

# UNIVERSITY OF HAWAI‘I SYSTEM ANNUAL REPORT



REPORT TO THE 2008 LEGISLATURE

Annual Report on  
The Hawai‘i Natural Energy Institute

House Bill 1003, HD3, SD1, CD1  
Session Laws of Hawai‘i 2007

November 2007

**Hawaii Natural Energy Institute (HNEI)  
School of Ocean and Earth Science and Technology  
UOH Manoa**

**SUBJECT:** Annual Report on Expenditures, Contracts, Activities, Technology required in accordance with HB1003 HD3 SD1 CD1 SLH 2007

**SUMMARY:** In 2007, the Hawaii State Legislature passed HB1003 HD3 SD1 CD1 SLH 2007, Relating to Energy. Several sections of this legislation contained provisions relevant to the operations of the Hawaii Natural Energy Institute.

Section 304A-A established the Hawaii Natural Energy Institute in statute, defined duties of the director and institute, and required an annual report to the legislature on its activities, expenditures, contracts developed, and advances in technology, coordination with state agencies, and recommendations for proposed legislation. A summary of HNEI activities is appended.

Section 304A-B requires the institute to establish an advisory council of seven members to make recommendations on the award of contracts and grants funded through the institute. The primary intent of this section was, HNEI believes, to provide counsel in the awarding of contracts and grants funded under the Energy Systems Development Special Fund (Section 304A-C). However, the 2007 legislature did not make an appropriation to this special fund. HNEI has begun to identify potential advisory council members and will coordinate with the Energy Resources Coordinator of DBEDT with the goal of establishing the advisory council in early 2008.

Section 304A-C establishes the Energy Systems Development Special Fund for the purpose of developing an integrated approach toward portfolio management of renewable energy and energy efficiency technologies to reduce Hawaii's dependence on fossil fuel and provide guidelines for administration of the fund. Unfortunately, no appropriation was made for this fund. Thus, although HNEI has continued to build partnerships relevant to the proposed effort, no projects specific to this fund have been initiated.

Section 304A-E calls for development of a plan of action for expenditures under Section 304A-C. Planning has been deferred until such time that funding is made available under the Energy Development Special Fund.

PART III of the legislation directs DBEDT to develop and prepare a bioenergy master plan in consultation with representatives of the relevant stakeholders. HNEI has participated in numerous resource and technology assessments and is ready to assist DBEDT should our assistance be requested.

**Summary of Activities, 2007**  
**Hawaii Natural Energy Institute**  
**School of Ocean and Earth Science and Technology**  
**University of Hawaii at Manoa**

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Staffing: Permanent Faculty (FTE)	9
Other permanent staff (APT)	3
Temporary Faculty	16
Other temp staff (APT, RCUH)	9
Training (a)	26

(a) Include post doctoral fellows, graduate and undergraduate students, visiting scientist

**Activities and Contracts:** Since 2001, the Hawaii Natural Energy Institute has experienced significant growth in its extramural funding from under \$2 million per year to over \$5 million per year. HNEI is a nationally acknowledged leader in research activities in areas such as hydrogen, fuel cells, biofuels and ocean resources. HNEI has undertaken a pivotal role within the State, consistent with its mandate from the legislature to reduce dependence on fossil fuels while contributing to the development of advanced energy technologies and systems aimed at finding solutions to energy shortage problems. In addition to technology development, HNEI has implemented several major public/private partnerships to deploy and demonstrate renewable energy systems to meet Hawaii's energy needs.

A very brief synopsis of select HNEI activities follows:

*Hawaii Distributed Energy Resource Technologies for Energy Security:* Managed by HNEI in partnership with GE Global Research, HECO and HELCO this program addresses technical issues associated with increased penetration of intermittent renewable and distributed energy technologies in the electrical grid. Analytic models developed under this program will be used to identify near-term energy transforming projects for implementation. This program also includes the deployment and testing of emerging distributed energy technologies at the Hawaii Gateway Energy Center

*Hawaii Hydrogen Power Park* - With funding from US Department of Energy (USDOE) and from the state's Hydrogen Capital Investment Fund through DBEDT, HNEI is the implementing partner for installation of a hydrogen fueling station on the Big Island, in the vicinity of Hawaii Volcanoes National Park (VNP). HNEI has worked with VNP to secure separate funding from the US Department of Transportation to develop plug-in hybrid fuel cell shuttle buses for use at the park.

