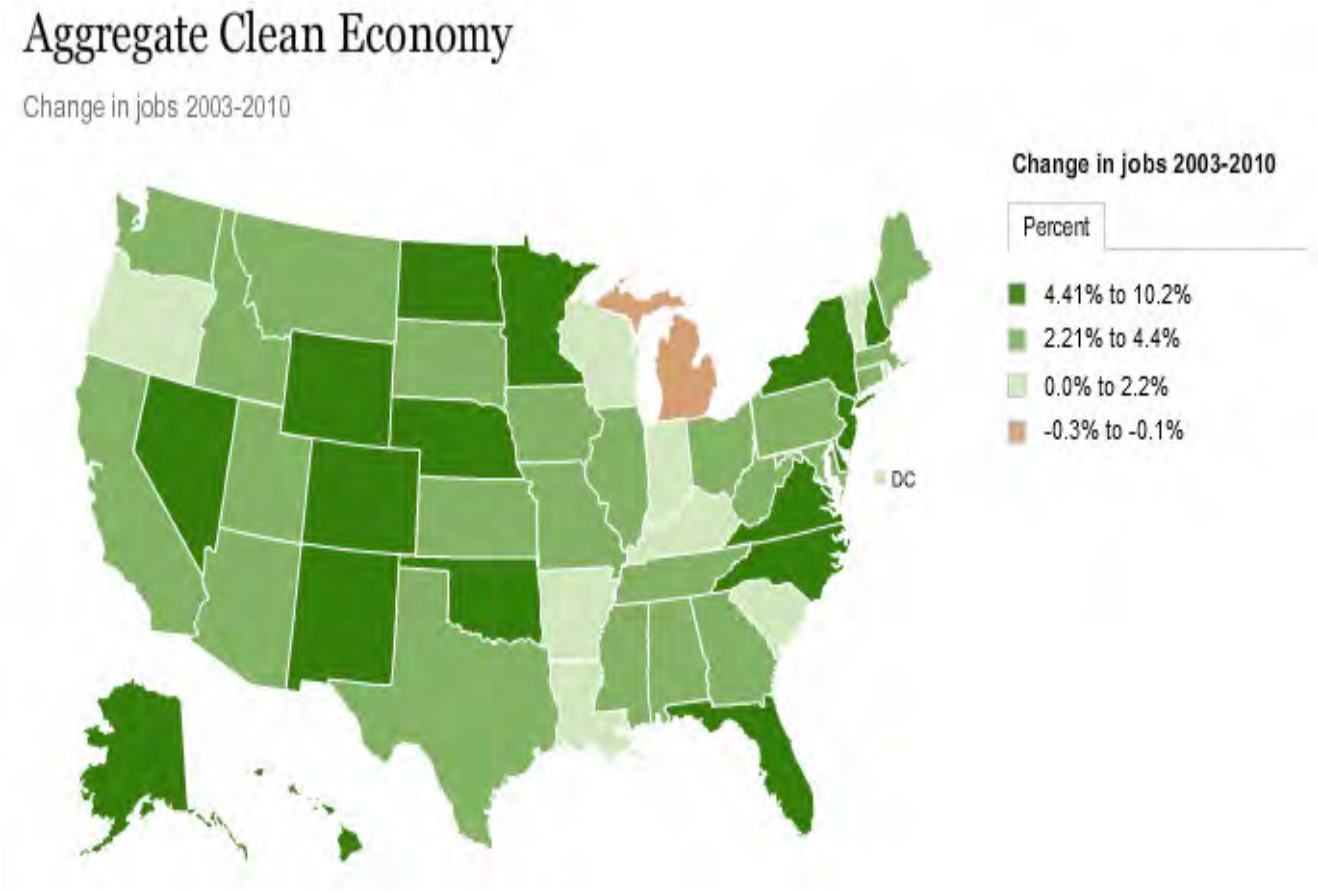
Clean Energy Investment and Deployment Program	Japan-U.S. Island Grid Project	Korea Smart Grid Project
		
Description Agreement with the China Council for Promotion of International Trade (CCPIT) to promote Chinese clean energy investment and deployment in Hawaii.	**Description** Agreement with New Energy and Industrial Technology Development Organization (NEDO) for a $37 million research and development partnership to demonstrate advanced smart grid technologies on Maui.	**Description** Partnership with Korea Smart Grid Institute (KSGI) to pilot advanced energy efficiency and micro smart grid technologies in Oahu hotels, as well as explore business opportunities for EV sharing.
Objective Advance clean energy deployment in the Asia Pacific	**Objective** Showcase Hawaii as the clean energy test bed of the Asia Pacific	**Objective** Showcase Hawaii as the clean energy test bed of the Asia Pacific
Partner China Council for the Promotion of International Trade (CCPIT)	**Partner** New Energy and Industrial Technology Development Organization (NEDO)	**Partner** Korea Smart Grid Institute (KSGI)
Participating Organizations Currently identifying companies to partner	**Participating Organizations** Japan: *Hitachi, Mizuho, CyberDefense* Hawaii: *US DOE & national labs, HECO, MECO, HNEI MEDB, Maui County*	**Potential Participating Organizations** Korea: *LG Electronics, Nara Controls, Hyundai, Hyosung, KT* Hawaii: *Royal Hawaiian Hotel, Moana Surfrider Hotel, Sheraton Waikiki Hotel, Enterprise Car Rental, Green Car Hawaii, HECO, HNEI*
Status MOU completed August 12, 2012. Currently planning program activities and events.	**Status** MOU completed November 22, 2011. AEC Hawaii established as Hitachi's Hawaii entity. Starting volunteer recruitment activities.	**Status** MOU to be completed end of 2012/ beginning of 2013

Clean Energy Investment & Job Growth

Hawaii's pursuit of energy independence is contributing to Hawaii's economy by generating millions of dollars in new investment and creating new jobs. With more than 11,000 green jobs statewide, this job growth is helping to offset job losses in the traditional construction sector.

Figure 9. Hawaii Clean Economy Job Growth

Hawaii ranked third in the nation in clean energy jobs from 2003-2010 by the Brookings Institute. The chart below illustrates Hawaii as being in the top percentile in this nation-wide study.



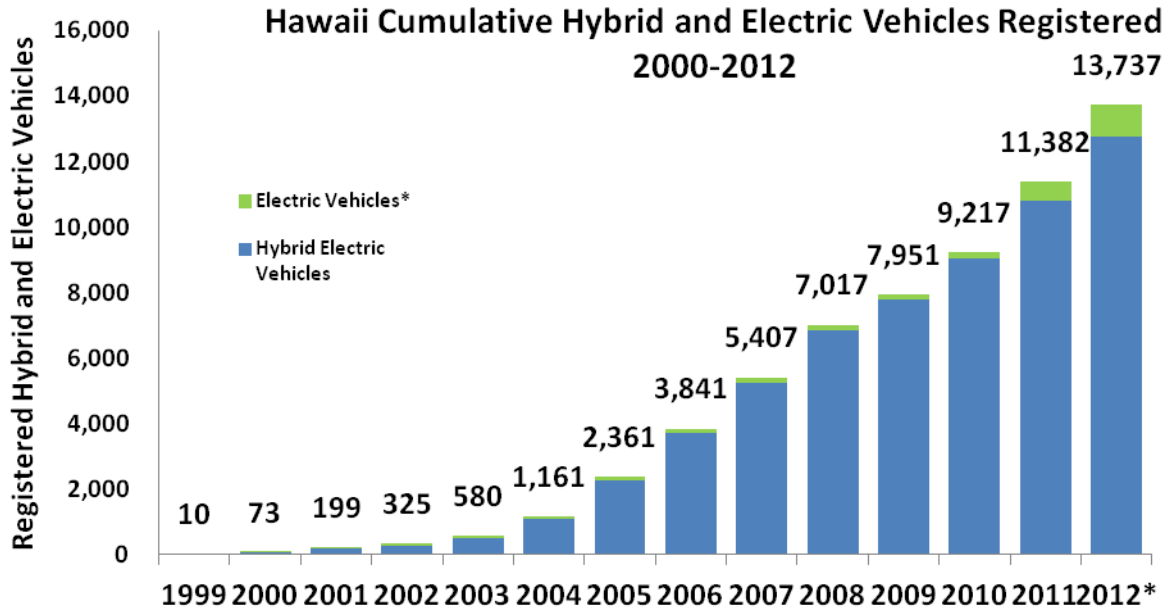
Source: ***Sizing the Clean Economy,*** **August 2011 (Brookings Institute)**

Alternative Transportation Indicator

SID is working on establishing a sustainable alternative-fuel strategy to help reduce Hawaii's dependence on imported oil. A primary goal is to explore alternatives, which will reduce the consumption of petroleum in ground transportation.

Figure 10. Developing Alternative Transportation Usage

This chart shows an upward trend in the cumulative number of hybrid and electric vehicles registered in the State of Hawaii. From years 1999 to 2012, hybrid and electric vehicles cumulatively increased from 10 to 13,737.



Source: National Renewable Energy Laboratory and *Monthly Energy Trends*, 2011-2012 (DBEDT), September 2012.

