

2018 - 2019
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.”

In conjunction with Chapter 227D-3 Hawaii Revised Statutes

<http://www.nelha.hawaii.gov>

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NELHA FY 2018 and FY 2019 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 45 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.

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 ocean science and advanced energy opportunities.	NELHA provides a wide variety of support to businesses in HOST Park.
Research Campus: Six-acre campus is located near the shoreline on Keahole Point and consists of over 20,000 square feet of office space, 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 professionals and who provide as 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 throughout HOST Park.	Ocean Environment: The steep ocean bottom gradient makes it possible to tap deep cold (4 degrees C) from up to 3,000-foot depths. This ocean water is of significant purity and has a high nutrient content.	Scientific and Cultural Support: Due to the long-term success of many business in HOST Park there are numerous mentors available in the fields of aquaculture, biosecurity, and advanced energy applications. In addition, there are established cultural and business links to Asia and other Pacific islands.
Accelerator: One of the only aquaculture accelerators in the world is based at NELHA and also offers a follow-on venture fund to take start-ups to the next level.	High Solar Insulation: In the lee of three major mountains, HOST Park received approximately 10 inches of rainfall annual and office 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 several businesses that offer educational tours of aquaculture and energy.

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 \$160 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

An analysis of the economic impact of NELHA’s HOST Park found that total economic impact of the park was \$104 million in 2018. The Economic Research Organization at the University of Hawaii (UHERO) completed the report for NELHA.

Total expenditures from the businesses at NELHA were \$92 million dollars, of which about \$65 million were paid to Hawaii entities in 2018 and created 509 jobs statewide. This equals about eight jobs created for every million dollars spent at NELHA. UHERO completed similar studies in the past using the same methodologies with 2010 and 2013 data.

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 \$104 million dollars. State tax revenue generated by NELHA remained high at \$4.8 million dollars in 2018. The analysis also found that not only do NELHA businesses employ hundreds of people but also that their expenditures contribute to the total of 509 jobs in the larger Hawaii economy in 2018.

The assessment of the economic impact of NELHA is based on standard empirical research methods. To estimate expenditures, UHERO researchers developed a survey of total expenditures broken down into 17 categories for 2018. Of the 44 surveys, 36 were completed. Using survey data, data supplied by NELHA, and UHERO estimates, the State of Hawaii's 2012 20 sector input-output (I-O) model was used to determine the economic impact for direct, indirect and induced economic activities by category.

A copy of the report can be found at <http://nelha.hawaii.gov/resources/library/>.

Implementation of Audit Recommendations from 2012 Legislative Audit

It is important to note that the Office of the Auditor began a Management Audit of NELHA in 2008 and completed this audit in 2012. The 2012 audit made 28 recommendations. In their follow-up report in 2015, the Office of the Legislator found that NELHA had implemented or closed 20 of the 28 recommendations and made significant progress on three other recommendations. The Office of the Legislator completed an additional follow-up report in 2018 and NELHA reported that it had completed seven of the remaining eight open recommendations. The only remaining open recommendation at the time of reporting to the Office of the Auditor and NELHA BOD has determined that no further action is necessary. As such, NELHA has completed all 28 of 28 recommendations from the audit.

Long-Term Action Plan – Key Focus Areas

- NELHA will continue to update plans on a regular basis. The master plan update should be complete in the next several years. The updated master plan will be used to continually develop and update our vision, strategic plan, leasing policy, biosecurity policy. Additional plans and key studies will include an updated EIS, Special Management Area permit and sub-division approvals (County).
- NELHA will develop additional revenue streams to distribute operating costs over a broader base of clients. We will generate additional revenue to cover development costs and make necessary improvements to facilities and infrastructure. We will continue to review our non-performing assets and realize the revenue potential afforded.
- NELHA's stretch goal is to become carbon neutral by 2030. Main initiatives include: 1) Establish an energy storage 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.

- NELHA will continue to provide consistent customer service by identifying standards of performance, provide proper training and certification to staff, and monitor performance on a regular basis. We will provide regular feedback to staff on customer service and solicit input from NELHA users.
- NELHA will continue efforts to position itself as the leading premier ocean science, aquaculture and advanced energy technology park in the world. Besides the sale of seawater and property leasing, begin to offer additional services and facilities to support "incubation – accelerator – proof of concept" type facilities and programs and other laboratory services as well especially in the field of global aquaculture innovation. We will continue to develop the strategy to establish an aquaculture proof of concept center at NELHA and identified as a place for innovation of global aquaculture technologies.
- The NELHA seawater system is the largest and most advanced in the world. We will continue efforts to improve efficiency, stabilize energy costs, maintain adequate reserve fund, upgrade monitoring devices, remote controls, and pump station security, and achieve 99.99 percent uptime.
- Freshwater has been a significant constraint in the past for preventing the use of existing parcels and the sub-division of land to provide additional parcels for lease. We will continue to work with our partners at State, HHFDC and County to increase the freshwater allocation to allow for expansion. Additional options for developing other sources of non-potable water for aquaculture will be explored.
- The road system needs upgrading, and additional new roads are required within HOST Park to access additional parcels.

- 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 success is an example of science delivering economic benefits to the state and creating diversity in high-quality jobs on the Island of Hawaii. It continues to be one of the state's most successful economic development programs, and we continue to expect and plan for additional growth in other areas, such as marine research,"

Gov. David Y. Ige 2019

Development



NELHA continues to prioritize development of new infrastructure and initiate programs to move from functioning as a landlord of an ocean science and technology park towards developing an environment or ecosystem where private sector businesses can grow and prosper.

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 several projects and funds were encumbered with contractors to begin construction and development in FY18 and FY19.

NELHA's leasing and marketing efforts also showed strong growth and strength in FY18 and FY19. NELHA's limited marketing efforts support the facility with social media, magazine articles, newspaper articles, newsletters, press releases and special events.

Road Construction

- Completed construction of Kaiminani Drive from Queen Kaahumanu Highway to Kahilihili Street, Kahilihili Street from Kaiminani Drive to Makako Bay Drive, upgrade intersection of Kahilihili Street and Makako Bay Drive, new gate near Destiny Deep Seawater, upgrade lighting on Makako Bay Drive and upgrade Makako Bay Drive from new gate to Queen Kaahumanu Highway. All of the project goals were completed in FY2018 ahead of schedule and under budget by approximately 4 percent.
- A blessing was held on September 5, 2017 and the road was opened to the public that same day. Pictures below show dignitaries at lei cutting ceremony and a lot of happy faces including Dr. Alexander Leonard who was in charge of the project for NELHA.



- A new sign was erected at the intersection of Kaiminani Drive with Queen Kaahumanu Highway indicating the new park entrance. County approval was obtained for the use of somewhat larger font size in this sign which is expected to mark the main entrance of the park in the future.



