DAVID Y. IGE
GOVERNOR

WESLEY K. MACHIDA
DIRECTOR

LAUREL A. JOHNSTON
DEPUTY DIRECTOR

EMPLOYEES' RETIREMENT SYSTEM
HAWAII EMPLOYER-UNION HEALTH BENEFITS TRUST FUND
OFFICE OF THE PUBLIC DEFENDER

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
P.O. BOX 150
HONOLULU, HAWAII 96810-0150

ADMINISTRATIVE AND RESEARCH OFFICE
BUDGET, PROGRAM PLANNING AND
MANAGEMENT DIVISION
FINANCIAL ADMINISTRATION DIVISION
OFFICE OF FEDERAL AWARDS MANAGEMENT (OFAM)

WRITTEN ONLY

TESTIMONY BY WESLEY K. MACHIDA
DIRECTOR, DEPARTMENT OF BUDGET AND FINANCE
TO THE HOUSE COMMITTEES ON ENERGY & ENVIRONMENTAL PROTECTION
AND ON WATER & LAND
ON
HOUSE BILL NO. 635

February 16, 2017

11:00 A.M.

Room 325

RELATING TO THE ISSUANCE OF SPECIAL PURPOSE REVENUE BONDS FOR THE NUUANU HYDROELECTRICITY PROJECT

House Bill No. 635 authorizes the issuance of Special Purpose Revenue Bonds (SPRB) up to $6,400,000 to assist the Honolulu Board of Water Supply and the Hawaiian Electric Company, Inc. to upgrade Nuuanu Reservoir #4 to meet State Dam Safety Standards, as a component of the Nuuanu Hydroelectricity Project pursuant to Part VI, Chapter 39A, Hawaii Revised Statutes.

The Department is providing comments only to advise the Legislature and prospective SPRB parties that should the legislation be approved, approval of the SPRB issuance and conduit loan will require further review of the financing proposal to ensure compliance with all federal, state and credit underwriting requirements. For additional information, please consult our FAQ located at the following link:

http://budget.hawaii.gov/wp-content/uploads/2012/11/SPRB-FAQ.pdf.

Thank you for your consideration of our comments.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFERY T. PEARSON, P.E.
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

Testimony of
SUZANNE D. CASE
Chairperson

Before the House Committees on
ENERGY & ENVIRONMENTAL PROTECTION
and
WATER & LAND

Thursday, February 16, 2017
11:00 A.M.
State Capitol, Conference Room 325

In consideration of
HOUSE BILL 635
RELATING TO THE ISSUANCE OF SPECIAL PURPOSE REVENUE BONDS FOR NU‘UANU HYDROELECTRICITY PROJECT

House Bill 635 proposes to authorize the issuance of special purpose revenue bonds to the Board of Water Supply and the Hawaiian Electric Company, Inc. to upgrade Nu‘uanu Reservoir #4 to meet State Dam Safety Standards, as a component of the Nu‘uanu Hydroelectricity Project. **The Department of Land and Natural Resources (Department) supports this measure as it could assist the dam and reservoir owner by providing an economic means to bring their facilities up to current safety standards, enhance groundwater recharge in the upper Nu‘uanu watershed, and aid the State in developing renewable energy projects.**

Nu‘uanu Reservoir #4 is the largest of four reservoirs developed for potable water supply in the early 1900s and was the primary water source of a hydroelectric system that generated electricity in Honolulu prior to the 1930s. The Nu‘uanu Reservoir #4 is a regulated dam under the Department’s Dam and Reservoir Safety Program as it has a height of 66 feet and maximum storage capacity of over 1170 million gallons of water. Although a significant amount of improvements has been invested in the facility, the dam is still considered to be in poor condition due to deficiencies in the outlet works and uncertainties regarding the embankment. Due to its location upstream of the Nu‘uanu residential area and downtown Honolulu, it is classified as a High Hazard Potential Dam.

Thank you for the opportunity to comment on this measure.

TESTIMONY OF
THE DEPARTMENT OF THE ATTORNEY GENERAL
TWENTY-NINTH LEGISLATURE, 2017

ON THE FOLLOWING MEASURE:
H.B. NO. 635, RELATING TO THE ISSUANCE OF SPECIAL PURPOSE REVENUE BONDS FOR THE NUUANU HYDROELECTRICITY PROJECT.

