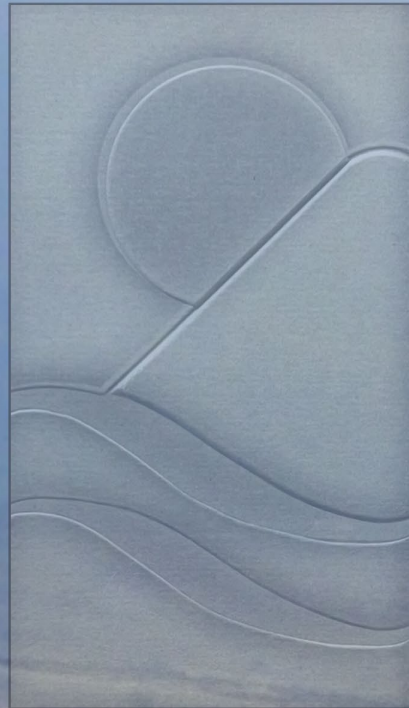


NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY

2020-2021
ANNUAL
REPORT



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>



Table of Contents

1. Introduction	1
2. Seawater System.....	11
3. Analytical Laboratory	19
4. Advanced Energy	23
5. Aquaculture.....	29
6. Development, Leasing and Marketing.....	35
7. Financial Statements.....	41
8. NELHA Board of Directors	45
9. NELHA Employees	47
10. Appendix: Historical Timeline of Major Events (1974 to 2021).....	48

NELHA FY 2020 and FY 2021 ANNUAL REPORT

Introduction and Background

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 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 over 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 generate electricity using ocean thermal energy conversion (OTEC) technology and in addition to re-using the same water a second time for other seawater projects. 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 but continues to explore the long-term potential of OTEC technologies as well as secondary uses for the seawater and the 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 additional main resource: high solar insolation. This includes advanced energy research and development such as solar thermal energy production, algae growth for biofuels, seawater air conditioning, desalination, and aquaculture, mainly as algae production for nutraceuticals and fish/seafood hatcheries.

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 start-up and new ocean technology oriented business enterprises. Accordingly, HOST Park is the premier choice for the location of a variety of leading-edge research, education, and commercial enterprises capitalizing on innovation at the nexus of energy, water, and food.

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 advanced energy and ocean sciences. The vision for HOST Park has long been to serve as an “outdoor demonstration site” for many of the US National Energy Laboratories as well as many private sector companies.

NELHA As a State Agency

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 has been 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.

As shown in the table below, NELHA provides many services, resources, and expertise to the 50 plus business clients in HOST Park.

SERVICES	RESOURCES	EXPERTISE
<p>NELHA services are tailored to fit each business in HOST Park.</p>	<p>NELHA is uniquely suited as a test bed for advanced energy and ocean science opportunities.</p>	<p>NELHA provides a wide variety of support to businesses in HOST Park.</p>
<p>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.</p>	<p>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.</p>	<p>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 reliable and accurate environmental monitoring data. The Lab has become a benchmark for environmental water quality analysis for ocean water.</p>
<p>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.</p>	<p>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.</p>	<p>Scientific and Cultural Support: Due to the long-term success of many businesses 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.</p>
<p>Accelerator: One of the only aquaculture accelerators in the world is based at NELHA and offers a follow-on venture fund to take start-ups to the next level.</p>	<p>High Solar Insulation: In the lee of three major mountains, HOST Park receives approximately 12.5 inches of rainfall annually and offers the highest solar insulation of any coastal site in the United States.</p>	<p>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.</p>

Overall Summary

NELHA continues to fulfill its mission by formulating and effectively communicating a motivating vision, goals, and strategic direction for NELHA, providing adequate resources to the NELHA team for training, experience to grow, think strategically and managing communication with its Board by providing periodic “flash updates” to events that could have an impact on overall policy.