Figure 11. Hawaii Per-Capita Basis Leader for Public EV Charging Availability

Thanks largely to the successful Hawaii EV Ready Program, Hawaii has surged to the national forefront for the deployment of public charging stations and is currently the nation's leader for public EV charging stations on a per capita basis. The following charts show Hawaii's publicly available chargers across the State, as of September 2012.

Number of Publicly Available EV Chargers Installed

Island	Number of Chargers	Number of Ports
Oahu	155	179
Hawaii	20	34
Kauai	18	21
Maui	31	39
State of Hawaii	**224**	**273**

Source: Department of Business, Economic Development & Tourism, September 2012

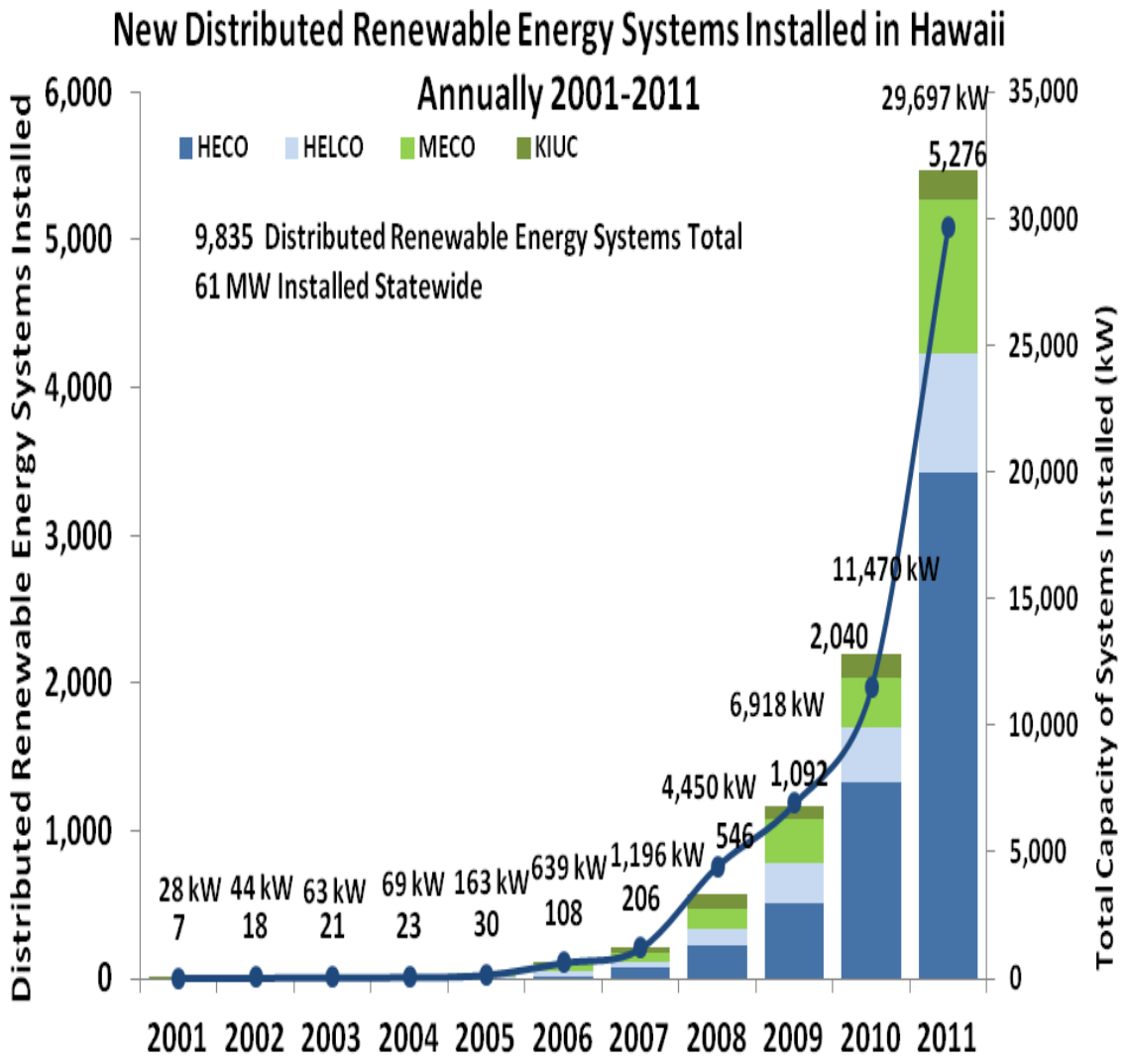
Renewable Energy Potential & Accomplishments

Most of Hawaii's electricity demand is on Oahu while much of the renewable energy resources are on the neighbor islands of Hawaii, Maui, Molokai, Lanai, and Kauai. Interconnecting the islands has been identified as the most effective and efficient means to introduce utility scale renewable energy into a stable grid environment, and will be an important step in securing more uniform and predictable electricity rates through-out the State. In 2012, Hawaii enacted a measure (Act 165, Session Laws of Hawaii 2012) to establish a regulatory structure for the installation and implementation of an interisland high-voltage electric transmission cable system and for the construction of on-island transmission infrastructure. As a next step a programmatic environmental impact statement (PEIS) is currently being prepared, in accordance with the National Environmental Policy Act, to consider impacts of a cable network and all commercially viable renewable sources that may be associated with a cable system.

- Since 2006, Hawaii's renewable electricity generation as a percentage of total generation has been on average 1.8% above that of the U.S.
- Of the electricity generated from renewable resources, those that are generated from biomass/waste-to-energy, geothermal, hydro, and wind are most abundant. In 2011, 99% of all electricity from renewable generation came from the aforementioned resources.
- A total of 34 renewable energy generation facilities totaling 322.8 MWs in nameplate capacity currently exist on the islands of Hawaii, Kauai, Lanai, Maui and Oahu. (Source: DBEDT)
- In 2011, a total of 5,276 distributed renewable energy systems with a total capacity of 31.2 MWs were installed statewide under the utilities' Net Energy Metering and Schedule Q programs. Since 2006, distributed generation system installations have increased rapidly. Whereas only30 systems with a total capacity of 163 kWs were installed in 2005, over 9,700 systems were installed statewide as of 2011 with a total capacity of 61 MWs. (See figure 12).

Figure 12. New Distributed Renewable Energy Systems

By 2011, 9,835 distributed renewable energy systems with a total capacity of 61 MW were installed statewide under the utilities' Net Energy Metering and Schedule Q programs. In 2011, a total of 5,276 systems were installed statewide with a total capacity of 29,697 kW.



Source: *Net Energy Metering Status Reports*, 2011 (Public Utilities Commission)

VI. HCEI Expenditures and Barrel Tax Funding

SID energy initiatives in the fiscal biennium 2011-2012 were primarily using federal funds (American Recovery and Reinvestment Act funds and Energy Efficiency and Conservation Block Grant funds), which were / are scheduled to expire December 31, 2012 and September 30, 2013, respectively.

The overarching spend plan for HCEI utilizing all currently available sources of funding for the State Energy Program is shown in **Figure 13**.

Figure 13. HCEI Expenditure Schedule

For the Three Fiscal Years Ending June 30, 2011, 2012, and 2013

Description		MOF	2011	2012	2013*
Personnel		B	171,661	1,625,676	2,986,548
Total Other Operating Expenses		B	214,299	729,624	836,294
	Total	B	385,960	2,355,300	3,822,842
Personnel		N	1,337,506	104,674	535,135
Total Other Operating Expenses		N	612,816	501,295	4,138,259
	Total	N	1,950,322	605,969	4,673,394
Personnel		V	1,769,672	1,389,032	503,281
Total Other Operating Expenses		V	16,237,398	12,149,011	980,001
	Total	V	18,007,070	13,538,042	1,483,282
	TOTAL SPENDING		20,343,352	16,499,311	9,979,518

Funding sources:
Method of Funding: B - Energy Security Special Funds
Method of Funding: N - Other federal funds (State Energy Program)
Method of Funding: V - American Recovery and Reinvestment Act

* Estimated

Funding for new and on-going clean energy initiatives are now primarily funded by the Environmental Response, Energy, and Food Security Tax (**EREFST**) monies through the ESSF, or by awards from federal formula or competitive grants. The HCEI ESSF expenditures are shown in **Figure 14**.