*Energy Analysis for Renewable Portfolio Standards:* HNEI is scheduled to assist the Hawaii Public Utility Commission (PUC) in the efforts related to renewable portfolio standards under the Hawaii State Legislature's Act 95, with attention to matters of energy policy.

*Hawaii Energy and Environmental Technology Initiative:* This program focuses on the development and testing of fuel cell and seabed methane hydrates. Current support for this and related efforts comes from the Office of Naval Research, DARPA, USDOE, and industry.

*Hydrogen Fuel Contamination Studies for PEM Fuel Cells -* Funded by US DOE, HNEI is working with government, industry, and International Standards Organizations to characterize effects of contaminants in hydrogen fuels. The ultimate objective is to assist in development of hydrogen fuels standards to accelerate acceptance of fuel cells.

*Solar Initiatives –* HNEI is the primary subcontractor to MVSystems, a mainland solar energy company, for development of technology for the solar production of hydrogen in a recently announced multimillion dollar four-year program. HNEI has critical patents in this field and is currently negotiating with industry for licensing and further development.

HNEI is also providing technical support and data acquisition and analysis services to the Department of Education for the installation of \$ 5million in solar systems on selected schools.

*Flash Carbonization:* HNEI has developed a patented process for the rapid production of charcoal from biomass. This technology, currently being scaled for commercial demonstration, also has the potential to sequester significant quantities of CO<sub>2</sub>, a primary contributor to global warming.

*Algal Bio-Oils for Biodiesel Production:* HNEI is working with industry to develop technology for the biological production of oils for biodiesel from waste streams.

<b>Expenditures:</b>	General Funds	\$ 1,335,682
	Tuition and Fees S Funds	\$ 54,186
	Res and Training Revolving	\$ 216,219
	Extramural Awards	\$ 5,500,000

All funds are expended in support of research and training activities described above. To date, in 2007, HNEI has been awarded more than \$ 3.1 million and has ongoing negotiations for more than \$ 2 million in additional awards. As previously stated, no funds specific to HB1003 HD3 SD1 CD1 SLH 2007 have been expended by HNEI.

**Contracts Developed:** No funds appropriated into the Energy Systems Development Special Fund and no contracts specific to HB1003 HD3 SD1 CD1 SLH 2007 were developed. HNEI has contracted support services from various partners under other federally funded programs. Most significant was a \$500,000 award to GE Global Research in support of the Hawaii Distributed Energy Resource Technologies for Energy Security project.

**Advances in Technology:** 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.

**Coordination with State Agencies:** HNEI works closely with DBEDT and other agencies on a variety of renewable energy projects. In 2007, these have included:

- Hawaii Hydrogen Power Park - funded by USDOE and Hydrogen Capital Investment Fund through DBEDT, with HNEI as implementing partner EPACT 355 - HNEI received supplemental funds from USDOE via DBEDT to conduct an assessment of the economic effect of various energy scenarios on the state's refinery operation. This report, required by Section 355 of the US Energy Policy Act of 2005 was delivered to DBEDT and to USDOE in the third quarter of 2007.
- HNEI is currently negotiating with the PUC to conduct an assessment of the technical and non-technical barriers to meeting the state's renewable portfolio standards. Information from this project will be used by the PUC to evaluate and as appropriate, adjust the standards for future years.
- HNEI has initiated discussions with DBEDT to simplify contractual arrangements between the two organizations. Such an agreement would position HNEI to further assist DBEDT effectively serving the State in the analysis and coordination of energy related R&D.

**Recommendations for Proposed Legislation:** Generally, HNEI does not initiate legislation but HNEI is a member of and works closely with the Hawaii Energy Policy Forum to review legislative initiatives in the energy area. However, HNEI does recommend funding the Energy Systems Development Special Fund as originally proposed. As oil prices continue to increase, putting further pressure on the consumer and energy providers, this fund would accelerate the acceptance and deployment of pre-commercial energy and energy efficiency technologies expected to have near-term impact on the Hawaii's energy infrastructure.