Over the past seven years key results include:

- Attracted 51 new businesses to locate at HOST Park. Many of these were start-ups and some either graduated, moved to another site or are no longer in business. Total number of existing businesses at HOST Park increased by 40 percent;
- Completed four CIP projects totaling \$16 million;
- Five CIP projects underway totaling \$6.5 million;
- Awarded six Federal and foreign grants in the past four years totaling \$10 million;
- Renovated warehouse/office building into 15,000 square foot incubator office building with 17 offices and collaboration space for start-up companies;
- Implementing advanced energy projects including: 1) the world’s largest forward osmosis (FO) solar thermal desalination plant for a high visibility ‘on sun’ demonstration of seawater desalination for agricultural applications; 2) construction of a PV and ESS testbed for testing artificial intelligence to reduce energy storage costs; 3) 65 kg/day hydrogen generation demonstration facility; and, 4) Grid scale advanced flow ESS demonstration project.
- Current energy use is 10 percent renewable and will increase to 25 percent within the next year;
- Increased energy efficiency of seawater pumping system by 15 percent in the past five years; and,
- Established one of the first global accelerators in the world to provide proof-of-concept and commercialization services to start-ups in Hawaii’s aquaculture cluster and attracting new investment to Hawaii.

Global Pandemic

NELHA recognized the challenges during the global crisis caused by the Global Pandemic of 2020 and into 2021. NELHA remained vigilant of operational issues caused by this crisis and closely monitored impacts on clients and potential downturns in demand for their products. NELHA took steps to ensure that any impacts on the health of NELHA staff are minimized to maintain operations with as little disruption as possible.

In response to the Global Pandemic of 2020, NELHA took steps to manage impacts on operations and clients including: 1) Closely monitor impact on NELHA clients and demand for their products; 2) Evaluate ways to assist smaller companies when warranted and especially those that are severely impacted; 3) Increase security in HOST Park by managing access when State and County issued proclamations ban or limit social gatherings especially at Wawaloli Beach Park and along the shoreline; 4) Review options to “work from home” for NELHA employees to lessen impacts of the pandemic when warranted; 5) Remain vigilant regarding impacts on health of NELHA employees to ensure use of personal protective equipment, sanitizers and social distancing; and, 6) Increase use of virtual meetings with clients and for NELHA Board of Director meetings.

Given the extraordinary times and in alignment with precautions set by other agencies, NELHA made changes to operations in March 2020. At that time, NELHA closed normal operations, and had only one operations staff report to work daily to ensure the seawater system was operating normally and one administrative staff report to work daily. All other employees “worked from home”. In addition, Wawaloli Beach Park, the Gateway Building, Hale Iako, NELHA Offices in Keena Hana and Hale Wai Ono were closed to the public. All public restroom buildings were closed, portable public restrooms were placed at the entrance to the Research Campus and at Wawaloli Beach Park, nighttime fishing permits were discontinued, and the security service patrolled HOST Park 24/7.

NELHA assisted several businesses impacted by the pandemic with applying for Federal, State and County disaster assistance programs and in receiving an exemption from Governor Ige’s proclamation as they were performing essential services. Given that NELHA employees are in four separate buildings, and many have separate offices NELHA, NELHA staff was able to resume modified normal operations with all staff reporting to work at HOST Park on June 1, 2020 after having purchased significant supplies of disinfectant, other sanitizer supplies, masks, temperature devices. Public restrooms were reopened however NELHA offices remained locked to visitors and NELHA made extensive use of Zoom for meetings.



NELHA was able to successfully work through June 2021 without any major disruptions. There were several instances of potential contact with COVID however with 10 day “work from home” for those NELHA employees potentially exposed, NELHA was able to make it through the year without any positive cases of COVID-19. NELHA

partnered with the Department of Health and Premier Medical Group Hawaii (shown

above) to offer free COVID-19 vaccinations to NELHA staff and HOST park employees at Hale Iako in 2021.

It important to note that in FY 2021 there were no closures of businesses at HOST Park, and NELHA welcomed six new clients to HOST Park. This is a strong indication of the resiliency of businesses in those sectors at HOST Park. NELHA considers that a strong indication of success in providing adequate support to clients and the strength of their operations.

2020 Highlights

1. Increase in revenue streams within the NELHA Board approved business plan.

Total revenue was \$4,600,000 for FY2020 and represented an increase of 4 percent over FY 2019. Specifically, although seawater system revenue was down by 6 percent due lower demand, lease base rent was up by 13 percent or \$170,000; and miscellaneous income was up by 200% due to a deposit on the HDMI building.

For the first time, although only for a short period, the offices in the Hale Iako building were completely leased out. NELHA lost only one small office rental as a direct result of the pandemic and this office was immediately leased up by an existing client. Occupancy in the research campus was also at some of the highest it has ever been despite the pandemic with small expansions from three companies (Pacific Hybreed, Ocean Era and Kanaloa Octopus).