BEFORE THE:
HOUSE COMMITTEES ON ENERGY AND ENVIRONMENTAL PROTECTION AND ON WATER & LAND

DATE: Thursday, February 16, 2017 **TIME:** 11:00 a.m.

LOCATION: State Capitol, Room 325

TESTIFIER(S): Douglas S. Chin, Attorney General, or
Randall S. Nishiyama, Deputy Attorney General

Chairs Lee and Yamane and Members of the Committees:

The Department of the Attorney General provides the following comments regarding this bill.

This bill authorizes pursuant to part VI, chapter 39A, Hawaii Revised Statutes, the issuance of $6,400,000 in special purpose revenue bonds ("'SPRBs") to assist the Honolulu Board of Water Supply, a municipal water utility, and Hawaiian Electric Company, Inc., an electric utility, "to upgrade Nuuanu reservoir #4 to meet state dam safety standards as part of the Nuuanu hydroelectricity project." According to the bill, the Nuuanu hydroelectricity project is intended to generate hydroelectric energy and provide off-peak energy storage, and also to "supplement usable groundwater supplies through the increase of groundwater recharge of captured stormwater."

We have the following comments regarding this bill:

While this bill states that the SPRBs will benefit the Honolulu Board of Water Supply and Hawaiian Electric Company, it is not clear who the borrower will be. We recommend that the wording of the bill specify whether it is both of these parties or just the Hawaiian Electric Company.

It is not clear whether the project is an electric utility or a water project or both. More information is needed to clarify this matter and to further describe what is being financed.

We will be happy to work with the Committees regarding our concerns.

Thank you for the opportunity to testify on this matter.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

February 16, 2017

The Honorable Chris Lee, Chair
and Members
Committee on Energy & Environmental Protection
House of Representatives
Hawaii State Capitol, Room 436
Honolulu, Hawaii 96813

The Honorable Ryan I. Yamane, Chair
and Members
Committee on Water & Land
House of Representatives
Hawaii State Capitol, Room 420
Honolulu, Hawaii 96813

Dear Chair Lee, Chair Yamane, and Members:

Subject: House Bill 635, Relating to the Issuance of Special Purpose Revenue Bonds for the Nuuanu Hydroelectricity Project

We strongly support House Bill 635, which authorizes the issuance of special purpose revenue bonds to upgrade the Nuuanu Reservoir No. 4 to meet State dam safety standards, provide adequate flood control for Nuuanu Stream and become an essential part of a proposed Nuuanu hydroelectric and managed aquifer recharge project.

The proposed Nuuanu hydroelectric project will drop captured storm water from Nuuanu Reservoir No. 4 to Nuuanu Reservoir No. 1 to generate renewable hydroelectric energy to help meet peak energy demands and recharge the groundwater aquifer supplying the Board of Water Supply's Kalihi Pump Station, an important drinking water source as a climate change adaptation measure.

This project will help Hawaii meet its renewable energy and water sustainability goals while increasing dam safety and flood control at Nuuanu Reservoir No. 4. We attach a project factsheet for your information.

Thank you for your consideration of our supporting testimony on House Bill 635.