Potable Water

- NELHA previously executed a \$2.5M contract 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 for HOST Park. We made significant progress in developing this upcountry resource in FY 18 and FY 19 including: 1) Well site grading plan; 2) Archaeological inventory survey; 3) Supplemental archaeological inventory survey (for access road re-alignment; 4) DLNR-SHPD approval of archaeological data recovery plan; 5) Arch data recovery; and 6) Family consultation regarding burial – result inconclusive – decision re- burial (BTP) remanded to the Burial Council. Environmental assessment completed and EA FONSI published November 2018. We are awaiting a final permit from the DLNR Commission on Water Resource Management.
- NELHA continued to explore additional alternatives for potable water including conservation, brackish wells, desalination and exploration of a deep freshwater aquifer. Total freshwater consumption decreased slightly in HOST Park. NELHA has worked with Cyanotech to successfully recommission an old iron ductile pipe to bring desalinated water from Koyo to Cyanotech for their operations.

Ocean CenterPiece

- Refining the vision for the 80-acre Ocean CenterPiece on the mauka lands of HOST Park continues to be a key long-term project for NELHA. We will continue to “tee-up” this development by reviewing potentially similar sites around the world and conduct site visits to speak with developers/owners and local officials. Securing a consultant to assist with the selection of an overall developer for this site was postponed due to lack of funding

Puna Damage

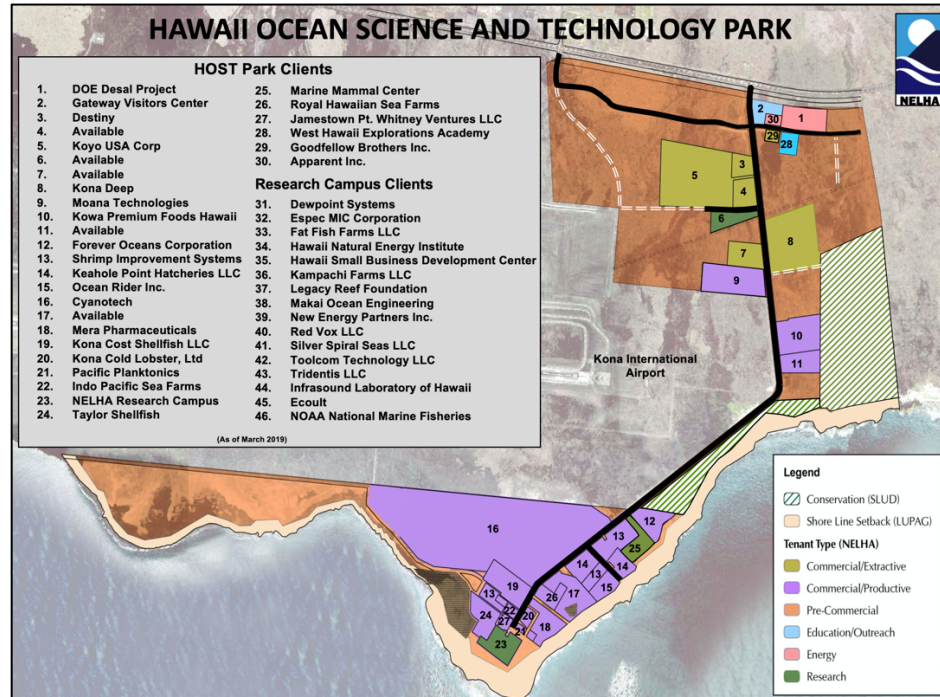
- NELHA worked to secure funds from FEMA to rebuild buildings destroyed by lava eruption in Puna. A special report on the buildings and facilities destroyed later in this report. NELHA completed damage assessment of reconstruction costs and submitted to FEMA for \$7.6M. Assessment was approved by FEMA and we continue to work with the State Risk Management Office and Puna Geothermal insurance company regarding insurance payments from PGV and State insurers.

Leasing

- The amount of leasing activity in FY 2018 and FY 2019 remained relatively stable. Although the number of agreements signed was lower than the previous years, many of these were agreements with new clients. If anything, the trend is towards a larger number of newer clients coming on board. This is in part due to new office leases in the Hale Iako incubation building. 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.

CATEGORY	FY 2011	FY 2012	FY 2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019
Number new agreements including subleases	7	7	8	9	15	15	21	11	12
Number new tenants	4	3	1	4	6	5	7	6	8
Number new subleases	1	1	1	0	2	1	0	0	0
Potential projects (some NELHA staff time investment)	13	8	17	7	15	28	29	25	24
Potential projects (significant NELHA staff time investment)	6	12	11	7	12	4	3	7	21
Total potential projects	19	20	28	14	27	32	32	32	45
Number of promising long term projects	2	2	1	6	8	5	6	5	4

- An Environmental Assessment (EA) was completed for the Mats4 LLC project on 1.3 acres situated by Kaiminani Drive. The completion of an EA was required to move forward on a commercial lease for this project following the Board's approval in concept. The Mats 4 project will have a focus on sustainable building design, sustainable fuels and NELHA sustainable products.

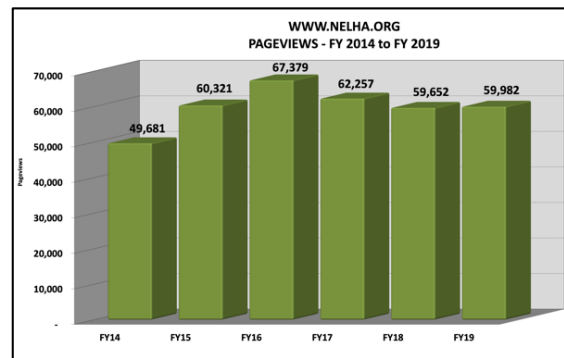
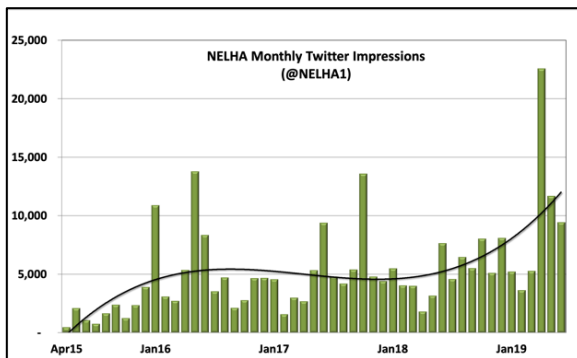


- NELHA released an RFI for a 4.5 acre with 7,500 sq ft building desalination property which was returned to NELHA. The proposal from Kowa Premium Foods Hawaii Corp. from Japan was selected and approval in concept was granted by the NELHA Board.

Kowa retracted their proposal after a year to instead expand into an additional 15 acres adjacent to Kowa’s existing NELHA property. A second RFI was issued in 2019 and NELHA is in negotiation for a new project to be located at this facility.

Social Media

- NELHA “revamped” its website and FY2014 was the first year it was fully operational in the new format. The chart below shows a level number of pageviews annually at 60,000 for the past five years. Monthly page views continue to average around 5,000.
- 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 and now averaging close to 10,000 impressions monthly.



- On Google, NELHA’s most popular website image was viewed over 400,000 times.



