

UNIVERSITY OF HAWAI‘I SYSTEM ANNUAL REPORT



REPORT TO THE 2016 LEGISLATURE

Annual Report on Net-Zero Energy for
the University of Hawai'i

HRS 304A-119

January 2016

**Report to 2016 Hawai'i State Legislature
Pursuant to Act 99, SLH 2015
HRS 304A-119
Net-Zero Energy for the University of Hawai'i**

The Governor signed into law Act 99 (SLH 2015) which established a collective goal for the University of Hawai'i *“to become net-zero with respect to energy use, producing as much (renewable) energy as the system consumes across all campuses by January 1, 2035.”*

This report details the activities, plans, improvements made and overall progress made to advance the Net-Zero energy goal for calendar year 2015; establishes baseline energy consumption and renewable energy data for FY 2014-15; and recommendations for proposed legislation in calendar year 2016 required in accordance with HRS 304A-119 (Act 99, Session Laws of Hawai'i 2015).

Net-Zero Energy is achieved when an organization’s total energy consumption is equal to the total renewable energy provided (via on-site generation or purchased from certified renewable energy providers).

There are two primary variables that must be managed:

1. **Energy efficiency** (reducing total energy use)
2. **Renewable energy** (providing enough to provide for total energy used)

NET-ZERO DASHBOARD BASELINE FY2014-15	kWh
Total Energy Consumed ¹	195,006,402
Total Renewable Energy Provided	3,768,606

KEY PERFORMANCE INDICATORS FY2014-15:

Energy Consumed:	195,006,402	KWH
Energy Efficiency Savings²:	(656,866)	KWH
Renewable Energy Produced:	3,768,606	KWH

¹ Includes non-campus facilities.

² Estimated kWh savings data provided by Hawai'i Energy based on rebate incentives paid FY 2014-15.

I. Overall progress toward the net-zero energy goal (by campus)

A. UH MĀNOA:

UHM NET-ZERO DASHBOARD BASELINE FY2014-15	
	kWh
Total Energy Consumed	125,153,670
Total Renewable Energy Provided	505,286 ³

Baseline:

The electricity consumed on the UH Mānoa campus during FY 2014-15 was 125,153,670 kWh⁴.

Energy Efficiency:

Total electricity consumed on the UH Mānoa campus during FY 2014-15 is (1,132,072) kWh less than FY 2013-14, and represents approximately a 0.90% decrease in overall energy use from the previous year.

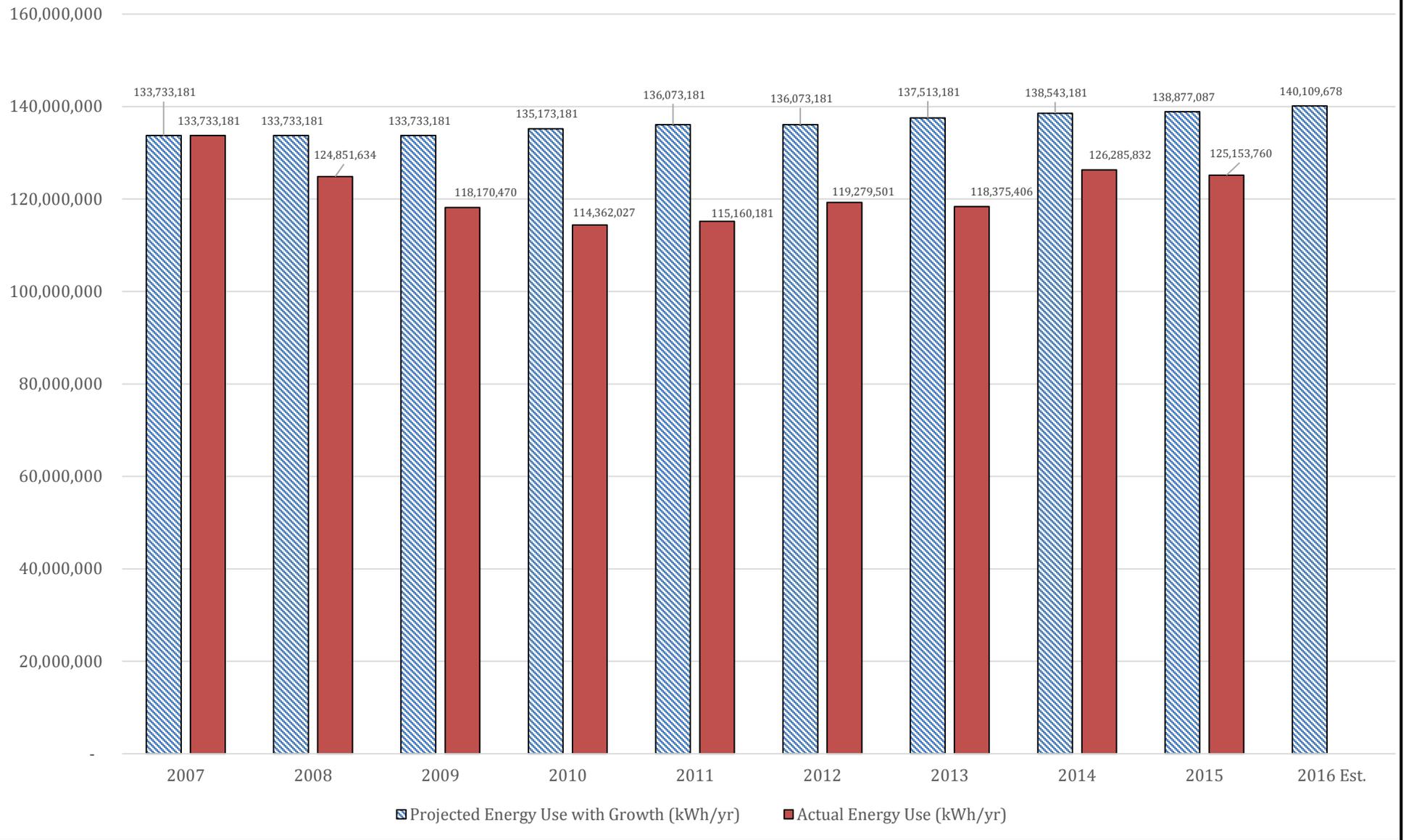
Total kWh consumed in FY2014-15 represents an almost 10% reduction from the projected estimate of 138, 877,087 kWh that was based on the UHM baseline year of 2007 (See Figure 1 on following page). The UHM 2007 baseline is aligned with the Hawai'i Clean Energy Initiative benchmark year:

As the following graphs (Figures 1 and 2) illustrate, a continuous energy reducing strategy has been in effect at UHM for several years. Prior years reduced energy levels are as much as 14% against the 2007 baseline year. The actual energy consumed in 2015 represents a reduction of 6.4% against the actual energy used in 2007.

³ Based on estimations from Hawaiian Electric data.

⁴ Includes UH Cancer Center and UH JABSOM.

UHM Energy Consumption: Projected vs Actual 2007-2016 (2007 base plus new bldgs)



- Notes:
1. For FY 2016, the projections are based on future months that use historical figures from the past year. The year end cost does not account for the carryover payments made for June 2015 paid in FY2016.
 2. Data includes off-campus facilities FMO is responsible for paying: IFA Hilo, Maui Ohia Ku, Maui Kula; UHM substations, and all UH Master Accts.
 3. Cost and electricity projections are gross of all recharge accts.

Figure 1: Actual vs Projected energy use at UH Mānoa

Overall energy use at the campus has declined despite overall Gross Square Footage increasing with the addition of 3 new high-performance buildings: *C-MORE Hale*, the *Center*, and the *Warrior Recreation Center*:

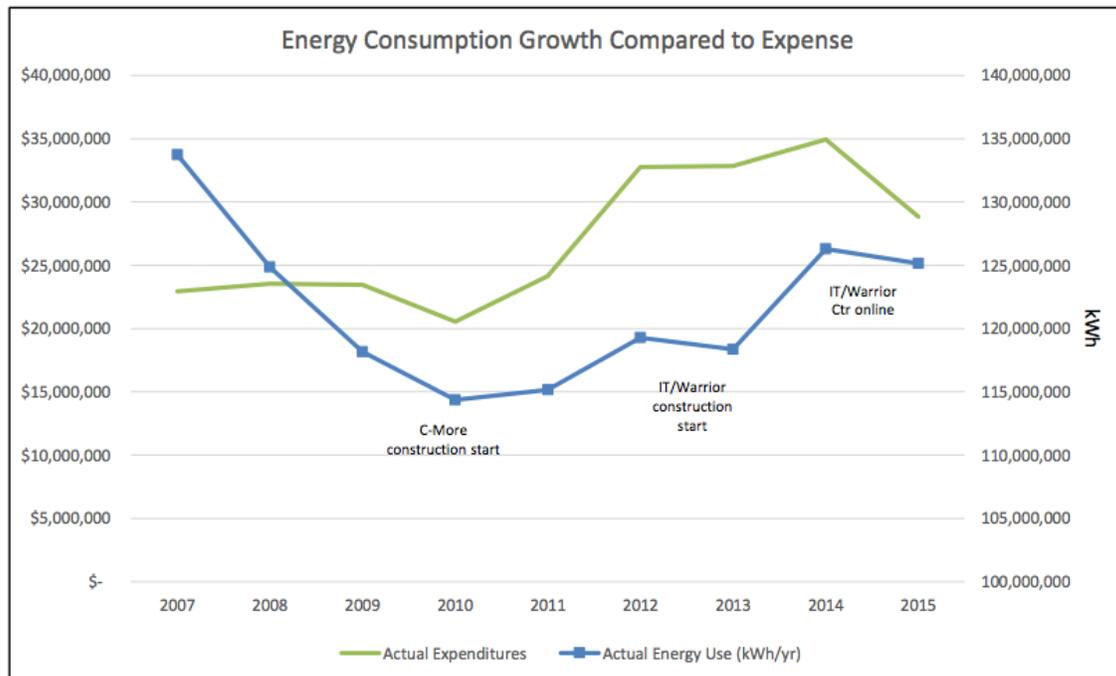


Figure 2: Energy Use vs Energy Expenditures

A number of upgrades to HVAC systems across 9 buildings at UH Mānoa campus were completed in FY 2014-15 and has contributed to the approximate 1% reduction of overall energy use from the year prior.

Currently the campus is connected to the Hawaiian Electric grid via just two substations. Electrical sub-meters are currently being installed at the building-level across the campus so that campus energy use can be tracked & reported in higher resolution and can be managed with more precision going forward:

Renewable Energy:

Seven (7) Solar PV systems⁵ are operational at UH Mānoa with a total generation capacity of 339KW, or approximately 505,286 kWh per year.

⁵ Includes: **Shidler** (5.1 kW, interconnected 10/30/14); **Gartley Hall / School of Architecture** (45 kW, interconnected 05/20/14); **Campus Center** (33 kW, interconnected 12/13/13); **Holmes Hall** (8.5 kW, interconnected 08/09/13); **Pacific Biomedical Research Center** (36.2 kW, interconnected 08/07/12); **Sinclair Library** (31.5 kW, interconnected 04/11/12); and **East West Center** (180 kW, interconnected 11/23/11).

B. UH HILO:

UHH NET-ZERO DASHBOARD BASELINE FY2014-15		kWh
Total Energy Consumed	14,276,015	
Total Renewable Energy Provided	107,098	

Baseline Consumption:

The electricity consumed at the UH Hilo campus during FY 2014-15 was 14,276,015 kWh.⁶

Energy Efficiency:

UH Hilo was able to complete a number of energy efficiency projects in FY 2014-15, including upgrades to air conditioning and electrical sub-metering that saved the campus (46,737) kWh⁷. A number of additional energy-saving projects are under way, including upgrades to lighting, HVAC systems, air conditioning, and chillers.

Renewable Energy:

Existing Solar PV systems at 6 buildings across the UH Hilo campus have a total aggregate PV system generating capacity of 568 kw. In FY 2014-15 the campus PV systems generated 107,098 kWh.

HELCO required a Standard Interconnection Agreement (SIA) to cover UH Hilo's total aggregate PV system, which exceeded the 100 kw threshold limit for a Net Energy Metering Agreement (NEMA). Under an SIA, UH Hilo must consume all the electricity generated from its PV system, and unlike the NEMA, the export of surplus energy to the grid is not allowed nor compensated for under an SIA.

Accordingly, the campus is pursuing alternative renewable energy options that do not rely on exporting power back to the utility grid or require costly off-grid energy storage.

⁶ Includes *SH Hilo Business Office, SH UHH – Hilo, UHH Business Office, and University of Hawai'i at Hilo*. Information obtained from HEI billing data.

⁷ Estimated kWh savings data provided by Hawai'i Energy based on rebate incentives paid FY 2014-15.

C. UH WEST O'AHU

UHWO NET-ZERO DASHBOARD BASELINE FY2014-15	
	kWh
Total Energy Consumed	3,271,305
Total Renewable Energy Provided	0

Baseline:

The electricity consumed at the UH West O'ahu campus during FY 2014-15 was 3,271,305 kWh.

Energy Efficiency:

The recently opened UH West O'ahu campus was constructed to meet LEED Gold building design standards, and is outfitted with many high-efficiency features. The campus has a new Planning & Operations management team in place, and is working on a number of energy efficiency projects under way to further improve energy performance, including aggressive building scheduling, optimizing building controls and HVAC systems, LED lighting upgrades, and more.

Renewable Energy:

A small stand-alone ground mounted solar photovoltaic system for five (5) buildings, each with a rated capacity of 100kW is currently under way and awaiting building permits. 3/5 buildings have received their interconnect approvals from Hawaiian Electric Company, and target completion date of the project is by end of calendar year 2016. It is anticipated that this PV system will generate an estimated 148,920 kWh per year.

