DEPT. COMM. NO. 361

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March 14, 2018

The Honorable Ronald D. Kouchi,
President and Members
of the Senate
Twenty-Ninth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki,
Speaker and Members of the
House of Representatives
Twenty-Ninth State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kouchi, Speaker Saiki, and Members of the Legislature:

For your information and consideration, I am transmitting a copy of the Natural Energy Laboratory of Hawaii Authority Fiscal Year 2017 Annual Report. In accordance with Section 93-16, Hawaii Revised Statutes, I am also informing you that the report may be viewed electronically at: http://dbedt.hawaii.gov/overview/annual-reports-reports-to-the-legislature/.

Sincerely,

Mary Alice Evans

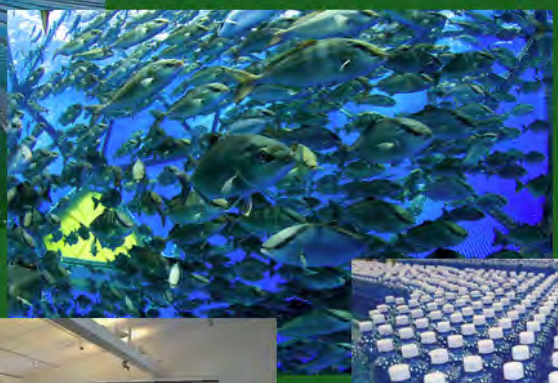
for Luis P. Salaveria

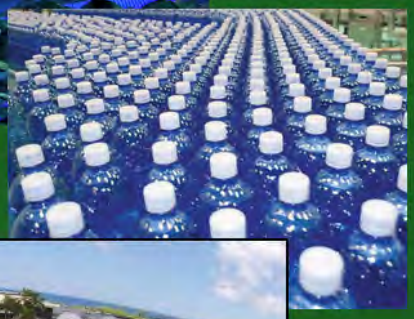
Enclosure

c: Legislative Reference Bureau

2017
Annual
Report

NATURAL ENERGY LABORATORY of HAWAII AUTHORITY





MISSION STATEMENT

"To develop and diversify Hawaii's economy by providing resources and facilities for energy and ocean related research, education, and commercial activities in an environmentally sound and culturally sensitive manner."

www.nelha.org

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NELHA FY 2017 ANNUAL REPORT

Introduction

The Natural Energy Laboratory of Hawaii Authority (NELHA) is a master-permitted ocean science and technology park whose mission is to bring economic development and diversification to the State of Hawaii and specifically West Hawaii. HOST Park is comprised of 870 acres of at Keahole Point, Kailua-Kona, on the Island of Hawaii. NELHA was created to host and support research, development, pre-commercial and commercial enterprises that make use of the unique resources at the laboratory's site at Keahole Point, particularly the clean, cold, deep ocean water accessible near to the shore as well as high solar irradiation. Its assets include a unique complement of support facilities, infrastructure, pristine natural resources and leasable land for a wide range of business research, commercial and educational applications. The NELHA story now spans 43 years and is an example of public investments by visionary State leaders that have yielded multiple returns for the benefit of all.

The original ocean science and energy concept for HOST Park was developed in 1974 as a response to the national oil crisis. The Research Corporation of the University of Hawaii and the High Technology Development Corporation originally developed two sites in Kona separately. The two projects in Kona were combined with a geothermal test site in Puna in 1990 and placed in the newly formed NELHA.

As its name implies, NELHA was formed to operate and further develop the State's geothermal experimental project in Puna and ocean thermal energy conversion (OTEC) experiments and re-use of the seawater for other projects in Kona. Over time, as geothermal matured and became commercially viable and the federal governments interest in OTEC waned, due to lower oil prices, NELHA has de-emphasized its initial involvement in geothermal development and looked to other secondary uses for its ocean science facilities and expansive seawater system in Kona.

Today, other uses for the seawater system have included projects needing to take advantage of the sites other main resource: high solar insulation. This includes aquaculture, mainly as algae production for nutraceuticals and fish/seafood hatcheries, water desalination, clean energy research and development such as solar thermal energy production, algae growth for biofuels, and seawater air conditioning.

Defining NELHA – Who we are.

As a "first mover" into the economic development space of ocean science and advanced energy the State, Federal and County of Hawaii investment of $150M has appreciated considerably in value over the past 43 years. It is imperative that NELHA move towards taking advantage of this comparative advantage of the most extensive land based surface and deep seawater system in the world by focusing on maintaining the seawater system, providing the infrastructure to make development at Ocean Centerpiece possible and growing the existing microgrid by adding additional power generation and storage.

Chart 1 below illustrates three main sectors that are the current and long-term target focus areas for programs, projects, and businesses envisioned for HOST Park. The illustration generally follows the concepts and ideas presented in the NELHA 2012 Master Plan. While the master plan talked generally about growth in "applied technology" it was not sufficiently defined and too broad to be useful for implementation of the master plan. Accordingly, this illustration better defines the specific target areas for future growth.

The main areas of focus are ocean science, ocean energy and storage, and ocean cooling. The strong ocean science and energy orientation of HOST Park is due to unparalleled comparative advantage that exists in the extensive seawater system developed over the past 43 years. There is no other seawater system in the world that can compare to the one found at HOST Park. It is also interesting to note that, in general, the size of the circle corresponds with the time frame the projects will experience the most explosive rates of growth and development.

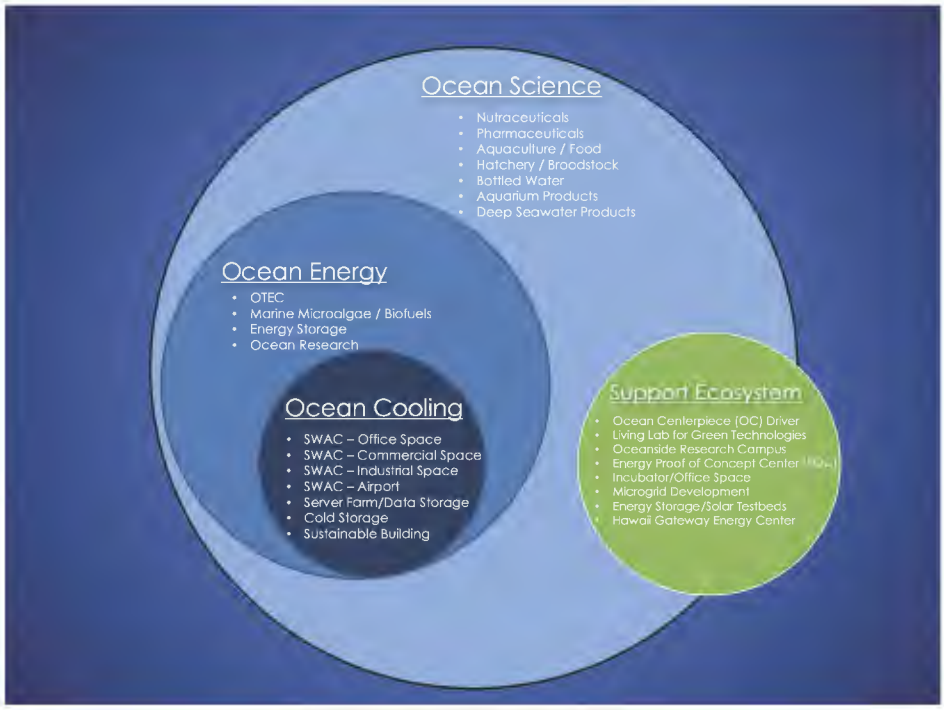
<u>Ocean Science</u>

The largest circle, ocean science, includes the entire array of projects and products found in HOST Park today. Many of these non-energy related uses were developed in the timeframe between 1990 and 2005 after the demand for OTEC waned. These projects currently make up a significant portion of the developed land at HOST Park. Growth in these types of companies is expected to continue, albeit at a slower rate. It is also important to note that one of the main ways to make a park with OTEC facilities, as the central element is to find other uses for the secondary use of the seawater. In this regard, these ocean science businesses will always play an important role at HOST Park.

New ocean science projects are continually evolving with recent interest in areas of potential high growth that include thermal aquaponics, hatcheries, and offshore activities such as habitats where traditional aquaculture would be impossible without the access to the unique seawater system. Given the availability of virtually unlimited cold and warm

seawater throughout HOST Park all of the aquaculture businesses (micro-algae, macro-algae, finfish and shellfish) are thriving.

Businesses at HOST Park are demonstrating new approaches to improve a sustainable seafood supply. Over the years, many businesses have continued to improve technologies, filtration and energy use to decrease overall system operating expenses and increase yields. In addition, we continue to see efforts by existing businesses and startups to expand the varieties grown in these environments and continue research into optimizing the growth of specific species to open new markets and increase distribution opportunities.



The existing business base (aquaculture, nutraceutical, advanced energy, and desalination) in ocean science also affords the opportunity to grow synergistic support service businesses. For example, the current plastic pre-form business recently located at Destiny Seawater for the desalinated water bottling businesses, aquaculture feed, aquaculture supply chain and distribution, CO2 generation, and pipe/tank manufacturing.

Ocean Energy

A community of like-minded entrepreneurs involved in ocean energy innovation can be created at HOST Park. Companies in this sector are beginning to emerge at HOST Park and/or will be targeted over the short-term for future growth.

HOST Park is unique in that there is a significantly high electric load (1.0 MW) consumed for pumping seawater and ancillary operations. In this regard, a focus on ocean energy, microgrid, and storage can more easily be developed jointly and part of a larger support ecosystem for all businesses in the park. Successful growth in this subset also has the very important benefit of lowering seawater-pumping costs for businesses in the park.

In terms of energy generation, national and international interest in OTEC research has seen resurgence in recent years due to rising oil prices and NELHA's seawater system is highly valued. Currently one R&D OTEC project (105kW) is underway and began production trials last year. NELHA continues seek a partner for a larger OTEC R&D test facility which would provide large amounts of both cold and warm seawater for other secondary uses. In addition, there has been at least one project focusing on the creation of biofuels from marine algae.

Worldwide energy storage space is potentially one of the areas in advanced energy development that will see considerable growth and technological advancement over the next ten years. Interest in this area is being driven due to the increasing number of the utility electrical circuits that have a high degree of penetration of renewable energy. There has been considerable interest in underwater compressed air storage at NELHA as well as other energy storage devices.

NELHA is well positioned as a future site for prototype and pre-commercial energy storage devices due to a combination of factors which include: unique infrastructure, high prices, strong policy framework and a high load demand for pumping seawater. Perhaps more importantly the development of a small microgrid at the park will allow entrepreneurs the opportunity to test pre-commercial storage devices in "real world" simulations connected to the demand side of the grid. The microgrid will provide additional energy efficiency information for the necessary validation of storage systems.