Figure 14. Energy Security Special Fund

Expenditure and Encumbrance Budget Plan for Fiscal Years Ending June 30, 2011, 2012, and 2013

INITIATIVE	2011	2012	2013
Hawaii State Energy Office – Personnel Costs	178,299	1,625,676	2,669,697
Agricultural Business Plan Competition - Kauai EDB		37,500	
Ag Web Portal Expansion - Hawaii County EDB		35,000	
Biopower System Evaluation - Kauai EDB		37,500	
Community Engagement - Enterprise Honolulu (Oahu EDB)		75,000	
County of Hawaii – County specific focus	70,920		
Energy & Economic Data and Research Website - DBEDT		15,000	
Energy Efficiency Programs			22,000
DOH On-line Permitting – State Energy Office	150,000		
Energy Education / Outreach – State Energy Office		43,735	
Hawaii County Clean Energy E-nitiative		40,000	
Hawaii Economic Development Task Force Support		5,884	
Interisland Cable Specifications – State Energy Office	500,000		
Kauai County – County specific focus	72,269		
Network Installation - State Energy Office		82,000	
Program Portfolio / Data Repository - State Energy Office		125,000	
PV Working Group Meeting Support - County of Hawaii		550	
Renewable Energy Mapping Project - State Energy Office		96,303	
Renewable Energy Resource Center – Maui EDB		50,000	
Renewable Energy Support Project (PEIS)		250,000	
Energy Community Interests / Expand Services - C&C Honolulu		75,000	
WaterStory Outreach – Maui EDB		25,000	
Program Support – State Energy Office	7,561	187,051	166,046
Special Fund Assessments	167,615	229,000	215,099
TOTAL	1,146,664	3,035,199	3,072,842

The HCEI projects enabled through the above spend plans relate to both HCEI program goals and areas targeted for achievement. Greater detail on these projects is highlighted in **Attachments 1 and 2**.

VII. **Environmental Response, Energy, and Food Security Tax Analysis**

The current amount and allocation of the EREFST is detailed in the chart below:

	Current
Environmental Response, Energy, and Food Security Tax	$ 1.05
Environmental response fund	0.05
Energy security special fund	0.15
Energy systems development special fund	0.10
Agricultural development and food security special fund	0.15
Total	$ 0.45
Balance to general fund	0.60

Under the Act three new funds were established:

1 **Energy Security Special Fund** – to be expended by DBEDT
2 **Energy Systems Development Special Fund** – to be expended by HNEI[1]
3 **Agricultural Development and Food Security Special Fund** – to be expended by HDOA[2]

The allowable activities for funding from each fund (specified within the Act) are as follows:

a. **Energy Security Special Fund**

- Subject to appropriation, moneys from the fund may be expended by DBEDT for the following purposes and used for no other purposes, except:
  - To support HCEI and the Energy Division, including staffing positions
  - To fund, to the extent possible, the Greenhouse Gas Emissions Reduction Task Force, climate change task force, grant-in-aids (§42F) to the economic development boards and economic development agencies of each county to meet the stated objectives of HCEI.

b. **Energy Systems Development Special Fund**

- Obtaining matching funds from federal and private sources for research, development, and demonstration of renewable energy sources;
- Awarding contracts or grants to develop and deploy technologies that will reduce Hawaii's dependence on imported energy resources and imported oil. Projects may be commissioned that:
  - Balance the risk, benefits, and time horizons of the investment to ensure tangible benefits to the Hawaii consumer, with priority given to short- term technology development;

[1] HNEI – Hawaii Natural Energy Institute of the University of Hawaii
[2] HDOA – Hawaii Department of Agriculture

- Emphasize innovative and renewable energy supply and energy efficient end use technologies focusing on environmental attributes, reliability, and affordability;
- Enhance transmission and distribution capabilities of renewable energy supply for electricity;
- Enhance reliability and storage capabilities of renewable energy for electricity;
- Ensure that research, deployment, and demonstration efforts build on existing programs and resources and are not duplicated;
- Address critical technical and scientific barriers to achieving energy self-sufficiency by reducing dependence on imported oil and imported energy resources;
- Ensure that technology used and developed for renewable energy production and distribution will be commercially viable; and
- Give priority to resources that are indigenous and unique to Hawaii; and

- Managing the portfolio of projects commissioned under this subsection.

c. **Agricultural Development and Food Security Special Fund**

- Subject to appropriation, Ag Dev & Food Security Special Fund can fund:
- Grants to farmers for agricultural production or processing activity;
- Acquisition of real property for agricultural production or processing activity;
- Improvement of real property, irrigation systems, and transportation networks necessary to promote agricultural production or processing activity;
- Purchase of equipment necessary for agricultural production or processing activity;
- Research on and testing of agricultural products and markets;
- Funding of agricultural inspector positions within the department of agriculture;
- Promotion and marketing of agricultural products grown or raised in the state; and
- Any other activity intended to increase agricultural production or processing that may lead to reduced importation of food, fodder, or feed from outside the state.

The program's (DBEDT, HNEI, HDOA) effectiveness in accomplishing the goals and objectives of the Act are as follows:

Energy Security Special Fund

The Hawaii State Energy Office has made significant progress towards achieving Hawaii's clean energy goals as evidenced by its national recognition and articulated in its "HCEI Road Map." However, the State's leveraging of $37 million in federal funds through the American Recovery and Reinvestment Act will be essentially expended by December 31, 2012. At that time, the State will be primarily dependent upon Energy Security Special Fund to enable retaining the capacity, staff resources, and project funding to continue critical initiatives. This progressive reliance on ESSF funds is documented for FY11, FY12,

and FY13 in Attachment 2. In FY13, it is projected that staffing costs alone will amount to or exceed $3.5 million. Also the large disparity in the amount of federal funds ($37 million) expiring and the funds received from the ESSF, within the fiscal year ($3.5 million) will cause difficult choices pitting energy program funding against retaining personnel unless the spending ceiling is raised.

An accounting of expenditures in FY12 from the ESSF follows:

- In-line with the intent of the Act, SID funded staff positions within the Division ($1,625,676), in which Petroleum Violation Exxon & ARRA funds needed to be replaced due to depletion. The fund also provided SID program support of its activities ($187,051).
- SID provided grants to the county economic development agencies to meet the stated objectives of HCEI and continue an on-going relationship to develop and implement appropriate energy measures. The grants utilizing the fund totaled $300,000.
- The fund was also used to support HCEI through SID initiatives to develop a program portfolio and data repository($125,000); installation of a wireless network ($82,000); a renewable energy mapping project ($96,303); energy and education outreach ($43,735); website development for energy and economic data and research ($15,000); and its initiative to conduct a programmatic EIS for an interisland cable ($250,000).
- Travel support for the Neighbor Island representatives participating in the PV Working Group (Act 198(11)), and Hawaii Economic Development Task Force, (Act 73(10)), which were legislatively mandated. Funds obligated totaled $6,434.
- Lastly, statutory 'special fund fee assessments' (revenue and administrative use) amounted to $229,000.

Energy Systems Development Special Fund

See HNEI attached report, **Attachment 3**.

Agricultural Development and Food Security Special Fund

The Department of Agriculture has, to date, encumbered and expended about one-half of the FY10-11 allocation to the Agricultural Development and Food Security Fund on programs and activities that will help the State reach its goal of food self-sufficiency and security. The activities and programs are summarized in the following table.

Figure 15. HEDTF DOA Expenditure – Encumbrance Update 2012

PROGRAM	PURPOSE	ACTIVITIES AND PROJECTS UNDERTAKEN	2012 EXPENDITURES AND ENCUMBRANCES (ROUNDED TO NEAREST THOUSAND)
Bio-Security Program	Pest prevention/management programs	1. Training to keep current on Good Agricultural Practices audits to prevent food borne illnesses. 2. Management training and information dissemination on Hawaii bio-security protocol.	$16,000 of $184,000 $436,000 of $1,816,000
Irrigation Program Operations	Irrigation infrastructure maintenance, dam safety compliance, equipment purchase, pump maintenance, fuel, utilities, other supplies	Maintenance of mechanical and electrical equipment for the five State irrigation systems, and electricity charge for pumping.	$725,000 of $725,000
East Kauai Irrigation Operations and Maintenance	Support ongoing operations and maintenance of the East Kauai Irrigation System	Solicitation for one project far exceeded the funds available.	None of $75,000
UH-Food Safety and Security Program	Food safety and agro-security research	1. Improving the performance of DNA-based diagnostics 2. Kaiaka Bay Watershed – updating of natural resources data to improve land use decision-making. 3. Unified food safety coaching and certification.	$100,000 of $100,000 $150,000 of $150,000 $250,000 of $250,000
Planner/Neighbor Island Support	Support food-energy security responsibilities/Free N.I. professional staff from clerical duties	1. Hiring one secretary for each of the neighbor island DOA offices. 2. Hiring one planner for the main office on Oahu.	$8,000 of $136,175
	TOTAL		$1,685,000 OF $3,436,175

Recommendations:

DBEDT and HDOA both support the restoration of funds for food and energy security, which currently goes to the general fund. The departments propose reallocating an additional 27.5 cents to the Agricultural Development and Food Security Special fund, and to the Energy Security Special Fund (See table below.).

	Current	Proposed
Barrel Tax	$ 1.05	$ 1.05
Environmental response fund	0.05	0.10
Energy security special fund	0.15	0.425
Energy systems development special fund	0.10	0.10
Agricultural development and food security special fund	0.15	0.425
Total	$ 0.45	$ 1.05
Balance to general fund	0.60	0.00

Conclusion:

It is clear that the expiration of ARRA funds has significantly impacted the rate and progress of HCEI advancement due to the large disparity in the amount of funding expiring and the amount of replacement funds being made available through the ESSF.