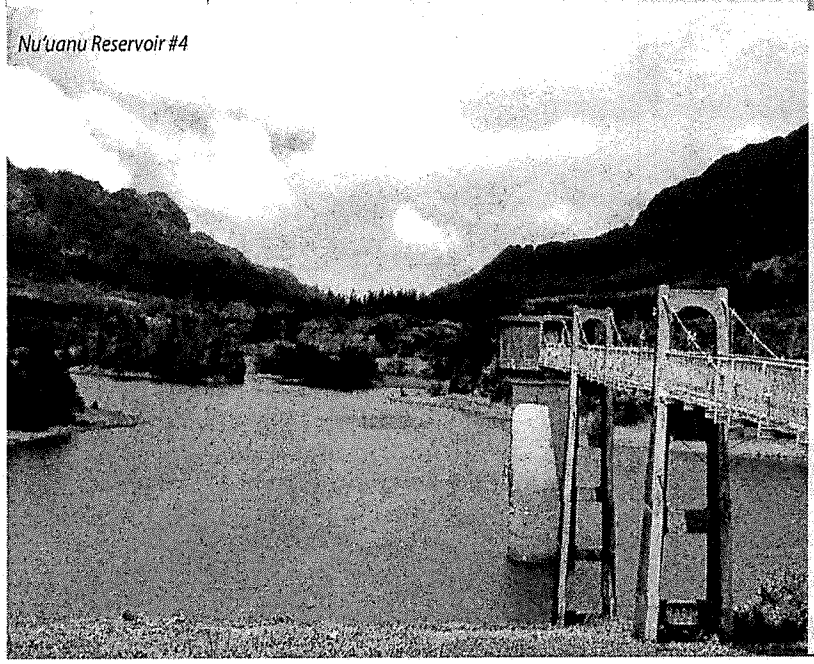
Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Attachment

Project Description

Nu'uanu Managed Aquifer Recharge and Pumped Storage Hydroelectricity Project



Nu'uanu Reservoir #4

SUMMARY OF BENEFITS

The Board of Water Supply has identified a project connecting existing reservoirs in the Nu'uanu Valley to ◔ generate renewable hydroelectric energy, ◔ provide energy storage to help meet peak energy demands using off-peak solar or wind supplies, and ◔ supplement usable groundwater supplies for drinking water purposes through the increase of groundwater recharge of captured stormwater.

This project will help Hawaii meet its renewable energy and water sustainability goals while increasing dam safety and flood control at two Nu'uanu reservoirs.

COST AND SCHEDULE

The two alternatives have a total cost ranging from **$28 to $51 million dollars.** Project work on dam improvements for Reservoir No. 4 could begin immediately. Startup of the hydropower facilities would occur by year 2025.

Introduction

Groundwater resources on O'ahu provide 100% of the drinking water that the Board of Water Supply (BWS) provides to its 1 million customers. University of Hawaii studies of climate change impacts indicate that groundwater availability will be adversely affected by decreased rainfall and increased temperatures. Consequently, there is a clear need for projects that enhance the island's irreplaceable groundwater resource.

Two alternative projects that enhance groundwater recharge and sustainability are being considered by the BWS. Both projects demonstrate the productive collaboration between the BWS and Hawaiian Electric that could increase the island's groundwater supply while also advancing the state's renewable energy goals.

Both projects capitalize on the use of two existing BWS stormwater reservoirs in the Nu'uanu Valley—Reservoir #1 which was constructed in 1889 and Reservoir #4 which was completed in 1910. The 600-ft elevation difference between the two reservoirs provides the opportunity to generate renewable power when water is moved downhill. By injecting some of this water into the underlying Kalihi groundwater aquifer, which is used by the BWS for water supply, beneficial use of this water resource becomes possible. Due to its location, the stormwater in Reservoir #4 is not available for eventual water supply use and eventually flows unused to the ocean.

Project Setting

Nu'uanu Reservoir #4 and Nu'uanu Reservoir #1 are located approximately two miles apart in the Nu'uanu Valley above the City of Honolulu (see Figure 1). Historically, the Nu'uanu reservoirs were connected as part of a hydroelectric project. The powerhouse at Nu'uanu #1 was commissioned by Princess Ka'iulani on March 23, 1888 to light the electric street lamps in downtown Honolulu. The remains of the pipeline and powerhouse are still visible within the forest near Reservoir #1 along Pali Highway.

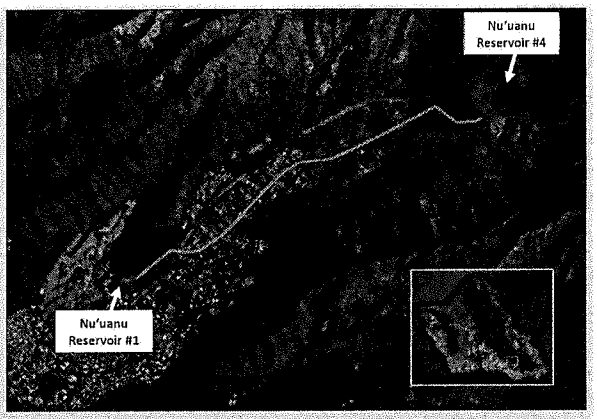


Figure 1. Potential pipeline alignment for the Nu'uanu Managed Aquifer Recharge and Pumped Storage Hydroelectric Projects