<u>Ocean Cooling</u>

Ocean Cooling, primarily seawater air conditioning (SWAC), is a unique subset of Ocean Energy in which HOST Park has a significant comparative advantage over many other sites around the world and the State. The primary cost of a SWAC system is the initial capital cost. The energy costs for pumping the seawater are a small fraction of the total cost. While relatively new from a commercial standpoint, it is a proven technology which is extremely cost effective and an attractive "green energy" investment. SWAC also has the important advantage of providing a solid uninterrupted constant supply of cool air (24/7) vis-à-vis using more intermittent renewable clean energy technologies such as wind and solar power.

A private firm in Honolulu is currently in the process of developing a 25,000-ton SWAC district cooling system for properties in downtown Honolulu. The cost for this system, using one 63" deep seawater intake, is estimated to be approximately $280 million.

It is to NELHA's advantage to find ways to capitalize its ability to provide low cost cooling, as for the most part; developers or businesses at HOST Park can already take advantage of SWAC. Virtually all of the capital costs have already been incurred. The pipeline system is based on one 55", one 40" and one 18" deep seawater intake pipelines. As such, the current deep seawater pipeline system at HOST Park already has the capacity to support a district SWAC cooling system significantly larger than the $280 million Honolulu system. The NELHA SWAC district would be on land controlled by NELHA. A majority of the additional cost would be for heat exchangers and connections to NELHA's seawater backbone that would most likely borne by developers or businesses.

It is also important to note that the current system has the capacity to include the airport and the University of Hawaii's new Palamanui Campus, which is across from the airport, into NELHA's SWAC district. The concept of using SWAC at the new proposed $36 million international terminal at Kona International Airport and Palamanui has been considered for many years. Selling deep seawater to the operators of their individual systems is another source of new revenue for NELHA.

While the original seawater air conditioning (SWAC) prototypes were originally developed at NELHA about 30 years ago, other than the NELHA buildings in the research campus, there is currently relatively little use of this technology at HOST Park today. It is anticipated that growth in this area will be significant when the infrastructure is in place to allow development of the Ocean Centerpiece driver (also referred to as the "economic driver" in the recent 2012 master plan).

The development of the Ocean Centerpiece has always been key to the long-term viability of the park. NELHA will need to seek a strategic partner to develop this 80A parcel of prime real estate in a manner that demonstrates strong revenue generation opportunities for both the developer and for NELHA. The key to successfully developing this parcel will be finding a strategic partner with a long-term vision, adequate financial resources, and a strong desire to complete a unique one-of-a-kind development entirely focused on sustainable living.

It is envisioned that this site will eventually become a world-renowned living laboratory and showpiece for green technologies that builds upon the natural assets at HOST Park such as deep-sea water, access to transportation, ocean research corridor and high solar insulation. In this regard, future development should emphasize the use of new and

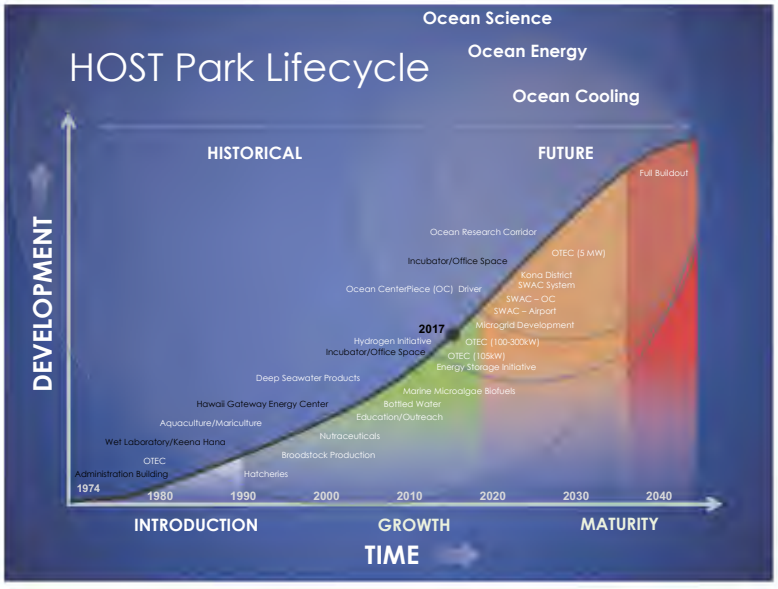
existing resources and clean technologies to reduce fossil fuel dependence, conserve potable water, green technologies that are environmentally friendly and provide community enhancement.

Development Lifecycle

In terms of looking forward to the next 30 years or so, it is important to review development of HOST Park from a historical perspective. Accordingly, following illustration shows the projects over the past 40 years and those focus areas and projects listed above from a product lifecycle perspective.

It is important to note that the illustration below is showing the Ocean Energy, as a subset of Ocean Science and likewise, Ocean Cooling is a subset of Ocean Energy. It can also be inferred from the illustration that all infrastructure is currently in place to begin focusing on Ocean Energy projects. However, additional infrastructure is necessary before significant growth can be realized in the Ocean Cooling subset.

With regard to the horizontal or time axis; the illustration below shows a 70-year development timeline. This is generally in line with the 2012 Master Plan. This timeline is fairly realistic in terms of past land absorption rates for development at HOST Park but could be accelerated if desired via policy decisions by the NELHA Board of Directors.



In terms of the vertical or development axis, the illustration represents a general combination of acres leased and revenue although the curve is only being shown for illustrative purposes. No data was assembled to draw the curve, however; there is general consensus by NELHA staff that the curve is a fairly accurate representation.

The products shown are generally placed at the beginning of when development began. Items in white lettering are products and those items in black letter are buildings constructed at HOST Park over the years.

Looking Forward

HOST Park can open the door for researchers to take their new ideas beyond research and demonstration to full commercialization, all at one location. HOST Park has also a unique combination of other natural resources, subtropical environment and community infrastructure that makes it a highly desirable location for new business enterprises. Accordingly, HOST Park is the premiere choice for the location of a variety of leading edge research, education, and commercial enterprises capitalizing on innovation in the combined use of seawater and high solar irradiation.

Proximity to an international airport, five minutes away, plays a vital role in helping the HOST Park clients get valuable products to the mainland as well as to Asian and other Pacific-rim markets fast. The prospects for the future are even greater with new and existing business expansions and recently completed facilities to support cutting edge R&D in renewable energy and ocean sciences. The vision for HOST Park has long been to serve as a demonstration site for many of the US National Energy Laboratories as well as many private sector companies.

NELHA As a State Agency - Current Services

As shown in the table below, NELHA provides many services, resources, and expertise to the 45 plus business clients in HOST Park.

SERVICES	RESOURCES	EXPERTISE
NELHA services are tailored to fit each business in HOST Park.	NELHA is uniquely suited as a test bed for clean energy and ocean science opportunities	NELHA provides a wide variety of support to business in HOST Park.
Research Campus: Located near the shoreline on Keahole Point the six-acre Research Campus consists of over 4,000 square feet of laboratory space, outdoor wet laboratory, conference rooms, restrooms and both covered and open industrial storage space.	**Site Conditions:** Planned master permitted subdivision includes a full range of infrastructure: access roads, potable water, underground telecommunication/electric lines, ocean water, intake and distribution pipes, pumping stations, disposal systems, and groundwater quality monitoring wells.	**Water Quality Laboratory:** The Lab is staffed with a professional chemist and provides a commitment to excellence combined with a wide array of analytical instruments to generate data of maximum quality. The lab has become a benchmark for environmental water quality analysis for ocean water.
Ocean Water Systems: NELHA is a seawater utility and is master-permitted to pump over 100,000 gallons per minute of pristine surface and deep ocean water within HOST Park.	**Ocean Environment:** The steep ocean bottom gradient makes possible the tapping of deep, cold waters at depths ranging from 50 to 3,000 feet. This ocean water is of significant purity and has a high nutrient content.	**Scientific and Cultural Support** is provided in the fields of biosecurity, ocean sciences and ocean energy applications. In addition, there are established cultural and business links to Asia and other Pacific countries.
Office Space: Several buildings within the Research Campus and the Hawaii Gateway Energy Center along Queen Kaahumanu Highway provide office space for businesses located in Host Park.	**High Solar Insulation:** In the lee of three major mountains, NELHA receives approximately 10 inches of rainfall annually and offers the highest solar insulation of any coastal site in the United States.	**Technical Support** is provided by engineers, electricians and mechanics. In addition, NELHA works closely with the Friends of NELHA to offer educational tours and information on clean energy projects.

From an agency lifecycle standpoint, NELHA is in transition and now entering a more mature phase. Much of the seawater infrastructure "backbone" has been completed with the distribution lines for the third deep seawater, potable water lines, underground electrical and telecommunication utilities, major roads and several buildings. In the 80s and 90s, much of the focus was on basic infrastructure development, environmental studies and build-out. The Federal government, State Legislature and Administration, and the County of Hawaii government have provided the policy and financial support the NELHA concept during this time with the investment of over $120 million.

Over the past 10 years self-sufficiency was the focus. Revenue growth and cost containment for operations were critical to achieving self-sufficiency. NELHA has successfully restructured its operations to become self-sufficient from an operating standpoint and looks forward to live up to its promise and expectation as an economic development engine.

This success has not happened on its own and NELHA acknowledges the strong support in the past that has helped it achieve success. The State administration, Legislature, small and large businesses, Hawaii residents and consumers and particularly NELHA's Board of Directors and excellent staff who have taken bold actions over the years to meet the demands and challenges of developing the world's premier ocean science and technology park

Economic Impact

According to The Economic Research Organization at the University of Hawaii (UHERO) the economic impact of HOST Park surged to $123 million in 2013 an increase of 40 percent over 2010. Total expenditures from the businesses at NELHA were $99 million dollars, of which about $72 million were paid to Hawaii entities in 2013.

On a broader level, using type II multipliers from the State's input-output model, UHERO estimated the total economic output to the greater Hawaii economy was $123 million dollars. That represents an increase of 40% between 2010 and 2013. State tax revenue generated by NELHA sales also grew to $5.0 million dollars in 2013. The analysis also found that not only do NELHA businesses employ hundreds of people but also that their expenditures contribute to the total of 617 jobs in the larger Hawaii economy in 2013.

The overall increase in the local (in-state) expenditures has led to the significant increase in the estimated impacts. The growth surge is a good indication which shows that the private sector still sees a lot of potential and is willing to invest in HOST Park.

Development

KEY FEATURES

- 65-year lease from State of Hawaii.
- Expires in 2066.
- 870 acres - Master Permitted.
- Outdoor demonstration site for marine science and advanced energy projects.
- World’s largest seawater delivery system.