Consequently, equilibrium investment to counter-balance the loss of ARRA funding to HCEI, its Roadmap initiatives, and SID staffing is imperative if program initiatives are to continue to provide positive contributions to economic development and jobs, and advance and achieve the State's energy goals and targeted timetable to achieve energy and food sustainability and independence.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
RFI for Interisland Cable	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program & Decision-makers	Prepare a Request for Information (RFI), review all transmission cable information collected & responses, provide recommendations and reports.	$50,000	Progress towards RPS objective. Completed.
Undersea Ocean Floor Surveys	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program & Decision-makers	Conduct submersible dives to assess the possible presence of chemical munition fields of surveyed routes & assess the extent of disposed ordinance and other debris south of Pearl Harbor.	$150,000	Progress towards RPS objective. Completed.
C&C Honolulu WAP Supplemental	Low income energy assistance	Low-income persons	Provide Weatherization Assistance Program (WAP) Services for Low-Income Persons.	$210,000	Progress towards EEPS objective. Completed.
Hawaii County WAP Supplemental	Low income energy assistance	Low-income persons	Provide Weatherization Assistance Program (WAP) Services for Low-Income Persons.	$100,000	Progress towards EEPS objective. Completed.
Kauai County WAP Supplemental	Low income energy assistance	Low-income persons	Provide Weatherization Assistance Program (WAP) Services for Low-Income Persons.	$80,000	Progress towards EEPS objective. Completed.
Maui County WAP Supplemental	Low income energy assistance	Low-income persons	Provide Weatherization Assistance Program (WAP) Services for Low-Income Persons.	$110,000	Progress towards EEPS objective. Completed.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
Kauai County Homestead Energy Program	Community energy efficient retrofits	DHHL Hawaiian Homestead Communities	Homestead Energy Program: Assist Homesteaders with energy efficiency retrofits of their homes to reduce energy consumption and costs.	$725,000	Progress towards RPS & EEPS objectives. Completed.
Hawaii County Homestead Energy Program	Community energy efficient retrofits	DHHL Hawaiian Homestead Communities	Homestead Energy Program: Assist Homesteaders with energy efficiency retrofits of their homes to reduce energy consumption and costs.	$725,000	Progress towards RPS & EEPS objectives. Completed.
C&C Honolulu Homestead Energy Program	Community energy efficient retrofits	DHHL Hawaiian Homestead Communities	Homestead Energy Program: Assist Homesteaders with energy efficiency retrofits of their homes to reduce energy consumption and costs.	$1,050,000	Progress towards RPS & EEPS objectives. Completed.
Maui County Homestead Energy Program	Community energy efficient retrofits	DHHL Hawaiian Homestead Communities	Homestead Energy Program: Assist Homesteaders with energy efficiency retrofits of their homes to reduce energy consumption and costs.	$400,000	Progress towards RPS & EEPS objectives. Completed.
Seawater Air Conditioning	Energy Innovation Development	Energy Program & Decision-makers	Provide a comprehensive written report evaluating the environmental costs & benefits of a district-wide Sea Water Air Conditioning System (SWAC) for Waikiki.	$200,000	Progress towards RPS objective. Completed.
Kauai Energy Efficiency Programs	Energy Efficiency Measure	General Public	Provide rebate for ENERGY STAR qualified refrigerators and properly dispose/recycle old inefficient appliances, retrofit State, County & non-profit buildings on Kauai with energy efficiency measures, provide rebates for solar water heaters.	$500,000	Progress towards RPS & EEPS objectives. Completed.
Ocean Floor Survey	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program & Decision-makers	Conduct additional seafloor sonar surveys to ascertain the northern boundary of chemical munitions field found and provide report to DBEDT.	$150,000	Progress towards RPS objective. Completed.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
EV Ready Grant Competition - County of Kauai	Transportation Enegy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$276,000	Progress towards TRANSPORTATION objective. Completed.
EV Ready Grant - C&C Honolulu	Transportation Energy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$400,000	Progress towards TRANSPORTATION objective. Extended.
EV Ready Grant - Better Place	Transportation Energy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$581,943	Progress towards TRANSPORTATION objective. Completed.
EV Ready Grant - Aerovironment	Transportation Energy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$820,000	Progress towards TRANSPORTATION objective. Extended.
EV Ready Grant - Plug-in-America	Transportation Energy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$50,000	Progress towards TRANSPORTATION objective. Completed.
EV Ready Grant - GreenCar Hawaii	Transportation Energy Diversification	General Public	EV Ready Grant Program supports the installation of commercially-available and standards-compliant charging equipment to accelerate the adoption of electric vehicles and plug-in hybrid vehicles in Hawaii.	$200,000	Progress towards TRANSPORTATION objective. Completed.
Alternative Fuel Vehicles & Infrastructure	Transportation Energy Diversification	Energy Program & General Public	Transformation of Hawaii's transportation sector to be less dependent on petroleum and assisting State government to comply with statutory requirements for electric vehicle parking and to lead by example through the acquisition of electric or plug-in hybrid electric vehicles, advanced technology or alterative fueled vehicles and electric charging equipment/stations.	$475,500	Progress towards TRANSPORTATION objective. Completed.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
Energy Conference Services	Industry & Staff Training	Energy Program, Industry & General Public	Provide conference, workshop, seminar, training, etc. facilitation services.	$160,000	Progress towards POLICY objective. Completed.
HCEI Outreach	Engage the public and community at large	Energy Program, Industry & General Public	Provide public relations and communications support to further the state's clean energy goal of 70 percent clean energy by 2030.	$500,000	Progress towards POLICY objective. Completed.
Energy Star	Energy Efficiency Measure	Building Operators	Provide ENERGY STAR technical assistance to hotels and commercial buildings in Waikiki to attain an ENERGY STAR designation.	$119,059	Progress towards EEPS objective. Completed.
Technical Assistance for High Energy Efficient Buildings	Energy Program Support	Energy Program	Advise State on Planning, Implementing & Overseeing Green Building Rating, Guidelines & Standards.	$300,000	Progress towards EEPS objective. Extended.
Technical Assistance for Sustainable Buildings	Energy Efficiency Measure	Building Operators & County Building Agencies	Provide technical assistance for high energy-efficient buildings including but not limited to owner, developers, county building code officials to ensure that new and renovated buildings are designed with high efficiency.	$367,000	Progress towards EEPS objective. Extended.
Energy Efficient Appliance Rebates - PUC	Energy Efficiency Measure	General Public	Provide rebates for energy efficient appliances and equipments for utility customers served on Oahu, Maui, and Hawaii. Another contract serves customers of Kauai.	$7,165,889	Progress towards EEPS objective. Completed.
Energy Efficient Appliance Rebates - KIUC	Energy Efficiency Measure	General Public	Provide rebates for energy efficient appliances and equipments for utility customers served on Oahu, Maui, and Hawaii.	$135,360	Progress towards EEPS objective. Completed.
Permitting Guidebooks & On-line Information	Facilitating Renewable Technology Deployment	Developers	Final editing and development of the Hawaii Renewable Permits and Approvals Guidebooks, assistance on the Renewable Energy Facility Siting Process, and develop a web-based tool that will enable users to generate a customized permit plan outlining the required permits for development of renewable energy facilitites in Hawaii.	$150,000	Progress towards RPS objective. Completed.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
Interisland Cable EIS	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program, Decision-makers, Industry & General Public	Perform preliminary studies and surveys consistent with Federal and State environmental study requirements of NEPA and HEPA for a programmatic EIS for Interisland Wind and Interisland Cable projects.	$2,997,947	Progress towards RPS objective. Completed.
DOH On-line Permitting – State Energy Office	Facilitating Renewable Technology Deployment	State & Developers	Develop on-line permitting application for DOH environmental health permits, information gathering, form creation, monitoring and tracking process to help implement the consolidated permitting process.	$375,000	Progress towards RPS objective. Completed.
Transportation Energy Diversification	Transportation Energy Diversification	Energy Program, Decision-makers, Industry & General Public	Accelerates the adoption of electric drive vehicles and related charging equipment in Hawaii through the Transportation Energy Diversification Project.	$1,424,780	Progress towards TRANSPORTATION objective. Completed.
Renewable Energy Tipping Point	Energy Innovation Development	Energy Program & Electric Utility	For MECO purchase of an energy storage device and other required equipment to increase MECO's ability to accommodate future renewable distributed generation.	$1,200,000	Progress towards RPS objective. Terminated.
Renewable Energy Tipping Point	Energy Innovation Development	Energy Program & Electric Utility	For HELCO to purchase and own two energy storage devices. HELCO will demonstrate the application of energy storage devices for stabilizing voltage & frequency fluctuations.	$900,000	Progress towards RPS objective. Completed.
Energy Assurance	Strengthen State's Energy Emergency Preparedness	Energy Program	Professional and technical services for energy assurance planning and program development.	$229,072	Progress towards ENERGY SECURITY/ENERGY ASSURANCE. Extended.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
Special Deputy AG for Interisland Cable	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program	Provide special deputy attorney general services for the Interisland Cable project.	$200,000	Progress towards RPS objective. Extended.
Hydrogen Fund	Transportation Energy Diversification	State & Developers	Encourage hydrogen pathway.	$8,700,000	Progress towards TRANSPORTATION objective. In process of closing.
Loan Loss Reserve Administration	Innovative Financing for Energy Deployment	Financial Institutions	Fee to administer loan loss reserve account.	$296,898	Progress towards EEPS objective. Extended.
Loan Loss Reserve	Innovative Financing for Energy Deployment	Financial Institutions, building owners, and general public	Expand the capital available to fund building retrofits and energy improvements across all building segments by creating and funding a loan loss reserve fund and program.	$2,660,324	Progress towards EEPS objective. All funds have been expended to the 3rd party administrator.
NETL Technical Assistance	Energy Program Support	Energy Program	Assist the state to fulfill the requirements of the NETL grant to establish policy framework that will enable and accelerate the integration of utility scale renewable energy using innovative demand side management, storage, smart grid, plus transmission and delivery technologies for the grid infrastructure of Hawaii, specifically for the island of Oahu.	$500,000	Progress towards RPS objective. Extended.
Energy Policy Assistance	Energy Program Support	Energy Program	Assist the state in administrative quasi-judicial proceedings by providing expert witness-related technical assistance regarding energy policy.	$150,000	Progress towards POLICY objective. Extension in progress.