The transfer of the Mera Pharmaceuticals facility to Sea Salts of Hawaii breathed some new life into a neglected facility. A new 1-acre demonstration project that uses concentrated solar power to recycle plastics for manufacturing tanks and other items began near the Gateway Center. Finally, despite the pandemic, two new companies from out-of-state (Blue Ocean Barns and Innovator Energy) established themselves at HOST Park.

2. Continued to improve landlord/tenant relationships.

Completed annual satisfaction survey in Fall 2019 with 30 respondents. As shown on page 10, satisfaction rate was very high with 95 percent indicating satisfied or very satisfied. Resumed semi-annual newsletters and published a Summer and Winter newsletter. Maintained strong contact with all tenants during COVID19 outbreak in March – June 2020 timeframe and no issues reported with traffic control.



Example of recent NELHA newsletter “The Pipeline” and can be found on the NELHA website.

2021 Highlights

NELHA continued to make significant progress in FY 2021 with a small staff of 16. From a financial perspective, NELHA closely monitored our special fund operational expenditures of \$5,000,000 and increased the special fund balance by \$160,000, continued to work on six CIP projects totaling \$5,100,000, and existing grant funds of \$5,500,000. In addition, NELHA realized an additional \$6,300,000 from the sale of a building, insurance proceeds of \$3,000,000 and a new EDA grant of \$1,800,000. Specific highlights include:

1. Increased utilization of under-utilized assets such as the Gateway Center and Hawaii Deep Marine sites. Complete sale or lease of old HDMI site.

NELHA completed several new leases in FY 2021 in the Research Campus and two new leases in HOST Park were executed. This includes the August sale of the old HDMI building to Blue Ocean Mariculture for \$1,500,000 and 4.5-acre lease the 10-acre lease to Blue Ocean Barns in June. Several proposals for the sale of the Destiny Deep Sea water site were evaluated and we continue to look at alternatives for the Gateway Center.

2. Updated NELHA Marketing plan to increase focus on attracting new clients.

NELHA updated the marketing plan to leverage some opportunities that have recently become available. HATCH has a very active marketing group, and this provides an opportunity to partner to attract both promising startups to the HATCH accelerator as

well as clients to HOST Park. Additionally, the EDA grant received has significant funding set aside to promote HOST park. A plan has been developed to make the most use of marketing funds (approximately \$225,000 over the next 4 years). This includes a new HOST park website, a virtual online tour, videos of success stories, HOST park brochure and other collateral materials, an improved social media presence and outreach work at trade meetings (virtual and in person).

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 and generate additional revenue to cover development costs and make necessary improvements to facilities and infrastructure. NELHA will continue to review non-performing assets and realize the revenue potential afforded.
- NELHA is endeavoring to reduce its carbon footprint and add more renewable energy sources. Main initiatives include: 1) Establish an energy storage testbed; 2) Develop an integrated energy district or microgrid; 3) Work with the University of Hawaii and US Department of Energy to develop a testbed for hydrogen technologies; 4) Expand efforts to assist the private sector in commercialization of OTEC; and, 5) Expand 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. NELHA will provide regular feedback to staff on customer service and solicit input from 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. NELHA will continue to develop the strategy to establish an aquaculture