NELHA's development of infrastructure and initiate programs to move from functioning as a landlord for an ocean science and technology park towards developing an environment or ecosystem where private sector businesses can grow and prosper. In this regard, we continued our priorities in FY 2017 on efforts to "tee-up" the Ocean Centerpiece" or economic driver area for eventual development and ensure that there are no long-term constraints.

These efforts included design and construction of access roads, electric utilities, additional potable water well development, detailed archeological survey and site visits to model developments around the nation. Funds were secured for all projects and funds were encumbered with contractors to begin construction and development in FY2017.

NELHA's leasing and marketing efforts also showed strong growth and strength in FY2017. NELHA's limited marketing efforts support the facility with television interviews, magazine articles, newspaper articles and press releases.

HIGHLIGHTS

Road Construction

- Received final approval from the County of Hawaii for all permits necessary to begin construction of Kahilihili Street and Kaiminani Drive extension between Queen Kaahumanu Drive and Kahilihili Street.
- Ground breaking for the road project was held in July and the project has been fast-tracked to complete as soon as possible to minimize disruption of access to Queen Kaahumanu Highway opening of the new southbound lanes opens in late 2017.
- At the end of FY2017 road construction was proceeding well and was ahead of schedule and under budget. It was anticipated to be completed in early September 2017 to coincide with the beginning of the new school year and changes to the traffic flows on the highway.

Potable Water

- NELHA executed a $2.5M contract in FY2016 with Water Resources International to complete the exploratory phase of a new water well which will provide for an additional 333,000 gallons per day of potable water. The notice to proceed has been issued and project is currently underway. Contractor is currently conducting field surveys to support the Environmental Assessment and Chapter 6E work. Project is delayed due to an access issue and steep terrain. NELHA was successful in negotiating and obtained a verbal commitment from the County of Hawaii to issue water credits for new projects at NELHA based upon our progress in securing a site, funding and selecting contractors to complete the work for a new well. This was a major achievement as the lack of potable water is no longer a constraint in continued development to new projects.

Ocean CenterPiece

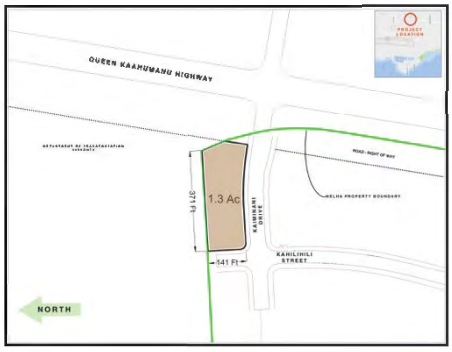
- NELHA identified several developments on the mainland that are similar is scope to the development envisioned for the Ocean CenterPiece development. Two science and technology parks were visited and NELHA staff spoke with developers. The sites were the Forrestal Development developed by Princeton University in New Jersey and the Sandia National Laboratory's science and technology park.

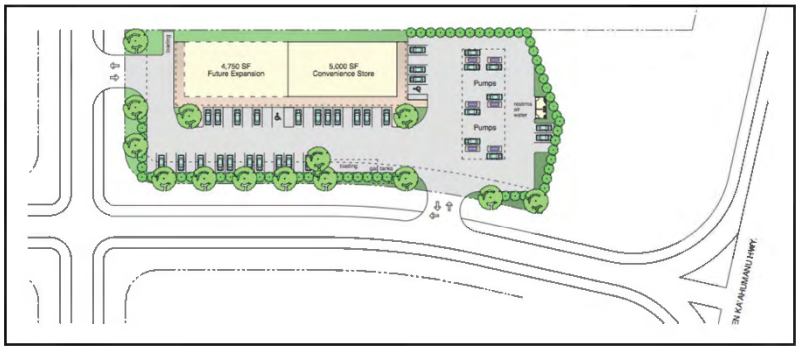
Leasing

- NELHA saw a significant increase of lease activity in FY 2017. As shown in the table below, activity included renewing existing agreements, new leases, negotiation of existing leases during rent re-opening periods, merger of existing leases and review of a multitude of new projects. A majority of this was due to the opening of Hale Iako.

CATEGORY	FY 2011	FY 2012	FY 2013	FY2014	FY2015	FY2016	FY2017
Number new agreements including subleases	7	7	8	9	15	15	21
Number new tenants	4	3	1	4	6	5	7
Number new subleases	1	1	1	0	2	1	0
Potential projects (some NELHA staff time investment)	13	8	17	7	15	28	29
Potential projects (significant NELHA staff time investment)	6	12	11	7	12	4	3
Total potential projects	19	20	28	14	27	32	32
Number of promising long term projects	2	2	1	6	8	5	6

- NELHA released a Request for Interest (RFI) in December 2016 for a prime site for commercial development in the Ocean CenterPiece area. The site is 1.3 acres and situated at the new main entrance to HOST Park on the highway and Kaiminani Drive. In January 2017 the Board of Directors approved "approval in concept" for a commercial lease to



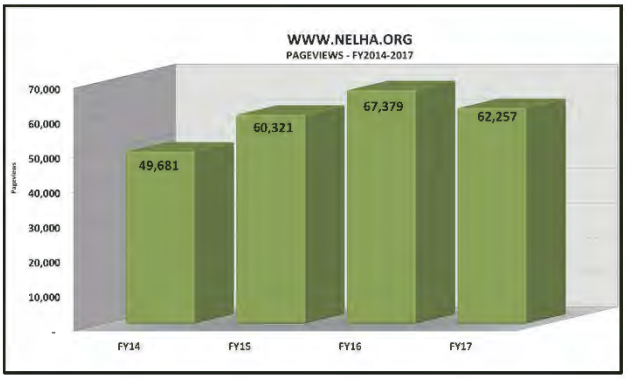


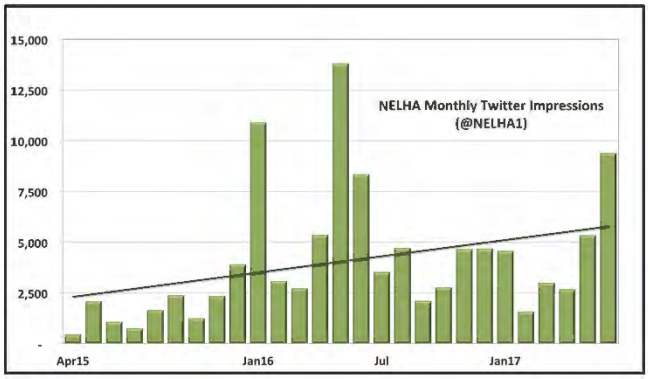
Mats4 LLC to operate a convenience store and fuel dispensing station with a focus on sustainable building design, sustainable fuels and NELHA sustainable products. Mats 4 LLC is seeking approval in concept for a thirty-year commercial lease.

Marketing and Public Relations

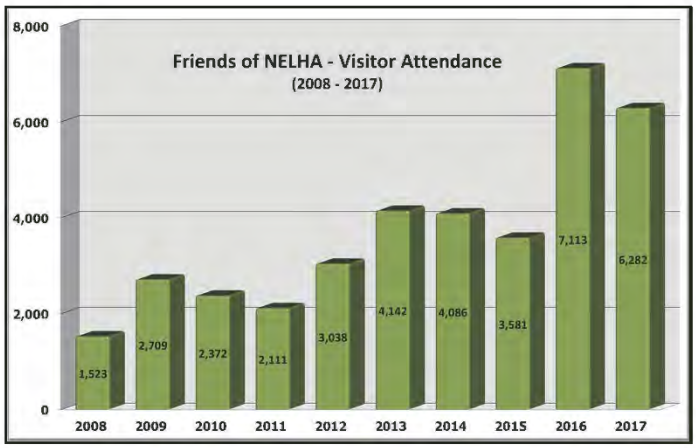
- NELHA recently completed a "revamp" of its website and FY2014 was the first year it has been fully operational in the new format. The chart below shows steady growth in the number of page views between 2014 and 2016 of approximately 36 percent. However, page views declined slightly by 8 percent in FY2017.

- NELHA ramped up its efforts on Twitter in FY 2016 to gain name recognition and increase visits to the main website. The chart below shows steadily increase number of monthly impressions over the past several years.





- NELHA provided almost $50,000 of in-kind support and works closely with the Friends of NELHA (FON). Approximately 6,300 visitors were hosted at the Hawaii Gateway Energy Center in 2017 and were given educational tours of the facility. FON provides an extremely valuable outreach service for NELHA and shown strong growth as shown on below.
- NELHA continues to nurture connections with high schools, community organizations, colleges, universities and research institutions to promote a culture of fresh ideas and new thinking and offers "place-based" training internships.



Kahilihili Street Construction

Reverend Bryan Boshard conducting the ceremonial blessing.

Ground breaking for road construction NELHA Executive Director and Board Members joined by Senator Inouye, Representative Nakashima and Representative Lowen.

NELHA Project Manager – Dr. Alex Leonard (2nd from R) gives a briefing to NELHA BOD members on construction progress.

Seawater System

KEY FEATURES

- **Largest seawater system in the world.**
- **Master permitted to pump over 130,000 gpm of seawater.**
- **Installed capacity is 90,000 gpm.**
- **Three deep seawater pipelines to depths of up to 3,000 ft.**
- **Three surface seawater pipelines at 80-foot depth.**
- **99.999 percent uptime.**

"Those affiliated with NELHA are covered under a master permit system, meaning they do not have to deal with government red tape to gain access to ocean resources. To go through the bureaucratic process of getting all those permits by yourself can take years. Here you can set up at NELHA in a matter of months and focus on what's most important – testing your concepts."

Rich Bailey
Founder –Dewpoint Systems

NELHA operates the world's largest seawater utility and provides both pristine surface and deep seawater throughout HOST Park. A listing of major pipelines is shown below. In addition, NELHA operates and maintains three major pump stations, four major backup generators and an extensive seawater pipeline distribution system throughout the park.

PIPELINE DESCRIPTION	DEPTH (ft)	SURFACE SEA WATER	DEEP SEA WATER
40-inch diameter	2,210		13,400 GPM
28-inch diameter	69	9,700 GPM	
18-inch diameter	2,060		3,000 GPM
24-inch diameter	33	5,400 GPM	
55-inch diameter	3,000		27,000 GPM
55-inch diameter	79	40,500 GPM	

Highlights

In FY2017 the focus continued on increasing efficiency of the seawater system, including replacing the existing pumps. Significant improvements were made to the seawater system to increase efficiency. This includes working with large users to lower pressures; installing more accurate pressure transducers; recalibrating flow sensors; switching rate schedules; and, reprogramming variable speed drives to automate pump schedules.

A key part of the automation of the seawater system is the installation of new flow meters at all of the main pumping stations. The new meters will be much more accurate and allow us to optimize the seawater system. As a result, NELHA was able to increase in efficiency of 3.1% in terms of power consumption per gallon.