Project Alternative No. 1 is the **Nu'uanu Managed Aquifer Recharge Hydrolectric Project.** Stormwater captured in Reservoir #4 would be piped through a new 12-inch pipeline in Old Pali Road, through a new hydroelectric facility located adjacent to Reservoir #1. Other facilities would include a sediment filter for pre-treatment which would be located near Nu'uanu Reservoir #2 approximately halfway along the pipeline alignment. A set of injection wells would be located near Reservoir #1 to recharge the groundwater aquifer with the outflow of the hydroelectric plant (See Figure 2 for schematic).

Project Alternative No. 2 is the **Nu'uanu Pumped Storage Hydroelectric Project**. This project is similar to Alternative No. 1 but adds the capability of pumped-storage hydroelectricity, a type of energy storage used by electric power systems for load balancing. Energy from intermittent and/or off peak sources such as wind or solar is stored in the form of gravitational potential energy of water, pumped from a lower elevation reservoir (Reservoir #1) to a higher elevation (Reservoir #4) using low-cost, off-peak electric power. During periods of high electrical demand (typically 5 to 9 p.m. on O'ahu), the stored water is released through turbines to produce electric power. This project would require a significantly larger (30-inch) pipeline to allow 10 million gallons of water to flow to Reservoir #1 during the peak electrical demand period which increases project cost. (See Figure 3 for schematic).

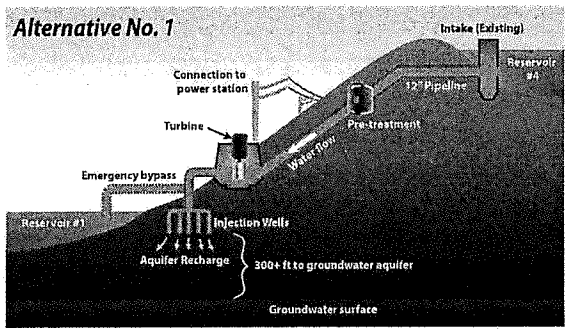


Figure 2. Schematic of Nu'uanu Managed Aquifer Recharge Hydroelectric Project

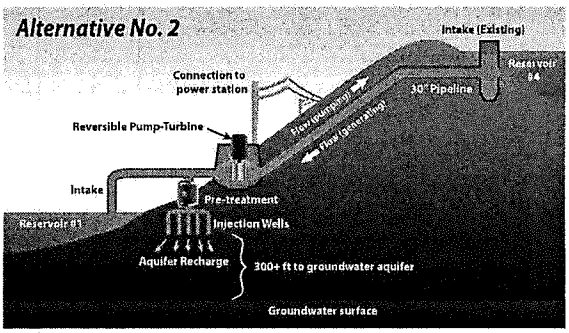


Figure 3. Schematic of Nu'uanu Managed Aquifer Recharge and Pumped Storage Hydroelectric Project

Pre-treated water injected into the ground near Reservoir #1 benefits from natural treatment within the soils. This water will travel 5 to 10 years before it reaches the existing BWS supply wells in Kalihi.

Table 1. Comparison of Features of the Nu'uanu Managed Aquifer Recharge and Pumped Storage Hydroelectric Projects

	Water Supply Benefit	Renewable Power Capacity and Hours	Energy Storage
Alternative 1: Managed Aquifer Recharge Hydroelectric Project	1 – 2 mgd	0.14 MW running 24 hrs/day	No
Alternative 2: Pumped Storage Hydroelectric Project	1 – 2 mgd	4 MW typically 5 p.m. to 9 p.m.	Yes

In addition to the pipeline, power production and groundwater injection facilities, both reservoirs include safety upgrades mandated by State Dam Safety standards.