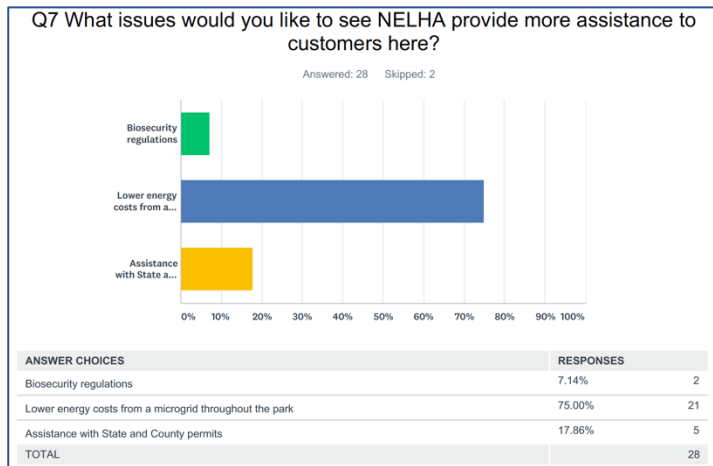
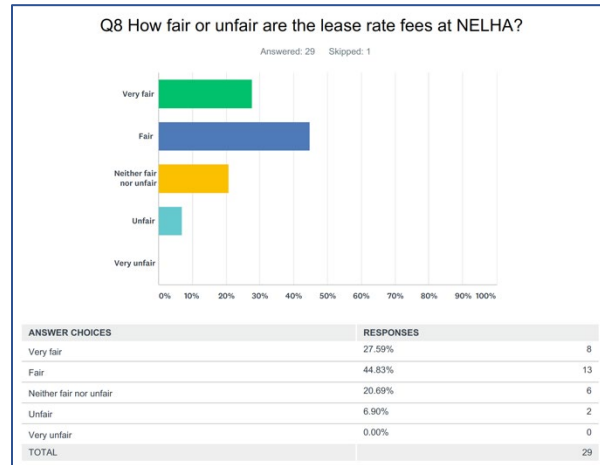
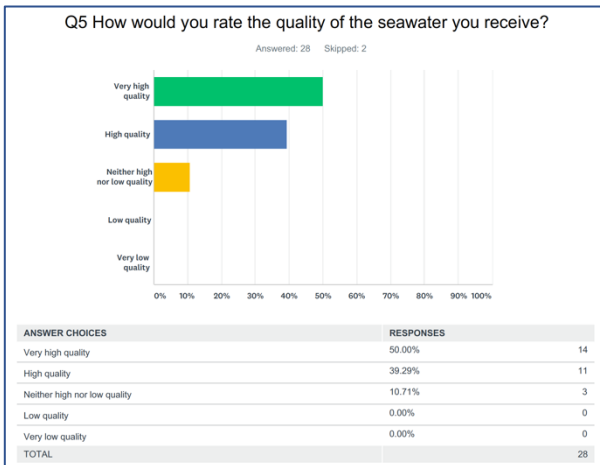
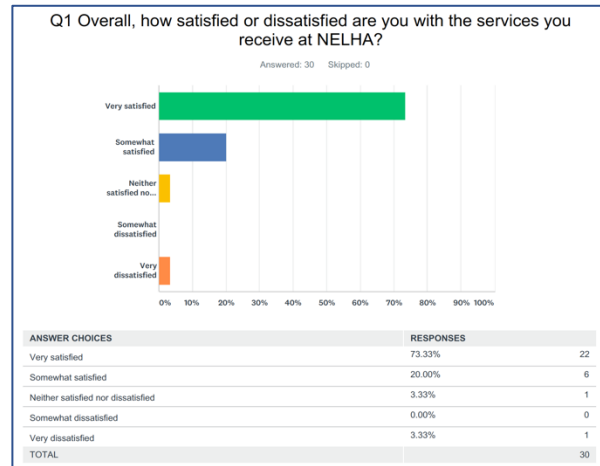
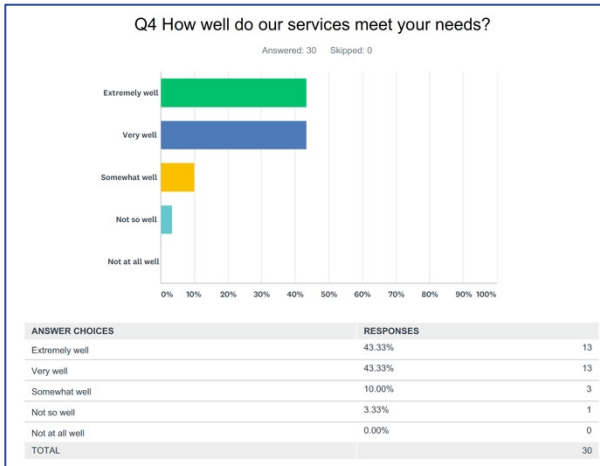
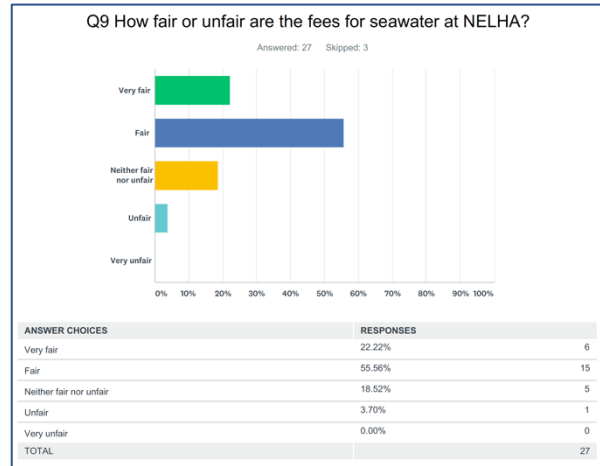
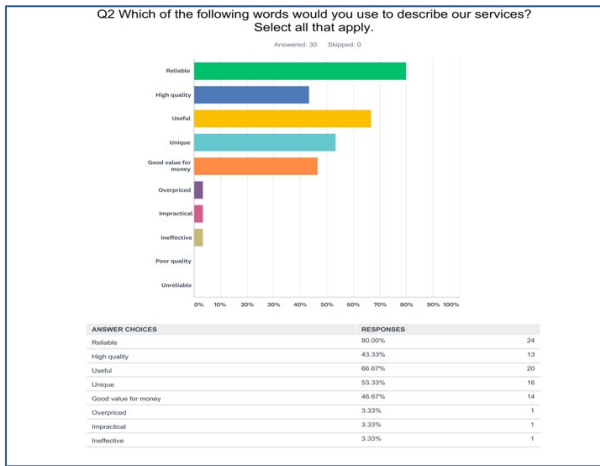
proof of concept center at NELHA and identified as a place for innovation of global aquaculture technologies.