A $5.2M CIP appropriation in reimbursable government obligation bonds obtained in FY 2016 for additional seawater system upgrades, new pumps, and maintenance. A technical error in the appropriation prevented NELHA from using the funds in FY 2017. However, the error was corrected during the 2017 Legislative session and the funds will be available for FY 2018.

NELHA hired the services of the University of Hawaii's Underwater Research Laboratory to survey all deep-seawater pipelines to a depth of 3,000 ft. NELHA's completes this survey once every five years to ensure that the pipelines are in good working order. NELHA staff that participated in the dives on the HURL submarine are pictured below and included (R to L): Laurence Sombardier – NELHA Chief Business Officer, Dr. Alex Leonard – NELHA Chief Projects Officer and Jan War – NELHA Chief Operating Officer.

Aquaculture

"NELHA is the world's premier ocean science and technology park and will continue to play a huge role in growing open ocean aquaculture"."

Neil Sims

Founder and CEO

Kampachi Farms LLC

Hawaii is a world center of aquaculture expertise in a wide variety of species and technologies and likewise, NELHA is home to a world-class aquaculture facility. Given Hawaii's year around growing climate, the biosecurity of its remote location and the easy access to pristine seawater at various temperatures, over 30 companies from around the world have located their aquaculture operations at NELHA.

At NELHA, public and private research organizations have pioneered the development of culture systems for a variety of aquatic species and regularly consult around the world. Local entities have extensive expertise in the spawning and rearing of marine shrimp, marine finfish, oysters, clams, abalone and algae. The level of cooperation between researchers, extension personnel and commercial producers in the local community is exceptional.

In FY2017, NELHA and Hawaii Strategic Development Corporation (HSDC) began developing an aquaculture initiative as a pilot effort to demonstrate the State's commitment to developing Hawaii's commercial aquaculture industry and to focus entrepreneur and investor interest in Hawaii as a location for globally relevant aquaculture companies.

This initiative is in recognition of several recent developments in the global aquaculture industry. These factors indicate that global aquaculture is poised for a sustained period of growth and expansion. Hawaii is home to both pioneering industry research efforts and commercial activities that have made significant contributions to the global industry. If Hawaii is to capitalize on the commercial opportunity in the global aquaculture industry it will have to undertake a concerted and collaborative effort to raise its global visibility in marine aquaculture. The key emerging factors are listed below.

- There is a clear global demand for more innovative industrial scale aquaculture operations; particularly in open marine environments as traditional wild fisheries no longer have the capacity to meet growing global demand. At the same time, food consumers are demanding traceability and transparency in the origin and safety of their food.
- The Federal government recognizes the increasing demand for sustainably farmed seafood and is taking steps to support the growth of a US aquaculture industry to mitigate the significant trade deficit in seafood. These steps include recent efforts to open up Federal waters in the Pacific Islands Region to commercial fish farming.
- Hawaii sits in the center of this new area and could, if positioned properly, grow as a base of intellectual property and development of systems capabilities in this sector.
- Recognizing these developments, and the success of the farmed salmon and farmed shrimp sectors, the world's capital markets are beginning to invest into the marine aquaculture sector and there has been a noticeable increase in investor interest in aquaculture companies.

- Hawaii is already recognized as a pioneer in this industry as it is home to the global brood shrimp industry and a pioneer in open ocean fish farming. A number of global industry players already have significant operations at NELHA. Given the biosecurity of Hawaii's remote location and pristine waters, Hawaii sourced products will be attractive as a disease-free source of genetic material as well as high value end products for the local and global seafood consumers.

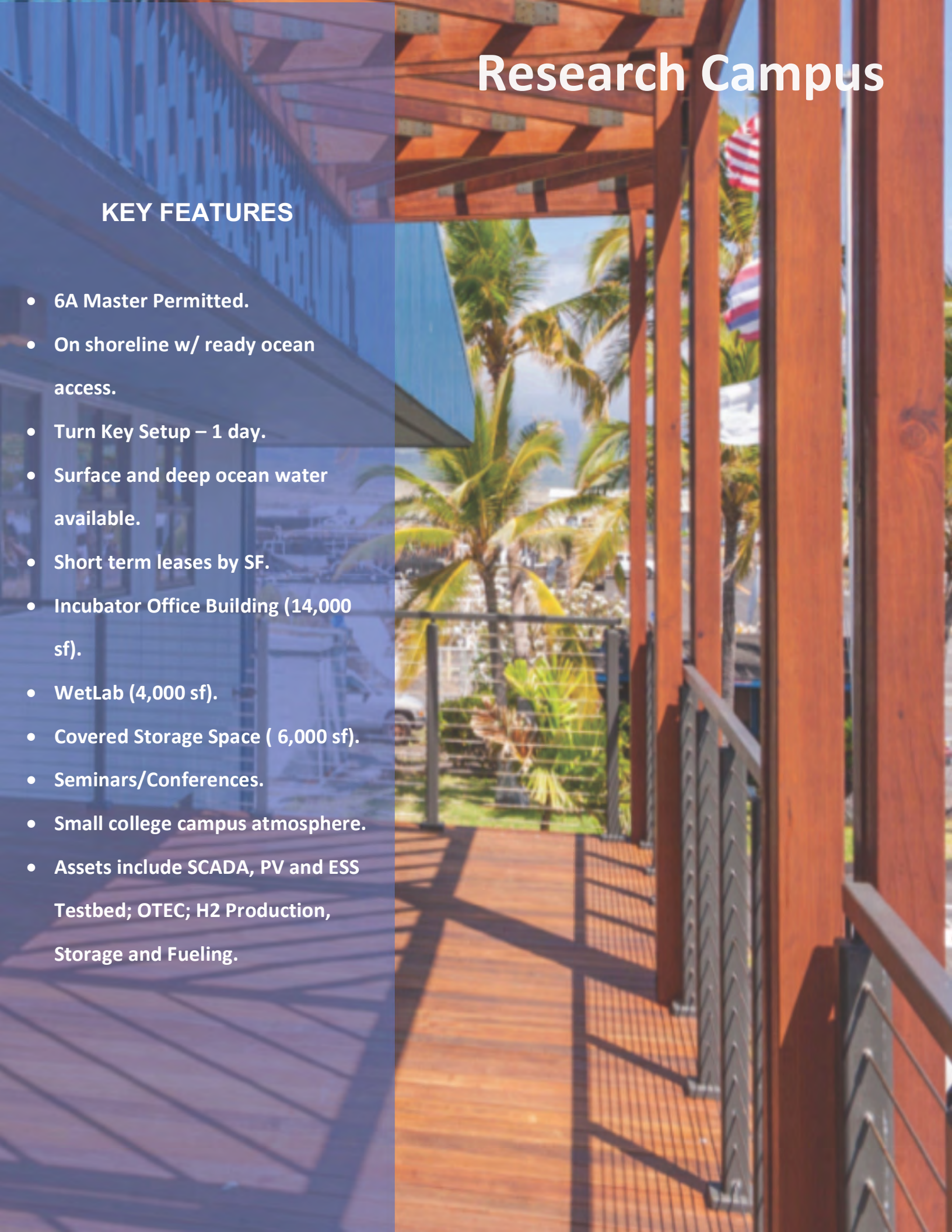
Hawaii Center for Aquaculture Sustainability

NELHA and HSDC are also working on a concept for an aquaculture innovation center at HOST Park, tentatively titled: The Hawaii Center for Aquaculture Sustainability (HCAS). HCAS is envisioned as a pilot effort to demonstrate the State's commitment to developing Hawaii's commercial aquaculture industry and to focus entrepreneur and investor interest in Hawaii as a location for globally relevant aquaculture companies. Developing technical expertise and intellectual property relevant to a global aquaculture industry will complement and benefit existing efforts of other State agencies currently involved in aquaculture with a focus on research and growing food for local consumption. NELHA and HSDC traveled to visit the Maine "Center for Cooperative Aquaculture" to see one of the nation's leading examples in this field.

HCAS will repurpose existing structures at HOST to create a facility and a program that supports innovative companies by helping them commercialize their product or service and secure financing for their growth. Bringing together innovative new companies, involving existing industry experts in their development, and promoting Hawaii as open for new businesses will create a pipeline of interesting opportunities that will of attract investor capital to Hawaii's aquaculture industry. A key objective of this project will be to establish a follow-on fund for aquaculture in Hawaii.

A persistent problem affecting aquaculture startups in the region is the lack of access to HOST's seawater infrastructure and the lack of access to world-class business and scientific mentoring resources to launch their businesses. Access to these resources would significantly mitigate risks in the startups' business plans and enhance their ability to raise startup capital. The HCAS Proof of Concept Model will address these gaps by providing a program to pull together the strengths of regional partners and delivering the commercialization services outlined below to targeted entrepreneurial companies in the aquaculture sector.

Research Campus



KEY FEATURES

- 6A Master Permitted.
- On shoreline w/ ready ocean access.
- Turn Key Setup – 1 day.
- Surface and deep ocean water available.
- Short term leases by SF.
- Incubator Office Building (14,000 sf).
- WetLab (4,000 sf).
- Covered Storage Space (6,000 sf).
- Seminars/Conferences.
- Small college campus atmosphere.
- Assets include SCADA, PV and ESS Testbed; OTEC; H2 Production, Storage and Fueling.

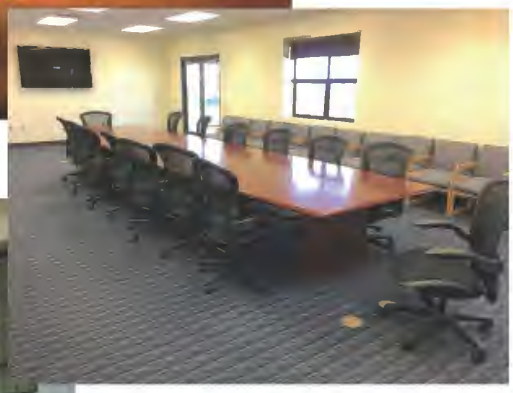
Efforts to upgrade and install new infrastructure was essentially completed in FY 2017. Numerous projects to transform the Research Campus were underway and completed during this period. With the exception of Hale Kaa all buildings in the Research Campus have been renovated or upgraded in the past five years.

Hale Iako: This is a mission critical piece of NELHA's efforts to transform the Research Campus in to a small college atmosphere. The building was completed in June 2016 at a total cost of approximately $5 million. Major contractors critical for the renovation were INK Arch LLC responsible for design and construction management. The general contractor for construction was F&H Construction. The work was funded with a $3 million grant from the U.S. Economic Development Agency; $1 million in CIP funds and $1 million in NELHA special funds. The building was approximately 60 percent leased upon completion.