- NELHA resumed publishing newsletters to allow park clients and members of the public to keep abreast of important or interesting activities at the park. The newsletters are issued semiannually and can be found at:

<http://nelha.hawaii.gov/resources/library/nelha-newsletters>

Special Events

- 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. NELHA welcomed three interns in FY18 and two in FY19.
- NELHA was not only a co-sponsor but also hosted the Hawaii Big Island Business Plan Competition at Hale Iako in November 2017. The \$25,000 first prize was won by Sunshine Pediatric Clinic.



- The popularity of Hale Iako space as a venue for gatherings, meetings and training has increased. The Small Business Development Center offers several classes and workshops per month. The collaborative space was utilized for events ranging from a University of Hawaii retreat, legislative visits, international delegation visits, client business meetings as well as NELHA agency and HOST Park events.

NELHA was pleased to be able to host a visit from the Senate Ways and Means Committee in October 2017.



- NELHA was approved as a Blue Zone in 2018. We called the effort HOST OLA. Ola is the Hawaiian word that can be translated to life, health, and well-being.



- NELHA provided almost \$50,000 of in-kind support and works closely with the Friends of NELHA (FON). Approximately 8,000 visitors per year for each of FY18 and FY19 were hosted at the Hawaii Gateway Energy Center and were given educational tours of the

facility. FON provides an extremely valuable outreach service for NELHA. FON received a \$175,000 grant-in-aid from the Legislature in 2019 and NELHA administered these funds and transferred them to FON for implementation.

NELHA was grateful to receive a Community Service Award from ThinkTech Hawaii in December 2017



Holiday Gathering for Research Campus NELHA Ohana Companies - December 2017

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.

“The direction NELHA is headed is part of the State’s plan for economic diversification. NELHA’s future is full of opportunity and possibilities which will lead to a strengthening of our communities and the economy for the island of Hawai’i and the State.”

Mike McCartney, Director,
Department of Business,
Economic Development and
Tourism. 2019.

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 FY2018 and FY 2019 we continued to focus on increasing efficiency of the seawater system, including replacing the existing pumps. In general, significant improvements were made to the seawater system to increase efficiency. NELHA continues maintain 99.99% uptime and review options to increase efficiency of the seawater system by several percentage points annually in terms of power consumption per gallon.

NELHA continued to make improvements to pump and controls efficiency by increasing automation and more precise control of pump combinations needed to deliver seawater. We completed numerous upgrades to pumps, variable frequency drives and electrical systems to increase redundancy in system to lower probability of seawater outage. We also added additional renewable energy systems to maintain seawater costs and sought funds for plans and design of removal of abandoned offshore deep seawater pipelines.

2018 Highlights

- Added additional flow meters for direct real-time data from the 14 largest seawater users representing 95% of total water flow.
- Total number of 700 data points on the SCADA system now logged in real-time and the number of sensors and different devices has expanded well over 100.
- Completed upgrades to seawater system that included: a) six new variable frequency drives; b) one new pump; c) one integrated circuit to auto sequence the VFD motor controls in research campus; d) six electrical surge and motor protection filters in research campus; and replaced all circuit wiring between control room and pump station in research campus.
- Drafted request for CIP funds to complete a planning and design study for removal of abandoned deep seawater pipelines. This request for \$500,000 in CIP funds was included in the Governor's Administration budget request and approved by the 2018 Legislature.
- Secured extension of \$4.9 million in reimbursable GO bonds with insertion of language the State budget bill which passed the Legislature in May 2018. Funding is for improvements and upgrades to the seawater system.

2019 Highlights

- Continued to increase efficiency in the pump systems that are now delivering seawater below 0.4 kW/kgal. We have achieved the best overall pumping efficiency system wide that is possible given the current equipment and configuration. After a review of earlier plans to install vertical turbine pumps at the 55" pump station we determined that it would not be cost effective at this time due to indications from clients that are making additional efforts to conserve seawater and reduce consumption.
- We were notified by the Korean Institute of Energy Technology Evaluation and Planning (KETEP) that we were selected as a participating organization for a grant award of \$1.73M USD for microgrid development.
- We worked closely with Sandia and Oak Ridge National Labs in reviewing a US DOE grant funding announcement for microgrid development and determined that the call was for foundational work as opposed to demonstration work which we had envisioned based on earlier indications.

- We initiated work to complete removal or securing in place of the abandoned deep-sea pipelines and a committee was formed to begin the procurement process. All previously surveys and information were assembled, and a detailed scope was completed. Due to the complex nature of the underwater work, as deep as 2,000 feet, it was determined that a two-step invitation for bid (IFB) process would be most suitable.

Aquaculture

An aerial photograph of an aquaculture facility. In the foreground, there are several large, circular, yellow-colored tanks. Behind them, there are more tanks, some of which are blue and white. To the left, there are several large, white, rectangular industrial buildings. The facility is situated on a dark, rocky coastline with the ocean in the background.

"The accelerator is in alignment with many of our existing research and training programs at the University of Hawai'i. We look forward to playing a significant role in creating a bright future in sustainable aquaculture for the state by helping to develop a skilled, knowledge-based workforce to make it flourish."

*Dr. Vassilis L. Syrmos UH
Vice President for Research
and Innovation*

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.

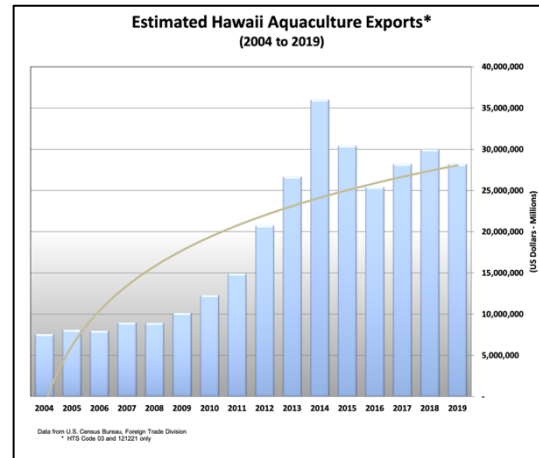
NELHA, Hawaii Strategic Development Corporation (HSDC) University of Hawaii (UH) Office of Innovation and Commercialization, and UH Ventures began developing an aquaculture initiative as a pilot effort to demonstrate the State's commitment to developing Hawaii's commercial aquaculture industry and to 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.



Aquaculture Proof of Concept Accelerator

This 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.

The initiative 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 attract investor capital to Hawaii's aquaculture industry. A critical key objective of this initiative will be to establish a follow-on fund for aquaculture startups 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 will significantly mitigate risks in the startups' business plans and enhance their ability to raise startup capital. Efforts 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.

2018 Highlights

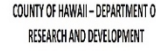
- We made very significant progress on this new initiative and continued to develop concept for a proof of concept center and seek funding solutions including State appropriations and/or grant funding.