Table 2. Comparison of Capital Costs for the Two Alternative Projects

Project Component	Alternative No. 1	Alternative No. 2
Upgrade Nu'uanu Reservoir #4 to meet State Dam Safety Standards	$6.4	$6.4
Upgrade Nu'uanu Reservoir #1 to meet State Dam Safety Standards	$4.8	$4.8
Design, permit and construct Managed Aquifer Recharge Hydroelectric Project	$12.0	–
Design, permit and construct Pumped Storage Hydroelectric Project	–	$31.0
Contingency @ 20%	$4.6	$8.4
Total ($M)	**$27.8**	**$50.6**

The above costs (in millions of dollars) are inclusive of planning, permitting, design, construction, inspection, startup and a 20% planning level contingency. Financing costs are not included.

Project Benefits

The benefits of a Managed Aquifer Recharge and Pumped Storage Hydroelectricity Project in Nu'uanu Valley include:

- Increased useable water supply through recharge of captured stormwater that increases the sustainability of groundwater supply and could delay the need for future supply development.
- Development of a source of renewable energy supply during peak energy use periods.
- Increased dam safety and flood control.
- Creation of energy storage (Alternative No. 2 only) that could be used to "time-shift" surplus energy production during off-peak hours to meet peak hour demands, reducing the load on existing fossil-fuel based peaking supplies.

Project Timetable

The preliminary timetable for the Managed Aquifer Recharge and Pump Storage Hydroelectricity Project will include planning (preliminary design, environmental assessment, and permitting) in FY18to FY20, design in FY21/22, and construction from FY23 to FY26. Upgrades to Nu'uanu Reservoir #4 will be constructed in FY18 and Nu'uanu Reservoir #1 will be designed in FY19/20 and constructed in FY20/21.

	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
Nu'uanu Managed Aquifer Recharge and Pump Storage Hydroelectricity Project										
Nu'uanu Reservoir #4 Upgrades										
Nu'uanu Reservoir #4 Upgrades										

Planning Design Construction

Figure 4. Estimated Timeline of Nu'uanu Managed Aquifer Recharge and Pump Storage Hydroelectricity Project

Summary

Implementation of this opportunity would allow the BWS to develop a project that increases the island's groundwater supply, advances the state's renewable energy goal, and ultimately helps keep water rates affordable for BWS customers.

Email: communications@ulupono.com

HOUSE COMMITTEES ON ENERGY & ENVIRONMENTAL PROTECTION AND WATER & LAND
Thursday, February 16, 2017 — 11:00 a.m. — Room 325

Ulupono Initiative Strongly Supports HB 635, Relating to the Issuance of Special Purpose Revenue Bonds for the Nuuanu Hydroelectricity Project

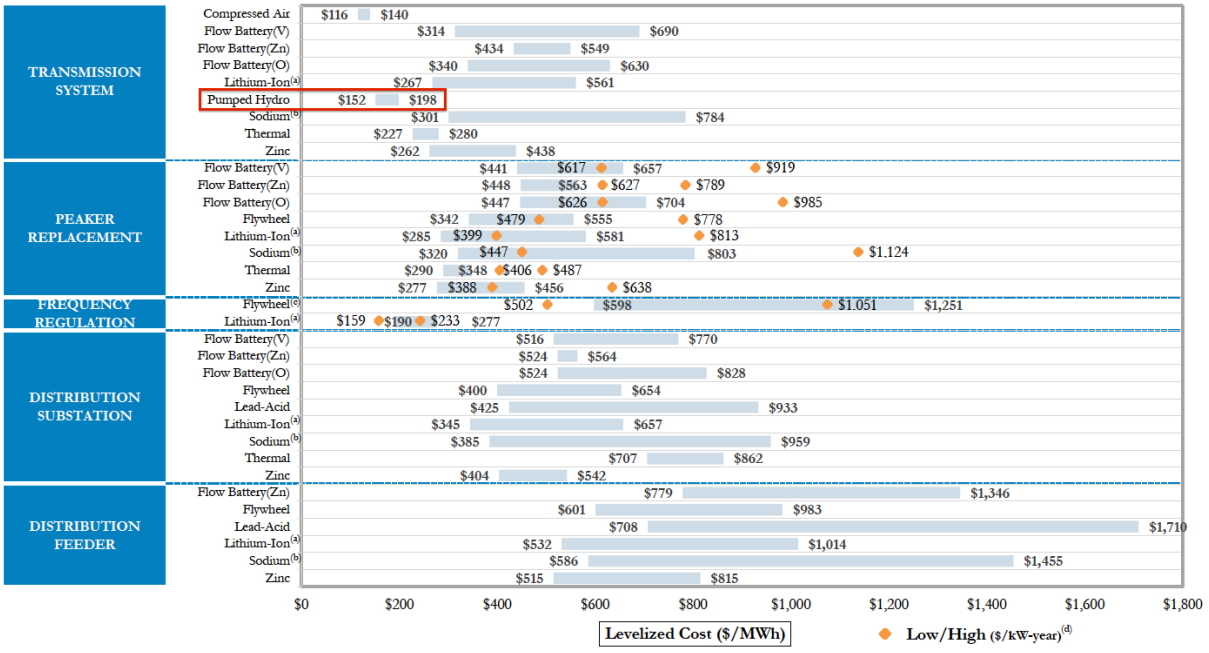
Dear Chair Lee, Vice Chair Lowen, Chair Yamane, Vice Chair Kong, and Members of the Committees:

My name is Murray Clay and I am Managing Partner of the Ulupono Initiative, a Hawai'i-based impact investment firm that strives to improve the quality of life for the people of Hawai'i by working toward solutions that create more locally produced food; increase affordable, clean, renewable energy; and reduce waste. Ulupono believes that self-sufficiency is essential to our future prosperity and will help shape a future where economic progress and mission-focused impact can work hand in hand.

Ulupono strongly supports HB 634, which authorizes special purpose revenue bonds for upgrading Nuuanu Reservoir #4 for a hydroelectric project, because it aligns with our goal of increasing the production of clean, renewable energy in Hawai'i.

Pumped storage hydro is one of the cheapest forms of energy storage currently available. The chart below indicates the price ranges for different types of energy storage.

Unsubsidized Levelized Cost of Storage Comparison



Source: Lazard and Enovation Partners estimates.

Note: Flow Battery(V) represents Vanadium Flow Batteries; Flow Battery(Zn) represents Zinc-Bromine Flow Batteries; Flow Battery(O) represents Other Flow Batteries. Lazard's LCOS v1.0 study did not separately analyze each of these distinct technologies within Flow Battery.

(a) Lithium-Ion-Power technology used in the Frequency Regulation and Microgrid Use Cases due to low duration/high power requirements. Lithium-Ion-Energy systems are used in all other Use Cases that include Lithium-Ion technology.