ATTACHMENT 1. HCEI FEDERAL FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	Encumbered	Measurable Outcome①
Cable Subject Matter Expert	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Energy Program	Provide technical expertise & act as the state's representative through the planning, design, procurement & construction phases of the Interisland Electrical Transmission Cable project.	$700,000	Progress towards RPS objective. Extended.
				$36,484,772	
					① Outcomes represent projects making a meaningful contribution to one or more of the following State policy objectives: (1) RPS, HRS 296-92; (2) EEPS, HRS 269-96; (3) Reducing by 70% petroleum used for ground transportation; (4) Food & Energy Security (Act 73(10)) and energy assurance, HRS 125C and HRS 128; (5) Activities in support of the State's energy policy and regulatory framework - relative to Hawaii's Clean Energy Initiative and building public/private partnerships necessary to deploy clean energy infrastructure.

ATTACHMENT 2. HCEI ESSF FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	FY 2011 Expended	FY 2012 Encumbered	Measurable Outcome
Agricultural Business Plan Competition - Kauai EDB	Need for business plan education	County	To provide education and training, networking and mentorship, team-building facilitation, and access to venture financing through business model and business plan creation.		$37,500	Progress towards County food security objective
Agriculture Web Portal Expansion - Hawaii County EDB	Need for web portal expansion	County	Overhaul outdated County agricultural website to provide one-stop-shop island agricultural information.		$35,000	Progress towards County food security objective
Bio-power System Evaluation - Kauai EDB	Need to assess bio-power technology	County	Evaluate the feasibility of deploying a modular bio-power system scalable to commercial size.		$37,500	Progress towards County specific energy support
Energy & Economic Data and Research Website – State Energy Office	Need for energy support thru public understanding	General Public	Provide functional visualizations of State energy use and progress in achieving energy goals.		$15,000	Progress towards POLICY objective.
Clean Energy E-nitiative - Hawaii County EDB	Need for better database documentation of energy initiatives	County	Establish an information clearinghouse to collect and communicate project developments, broaden public outreach, encourage adoption of renewable production and conservation measures, measure impacts, and transform behavior.		$40,000	Progress towards County specific energy support
Community Engagement Meetings - Enterprise Honolulu (Oahu EDB)	Ag & Energy issue discussion via a non-confrontational approach	County	Conduct a series of community engagement meetings on energy and food security to identify key stakeholders, issues, conflicts and opportunities thru inclusive and collaborative dialogue.		$75,000	Progress towards County specific energy & ag support
County of Hawaii – County specific energy focus, but in-line with the State	Continuation of cooperative energy efforts with the State	County	County initiatives focusing on regulatory, energy efficiency, distributed generation, and energy assurance planning.	$70,920		Progress towards County specific energy support
DOH On-line Permitting – State Energy Office	Need for a consolidated permitting process	Developers	Develop on-line permitting application for DOH environmental health permits, information gathering, form creation, monitoring and tracking process to help implement the consolidated permitting process.	$150,000		Progress towards RPS objective. Completed.
Energy Education / Outreach – State Energy Office	Need for energy support thru public understanding	General Public	Provide public relations and communications support to further the state's clean energy goal of 70 percent clean energy by 2030.		$43,735	Progress towards POLICY objective. Continued progress.

ATTACHMENT 2. HCEI ESSF FUNDED INITIATIVES

Target Market	Reason For Selection	Persons Served	Program Objectives	FY 2011 Expended	FY 2012 Encumbered	Measurable Outcome
Renewable Energy Support Project (PEIS)	To develop guidance that can be used in making decisions about future funding decisions and other actions to support Hawai'i in achieving the goals established in HCEI.	Decision-makers	Will analyze, at a programmatic level, the potential environmental impacts of clean energy activities and technologies in the following clean energy categories: (1) Energy Efficiency, (2) Distributed Renewables, (3) Utility-Scale Renewables, (4) Alternative Transportation Fuels and Modes, and (5) Electrical Transmission and Distribution.		$250,000	Progress towards RPS objective. Continued progress.
Interisland Cable – State Energy Office	Interconnecting the islands via electric transmission cable would provide increased energy security and system efficiencies and enable the islands to have backup power	Decision-makers	Provide technical expertise & act as the state's representative through the planning, design, procurement & construction phases of the Interisland Electrical Transmission Cable project.	$500,000		Progress towards RPS objective. Continued progress.
Kauai County – County specific focus, but in congruence with the State	Continuation of cooperative energy efforts with the State	County	County initiatives focusing on regulatory, energy efficiency, distributed generation, permitting, and energy assurance planning.	$72,269		Progress towards County specific energy support
Renewable Energy Mapping Project – State Energy Office	Supports Energy Office functions	Developers	Develop GIS layers to identify renewable energy zones.		$96,303	Progress towards RPS objective. Completed.
Personnel Costs– State Energy Office	Supports Energy Office functions	Energy Program	Provides the State Energy Office the capacity to fully staff legislatively mandated energy functions.	$178,299	$1,623,034	Energy Office Support
Program Support– State Energy Office	Supports Energy Office functions	Energy Program	Provides the State Energy Office the administrative capacity to support State / industry energy initiatives.	$7,561	$30,885	Energy Office Support
Program Portfolio / Data Repository – State Energy Office	Supports Energy Office functions	Energy Program & General Public	Project and data management, which is web-based and centralized		$125,000	Energy Office Support
Represent Energy Community Interests & Expand Services - C&C Honolulu	Build cooperative energy efforts with the State	County	County initiatives focusing on green PC program, energy efficiency outreach, building energy code compliance, energy permitting, and energy assurance planning.		$75,000	Progress towards County specific energy support

ATTACHMENT 2. HCEI ESSF FUNDED INITIATIVES

Renewable Energy Resource Center – Maui EDB	Leveraging an EDA grant	County	Demo project to build an energy resource center utilizing renewables as a backup for disasters and implementing energy measures to attain LEED building 'green' certification.		$50,000	Progress towards County specific energy support
Network Installation – State Energy Office	Supports Energy Office functions	Energy Program	Provides the State Energy Office meeting venues with wireless networking capability.		$82,000	Energy Office Support
WaterStory Outreach – Maui EDB	Need for water serves as a driver and fundamental resource	County agriculture community and general public	Deploys a piloted story on 'water' to provide outreach in understanding County water resources, and agricultural systems.		$25,000	Progress towards food security objective
Source: State Energy Office						

ATTACHMENT 3

UNIVERSITY OF HAWAI'I SYSTEM ANNUAL REPORT

REPORT TO THE 2013 LEGISLATURE

ANNUAL REPORT FROM THE HAWAI'I NATURAL ENERGY INSTITUTE

HRS 304A-1891

November 2012

Report to the 2013 Legislature

Annual Report on
The Hawai'i Natural Energy Institute

HRS 304A-1891

Hawai'i Natural Energy Institute (HNEI) School of Ocean and Earth Science and Technology UH Mānoa

SUBJECT: Annual Report on Activities, Expenditures, Contracts Developed, Advances in Technologies, Its Work in Coordination with State Agencies and Programs, and Recommendations for Proposed Legislation, required in accordance with HRS 304A-1891 (Act 253, SLH 2007).

SUMMARY: Act 253 passed by the Hawai'i State Legislature in 2007 established the Hawai'i Natural Energy Institute (HNEI) in statute, defines the duties of the institute and its director, and requires an annual report to the legislature on its activities, expenditures, contracts developed, advances in technologies, coordination with State agencies and programs, and recommendations for proposed legislation. It also established the Energy Systems Development Special Fund (ESDSF) and directed that it be managed by HNEI. In 2010, ACT 73 established a barrel tax and authorized that 10 cents of the tax on each barrel be deposited into the ESDSF. The authorization to access those funds was included in the Budget Worksheets under Program ID#BED120, under the Department of Business, Economic Development and Tourism (DBEDT) until 2011, which delayed UH/HNEI access to those funds.