- NELHA hosted a statewide aquaculture industry summit on November 16, 2017. The event was held at Hale Iako and included 110 professionals who gathered to develop the best strategies for Hawaii to highlight its many strengths in aquaculture at the upcoming 2020 World Aquaculture Society meeting in Hawaii. The premise was that if Hawaii is to



Hawaii Statewide Aquaculture Industry Summit

The Future of Hawaii's Blue Economy
"Organizing for 2020"



capitalize on the commercial opportunities in the global aquaculture industry it will have to undertake a concerted and collaborative effort to raise the global visibility of its commercial aquaculture industry. Breakout sessions were organized with the goal of sharing success stories, identifying strengths and opportunities, and building consensus on what the top aquaculture priorities should be. The breakout sessions were divided into four sectors: oceanic farming, freshwater farming, breeding/seedstock marine species and algae production. All four sectors had the build out of a Hawaii brand (including certification to protect the brand) as a key goal. Another recurring key goal was the development of programs including incubator/accelerator programs and establishing/strengthening existing advocacy/trade associations. Policies to further develop the aquaculture sectors included support from legislators and others to fund business launch and growth, streamlining species importation and perhaps developing a biosecurity center to establish guidelines for sustainable best practices for aquaculture.

- Successfully worked to get a request for \$500,000 in general funds in the Governor's budget request and effectively worked to obtain Legislative approval in the FY2019 State budget. NELHA continued to work with groups involved in securing venture funds to compliment the proof of concept center.

2019 Highlights

- Developed and released a Request for Information (RFI) to assist in secure operator for POC or accelerator and associated investment fund. Received four proposals and selected HATCH Blue to operate the accelerator. Also secured a three-party grant from the US Economic Development Administration (EDA) for \$275,000 to assist in project implementation. UH also agreed to contribute \$330,000 as a match for the EDA funds. We entered into a five-way agreement with State partners listed above and HATCH. HSDC initially managed this agreement with HATCH. The agreement included funds listed above as well as



\$475,000 from NELHA in general funds as well as \$500,000 of in-kind services, resources and rent was executed in April 2019. A successful press conference was held in Governor Ige's office on April 17, 2019.

- Worked with other State agencies (HSDC/UH/HTDC/DOA) and private sector to develop investment funds for businesses in POC and "follow-on" funding for successful business. The RFI described above also included the requirement to develop a "follow-on" funds to support successful businesses coming out of the accelerator. HATCH agreed to establish a fund of up to \$8M and HSDC agreed to provide a capital contribution of \$1.85M. A Limited Partnership Agreement was executed with HATCH as the general partner on April 15, 2019. HSDC was dissolved as a result of legislation enacted in June 2019 and HSDC's interest in the partnership agreement was transferred to NELHA as the limited partner in the accelerator fund. Accordingly, NELHA will receive its pro rata share of operating distributions from portfolio company stock from the investment fund.
- To support the new initiative, we upgraded open space and infrastructure in research campus to accommodate aquaculture businesses in cohort. A lease agreement was signed with HATCH for the operation of the accelerator and electrical and seawater.



Analytical Laboratory

Quarterly Water Chemistry Environmental Sampling

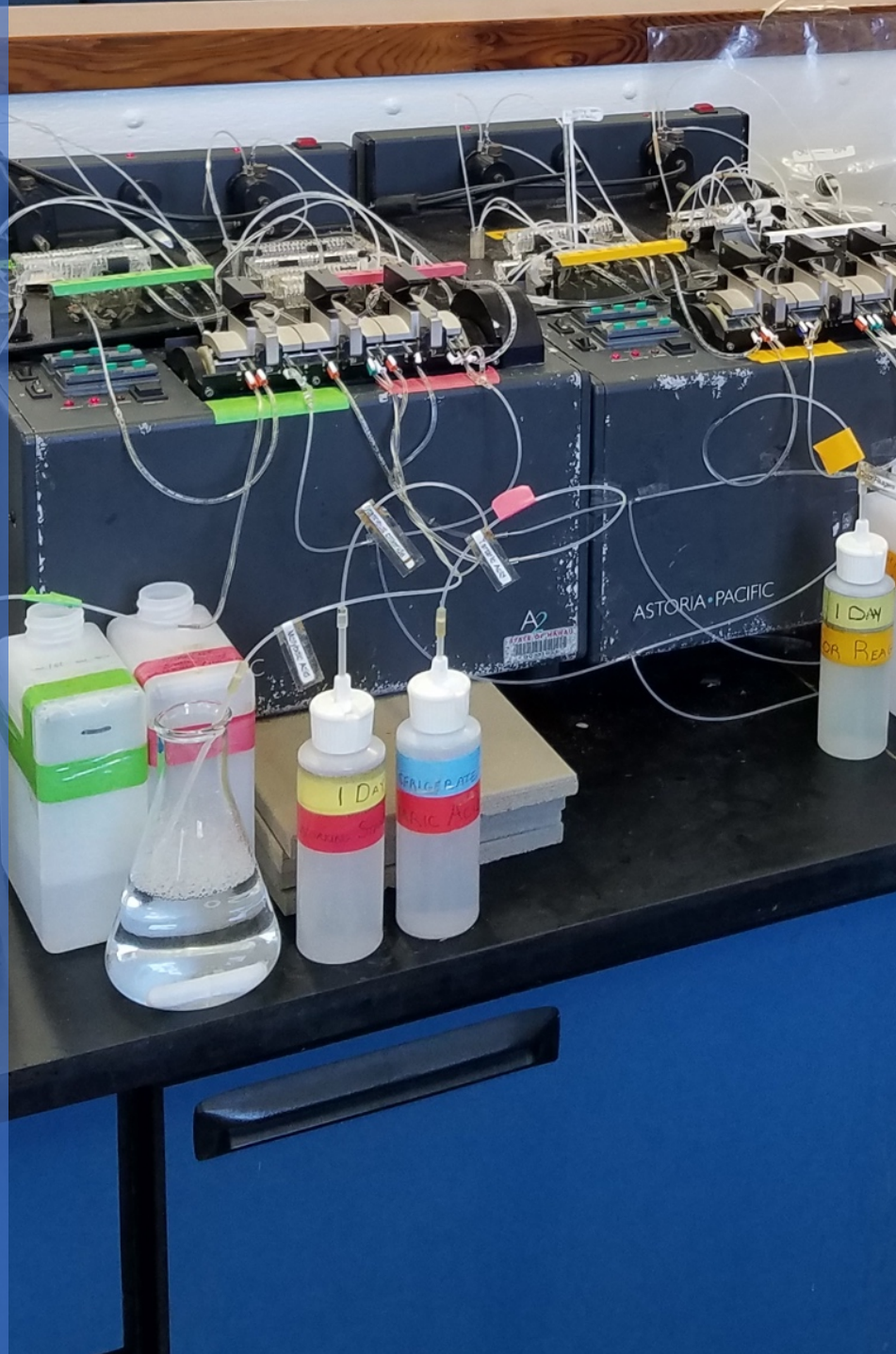
- **Ground Water Sample Locations**
34 Wells
3 Anchialine Ponds
- **Marine Water Sample Locations**
30 Marine Transects
1 Coastal Stations
- **Tenant Effluent Discharge Locations**
54 Tenant Discharge Sites

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

SCADA System Development

- 116 sensors and devices online.
- "Real-time" information to the desktop regarding 85% of total seawater flows.