Senator Lorraine Inouye was on hand for the Grand Opening of Hale Iako and gave opening remarks. Senator Inouye is being greeted by DBEDT Deputy Director Mary Alice Evans while NELHA Board Chair John Delong and HTDC CEO Robbie Melton survey the scene.

Despite slight delay in opening of Hale Iako, the occupancy at the end of the fiscal year was slightly below 70 percent. Procurement for new security fencing was completed and LED lighting continues to be installed. Fire protection design for new hydrants was completed.

NELHA began complete renovation of another key building, Hale Kaa, in the Research Campus. This project will include installing new windows, insulation, drywall, lights, a deep-seawater air conditioning system and painting the outside of the building. When finished this will complete our 5-year program to renovate and upgrade the facilities in the Research Campus. This included upgrade or renovation to 9 buildings, electrical system, wastewater system, design for new fire suppression and hydrants, walkways and security enhancements. Total cost for this work was almost $6 million. Projects were funded from $3.22M in federal grants, $1.3M in State CIP and $1.4M in NELHA special funds.



Hawaii Ocean Science and Technology Park

Featured Business 2017

Friends of NELHA
Gateway to the Future

NELHA is extremely fortunate that the Friends of NELHA (FON) was established in 2001. FON is possibly the only non-profit in Hawaii with educational and outreach services to residents and off-island visitors that was established to support a State agency goals. As such, NELHA is the envy of many other State agencies and provides exclusive use of its visitor center and general support to FON in return for their services.

FON's goal is to engender an attitude that natural resources and systems should be preserved and renewed. In this regard, FON is trying to change the world, one student or visitor at a time and is devoted to the cause of achieving a sea change in public opinion towards environmental sustainability. They accomplish this by exposing visitors to advanced energy, food security, and other sustainable technologies by providing lectures, tours, tutorials, and other presentations to residents and visitors of all ages. These primary tools have been developed over more than 15 years of interaction with the community and with the variety of scientists and technologists.

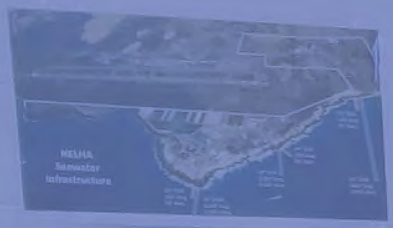
FON's initial purpose was to serve as the public visitor interface for NELHA and grew out of a volunteer only organization. FON provided presentations on NELHA history and technology, as well as tours of a few NELHA tenant companies. Since then, FON has hired a full-time Executive Director and developed a sensational tour schedule. Current themes for daily tours include: 1) **Inspiring Innovation**; 2) **Ocean Conservation**; and, 3) **Sustainable Aquaculture** focusing on an outdoor oriented charter school with a live shark tank, an advanced energy OTEC facility, a hydroponics grow out facility, a monk seal hospital, a fish farm research facility and an abalone grow out farm.

FON is located in the iconic Hawaii Gateway Energy Center. FON offers informative displays in the visitor center which explain and showcase advanced energy and sustainable technology alternatives and projects. FON sponsors other programs, such as energy lecture series and energy efficiency workshops at the visitor center. They have been instrumental in organizing the Japan-US OTEC Energy Conference over the past eight years. Other activities have included energy efficiency workshops and events.

FON's current plan, recently developed under the leadership of its new Executive Director Candee Ellsworth, and recently started a new STEAM (STEM with the addition of the Arts) program highlighting sustainable aquaculture at NELHA for students. In addition, FON is exploring a number of exciting options to take the visitor experience to a greater level. Options include: 1) increasing frequency of tours; 2) including additional companies; 3) extend tours using mini-buses 4) upgrading the quality of exhibits at the Gateway Visitor Center; 5) holding more community events; and, 6) expanding merchandising and sales of branded souvenirs. FON relies heavily on a dedicated and wonderful team of volunteers, who give their time, knowledge, and expertise because of their belief in FON's mission.

The iconic "Hawaii Gateway Energy Center"

Analytical Laboratory



Quarterly Water Chemistry Environmental Sampling

- **Ground Water Sample Locations**
  34 Wells
  3 Anchialine Ponds

- **Marine Water Sample Locations**
  30 Marine Transects
  1 Coastal Stations

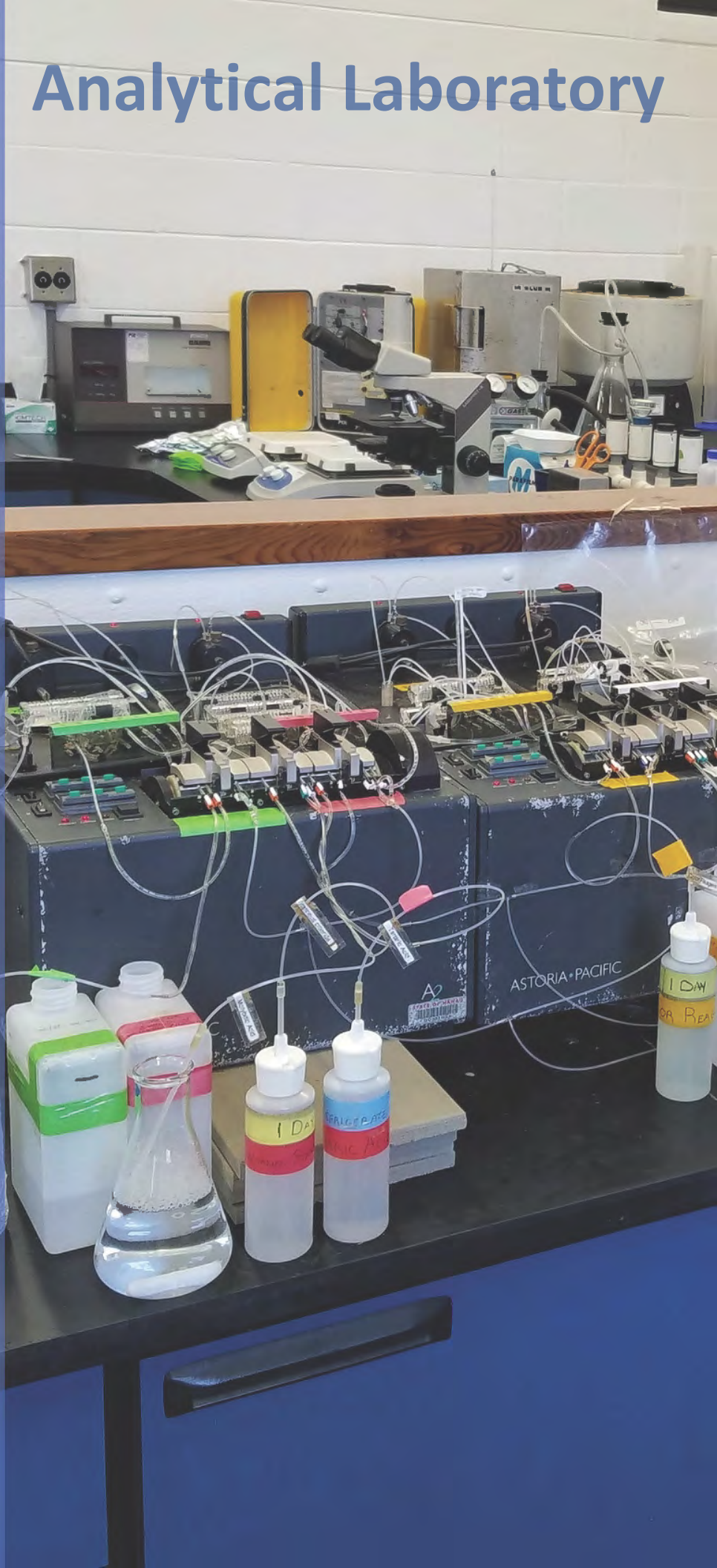
- **Tenant Effluent Discharge Locations**
  54 Tenant Discharge Sites

Annual Biota Surveys

- **Marine Fish Species and Biomass**
  18 Marine Fish Survey Sites

- **Coral Species Abundance**
  18 Benthic Community Sites

- **Anchialine Pond Species Abundance**
  15 Anchialine Pond Survey Sites



NELHA's Analytical Laboratory specializes in environmental sampling and marine water chemistry analysis. Much of the environmental monitoring work involved the implementation of NELHA's Comprehensive Environmental Monitoring Program (CEMP), collecting and analyzing samples from more than 120 sites located both onshore and offshore. In addition, the Lab is responsible for operating the NELHA weather station, SCADA system for real-time monitoring of the seawater system and biosecurity plans and monitoring.

The CEMP allows NELHA to monitor its pristine offshore environment and serves as an early detection system should any irregularities in onshore effluent disposal occur. The NELHA Analytical Laboratory again received its certified acceptable proficiency rating in FY 2017 from the US Environmental Protection Agency's Discharge Monitoring Report-Quality Assurance Program on routinely performed water chemistry analytes.

The 2017 CEMP reports show no extraordinary groundwater water quality issues were noted. In addition, NELHA's ocean transect sampling results were within the historical range of NELHA pipeline and ocean transect data set. The results are also similar to other West Hawaii marine water quality monitoring programs.

It is important to note that since July 2010, a seawater disposal-monitoring program was gradually phased in and fully executed by January 2011. No unusual seawater disposal observations have been noted since its inception. The seawater disposal-monitoring program involves quarterly sampling of terrestrial seawater disposal sites at the NELHA facility. NELHA measures total suspended solids, biological oxygen demand, total nitrogen, and total phosphorous as guided by HAR Title 11 Chapter 62 with further recommendations from the HDOH Wastewater Branch.

One of the key new responsibilities for the Lab is to monitor client's efforts to maintain biosecurity. A major update to the NELHA biosecurity policy was completed in FY 2016. NELHA worked closely with the Research Advisory Committee to assist in the update. The group met ten times to develop the proposed amendments and received considerable input from all stakeholders at NELHA and worldwide experts in shrimp production. All together the process amounted over 300-person hours of work. The Lab has also implemented a monitoring program and regular site visits.

Pam Madden collecting water samples offshore.

The lab continued efforts to increase biosecurity, especially in the area of shrimp grow-out, with development of client self-inspection checklists and buildup of import and transfer permit databases. Significant progress with 100% completion of checklists by shrimp

growers and 75% shellfish and 50% finfish was made by the lab staff. Building of import and transfer permits is progressing but Department of Agriculture has not agreed to provide copies of permits to NELHA. Adding this requirement to our Administrative rules is the planned solution to complete the database.