In June 2011, UH was able to access the funds. In the fall of 2011, in collaboration with the State Energy Coordinator, HNEI developed an expenditure plan to maximize value of these funds to meet near term needs and opportunities within the state. HNEI initiated actions on all but one of the original items. HNEI has recently, again in collaboration with DBEDT, expanded the project portfolio to include additional high priority projects. The attached report summarizes HNEI's current research activities for the past year and provides a detailed summary of the proposed expenditure for the currently available funds provided under ACT 73.

Summary of Activities, 2011
Hawai'i Natural Energy Institute
School of Ocean and Earth Science and Technology
University of Hawai'i at Mānoa

Director: Richard E. Rocheleau
Phone: 808-956-8346
rochelea@hawaii.edu

Staffing:		
	Permanent Faculty (FTE)	7
	Other permanent staff (APT)	3
	Temporary Faculty	22
	Other temporary staff (APT, RCUH)	19
	Training (a)	45

(a) Includes post-doctoral fellows, graduate and undergraduate students, and visiting scientists.

SUMMARY OF CONTRACTS AND ACTIVITIES: Between 2001 and 2007, the Hawai'i Natural Energy Institute (HNEI) experienced substantial growth in its extramural funding from under $2 million per year to over $5 million per year. Due to new or expanded programs in ocean energy, hydrogen, smart grids, and interest by the Office of Naval Research(ONR) to utilize Hawai'i as a site for alternative energy testing in the Pacific region HNEI has seen a dramatic increase in extramural funding since then from $5.7 million in 2007, to over $25 million for 2011 and 2012 (based on 3 year rolling averages).

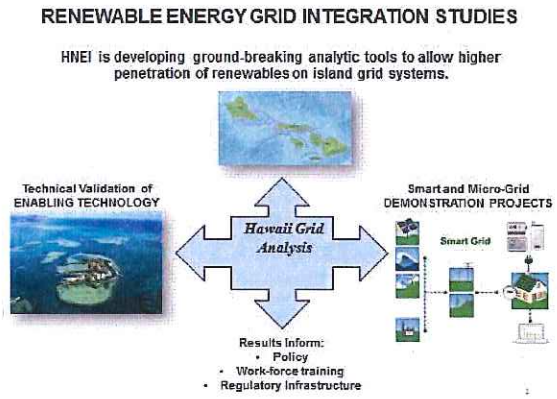
HNEI is a nationally acknowledged research leader with major activities in areas such as hydrogen, fuel cells, biofuels and ocean resources. While continuing to conduct basic and applied research, HNEI has, in accordance with HRS 304A-1891, also undertaken a pivotal role within the state to reduce dependence on fossil fuels including identification, evaluation, and testing of advanced energy technologies and systems aimed at reducing Hawai'i 's dependence on fossil fuels. HNEI serves as the implementing and/or managing partner for several major public/private partnerships to deploy and demonstrate renewable energy systems to meet Hawai'i's energy needs. These efforts support the goals of the Hawai'i Clean Energy Initiative (HCEI).

A brief synopsis of select HNEI activities follows:

Hawai'i Energy Sustainability Program (HESP): HESP is a continuation of the Distributed Energy Resource Technologies for Energy Security program initiated in 2006. Under this program, managed by HNEI and conducted in partnership with GE Global Research, the Hawaiian Electric Company (HECO), Maui Electric Company (MECO) and the Hawai'i Electric Light Company (HELCO), HNEI has an established a research and assessment program in integrated energy and systems analysis of electricity technologies. Through this program, HNEI conducts essential research in areas of relevance to Hawaii and abroad including analysis and modeling of isolated grid systems with high amounts of renewable

energy resources, power distribution and microgrid systems, and advanced power system monitoring, intelligent control, communications and enabling technologies. HNEI's program is focused on identifying technically-sound cost effective solutions and practical strategies that energy generators and grid operators can implement to deliver commercially viable renewable energy to achieve reduced dependence on oil and other fossil fuel resources. Major activities under this program have included:

Oahu Wind Integration Study (2008 - 2010) – Utilizing a variety of modeling and grid simulation tools, this study evaluated the technical feasibility and economic viability of operational strategies, improvements to existing infrastructure, and new technologies to enable high penetrations of renewable energy in Hawaii. A viable strategy was developed to integrate up to 500 MW of wind and 100 MW of solar energy on the isolated Oahu power grid.



Hawaii Solar Integration Study (2010 - 2012): The just ending Hawaii Solar Integration Study (HSIS) builds upon the knowledge gained in the Oahu Wind Integration Study (OWIS). The study examines very high penetration scenarios of solar and wind energy – up to 760 MW of distributed and utility scale solar PV and 300 MW of wind resources for Oahu, and up to 45 MW of distributed and utility scale solar PV and 72 MW of wind on Maui. Focusing on the operational impact on the Oahu and Maui bulk power systems, the HSIS evaluates reserve strategies, impacts on thermal unit commitment and dispatch, utilization of energy storage, renewable energy curtailment, and other aspects of grid reliability, operations and costs. Study final reports are targeted for December, 2012, publication.

Oahu – Maui County Grid Interconnection Study (2012 – 2013): HNEI continues to drive, in partnership with Hawaiian Electric Company, a study that builds upon the work of both the OWIS and HSIS to examine the value proposition of prospective grid interconnection of the power systems on Oahu to those in Maui county (Maui, Lanai and Molokai) via submarine power cables, advanced control systems and operational strategies. This study is of critical importance to the State of Hawaii as high-cost investment decisions regarding the desirability and benefits of grid interconnections via submarine power cable systems progress. Study completion and report publication is targeted for February, 2013.

Oahu EV Charging Study (2012 – 2013): Leveraging the validated models of the Oahu power grid refined in the OWIS and HSIS, the study's primary objectives are to quantify the impact of electric vehicle charging on Oahu grid operations and to explore how different control techniques to manage EV charging profiles could further enhance the integration of wind and solar resources (e.g., by reducing curtailment and/or providing a new source of reserves). Study completion and report publication is targeted for March 2013.

In addition to the technical studies, HNEI has committed $1million from the Energy Systems Development Special Fund to support the Hawaii Clean Energy Programmatic

EIS efforts. This is being closely coordinated with the State Energy Office, and is described in more detail below, in the section on the Energy Systems Development Special Fund.

Liquefied Natural Gas Study: In response to a request from the state, HNEI has retained FACTs Inc. to evaluate the potential importation of liquefied natural gas (LNG) to Hawaii. The study will (1) assess the potential demand for LNG in Hawaii, (2) evaluate the costs and benefits of LNG compared to other fossil fuels, (3) identify the potential impacts of LNG on Hawaii's economy and Hawaii's energy future, (4) identify and assess regulatory policies and practices that may be necessary or appropriate for Hawaii to consider for the importation of LNG. The final report is due December 20, 2012 and HNEI will use approximately $150,000 from this program to fund the study. In a separate body of work, HECO is contracting for studies to assess the technical feasibility of various import facility options and infrastructure requirements, and to assess different LNG supply options, including potential sources, pricing, security, and contracting options. Together the HNEI and HECO studies should begin to provide a foundation to assist in planning and decision making as the importation and use of LNG in Hawaii is considered.

Hawai'i Hydrogen Program: Since 2003, HNEI has developed funding from various federal, state, and private sources to deploy hydrogen infrastructure at multiple sites on O'ahu and the Big Island in support of both DOD and civilian transportation projects. These efforts, summarized in the following subsections, are budgeted at over $ 8 million including approximately $500,000 from the Energy Systems Development Special Fund to support a local bus service in the Hilo-Puna area on the Big Island.

Hydrogen Energy System as a Grid Management Tool: In a joint USDOE-DOD project HNEI is developing hydrogen production infrastructure at the Puna Geothermal Venture (PGV) electricity production plant on the Island of Hawai'i. The project objectives include dynamic operation of an electrolyzer to demonstrate its potential to provide frequency control in support of additional renewable generation, and to provide fuel for two transportation demonstration projects. The PGV hydrogen system has been delayed due to permitting and other agreemetns but is now expectedto be operational by June 2013. The total budget is approximately $5 million.

Marine Corps Base (MCB) Hawai'i Hydrogen Fueling Station at Kaneohe Bay: The Office of Naval Research (ONR) has leased and deployed five General Motors (GM) Equinox Fuel Cell Electric Vehicles (FCEVs) at MCB to enable the US Navy/Marine Corps to conduct technical evaluations and gain experience in the operation of FCEVs utilizing direct hydrogen fuel. HNEI has signed an MOA with MCB Hawaii to provide high pressure refuleing infrastructure in support of this work. Completion is expected in first quarter 2013..

Maui Smart Grid: This very significant HNEI-led USDOE demonstration project was formally started on October 17, 2008, with partners that include General Electric, MECO, HECO, Sentech, and First Wind, among others. This $15 million project is intended to demonstrate reduction of peak electricity demand by at least 15% through the use of advanced smart grid and demand-side-

management technologies, and to assist MECO in providing reliable and stable electricity with increasing percentages of as-available renewable resources. We will finish installing equipment in 2012 and conduct the demonstration through 2013. HNEI is also serving as one of the Hawai'i implementing organizations for the recently announced NEDO Smart Grid Initiative, also located on the south side of Maui. In addition to general advice, HNEI is leading efforts to coordinate between the two smart grid projects

DOE Smart PV Inverter Project: In a project that closely supports the Maui Smart Grid efforts, an HNEI-led team won a new project to develop and demonstrate new "smart grid-enabled" PV inverters. This project, announced in September 2011, is intended to facilitate higher penetrations of solar PV systems by mitigating the utility operations issues resulting from variability of PV systems.