- The NELHA seawater system is the largest and most advanced in the world. NELHA 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. NELHA will continue to work with 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.



Looking north from the Research Campus with Maui on the horizon

Results from the NELHA Customer Satisfaction Survey – Summer 2019



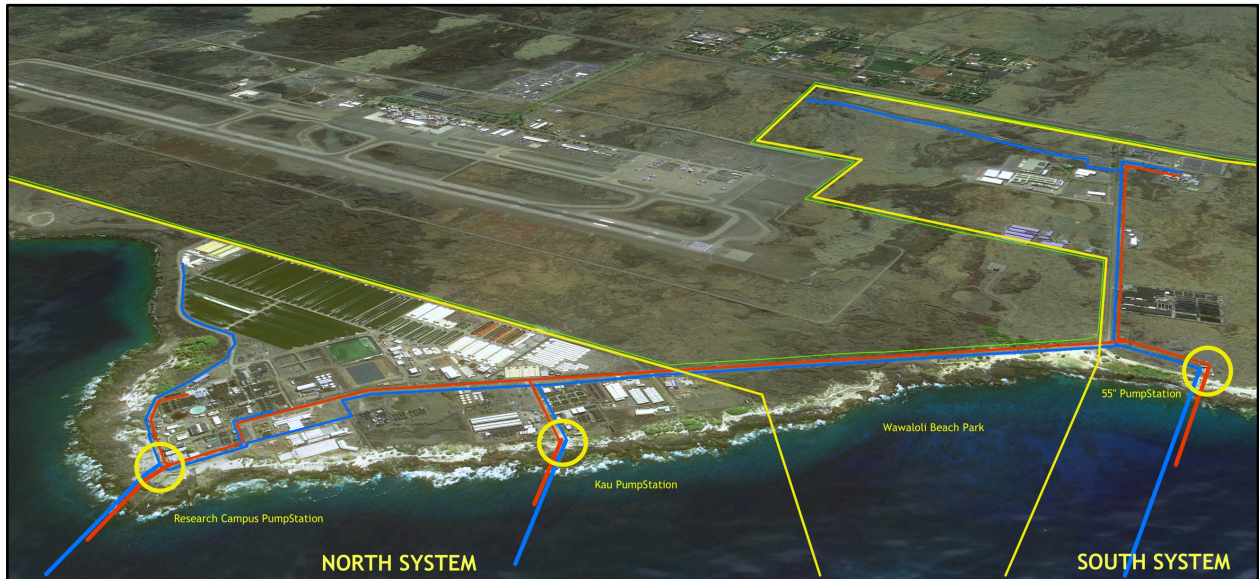
Seawater System



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.

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	

In FY 2020 and FY 2021 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 to 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. NELHA completed numerous upgrades to pumps, variable frequency drives and electrical systems to increase redundancy in system to lower probability of seawater outage. NELHA 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.

2020 Highlights

1. Continued to maintain 99.99% uptime and reviewed options to increase efficiency of the seawater system by 1% in terms of power consumption per gallon. Made improvements to pump and controls efficiency by increasing automation and developing more precise control of pump combinations needed to deliver seawater. Completed plans to install new pumps at the 55" pump station.