An initial feasibility study of UH West O'ahu mauka lands has determined that it is technically feasible to develop a utility scale PV installation of 99MW, which would produce more than 80% of the O'ahu campuses' current energy consumption. A working group has been assembled consisting of experts from HNEI and Hawaiian Electric to examine grid capacity and social impacts so that financial and legal strategies can be developed. Legislative support will be necessary to create the appropriate regulatory structure for such a project to be implemented.

D. UH COMMUNITY COLLEGES

UHCC NET-ZERO DASHBOARD BASELINE FY2014-15	
	kWh
Total Energy Consumed	23,758,077
Total Renewable Energy Provided	2,416,455

Baseline Consumption:

The electricity consumed at the UH Community College campuses during FY 2014-15 was 23,758,077 kWh.

Energy Efficiency:

(2,144,159) kWh were avoided in FY 2014-15 at the UH Community College campuses during FY 2014-15⁸.

More than 19 different types of Energy Conservation Measures (ECMs) have been implemented across four community college campuses⁹ during the installation phase of the Johnson Controls and Opterra performance contract over the last three years (since FY 2012-13).¹⁰

Renewable Energy:

An estimated 2,417,455 kWh was generated by the following renewable energy systems deployed across the campuses:

SOLAR PV	kWh
OCCRE solar agreement (HonCC, KapCC, LCC)	1,479,704
HonCC PV Shade Structure	6,469
UHMC PV	835,295
CCs Solar Hot Water Heating*	95,987
TOTAL	2,417,455

*Converted from therms

⁸ Does not include UH Maui College.

⁹ Includes Honolulu CC, Kapi'olani CC, Leeward CC, Windward CC, and Kauai CC.

¹⁰ Refer to 'Energy Savings Performance Contracting Year 3 M&V Report for the University of Hawai'i Community Colleges District, by Joe Caldwell, ESPE, Johnson Controls Inc. Oct 8th, 2015' for a detailed summary of Energy Conservation Measures implemented in FY 2015 for Honolulu CC, Kapi'olani CC, Leeward CC, and Windward CC.

II. Plans and recommendations to advance the net-zero energy goal

ACTIVITIES:

- Establish baseline energy usage
- Track energy efficiency conservation measures
- Track renewable energy provided
- Compile existing data, reports, and documentation of previous strategic energy management efforts
- Develop accounting infrastructure to track, harness and reinvest savings from energy efficiency investments

CAPACITY BUILDING:

The university is hiring key staffing positions to support Strategic Energy Management. This team will be responsible for providing managerial and technical oversight for the Net Zero Energy goals of the university. The team collaborates with Hawai'i Energy, Hawaiian Electric, HNEI and other internal & external stakeholders across the State to identify and prioritize areas for institutional sustainability efforts; plan and implement long –and short range energy efficiency & renewable energy programs; and engage with institutional leaders to foster sustainability broadly across campus units.

Technical:

Electrical Metering and Energy Information Management Systems are being implemented across the campuses so that energy can be managed more precisely to reduce overall consumption and energy costs. Various renewable energy projects are under way across the campuses to increase the university's ability to provide energy from renewable sources.

Fiscal:

Mechanisms to track, harness and reinvest operational savings realized from energy efficiency projects are currently being piloted. Savings can be reinvested into additional energy efficiency and renewable projects to further reduce operating costs and ensure long-term economic viability of energy management and sustainability efforts across all ten campuses. Funding strategies for institutional strategic energy management (including renewable energy development) are under development for deployment at large-scale.

LEGISLATIVE OUTLOOK

1. Establish a special fund to collect and expend revenues that will reduce energy consumption and operating costs towards achieving the University of Hawai'i's net-zero energy goal.

Green Revolving Funds are an innovative and proven mechanism for universities and other large institutions to reduce operating costs and environmental impact while promoting education and engaging stakeholders.

A Green Revolving Fund is an internal fund that provides a direct source of capital to all ten University of Hawai'i campuses to implement energy efficiency, renewable energy, and other sustainability projects that generate cost savings. These savings are tracked and used to replenish the fund for the next round of green investments, thus establishing a sustainable funding cycle while reducing operating costs and environmental impact.

Establishing a Green Revolving Fund (GRF) will support the university to track & reinvest savings realized from energy efficiency and renewable energy projects into additional cost-saving measures that reduce energy consumption and strengthen Net-Zero Planning Efforts.

2. Work with the State Legislature, Public Utilities Commission and Hawaiian Electric to determine appropriate regulatory structure necessary to support UHWO mauka lands utility scale PV project development.

An initial feasibility study of UHWO mauka lands has determined that it is technically feasible to develop a utility scale PV installation of 99MW, which would produce more than 80% of the Oahu campuses' current energy consumption.

A working group has been assembled consisting of experts from HNEI and Hawaiian Electric to examine grid capacity and social impacts so that financial and legal strategies can be developed. Legislative support may be necessary to create the appropriate regulatory structure for such a project to be implemented.