These new PV inverters will be tested as a part of the ongoing smart grid demonstration projects on Maui and another smart grid pilot project in Oklahoma. Project partners include Fronius, which is supplying the advanced PV inverters, and Silver Spring Networks, which will integrate them into the smart grid network they developed. Maui Electric Company, Hawaiian Electric Company, and Oklahoma Gas and Electric are the utility partners supporting the live demonstrations on their utility grids. HNEI used $400,000 from the Energy Systems Development Special Fund to meet a critical funding shortfall and to insure timely and successful completion of this effort.

Asia-Pacific Research Iniitiative for Sustainable Energy Systems: The APRISES initiative, formerly named the Hawai'i Energy and Environmental Technologies Initiative (HEET) was initiated in 2001 with funding from the Office of Naval Research (ONR), focused on the development and testing of fuel cells and seabed methane hydrates has been expanded to include biofuels and to support testing of critical heat exchanger technology in support of Ocean Thermal Energy Conversion (OTEC). More recently the program was again expanded to include deployment and testing of net energy neutral buildings, testing of grid scale Li-ion high power batteries for grid support, and, as described above, support of various hydrogen infrastructure projects on the islands. In 2013 we will continue the current activities and with further expansion to include testing and evaluation of renewable generation and power system controls for smart and micro-gird applications.

Hawai'i National Marine Renewable Energy Center (HINMREC): In March 2009, USDOE executed a five-year agreement with UH - HNEI to establish a new Center to facilitate the development and implementation of commercial wave energy converters (WECs) and to assist the private sector in developing Ocean Thermal Energy Conversion (OTEC) systems for use in Hawai'i and around the world. The HINMREC has established industry-driven partnerships between WECs and OTEC developers, utility companies, engineering and environmental support companies, university researchers, federal and state government agencies, and other non-government organizations (NGOs). The HINMREC coordinates engineering and science efforts to address industry needs and leverage U.S. Department of Defense (DOD) interest in Hawai'i energy projects. In 2011, USDOE awarded $2,333,379 for the second and third years of funding in addition to the first-year

federal funding of $978,048. In 2012, HNEI was awarded an additional $3 million to support development of a grid-connected wave energy test site at MCBH and to support industry testing at that site.

Solar Initiatives:

HNEI is also working with USDOE and ONR to conduct high-fidelity resource assessments and testing of emerging solar technologies. The objectives are to characterize emerging photovoltaic (PV) technologies, to understand the performance of PV in differing environments, and to collect information to evaluate the effects of high PV generation on the grid. Multiple testsites became operational in 2012. Additional test sites will be developed in 2013.

The Flash Carbonization™ process: Under this technology development effort, HNEI is scaling-up a UH patented process invented at the Institute for the rapid and efficient production of charcoal from biomass. Charcoal is the renewable replacement for coal that is burned in Hawai'i for power generation and is the biggest contributor to global warming. To assist licensees of our patents, HNEI is now developing emissions control technology that will facilitate the permitting process so that the technology can be operated in Hawai'i and on the Mainland. HNEI also is exploring the use of this technology to produce charcoal from Honolulu sewage sludge, and the production of charcoal to replace coke used to reduce silica to silicon for the manufacture of photovoltaic cells. The latter work is funded by the National Science Foundation and involves a collaboration with the Dow Corning Corporation.

Electrochemical Power Systems R&D: Researchers in HNEI's Electrochemical Power Systems Laboratory conduct testing and modeling to develop advanced battery system diagnostic and prognostic technology to further understanding of the performance of advanced batteries for use in electric vehicles and renewable energy storage applications. Funding sources include the US Department of Energy EERE Office through the Idaho National Laboratory, the Air Force Research Laboratory through the Hawai'i Center for Advanced Transportation Technologies, and Hawai'i Renewable Energy Development Venture funds through Better Place.

EXPENDITURES: **General Funds $ 1,074,351**
Tuition and Fees S Funds $ 31,390
Research and Training Revolving $ 198,547
Extramural Awards $ 21,588,319

All funds were expended in support of research and training activities described above. We anticipate 2013 extramural funding levels to be comparable to those from 2012. The rate of expenditure is expected to be similar to that of 2011.

CONTRACTS DEVELOPED: HNEI has developed many subcontracts under its existing extramural federal funding. Contracts using the Energy Systems Development Special Fund are described in the section below on the specific projects funded by ESDSF. HNEI coordinates and plans for ESDSF expenditures with the State Energy Coordinator and anticipates development of several additional contracts under the Special Fund during 2013.

ADVANCES IN TECHNOLOGY: HNEI continues to conduct research to advance renewable energy technologies. HNEI has patents in the areas of battery charging, conversion of biomass to charcoal, solar production of hydrogen, and conversion of waste streams to valuable bioplastics in the processing of ethanol. Licensing discussions are ongoing in all of these areas.

COORDINATION WITH STATE AGENCIES: HNEI works closely with DBEDT and other agencies on a variety of renewable energy projects and continues to seek new opportunities and means to do so. Projects initiated or ongoing in 2012 which involve strong collaboration/coordination with DBEDT include the following:

- ***Hawai'i Hydrogen Power Park*:** The hydrogen power park is funded in part by USDOE and in part by the Hydrogen Investment Capital Special Fund through DBEDT. HNEI is the implementing partner and works closely with DBEDT in the execution of this project.
- ***Hawai'i Hydrogen Plan*:** HNEI, via Kolohala Ventures developed the State Hydrogen Plan as called for as part of the Hydrogen Investment Capital Special Fund. This work was completed in 2012.
- ***Marine Corps Base (MCB) Hawai'i Hydrogen Fueling Station at Kaneohe Bay*:** HNEI is leveraging the State of Hawai'i investment in the Hawai'i Hydrogen Power Project by reallocating the hydrogen production and fueling station from Hawai'i Volcanoes National Park to MCB Hawai'i, in support of the deployment of the ONR/GM Equinox fuel cell vehicles. HNEI has worked closely with DBEDT in coordinating this evolving project. This project is receiving global interest as a result of GM's commitment to target Hawai'i for the first commercial rollout of its FCEV program.
- ***Utility Scale Clean Energy Capacity Project*:** HNEI provided substantive assistance to DBEDT in the development of this award from the USDOE and was recently awarded funding from DBEDT to evaluate the impact of electric vehicles on the O'ahu grid system.
- ***National Marine Renewable Energy Center*:** HNEI is working closely with DBEDT to attract technology providers to the state to participate in this project and to provide assistance in the permitting process.
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RECOMMENDATINOS FOR PROPOSED LEGISLATION: Generally, HNEI does not initiate legislation, but HNEI does recommend the continuation of funding the Energy Systems Development Special Fund. As high oil prices continue to pressure the consumer and energy providers, this fund would help accelerate the acceptance and deployment of pre-commercial energy and energy-efficiency technologies expected to have near-term impact on Hawai'i's energy infrastructure.

HNEI is a member of the Hawai'i Energy Policy Forum and works closely with this group to review legislative initiatives in the energy area. Via federal funds, HNEI also financially supports the University of Hawai'i's Hawai'i Energy Policy Forum for outreach and analysis efforts.

ENERGY SYSTEMS DEVELOPMENT SPECIAL FUND

As described above, the Energy Systems Development Special Fund was established in 2007 under ACT 273 but went unfunded until 2010, when, under ACT 73, the Hawai'i Legislature established a barrel tax and authorized that 10 cents of the tax on each barrel of oil be deposited into the Fund. Due to account issues, UH/HNEI was unable to access these funds until June 2011. Between June 2011 and June 30, 2012, HNEI has received total funding in the amount $4,960,000. Funds continue to accrue. HNEI has worked in collaboration with the State Energy Coordinator to develop an expenditure plan to maximize value of these funds to meet near term needs and opportunities within the state; and maximize leveraging of federal dollars.

Below is a description of the existing commitments from the Fund, totaling $3,278,000 and the proposed plans for expenditure of up to an additional $2,550,000 million from the Fund for contract, research and support of renewable energy and energy efficiency technologies.

Current Commitments (Total to Date: $3,278,000)

Geothermal Resource Assessment: **($400,000)** The US DOE is funding a project led by the University of Hawai'i to validate a new geophysical inversion and analysis procedure to map the subsurface structure of the geothermal resource and lower exploration costs. DOE funding is approximately $1 million over two years with additional cost share from industry partners. HNEI committed $400,000 from the Fund to purchase the relevant equipment and support one scientist to conduct the analysis to insure that the equipment and know-how developed under this effort will be available for additional resource studies with near-term target areas on both the Big Island and Maui. This work, initiated in Spring 2012 will allow initial site exploration on the Island of Maui.