The NELHA environmental monitoring program follows the guidelines instituted in 1988 with the NELHA Comprehensive Environmental Monitoring Program (CEMP). The CEMP program provided a framework for the environmental sampling and water quality analytical work NELHA performs daily. This work includes collecting 542 samples and performing 6,102 analytical tests annually. The NELHA Water Quality Laboratory also works closely with Hawaii Department of Health and other regulatory agencies to insure all environmental regulatory requirements are followed at our facility. In addition, the NELHA Water Quality Laboratory operates a research grade weather station, monitors the seawater system with its real-time Supervisory Control and Data Acquisition system (SCADA), and provides guidance to its clients on biosecurity issues and monitoring.

As seen from Kahilihili Street, winter storm dumped heavy snows on Mauna Loa December 21, 2017.



The CEMP program facilitates NELHA's ability to monitor its pristine offshore environment and serves as an early detection system should any irregularities with onshore effluent disposal occur. The NELHA Water Quality Laboratory has received its certified acceptable proficiency rating from the US Environmental Protection Agency's Discharge Monitoring Report-Quality Assurance Program (DMRQA) for FY 2019 and has maintained this level of analytical performance since 2008.



Snowcapped Haleakala on Maui as seen from the Research Campus on February 19, 2018.

The 2018 and 2019 CEMP reports show no extraordinary groundwater water quality issues. 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.

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, biochemical oxygen demand, total nitrogen, and total phosphorous as guided by HAR Title 11 Chapter 62 with further recommendations from the HDOH Wastewater Branch.

Biosecurity has increasingly been an important aspect of the laboratory's responsibilities, especially in the area of shrimp and mollusk grow out. NELHA continues to work with its clients in the biosecurity arena by providing self-inspection checklist and to monitor importation and transfer permits

Several years ago, NELHA began developing SCADA system and a sensor network to monitor the: 1) weather; 2) seawater structure (flows, water quality, 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.

The SCADA system has greatly enhanced NELHA's ability to obtain real-time operational performance information to the desktop. NELHA continues to upgrade SCADA and the Water Quality Lab with new instruments, monitoring devices, and software. The SCADA system future expansion goals will include faster networking capabilities, additional real-time integration of client flow meters, management reports and controls for our seawater system. The Water Quality Laboratories future expansion goals are to update aging instruments and to obtain more contract analytical work with NELHA's clients and other government agencies.

The Lab produces several publications annually including the CEMP and Meteorological reports. The 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.

Solar Desalination Project

- A conditional grant approval was received from US Department of Energy Solar Energy Technologies Office (SETO) on September 25, 2018 and Final grant approval was received on March 28, 2019. The total grant amount from the SETO is \$1,928,938. NELHA completed and received all State approvals and negotiated a contract agreement for \$1,846,412 with Trevi Systems Inc. which is the main contractor for this project.



The three-year project includes construction and operation of the world's largest FO solar thermal desalination plant is intended to demonstrate at scale, a novel desalination process called forward osmosis – or “FO” – which is quite literally the physicochemical opposite of conventional reverse osmosis. Recent breakthroughs in polymers and membrane manufacturing and have cleared hurdles in moving the technology out of the lab. By capitalizing on a unique pairing of resources at HOST Park the world's largest seawater distribution system and an existing 2MW concentrating solar power array, the project will leverage Trevi System's nine years of development of proprietary FO technology to design a system that will produce up to 130,000 gallons of agricultural-grade water per day, and by doing so also collect real-world data to derive the cost of FO desalinated water in commercial quantities. The water produced will be used by Cyanotech, a partner on this project, will utilize the water for growing microalgae.

Energy Storage Systems (ESS) Testbed Development

- NELHA held a second Energy Storage conference in Kona in December 2018. The conference was very successful, well attended and very well received with significant positive feedback. Activities included raising funds for the meeting, recruiting speakers, recruiting a vendor to assist with logistics of the meeting, preparing agenda, and handling details related to the meeting, site visits and UET project inauguration. The conference was included key officials from four national labs, US DOE program managers, other Federal, State and County agencies local utilities, and key private sector representatives and resulted relationship and network building for future projects. Summary can be found at: <http://nelha.hawaii.gov/energy-initiatives/energy-conference-december-5-6-2018/>.



Vanadium Redox Flow ESS. Contracts with Sandia National Laboratory and UniEnergy Technologies LLC (UET) were executed for a 100kW/400kWh energy storage system (ESS). Coordinated efforts with other funding partners (HELCO and Ulupono) to ensure complete battery purchase, installation and commissioning. A data acquisition system was completed and reporting on progress and presenting at annual US DOE performance review conferences was completed. Some anomalies occurred during the testing of the new technology the ESS we are looking at improved modules, a new power control system, transformer and outdoor rated enclosure.

PV Initiative

- NELHA completed installation of 178kw of additional PV in the Research Campus bringing the total amount of PV in the Research Campus to 215kw. NELHA will see

annual savings of over \$50,000 annually. 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. NELHA was selected as a demonstration site for this project and substantial funding for implementation will be available from KETEP.

Hydrogen Production, Storage and Filling Station

- Construction and testing work continued in FY18 and FY19 on HNEI's hydrogen production, storage and filling station in the Research Campus. NELHA is providing additional support by assisting with the planning, permitting and preliminary site work.

Regional Seawater Air-Conditioning Analysis

- NELHA requested and obtained \$250,000 in CIP funds to determine the feasibility of establishing a sea water cooling district (SWCD) in West Hawaii to provide SWAC to the West Hawaii community at large. The SWCD would provide a low-cost cooling alternative to the more conventional power intensive and less environmentally friendly air conditioning technologies currently available. The SWAC technology is proven, extremely cost effective and provides an attractive green energy investment to help Hawaii achieve its goal of 100% renewable by 2045. The purpose of this project is to determine the conditions under which the establishment of a SWCD supplied by existing NELHA infrastructure will be economically and technically feasible.

SPECIAL REPORT - NELHA Puna Property Damage Summary May 2018

Property

The property consists of 4.1 acres of graded land. It is owned by the State of Hawaii and leased to the Natural Energy Laboratory of Hawaii Authority (NELHA) since February 14, 1986. The property, Tax Map Key: (3) 1-4-001:082, is located at 14-3901 Pohoiki Road in Kapoho, Puna, Island of Hawaii, Hawaii. This site was originally developed to facilitate the demonstration of the viability of the underlying geothermal resource and afford the opportunity for research related to secondary uses of geothermal heat. The land was graded and included three structures, paved driveways, paved parking, utilities, fencing and gates. The property was leased the Puna Geothermal Ventures Inc. since 1999 for \$2,054 per month.

Event Description

The most recent eruption of Kilauea volcano in the East Rift Zone began in Leilani Estates on May 3, 2018. There were numerous fissures that opened in the rift zone. On May 22, 2018 lava from Fissure 15 began flowing onto this property from the south and destroyed one building and started a fire in another building as the lava surrounded it. By May 28, lava from Fissure 8 began flowing onto the property from the West and completely covered the property with lava from a depth estimated to be between 50 – 100 foot thick. There is no longer any visual evidence of these structures or any of the infrastructure that was on this property.