NELHA has achieved its goal for 2020 of being below 0.40 kWhr/kgal in terms of pumping efficiency facility wide. Although there was a 1.33% decrease in efficiency from FY2019, the unfavorable efficiency direction was due to the drop-in seawater demand. NELHA experienced a 10.9% drop in seawater delivery in FY2020. We were able to react to larger changes at the 55" pump station to avert costly pumping by reducing to one in service deep seawater (DSW) pump and tuning the variable frequency drives (VFD) pressure control persistence to force the pump in operation to roll through temporary demand spikes. In general, these changes saved NELHA 25 -35 kW per hour that would have increased the overall cost of the pumping operation from last year.

NELHA's Research Campus pump station continues to be the most efficient system in terms of energy utilization per kgal (0.369kWhr/kgal) but does half the work as the 55" pump station, as the research campus only lifts the water to 30.13 ft. (13.5 psi) while the 55" pump station lifts the seawater to 64.5 ft. (28 psi). The 55" pump station has an energy utilization of 0.407kWhr/kgal where the surface seawater (SSW) pumps operated at 0.385kWhr/kgal and the DSW pumps operated at 0.429kWhr/kgal. This difference is not surprising, as there are greater frictional losses due to the pipe length creating greater draw down in the DSW system vs the SSW system. The Booster and interim surface seawater (ISSW) pump stations recorded an overall energy utilization of 0.424kWhr/kgal and 0.359kWhr/kgal respectively. In FY 2019, the Booster and ISSW pumps recorded an overall energy utilization of 0.321kWhr/kgal and 0.304kWhr/kgal respectively. This was a 32 percent increase in energy usage to deliver 1 kgal of water for the booster pump last year. We observed a 15 percent increase in energy usage to deliver 1 kgal of water for the ISSW pump system. We are considering utilizing a smaller 40 hp pump at the booster pump station to increase efficiency and planning to install a smaller new pump at the ISSW pump station. Both

of these changes will increase pump efficiency, but may not realize a large monetary savings, as the electrical loads are very low in both systems.

NELHA is exploring ways to upgrade the control systems to make decisions from a facility wide perspective vs. an individual pump station perspective. This goal will take considerable programming and control system upgrades to implement.

More specifically, two additional Gould pumps of the same model that NELHA is presently operating at the 55" pump station were ordered. One will be a complete pump and the second pump will be a pump only with no electric motor or frame. These upgrades will be sufficient for the next 3-5 years.

We chose not to install a new, single vertical turbine pump due to complexity of the modifications that would have to be made to accommodate this type of pump under the current demand requirements. NELHA's crane would also not be capable of installing or removing this type of pump.

At the Research Campus, we continue to install more electrical circuits and electric motor protection devices. This has reduced submersible motor failure and created more uptime for the pumps.



Underground deep seawater and surface seawater intakes at the 55" pumpstation before installation

2. Selected consultant to formulate plans and design of removal of abandoned deep seawater pipelines.

The \$500,000 amount appropriated for this project has been encumbered. Consultant was selected and the resulting contract has been awarded and executed for the underwater survey of pipeline locations. Remaining funds for the design of removal or anchor in place have been encumbered. Project is on hold (underwater survey company is from Alaska) due to COVID19 travel restrictions.

2021 Highlights

1. Continued to maintain 99.99% uptime and reviewed options to increase efficiency of the seawater system by 1% in terms of power consumption per gallon. Made improvements to pump and controls efficiency by increasing automation and developing more precise control of pump combinations needed to deliver seawater. Completed installation of new pumps at the 55" and Research Campus pump stations.

Our FY 2021 energy review for the seawater system, shows the facility has increased its overall efficiency by 4.43% in terms of power consumption per gallon from FY 2020. In short, we saved \$39,347 this year in electrical cost alone when compared with the facilities kWhr/kgal efficiency rate last year with the FY 2021 electrical costs and pumping volumes. In FY 2020, we observed a 0.395 kWhr/1,000 gallons (kgal) energy usage rate (an energy cost of \$0.1176 to pump a kgal at an annual utility rate of \$0.2980/kWhr). In FY 2021, we observed 0.377 kWhr/kgal energy usage rate (an energy cost of \$0.1074 to pump a kgal at an annual utility rate of \$0.2846/kWhr). This was due to three factors, deployment of new pumps at the Research Campus, fixing the leaks in the distribution system, and strategically deploying the appropriate pumps for the pump load as discussed below.

Looking back five years shows considerable increases in efficiency and we continue to move in the right direction. When we began to log all the data necessary for this analysis in 2016, the energy usage rate was 0.442 kWhr/kgal versus 0.377 kWhr/kgal today or an increase in efficiency of 15 percent.