Geothermal Strategic Development Study **($115,000)** HNEI has contracted to PICHTR to assess the current environment for geothermal development in the state, including the level of industry interest, and the identification of state and county agency needs to adequately perform the functions necessary for anticipated geothermal development. From this information PICHTR is preparing a geothermal strategic development plan that will help agencies be prepared for the complex planning, assessment, regulatory, and permitting activities required. This plan, to serve as a guide to DBEDT and other state agencies (e.g. DOH and DLNR) involved in geothermal development is expected to be completed in December 2012.

Smart Inverter Deployment: **($400,000)** The US DOE is funding a project led by the University of Hawai'i to develop and commercialize smart grid-enabled PV inverters to mitigate grid reliability impacts of high penetrations of PV systems, and demonstrating these systems at two sites, one on Maui and one on the mainland. This project is part of the

ongoing smart grid demonstration projects on Maui. HNEI obligated $400,000 from the Fund to match partner cost share. This cost share from the Fund resulted in an initial federal award of $1.5 million with an additional $4.5 million to be awarded upon successful demonstration of the go/no-go deliverables in early 2013.

***Hydrogen for Grid Management:* ($500,000)** In 2011 HNEI was awarded $ 1.7 million by the Naval Research Laboratory (funds provided to NRL by US DOE) to demonstrate the use of electrolyzer technology to simultaneously produce hydrogen for fuel and for grid management. This program leverages other investment from the US Department of Energy, the Hawai'i Hydrogen Capital investment Fund, and in-kind cost share from Puna Geothermal Venture and County of Hawai'i Mass Transit Agency The $500,000 from the Fund has been identified support development of an advanced fuel cell bus for operation in the underserved Puna area. This work has not yet been contracted.

Hawai'i Clean Energy Programmatic Environmental Impact Statement: ($1,000,000) A Programmatic EIS for the undersea cable was identified by USDOE and DBEDT as the next critical step in planning for the interconnection of the Hawaiian Islands via undersea cable - a critical step to meet HCEI goals. In July 2012, in coordination with the USDOE and DBEDT, HNEI contracted New West Technologies to conduct a Programmatic Environmental Impact Study for alternative scenarios for deployment of undersea electrical cables for interconnection of O'ahu, Maui, and Hawai'i Counties electrical grids. The PEIS is analyzing, at a programmatic level, the potential environmental impacts of clean energy activities and technologies in the following clean energy categories: (1) Energy Efficiency, (2) Distributed Renewables, (3) Utility-Scale Renewables, (4) Alternative Transportation Fuels and Modes, and (5) Electrical Transmission and Distribution (including undersea cables). The State of Hawai'i and the U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) are cooperating agencies in preparing this PEIS. The PEIS will provide both federal and local agencies and policymakers with information and guidance they can use to make decisions about actions to support achieving HCEI goals. This work has been contracted and is underway.

The Pacific Asian Center for Entrepreneurship and E-Business: ($50,000) PACE consists of an integrated set of leading-edge entrepreneurship programs at the University of Hawaii Shidler College of Business with an innovative curriculum, research projects, and community outreach and involvement with Pacific and Asian entrepreneurs and entrepreneurial ventures. HNEI expended $50,000 of the Fund to support several PACE fellowships to conduct technical and business analyses of critical energy issues. Support of this program is intended to provide future workforce cross-trained in both the business, legal and technical aspect of future energy systems.

***HCEI Metrics* ($113,000).** HNEI committed $113,000 to support the Hawaii Energy Policy Forum and the Social Science Research Institute at the UH in their development of a set of metrics to measure the State's progress toward meeting the Hawaii Clean Energy Initiative's requirements. This effort is ongoing with completion expected in time for the 2013 legislative session.

Wave Energy Test Site ($500,000) UH/HNEI through the National Marine Renewable Energy Center has been awarded an additional $ 4.3 million by USDOE to support of wave energy testing at the to be constructed Wave Energy Test Site (WETS) at MCBH. This

$500,000 cost-share from the fund was critical to receipt of this award and is in addition to . $3.8 million from the private sector.. These funds will support environmental and resource studies supporting the Navy sponsored plug-and-play facility. Navy has committed approximately $11 million for infrastructure at the WETS. Combined resources of Navy, USDOE and the Fund will result in a grid-connected site where developers can test their technology for proof of seaworthiness, functionality, system integrity and technology viability.

Sea Water Air Conditioning Monitoring **($200,000)** Seawater air conditioning has the potential to contribute significantly to the state's energy efficiency goals. HNEI has procured federal funding to develop high-fidelity plume models to assess the impacts of cold water return depth, a factor which has major impact on the capital cost of these projects. HNEI has also procured funding to initiate on-site monitoring before and during operation of the Honolulu SWAC system to assess impacts and validate models. HNEI will use $200,000 from the barrel tax to conduct the long-term monitoring necessary to validate performance. Depth of discharge has major impact on the overall cost of the SWAC project. This work has the potential to save millions from future projects substantially increasing the likelihood of future SWAC development and resulting fuels savings.

Proposed New Projects (Total new expenditure: $1,800,000 - $2,550,000)

Based on community discussions and collaboration with DBEDT, the section below summarizes projects that have been identified for funding pending final detailed planning. The projects include new initiatives, and, where necessary, follow-on funding to commitments already made (see above). Cost for each are estimates based on similar work in the past. Total expenditures for these new and follow-on expenditures from the Fund are expected to range from $1,800,000 to $2,550,000. Projects shown below are planned but funds have not yet been committed.

Hawaii Clean Energy Programmatic EIS ($500,000 - $750,000) Based on discussions with the contractor and USDOE, it is anticipated that an additional $500,000 to $750,000,000 will be necessary to complete the work. These funds will only be committed after thorough review of progress under the initial funding and upon approval by DBEDT.

The Pacific Asian Center for Entrepreneurship and E-Business ($100,000) HNEI plans to continue its support of the pace PACE program that will help provide a future workforce cross-trained in the business, legal and technical aspects of future energy systems. $100,000 will support two fellowship teams to address business cases on interest to the renewable energy community. We intend to coordinate with DBEDT to identify projects of interest to the State.

Grid Modernization Projects ($600,000-$800,000) HNEI, with funding from USDOE and cost share from HECO has been funding GE to conduct detailed analyses of the various

island grids including high penetration solar studies for Maui and Oahu, and studies to quantify the operational benefits of interconnecting Oahu and Maui counties. These studies conclude in fall 2012. We anticipate the need for a limited number of well-defined follow-on studies to address unanswered issues important to HCEI. In addition to fuel cost savings, it is intended to identify and quantify the costs of necessary infrastructure and operational changes to implement the new systems, allowing assessment of the impact on electrical rates. These studies could also encompass a more detailed assessment of the potential for wind and solar electricity production on Oahu necessary to make informed decisions on planning, including alternatives should technical or community issues limit deployment of the undersea cable interconnecting Maui and Oahu counties. This latter effort would include an assessment of available wind and solar resource mapping data, GIS, and other data to determine the potential production of these resources on Oahu.

***National Fuel Cell Bus Program*: ($0 - $200,000)** HNEI is teaming with UTC Power on a proposal to the U. S. Federal Transit Administration (FTA) to deploy a state-of-the-art 40-foot fuel cell transit bus with the County of Hawaii Mass Transit Agency (MTA) in Hilo to be operated on the Big Island on a variety of routes. If awarded, FTA and UTC cost share is expected to total $ 2.2 million. The project will leverage hydrogen infrastructure installed at the PGV geothermal plant and MTA that was funded by the US DOE, Office of Naval Research, and State of Hawaii. HNEI proposes to use $200,000 from the Fund to meet the FTA cost share requirement only if the full award from FTA is approved.

***Smart Meter Education* ($150,000 - $250,000)** Utilities need to effectively educate their consumers in order for them to gain the full benefit provided by smart meters. Failure to do so may have significant negative consequences on the utility's ability to modernize their grid systems. HNEI will work with local utilities and interest groups to develop a framework to guide utilities smart meter education efforts to effectively engage consumers, communities and advocates. The framework would identify best practices and successful techniques, and may include a sample education plan.

***Maui County Load Management Assessment* ($200,000)** HNEI proposes to fund an in-depth analysis of load management opportunities to evaluate the potential to reduce curtailed wind energy for Maui County. This assessment will include an evaluation of the ability of water utilities to time their use of electricity for pumping water to most benefit the island's grid and assist with the integration of intermittent renewable energy into the system without negatively impacting operations.

Energy Efficiency ($250,000) While ceiling fans are an energy efficient alternative to mechanical air conditioning, current controls can't manage large banks of fans (more than 6), or respond to varying interior environmental conditions (temperature and humidity). HNEI proposed to partner with the UH School of Architecture's Environmental Research and Design Lab (ERDL), and Loisos + Ubbelohde (an architecture and engineering firm) to leverage current research initiated at Lawrence Livermore to develop ceiling fan controls hardware, and to prototype and test the controls in facilities currently monitored by HNEI.

The technology developed will be directly applicable to schools and other state facilities that need to improve comfort and reduce energy costs, and will allow more buildings to be naturally ventilated, thus advancing HCEI goals. We anticipate that this research would generate Intellectual Property that will derive residual revenue, a portion of which would flow back into the Energy Systems Development Special Fund.