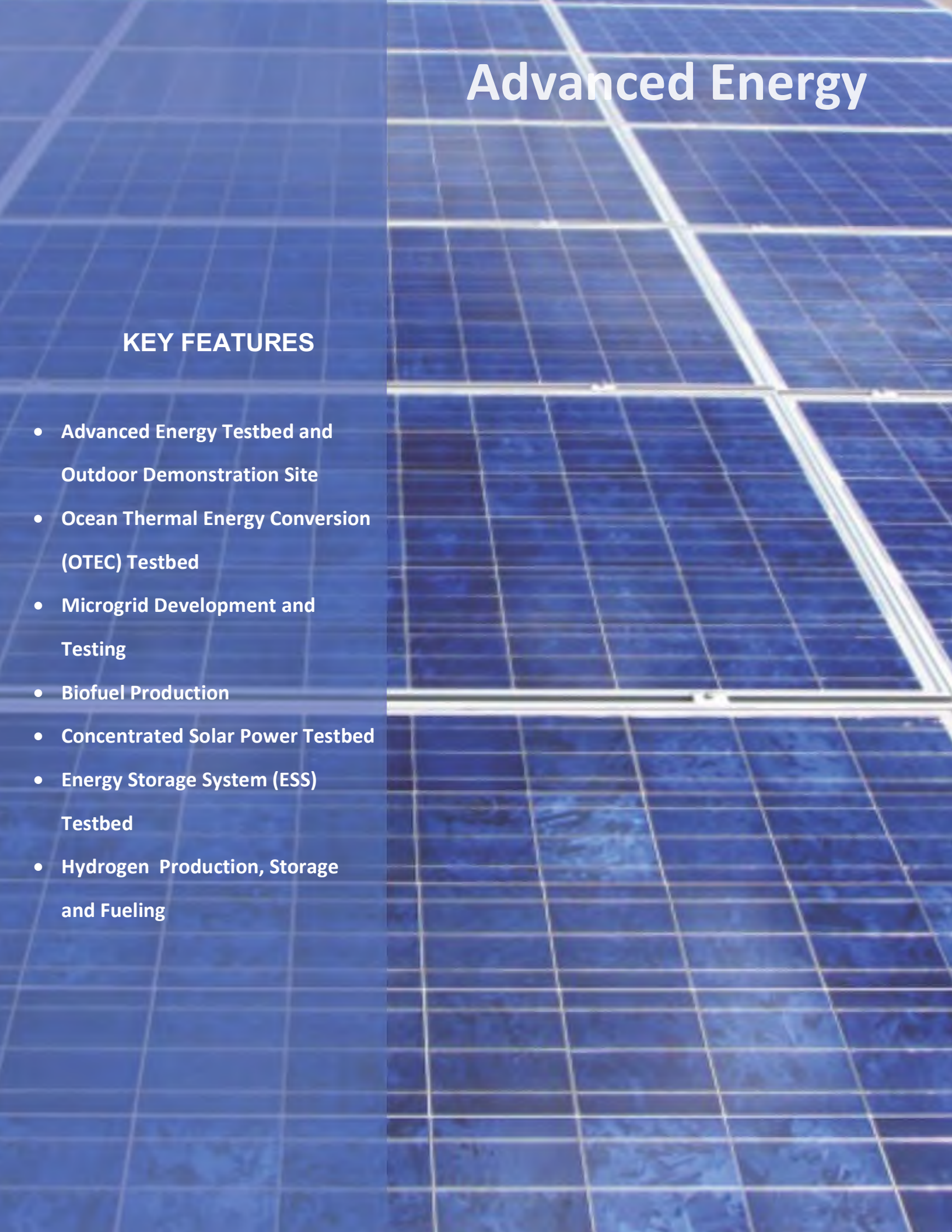
Several years ago, NELHA began developing a Supervisory Control and Data Acquisition (SCADA) system and network to monitor the: 1) weather; 2) seawater structure (flows, water quality and temperature, and electrical usage); and 3) power production and storage. Responsibility for the maintenance and further development of the SCADA system has been assigned to the Lab.

Data from the SCADA system has greatly enhanced ability to obtain real-time information to the desktop on operational performance and was instrumental in completing the recent seawater rate analyses and making the seawater system more efficient.

Development has been steady over the past several years and now includes communication with approximately 110 different devices and sensors. This includes 20 variable frequency drives for the pumps, 13 pressure sensors, 7 temperature sensors, 30 flow meters, 12 electric utility meters, and 13 scientific and meteorological sensors. A communication backbone has been established using direct cable, wireless communication and 6 different radios. NELHA has installed state of the art security devices and servers to record and display the over 700 different data points that we are collecting in real-time. In Fiscal 2017, we were able to extend the system to begin monitoring five individual client flow and pressure meters which account for approximately 75 percent of total flow. This was completed using the development of a hub and spoke system throughout the park and laid the framework for achieving remote monitoring of between 90-95 percent of flow volume to the individual clients.

The Lab produces several publications annually including the CEMP and Meteorological report. Both reports can be found online at www.nelha.hawaii.gov.

Advanced Energy



KEY FEATURES

- Advanced Energy Testbed and Outdoor Demonstration Site
- Ocean Thermal Energy Conversion (OTEC) Testbed
- Microgrid Development and Testing
- Biofuel Production
- Concentrated Solar Power Testbed
- Energy Storage System (ESS) Testbed
- Hydrogen Production, Storage and Fueling

NELHA's energy initiative's goal is to learn about nascent renewable technologies and grid modernization that will reduce our carbon footprint. We can provide an outdoor demonstration site to test renewable energy technologies on the cusp of commercialization.

Major aspects of this effort include: 1) Establish an energy storage systems (ESS) testbed; 2) Develop an integrated energy district or microgrid; 3) Reduce our carbon footprint by adding renewable energy from solar photovoltaic (PV) panels; 4) Work with the University of Hawaii and US Department of Energy to develop a testbed for hydrogen technologies; 5) Expand efforts to assist the private sector in commercialization of OTEC; and, 6) Expand our relationships with the national laboratories and other key players in Hawaii's energy field such as the Hawaii Natural Energy Institute and the utilities.

Energy Storage Systems (ESS)

ESS Conference: September 2016

NELHA organized a very successful energy storage conference in FY2017. The first day of the conference took place at the Sheraton Kona at Keauhou Bay. The conference included one full day of presentations and panel discussions followed by a second day of site visits on the island of Hawai'i. Conference logistics were provided by University of Hawaii at Hilo Conference Center.

The focus of the conference was on electrical energy storage (ESS) to start addressing the increasing penetration of renewable energy, particularly from intermittent sources such as PV and wind, on the Hawaiian island grid. This is also an area of important potential economic development for the Hawaiian Islands.

NELHA was able to attract a very high caliber of speakers which included two Department of Energy Project Managers, representatives from five national labs including two associate laboratory directors, industry leaders and local leaders in the field of energy storage. The meeting had 110 attendees with 20% coming from the mainland and 80% from Hawaii.

The conference was accomplished with even greater success than originally anticipated. Several energy storage projects are expected to be implemented as a result of networking that was able to take place during this meeting. The County of Hawaii is able to play an important role in the field of energy storage and this meeting has played a part in establishing that role. Lessons learned from this conference include planning for a larger meeting room given the popularity of the conference, clearly demonstrating the interest from business, economic, and policy perspectives form a variety of stakeholders.

NELHA wishes to express its utmost appreciation for the assistance the County of Hawai'i Department of Research and Development was able to provide through this project.

Vanadium Redox Flow: A $500,000 joint project with US Department of Energy, Sandia National Lab, HELCO, , Ulupono, UniEnergy Technologies (UET) and NELHA. The project, a result of the September ESS conference, includes a "grid-scale" 100kW/500kWh advanced flow battery where rechargeability is provided by two chemical components dissolved in liquids contained within the system. Its characteristics are: a) unlimited longevity over most conventional rechargeables; b) current comparatively less powerful; and, c) requires more sophisticated electronics. Funding from US DOE via Sandia has been secured and all agreements have been executed. Installation at Hawaii Gateway Energy Center will begin in FY2018.

Lead-Acid: Ecoult, an Australian company that would like to break into the US market has been in discussions with NELHA. This is a hybrid battery with upgraded technology from the capacitor aspect. We anticipate installation of this battery in FY2018.

National Energy Labs

NELHA continued making significant progress in developing strategic partnerships, especially with Sandia National Laboratory and National Renewable Energy Laboratory (NREL) in FY 2017.

Key events included the participants from five national labs at the ESS Conference listed above. In addition, NELHA signed an agreement with Sandia National Lab for the vanadium redox flow battery.

The NELHA Executive Director was invited to speak at NREL's third annual Advanced Energy Roundtable on June. The gave a presentation on the Global Leadership in Advanced Energy: Market and Business Opportunities. In addition, he met with key NREL officials and industry leaders to discuss future collaboration efforts.

PV Initiative:

NELHA released an RFP for 130 kw of PV in the Research Campus. The RFP included several options including purchasing the power via a20 year power purchase agreement. In addition,

requested quotes for the installation of the equipment at NELHA's expense with no annual power costs. We also requested quotes for a combination of the two alternatives. It is important to note that HNEI is considering providing a cash contribution to this project if it meets their price criteria. Power could be used for the hydrogen project as well.

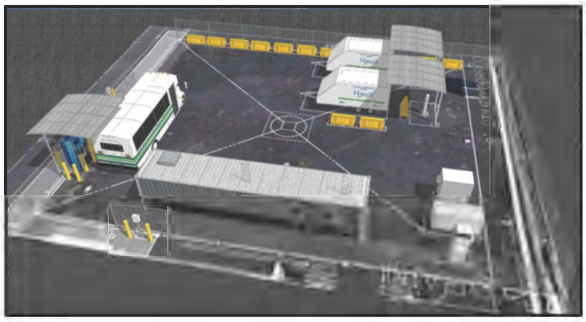
Microgrid Initiative

NELHA worked with Hawaii Natural Energy Institute (HNEI) regarding a grant application to the Korea Institute of Energy Technology Evaluation and Planning (KETEP). This grant application builds upon a MOU signed between KETEP and DBEDT and a MOU between UH and Seoul National University.

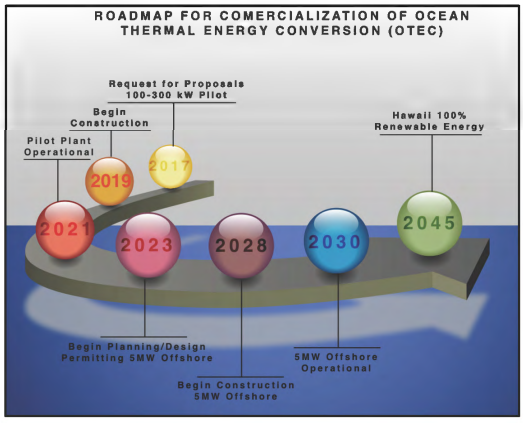
The purpose of the grant is to evaluate the feasibility of demonstration microgrids at several sites in Hawaii and including NELHA. It is envisioned that this project if completed will assist in achieving optimal energy management and cost reduction, efficiency and control of distributed energy resources and increased resiliency. If NELHA is selected as a demonstration site for this project substantial funding for implementation would be available from KETEP.