NELHA's Operations Department has been diligent in right sizing pumps for the water demand over the past 2 years. Accordingly, we installed four new submersible pumps at the Research Campus, two 85 horsepower (hp) pumps and two 44 hp pumps. The 85 hp pumps were not physically compatible with the existing pump mounting system. Therefore, the 85 hp pumps were removed from operation and the intake area

connection elbows will be replaced with the correct model. The 44 hp pumps were installed successfully in the Surface Seawater (SSW) pumping system. We determined that new pumps were not warranted for the 55" pump station at this time.

NELHA repaired two significant surface seawater leaks in late March and early April 2021. NELHA is increasingly utilizing techniques, such as throttling a cross over valve between the 55" Pump Station and the Research Campus Pump Station to add to overall efficiency. In addition, although indirectly related to energy efficiency, the Operations Department has significantly minimized the number of pumps in operation system wide. This includes the shutting down of the Kau Pump Station and optimizing our pump selection process so only one pump is running at each pump station. By and large, this has reduced the number of pumps operating from 11 pumps to 6 pumps at any one time. Some of the reductions are due to decreased demand, however, the remainder has been due to closely matching pump capacity with demand and throttling the crossover valves. Focusing on utilizing the bare minimum of pumps to meet our clients demand, we have decreased the number of hours on the total number of pumps in the system and hopefully this will translate into less overall maintenance costs and increased readiness, as we have more pumps to available when needed.

In addition, managing demand is also critical to reducing overall energy costs and NELHA continues to evaluate alternatives to minimize HELCO demand charges to electrical costs. This is sometimes unavoidable, but it is a costly aspect of the overall energy costs. Currently, the demand charges have risen for the J schedule from \$13/kWhr to \$14/kWhr and for the P schedule from \$25/kWhr to \$27/kWhr.

Progress is being made to further improve the overall system efficiency and uptime of the seawater operations by 1) finishing the installation of over temperature and water leakage detection devices for the Research Campus submersible pumps. These protection devices have reduced the number of failures of our submersible motors. We also began planning for the system wide implementation of Schneider Electric ScadaPacks in FY 2022. These devices will provide more reliable remote monitoring and control of each pumping station.

Finally, the installation of valves at strategic locations in the seawater distribution system to balance load (Isolation Valve Project) between the South and North Seawater systems has begun and is in the planning stages. We polled tenants to determine the duration and timing of major seawater shutdowns, which are necessary

to complete the project and shutdown is now planned for FY 2022. Installing these new isolation valves will expand our flexibility to further increase efficiency and lower overall maintenance costs.

2. Continued work to create a detailed locational survey using underwater remote operated vehicles of deep seawater pipelines that were abandoned over 30 years ago.

NELHA coordinated work between the contracted underwater survey company (Terrasond) and the engineering team that is the user of this data - for designing the mitigation strategy to address the risks posed by these pipelines – to refine the scope for the survey and the data collection methodology to meet the needs of the design team. This project was severely impacted by the pandemic as Terrasond is based in Alaska. In addition to restricted travel from Alaska for their personnel, NELHA staff were very concerned about being on a vessel offshore in confined quarters for up to one week.

A notice to proceed for the survey was finally issued in June 2021 and a survey team mobilized to Kona to set-up and start fieldwork. The custom-built ROV chosen by the contractor is state-of-the-art, being capable of operating at greater depths and for longer durations than any in its size-class, at the same time requiring much smaller deployment tether, and therefore smaller (more available and less costly) vessels to work from. However, this new class of ROV had not yet been proven at the 2,000-foot depth required for this project, and it was unable to perform adequately under the current flow conditions in the survey area. Contractor attempted for several weeks to resolve various failure modes but was unsuccessful and ceased work to return to their home base in Alaska. There was very little likelihood that the work could be completed with the equipment shipped to Hawaii.

The consultant is regrouping and seeking alternative equipment to complete this challenging underwater survey at 2,000-foot depth. In late June, the consultant indicated positive developments. Terrasond has committed to completing the contracted scope of work and has presented a new workplan – however COVID pandemic travel restrictions and safety protocols precluded any work until fall of 2021 – at which time winter storm season made for unsafe working conditions. Contractor requested, and we approved, a delay in restarting the survey until after this storm season, in spring of 2022.

3. Selected contractor to plan and design strategies to address the long-term status of abandoned deep seawater pipelines.