Structures

1. Visitor Center:

This structure served as the main visitor's and information center for the facility. The design of the building was "open Polynesian style" to allow natural air flow and open view planes of the landscaped grounds and wooded area. The Center included men's and women's bathrooms and a refrigerated drinking fountain.

2. Power Center:

This structure was originally constructed to house the main geothermal electric power plant equipment and process plumbing. The structure was prefabricated metal structural steel framing with corrugated metal siding. An ancillary metal frame building was attached to the side of the primary building at the southwest end. This ancillary building included an engineer's office, a separate restroom and a separate chemistry laboratory. The primary building was 29.5 ft. high and originally included a traveling bridge crane. After the resource well was shut down and abandoned, the main power plant equipment was sold as surplus material. This included dismantling the bridge crane and guide rail system.

3. Research Center

This structure and complex were constructed in two phases as a separate facility. Some of the superheated geothermal well fluid was flashed into steam at the Puna Geothermal Facility to drive the electric turbine generator. Some of the fluid was also plumbed to the Research Center and utilized in innovative ways to demonstrate the direct use of this hot fluid for potential commercialization.

Infrastructure

1. Driveways

Approximately 1,115 lineal feet of asphalt paved driveways. These driveways are nominally 20 ft. wide, which amounts to approximately 22,300 square feet of paving. This does not include separate parking lots adjacent to each building, as further described above.

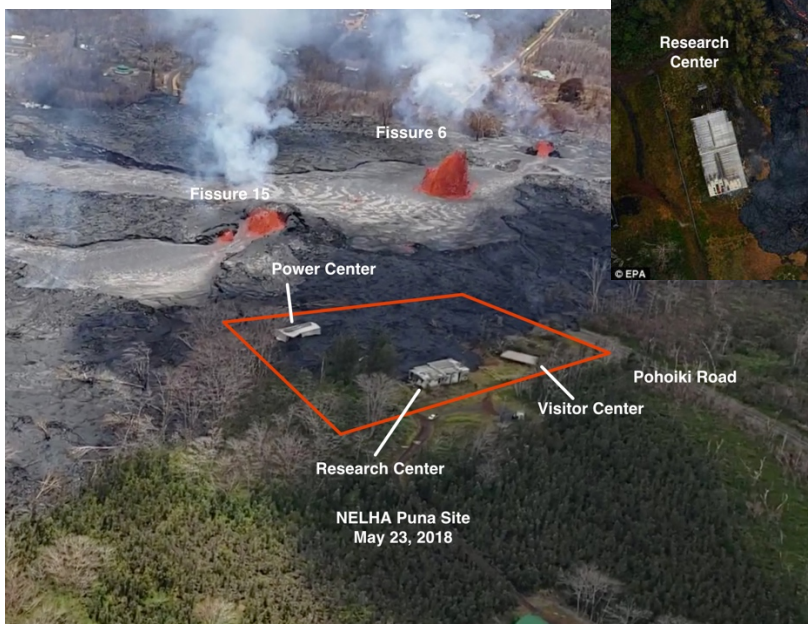
2. Utilities:

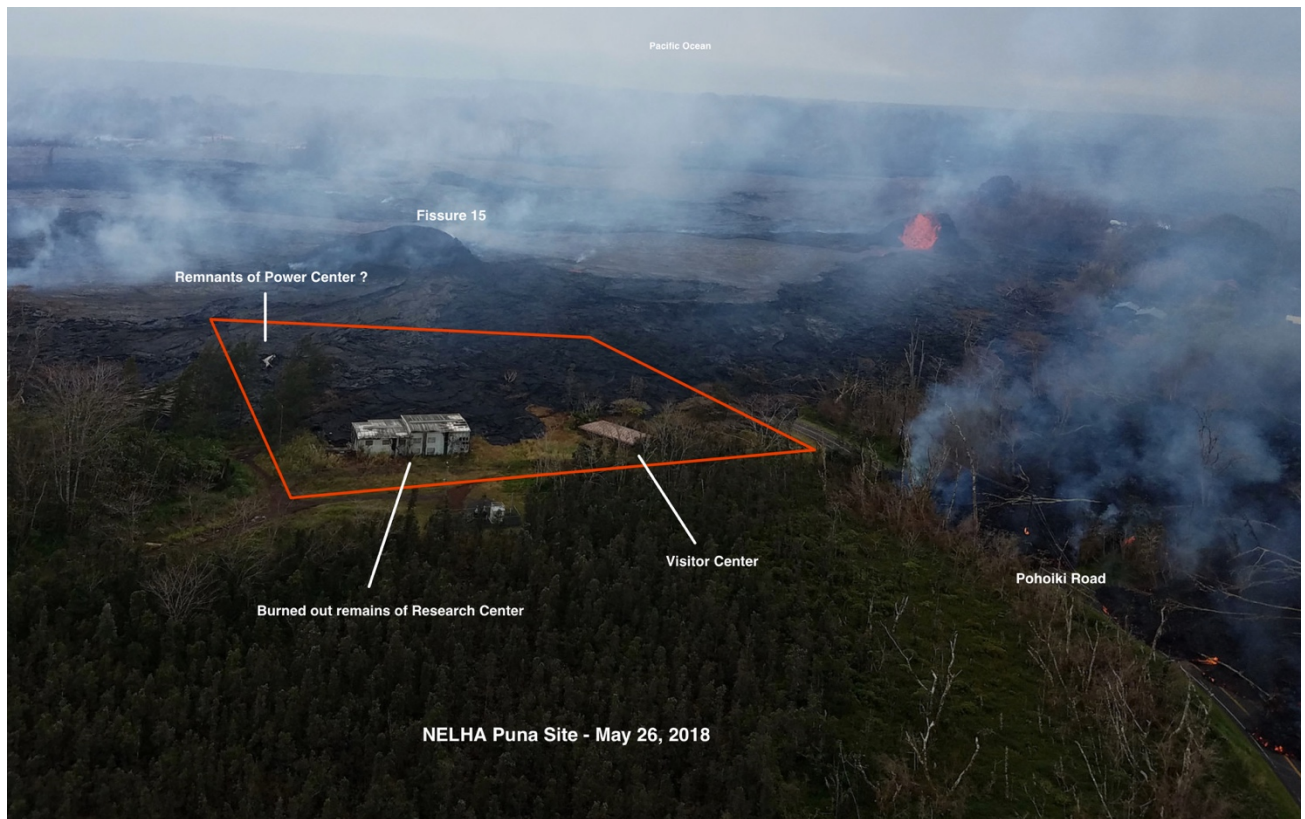
The property also contains street lighting standards, fire hydrants and underground vaults for electricity, telephone and water utilities evenly spaced along the roadways and driveways.

3. Fencing and Gates:

The property was surrounded by 1,250 lineal feet of 6 ft. high security fencing with three strands of barbed wire. This did not include separate fencing for the Visitor's Center. The fencing material was all hot-dipped galvanized. There were three 20 ft. wide vehicle gates incorporated within the fencing.