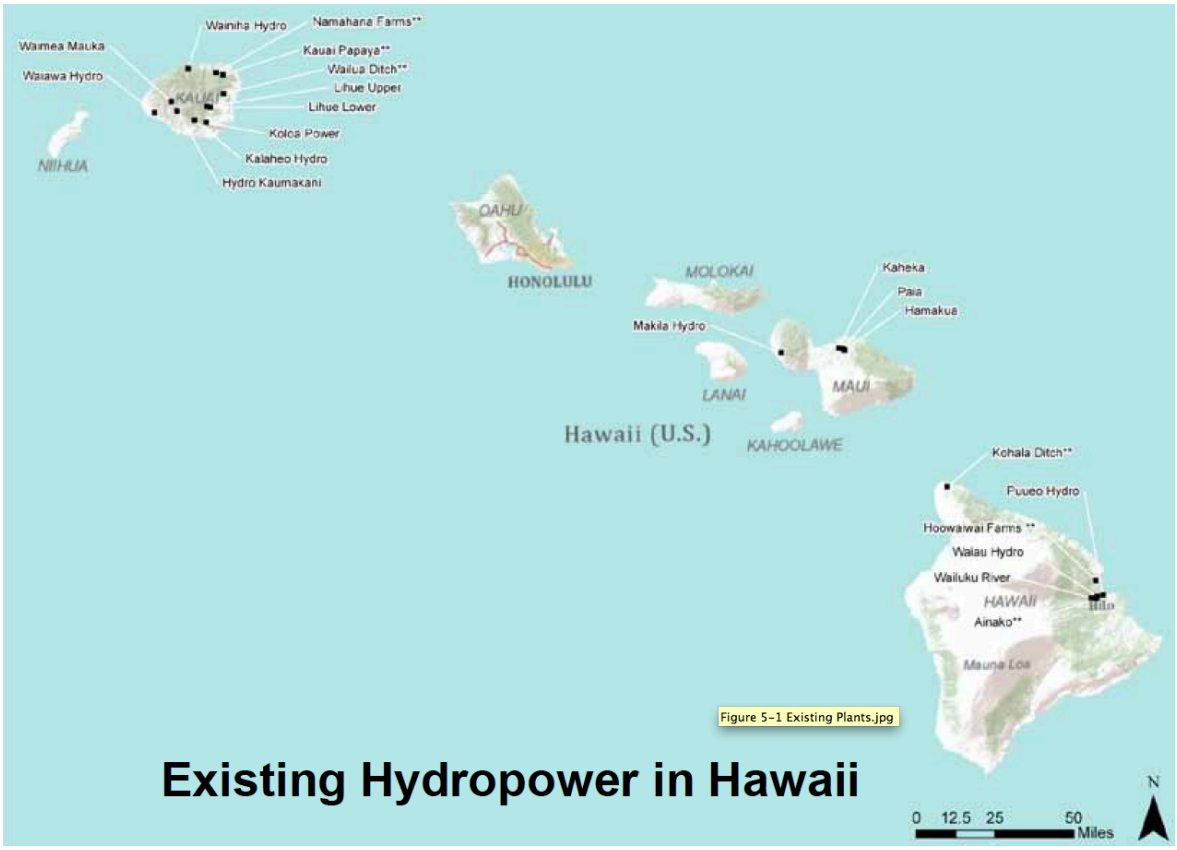
(b) Sodium-Low Temperature systems are used in Commercial Appliance and Residential Use Cases. Sodium-High Temperature systems are used in all other Use Cases that utilize Sodium technology.

(c) Flywheel storage in the Frequency Regulation Use Case represents short-duration storage. Flywheel storage in all other Use Cases represents long-duration storage.

(d) Reflects conversion of LCOS figure ($/MWh) by multiplying by total annual energy throughput (MWh) and dividing by capacity (kW).

With high intermittent renewable energy production, Hawai‘i requires more energy storage to increase its use of additional renewable energy sources. Yet, there are few locations, particularly on O‘ahu where power demand is highest amongst all Hawai‘i counties, that a pumped storage hydro project makes topographic and economic sense. Nuuanu reservoirs provide an opportunity to develop a needed energy project using reservoir infrastructure that exists.

Currently, hydroelectric projects exist in all of Hawai‘i’s counties except Honolulu. Hydroelectric power production is highest on Kauai where it provides 7.5 percent of the island’s electricity.



The combined statewide hydroelectric plants have a total generating capacity of about 37 megawatts, which is approximately equal to the generating capacity of a 70 megawatt solar farm. Hydroelectric plants also replace 250,000 barrels of oil equivalent. Hydroelectric plants statewide would represent 1.67 percent of O'ahu's 2016 generating capacity and roughly 0.49 percent of the state's primary energy production.

As Hawai'i's energy issues become more complex and challenging, we appreciate this committee's efforts to look at policies that support renewable energy production.

Thank you for this opportunity to testify.

Respectfully,

Murray Clay
Managing Partner

LATE

February 16, 2017

Testimony support for water conservation regarding bill numbers:
HB 634 and HB 635

Rachel Sherman
425 Ena Rd. #1107B
Honolulu, HI 96815
shermanrms@msn.com

Aloha,

As an engaged citizen of Hawai`i and graduate student in the sustainability discipline, I am writing in support of bill numbers: HB 634 and HB 635 - Water Conservation Device Rebate.

These bills will support the conservation of Hawai`i's fresh water resource. As reported by the Hawaii community Foundation's *Freshwater Blueprint for Action*, fresh water security on Oahu is forecasted to become compromised due to decreased annual rainfall and increased usage due to population growth.

These bills will also support the economy through decreasing utility costs to citizens and the community.

Passing these bills demonstrate support of our legislature's sustainability goals to protect our watersheds and the economic interests of our citizens.

Sincerely,

Rachel Sherman