Hydrogen Production, Storage and Filling Station

HNEI determined that the best site for their hydrogen production, storage and filling station for the Island of Hawaii would be at NELHA. They began leasing space in the research campus and Hale Iako. NELHA is providing additional support by assisting with the planning, permitting and preliminary site work. We entered into an agreement with Nan Inc. for site development and began construction of the site. The facility should be completed in FY2018.



Ocean Thermal Energy Conversion Initiative



NELHA began a new initiative to request proposals for the private sector to construct and operate a 100 – 300kW OTEC plant for a minimum of 10 years. Major project goals would include: 1) facility would be land based but must emulate a marine site to the maximum extent possible to represent a quantum leap forward in the commercialization of OTEC; 2) further OTEC commercialization by developing a pilot plant that can be used to provide data and information to the private sector for building a 5mW system offshore; 3) stabilize NELHA's current electrical

rates for 10+ years; and, 4) continue NELHA's efforts to achieve stretch goals reducing its carbon footprint to 0 by 2022. NELHA will agree to a Power Purchase Agreement for 10+ years and provide the land and access to warm and cold seawater at no cost. NELHA plans to release the RFP in FY 2018.

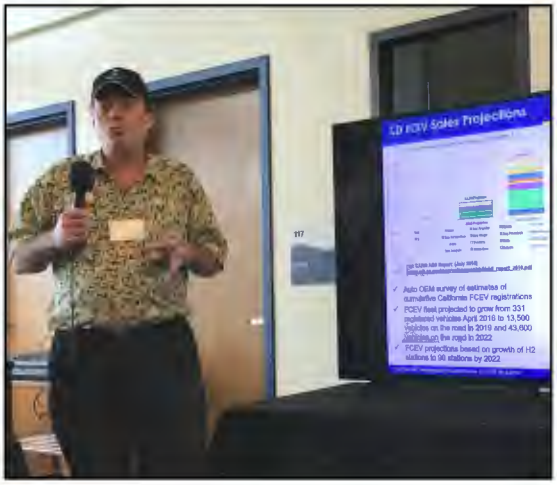
NELHA also hosted participants for the first day of the eight annual Hawaii – Okinawa Ocean Energy and Economic Development Symposium in June. NELHA speakers at the event included (R to L) Executive Director – Gregory Barbour; Board of Directors – William Rolston; Chief Operations Officer – Jan War; and Chief Science Officer – Keith Olson.

8th OCEAN ENERGY AND ECONOMIC DEVELOPMENT SYMPOSIUM & WORKSHOP

ESS Storage Conference – September 2016

Dr. Imre Gyuk, US DOE ESS Program Manager address conference with a panel that included Dr. Rick Rocheleau, Mark Glick, and Representative Nicole Lowen.

Larry Visocky for Koyo USA gives a tour of their bottling plant at HOST Park.



Pete Devlin, US DOE Hydrogen Program Manager explains the national Hydrogen Program.

Participants at Hale Iako on the 2nd day of the conference.

Henk Rogers of Blue Planet Foundation gave a personal tour of their facilities at Puuwaawaa Ranch.

VISITORS

Who's Who at NELHA

Public Utilities Commissioner Loraine Akiba with Hawaii Island PUC representative David Mattice visit the Makai Ocean Engineering OTEC tower with Laurence Sombardier.

DBEDT Director Luis Salaveria hears Dr. Gerry Cysewski explain Cyanotech's algae ponds

The Kona-Kohala Chamber of Commerce "Afterhours" gathering at Hale Iako was well attended.

Contestants in the "Snowman" competition at the Christmas party.

Key members of NELHA's Christmas Party Planning Committee.

We were pleased to have the opportunity to host the West Hawaii Science Fair at Hale Iako in February 2017.

Awards

Dr. Marty Fletcher of Hawaii Community College's Palamanui Campus presented NELHA with their 2017 Mahalo Award.

Laurence Sombardier is presented with her 10-year Service Award from Board Chair John DeLong

Board Member Dr. Gerry Cysewski receives the "Pualu Business Innovation" award from the Kona-Kohala Chamber of Commerce

HIGHLIGHTS

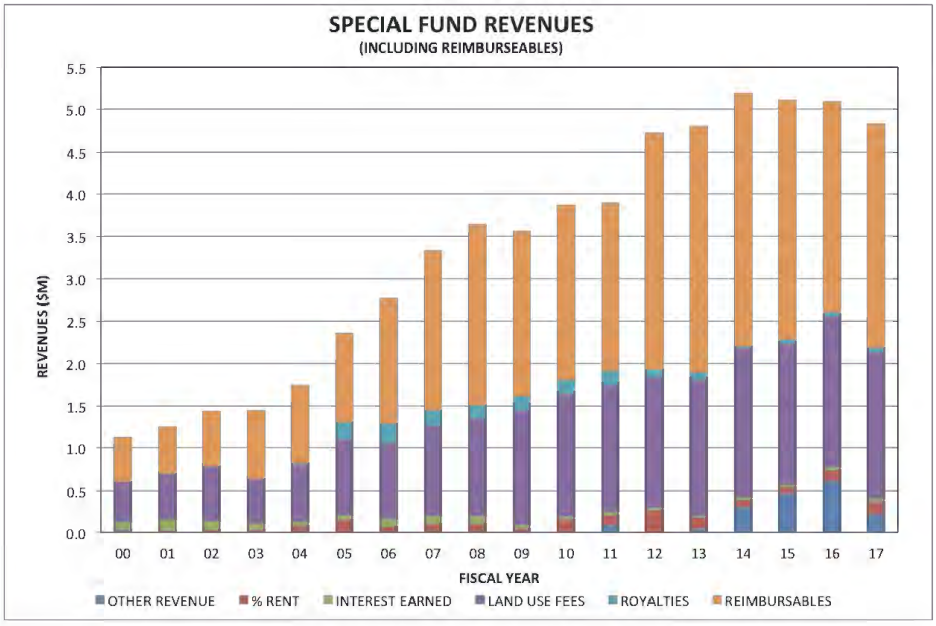
Revenue – including reimbursables

- Total revenue has increased by approximately 30% in the past 5 years.
- Revenue has remained over $5m for the previous 3 years, but dipped slightly in FY2017.
- The sale of seawater (reimbursables) accounts for approximately 50% of total revenue and is operated on a break-even basis.
- Revenue has declined slightly in the past several years due to a decline of $500,000 (20%) in reimbursables.
- This is mainly due to a significant decrease in the price of electricity which makes up approximately 50% of the price of seawater. which has a significant impact on the price of seawater.

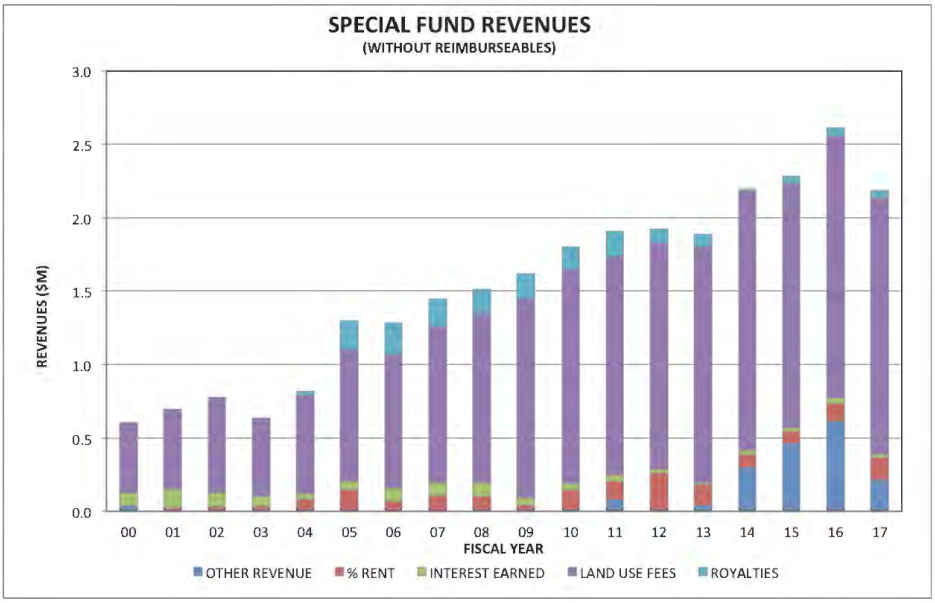
Revenue – without reimbursables

- Revenue, has increased slightly over in the past 10 years.
- A majority of this revenue is land use fees, however that category actually fell by $300,000 in FY2017. The decline was also affected by a delay in opening the new incubator building.
- Other revenue, mainly grants and special projects, has also increased significantly in the past several years but fell off in FY2017.