NELHA PUNA SITE



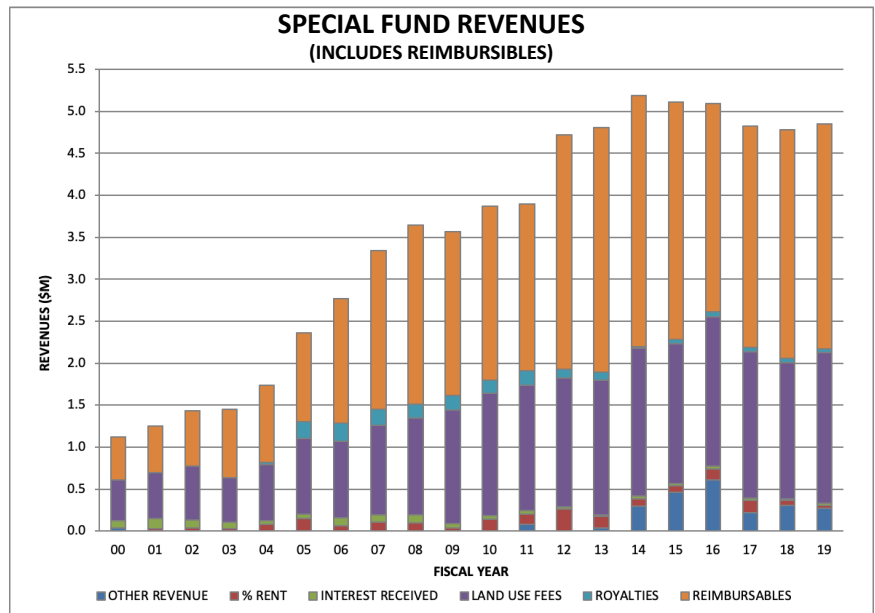


HIGHLIGHTS

Revenue – including reimbursables

- Total revenue has increased by approximately 30% between FY11 and FY16 but has remained relatively stable since that time.
- 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 decrease in the price of electricity and increases in pump efficiency which has a significant impact on the price of seawater.

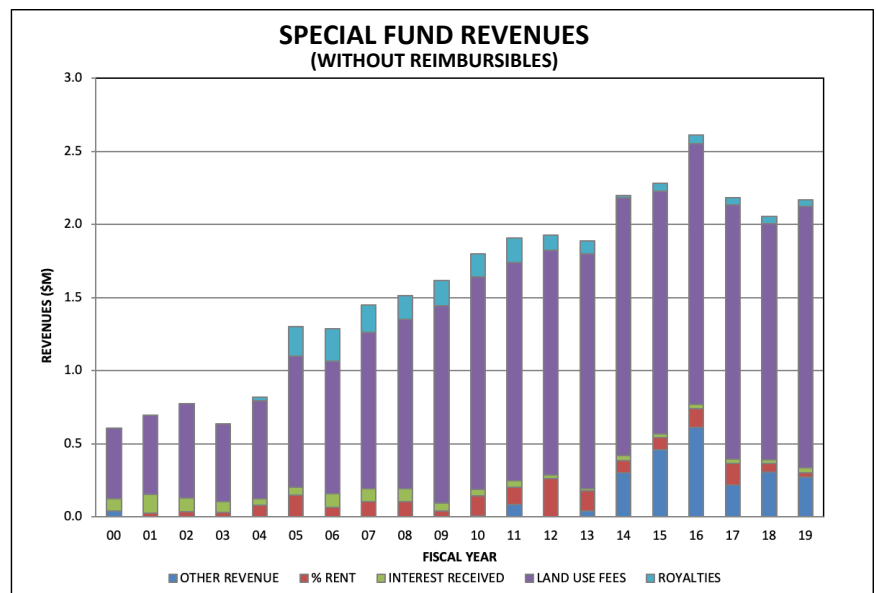
Total Revenues



Revenues

Revenue – without reimbursables

- Revenue has remained relatively stable over the past 5 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 FY17 and has remained relatively stable in the past several years.

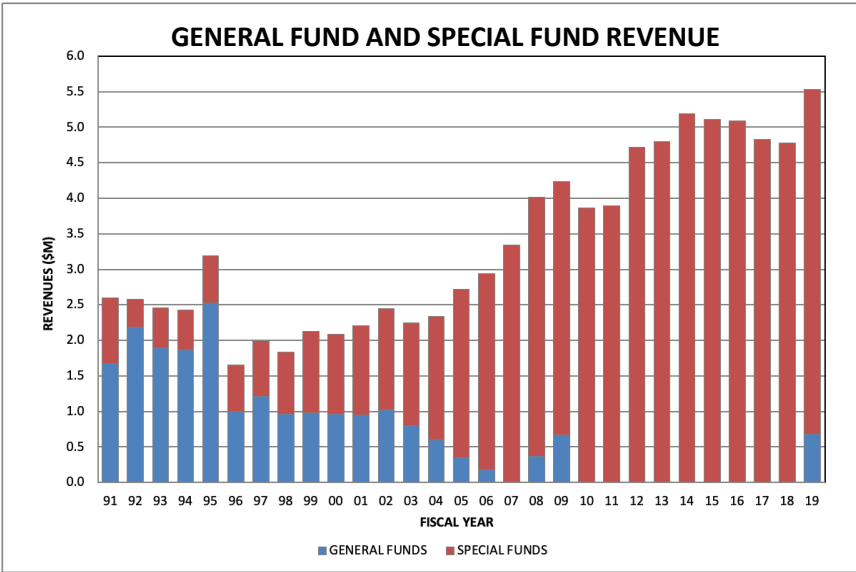


General & Special Funds

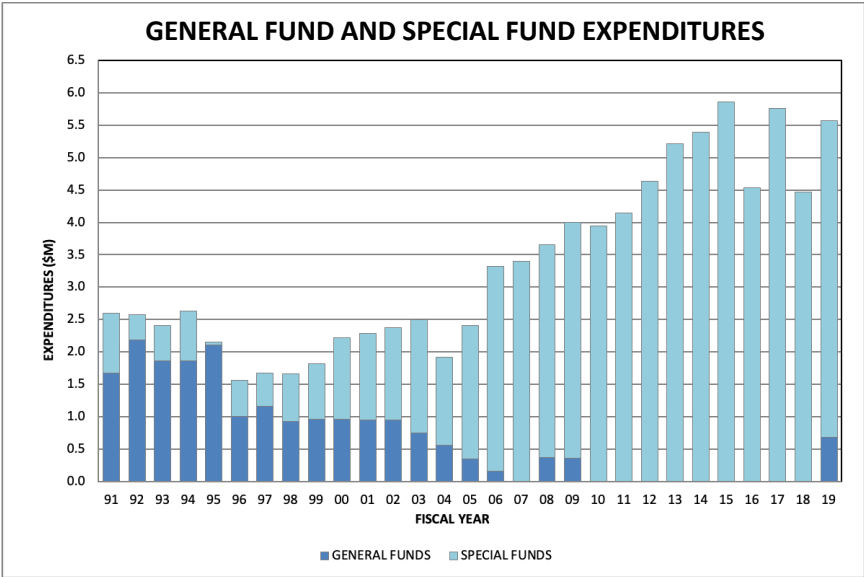
HIGHLIGHTS

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 received \$500,000 in general funds in FY19 for the new aquaculture accelerator program and a \$175,000 grant-in-aid passthrough for Friends of NELHA.
- NELHA continues to receive funds from the State for capital improvement projects, such as roads and are not included in this chart.