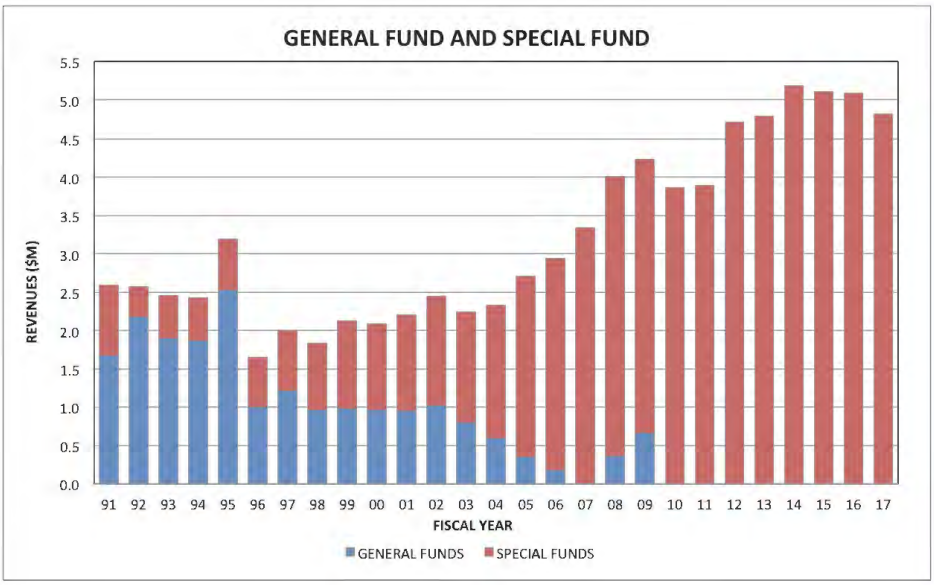
Total Revenues



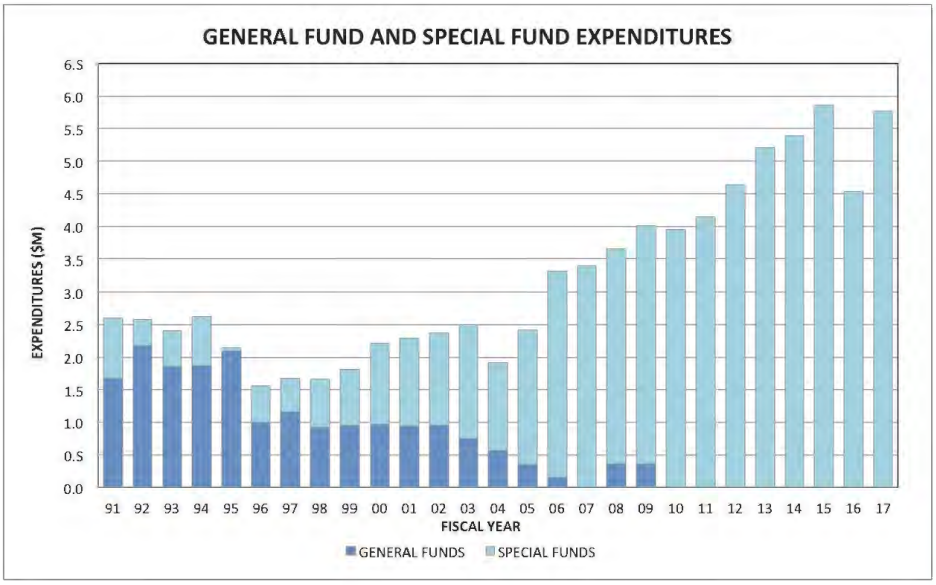
Revenues



General & Special Funds



Expenditures



HIGHLIGHTS

General vs. Special Fund Revenue

- Self-sufficiency continues to be the focus at NELHA. Revenue growth and cost containment for operations were critical to achieving self-sufficiency and NELHA has had tremendous success.
- The chart shows an annual subsidy, shown as general funds in light blue, of approximately $1 million annually being replaced by revenue from the seawater and land use fees being placed in NELHA's special fund.
- NELHA has been self-sufficient from an "operating standpoint" for the past eight years.
- NELHA continues to receive funds from the State for capital improvement projects, such as roads and are not included in this chart.

General vs. Special Fund Expenditures

- Expenditures show a similar pattern over the past 25 years
- While there was a significant decline in FY 2016, due to special one-time projects in the previous several years and reduced electricity costs for pumping seawater, FY 2017 revenues are in line with FY 2015.

NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY
FINANCIAL STATEMENT - FISCAL YEAR 2017

(Fiscal Year - July 1 to June 30)

	Fiscal Year 2017
REVENUES	
Land Use Fees	1,738,392.19
Seawater Royalties	51,962.12
Reimbursables	2,639,701.89
Interest Received	29,174.36
Other	215,779.54
Percentage Rent	149,404.23
Subtotal	4,824,414.33
EXPENDITURES	
Salaries	1,785,067.49
Operations	3,612,259.98
OHA (Ceeded Lands Transfer)	369,713.03
Subtotal	5,767,040.50
FINANCIAL POSITION	
Special Fund Cash Balance (July 1)	1,094,129.84
Prior Year Unrequired claims	
Prior Year Transfers	103,755.31
Special Fund Revenues	4,824,414.33
Subtotal	6,022,299.48
Special Fund Expenditures	5,397,327.47
OHA (Ceeded Lands Transfer)	369,713.03
Special Fund Cash Balance	**255,258.98**

Note: All data as of end of fiscal year (June 30) unless otherwise noted.

Board of Directors

John DeLong, Chair
President, Hawaiian Cement
At Large Member appointed by Governor

William F. Mielcke, Vice-Chair
Retired, President of Mauna Kea Properties
At Large Member appointed by Governor

Linda Rosehill
President, Linda Rosehill and Associates
At Large Member appointed by Governor

Dr. Vassilis L. Syrmos, Ph.D.
Vice-President for Research and Innovation, University of Hawaii
Ex-Officio – President, University of Hawaii

Dr. John Morton, Ph.D.
Vice- President for Community Colleges, University of Hawaii
Ex-Officio – High Technology Development Corporation

William Rolston
Energy Analyst
Ex-Officio – Mayor, County of Hawaii

Dr. Gerry Cysewski, Ph.D.
Chief Science Officer/Executive Vice-President, Cyanotech Corporation
Ex-Officio – Tenant Representative

Michael Eldred
OTEC Project Manager, Makai Ocean Engineering
Ex-Officio – Tenant Representative

Board of Directors

Neil Sims
Founder and CEO, Kampachi Farms LLC
Ex-Officio – Tenant Representative

Luis P. Salaveria
Director, Department of Business, Economic Development and Tourism
Ex-Officio – Director, Department of Business, Economic Development & Tourism

Dr. Bruce Anderson, Ph.D.
Administrator, DLNR Division of Aquatic Resources
Ex-Officio – Director, Department of Land and Natural Resources

Alan Hilton
Marine Operations Coordinator, University of Hawaii Marine Center
Ex-Officio – Research Advisory Committee Chair

Dr. Jim Wyban, Ph.D.
Founder, High Health Aquaculture
Ex-Officio – Research Advisory Committee Vice-Chair

The NELHA Team in 2017

POSITION TITLE	INCUMBENT
Executive Director	Barbour, Gregory
Senior Secretary	Appleby, Karen
General Laborer II	Debina, Chad
Secretary III	Espinueva, Georgette
Maintenance Mechanic I	Gibo Jr., Celestino
Water Quality Specialist	Madden, Pamela
Fiscal Officer	Kaniho, Sheryll
Administrative and Projects Manager	Leonard, Alexander
Accounting Clerk III	Miranda, Jerrae
Maintenance Mechanic I	Mitchell, Anthony
Engineering Project Coordinator	Babbitt, Bryan
Chief Science Officer	Olson, Keith
Utility Electrician	Pierce, Thomas
Electrician II	Allon Thompson
Chief Marketing Officer	Sombardier, Laurence
Operations Engineer	Towle, Dean
Operations Manager II	War, Jan
Laboratory Intern (Kealakehe High School)	Garces, Eva
Laboratory Intern (Brigham Young University)	Nakamoto, Talmage
Laboratory Intern (Suncheon University)	Seo, Chanung

Appendix – History of Major Events

1974 Natural Energy Laboratory of Hawaii, operated by the University of Hawaii, was established as a response to the first oil crisis.

1979 Mini-OTEC was anchored offshore of Keahole Point, demonstrating the world's first production of net electrical power via closed-cycle OTEC.

1980 Laboratory facilities and its first pipeline to draw deep seawater from 2,000 feet and surface seawater from 45-foot depths were completed.

1981 Shore-based OTEC research began with a project testing biofouling and corrosion countermeasures for the closed cycle OTEC process.

1984 Legislation authorized commercial activities, allowing the Laboratory to host new business ventures.

1985 Legislature authorizes NELH to assume the management responsibility of the Puna Geothermal Facility to NELHA. Facility consists of a 3 mW electric power plant and the Noi'I O Puna Research Center.

1986 Hawaii Ocean Science and Technology (HOST) Park was created on an adjacent 500+ acres and operated by the Hawaii Technology Development Corporation (HTDC). US DOE and HOST Park combine resources to install 40" deep seawater and 28" surface seawater system at Keahole Point. Laboratory building air conditioning system converted to deep seawater cooling. Legislature appropriates funds for 18" deep seawater pipeline.

1987 Heat and Mass Transfer Scoping Test Apparatus (HMTSTA) open cycle OTEC test tower constructed and operated by Pacific International Center for High Technology Research (PICHTR).

1989 Puna Geothermal Facility and HGP-A well shut down. The Aluminum Company of Canada (ALCAN) develops program at the Laboratory for testing "roll bonded" aluminum heat exchangers.

1990 NELH, operated by UH, and HOST Park, operated by HTDC, merge to become the Natural Energy Laboratory of Hawaii Authority (NELHA).

1992 210 kW open-cycle OTEC Net Power Producing Experiment (NPPE) constructed at NELHA and operated by PICHTR.

1994 Micro-tunneling begins to construct two 66" diameter tunnels under the shoreline and offshore reef as a pipeline protection crossing in preparation for NELHA's new 55" warm and cold seawater pipelines.

1995 CEROS transferred from HTDC to NELHA

1998 NPPE Open-cycle OTEC power plant decommissioned.

2000 Construction begins for NELHA's new 55" offshore intake pipelines and pump station. Planning and design process started for new Hawaii Gateway Distributed Energy Center.

2002 Successful deployment of 55" deep seawater pipeline offshore and construction of initial phase of onshore pump station using specially designed fiberglass reinforced (FRP) intake canisters. First deep seawater desalinization project begins experimentation to develop bottled drinking water.

2003 NELHA tenant count reaches 34. Non-profit "Friends of NELHA" (FON) formed to assume basic public relations and outreach functions for NELHA.

2004 Construction of Hawaii Gateway Distributed Energy Center completed.

2005 55" warm and cold seawater pump station and distribution pipelines completed.

2006 NELHA Foreign Trade Zone status granted by US Department of Commerce. Keahole Solar Power LLC begins construction of solar thermal research and demonstration facility. Five leases to desalinize deep seawater to produce boutique drinking water.

2007 Cellana in partnership with Royal Dutch Shell begins construction of a 6-acre micro algae to biofuels research center.

2011 Makai Ocean Engineering completes construction of corrosion lab and heat exchanger test tower to investigate the use of aluminum alloys for OTEC.

2012 UH Economic Research Organization (UHERO) completes first economic impact study regarding HOST Park. Results indicate economic impact and job creation is much higher than anticipated and is almost $90 million annually and 600 jobs. Master Plan and Strategic Plans updated. Federal grants totaling almost $3.5 million received for renovation of Main Administration building and micro-grid infrastructure for the Research Campus.

2013 HOST Park economic impact surges by 40 percent since 2010. Repairs offshore pipeline ($5M) completed to extend life of pipeline by 15 years.

2014 NELHA receives almost $12 million in CIP funding for new pipelines and road construction. National Lab relationships strengthened.

2015 NELHA begins construction of numerous projects including office incubator, 28-inch cross connector surface seawater pipeline to connect the north and south seawater systems and buildout of the SCADA system to monitor real-time use of seawater and electrical consumption.

2016 NELHA completed significant improvements to the Research Campus including of the main administrative building in the Research Campus and turned it into a 14,000 s.f. blue technology and advance energy incubator building with 17 offices, covered storage space, walkways and various smaller office buildings.

2017 NELHA begins major projects to open up the "Ocean CenterPiece" 80-acre economic driver including a $10M road construction project and efforts to develop an exploratory well as a new freshwater source.

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