Expenditures



General vs. Special Fund Expenditures

- Expenditures show continued growth until FY14 and then stable or declining since that time as the special fund balance declined as we continued to invest in new infrastructure such as the business incubator building Hale Iako.
- In addition, expenditures are lower over the past several years as electricity costs for pumping seawater have declined and we have increased efficiency of the pumps.

NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY
FINANCIAL STATEMENT - FISCAL YEAR 2018
(Fiscal Year - July 1 to June 30)

	Fiscal Year 2018
--	------------------

REVENUES

Land Use Fees	1,619,546.50
Seawater Royalties	46,487.09
Reimbursables	2,728,768.54
Interest Received	20,231.48
Other	305,978.29
Percentage Rent	61,387.17
Subtotal	4,782,399.07

EXPENDITURES

Salaries	1,865,333.35
Operations	2,277,664.95
OHA (Ceeded Lands Transfer)	330,096.63
Subtotal	4,473,094.93

FINANCIAL POSITION

Special Fund Cash Balance (July 1)	254,278.34
Prior Year Unrequired claims	
Prior Year Transfers	-
Special Fund Revenues	4,782,399.07
Subtotal	5,036,677.41
Special Fund Expenditures	4,142,998.30
OHA (Ceeded Lands Transfer)	330,096.63
Encumbrances	182,622.52
Special Fund Cash Balance	380,959.96

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

NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY
FINANCIAL STATEMENT - FISCAL YEAR 2019
(Fiscal Year - July 1 to June 30)

	Fiscal Year 2019
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REVENUES

Land Use Fees	1,790,066.65
Seawater Royalties	44,980.60
Reimbursables	2,683,231.89
Interest Received	32,235.73
Other	272,426.27
Percentage Rent	29,880.10
Subtotal	4,852,821.24

EXPENDITURES

Salaries	1,940,818.35
Operations	2,592,242.08
OHA (Ceeded Lands Transfer)	361,638.05
Subtotal	4,894,698.48

FINANCIAL POSITION

Special Fund Cash Balance (July 1)	393,700.42
Prior Year Unrequired claims	-
Prior Year Transfers	156,424.20
Special Fund Revenues	4,852,821.24
Subtotal	5,402,945.86
Special Fund Expenditures	4,533,060.43
OHA (Ceeded Lands Transfer)	361,638.05
Encumbrances	96,753.30
Special Fund Cash Balance	411,494.08

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

NELHA Board of Directors

Linda Rosehill, Vice Chair (FY 2018) and Chair (FY 2019)

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

William F. Mielcke, Chair (FY 2018) and Vice-Chair (FY 2019)

Retired, President of Mauna Kea Properties
At Large Member appointed by Governor

Cyd Miyashiro (FY 2019)

Senior Vice-President, American Savings Bank
At Large Member appointed by Governor

Dr. Vassilis L. Syrmos, Ph.D. (FY 2018 and FY 2019)

Vice-President for Research and Innovation, University of Hawaii
Ex-Officio – President, University of Hawaii

Dr. John Morton, Ph.D. (FY 2018 and FY 2019)

Vice-President for Community Colleges, University of Hawaii
Ex-Officio – High Technology Development Corporation

Ron Whitmore (FY 2018)

Deputy Director, Department of Research and Development
Ex-Officio – Mayor, County of Hawaii

Diane Ley (FY 2019)

Director, Department of Research and Development
Ex-Officio – Mayor, County of Hawaii

Dr. Gerry Cysewski, Ph.D. (FY 2018 and FY 2019)

Chief Science Officer/Executive Vice-President, Cyanotech Corporation
Ex-Officio – Tenant Representative

Neil Sims (FY 2018 and FY 2019)

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

Mary Alice Evans (FY 2018)

Deputy Director, Department of Business, Economic Development and Tourism
Ex-Officio – Department of Business, Economic Development and Tourism

Michael McCartney (FY 2019)

Director, Department of Business, Economic Development and Tourism
Ex-Officio – Department of Business, Economic Development and Tourism

Michael O'Malley (FY 2018 and FY 2019)

Managing Partner, Goodsill, Anderson, Quinn & Stifel
Ex-Officio – Director, Hawaii Strategic Development Corporation

Dr. Bruce Anderson, Ph.D (FY 2018)

Administrator, DLNR Division of Aquatic Resources
Ex-Officio – Director, Department of Land and Natural Resources

Robert Masuda (FY 2019)

Deputy Director, Department of Land and Natural Resources
Ex-Officio – Director, Department of Land and Natural Resources

Alan Hilton (FY 2018 and FY 2019)

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

Dr. Jim Wyban, Ph.D. (FY 2018)

Founder, High Health Aquaculture Inc.
Ex-Officio – Research Advisory Committee Secretary

Dr. Phillip J. Bossert, Ph.D. (FY 2019)

Executive Director, Hawaii Association of Independent Schools.
Ex-Officio – Research Advisory Committee Secretary.

<p style="text-align: center;">The NELHA Team FY 2018 and FY 2019</p>	
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
Business Officer (2018)	Kaniho, Sheryll
Business Officer (2019)	Miranda, Jerree
Accounting Clerk III (2018)	Miranda, Jerree
Accounting Clerk III (2019)	Rasmussen, Jennifer
Administrative and Projects Manager	Leonard, Alexander
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 (Kealahou HS 2018)	Garces, Eva
Laboratory Intern (Brigham Young University 2018)	Nakamoto, Talmage
Laboratory Intern (Suncheon University 2018)	Seo, Chanung
Laboratory Intern (George Mason University 2019)	Benedict, Romilly
Laboratory Intern (Massachusetts Inst. of Technology 2019)	Vermeulen, Sidney

**Keith Olson receives
his 10-year Service
award from NELHA
Board of Directors
Chair William Mielcke**



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.
1993	State Legislature passes Act 252 to better define the role of NELHA.
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.

- 2018 The eruption of Kilauea volcano in the East Rift Zone began in Leilani Estates in May and numerous fissures opened. On May 22 lava from Fissure 15 began flowing onto NELHA's 4.1-acre Puna Geothermal facility from the south and destroyed one building and started a fire in another building as the lava surrounded it. By May 28, lava from Fissure 8 began flowing onto the property from the west and completely covered the property with lava from a depth estimated to be between 50 – 100 foot thick. There is no longer any visual evidence of these structures or any of the infrastructure that was on this property.
- 2019 NELHA increases focus on aquaculture and establishes an accelerator and follow-on investment fund to grow startups to grow global aquaculture.

2018-19
Annual
Report