Consultant was selected, and the resulting contract has been awarded and executed for defining the scope and designing the mitigation strategy to address the risks posed by the abandoned pipelines. We executed a contract for Makai Ocean Engineering (MOE) to complete this work. However, the project has been delayed pending the results for the underwater survey by Terrasond listed above. MOE working with NELHA and Terrasond, refined the scope and data collection methodology of the field survey to meet the needs of the design team. Further work is pending receipt of results of the underwater field survey from Terrasond.

4. Made progress on securing three offshore pipes (nearshore).

All of the specialized parts and materials have been purchased for this project and procurement for a company to install the new hold-downs was completed. However, we did not execute a contract for their services due to budget shortfalls. The project is currently scheduled for the Spring 2022 after the winter surf season and the selected contractor is so far willing to hold their bid price and to wait for the award.



Research campus view looking South

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

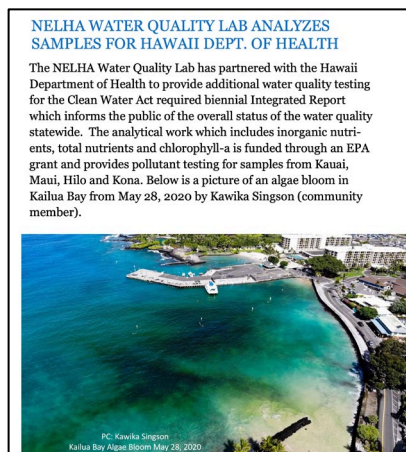


The NELHA environmental monitoring program follows the guidelines instituted in 1988 with the NELHA Comprehensive Environmental Monitoring Program (CEMP). The CEMP program provided a framework for the environmental sampling and water quality analytical work NELHA performs daily. This work includes collecting 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.

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 2020 and has maintained this level of analytical performance since 2008.

The 2020 and 2021 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.



The NELHA Water Quality Laboratory manages a benthic and biota monitoring program. The nearshore marine environment surrounding NELHA, known as Keahole Point, is known for supporting abundant and diverse benthic and fish communities. The development of NELHA included the installment of pipeline infrastructure on the reef in order to pump surface and deep seawater to the operational facilities. Since installing the

underwater pipe components, a comprehensive monitoring program was developed to ensure the NELHA infrastructure and activities do not detrimentally affect the health and productivity of the nearby marine environments. This monitoring program performs annual characterizations of the anchialine habitats, benthic substrate, and nearshore fish assemblages.

Since the monitoring program began in 1989, more than 48 annual surveys of these environments have been conducted and extensive reports have been prepared. The results, findings, summaries, and references for these reports are both publicly available and discussed throughout these reports posted on our website.

The marine surveys are conducted at six stations along the coastline adjacent to the NELHA facilities. At each station, transects are conducted at three depth (fsw = feet salt water) gradients (~15-fsw, ~30-fsw, and ~50-fsw) for total of 18 transects. Benthic habitat is characterized by surveying all abiotic and biotic feature of the substrate along 50-m transects. The benthic surveys reported a gradual increase in coral cover for the first 20 years of the study (Ziemann 2010), and corals in the genus *Porites* have been the dominant species among all stations and depths. Data from the last nine years have found the coral cover to stabilize in the range of ~30.0 – 50.0%. The overall coral cover for 2020 was 37.4%, which is within this range and shows the benthic communities to have exhibited relatively consistent values of coral cover for the last nine years. Permanent pins were established in 2017, which improves the ability to temporally track shifts in benthic composition and structure over time. The data from 2020 were quite consistent to data collected from 2017 – 2019 which indicates the pins are assisting with temporal monitoring of the study sites.



One of NELHA's Pam Madden staff was among a dive group that were the first to report a new species of nudibranch to Hawaii. It is one of the 'solar-powered' sea slugs that can incorporate its host algae's chloroplasts into its body so this animal can carry out photosynthesis to fuel itself.

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 and improve the SCADA system by 1) adding reliable high-speed communication between pump stations and the SCADA server, installing more data acquisition devices to capture client seawater and electric usage; 2) programming and testing of a SCADA HMI display which controls our variable frequency drives (VFDs); 3) programming and testing of ClearScada's Graphical Information System for alarms and notifications and 4) implementing operator's logbook within ClearSCADA.

We also began planning for the purchase additional commercial grade equipment including 1) pressure transducers in areas of the distribution system that are not covered with reliable sensors and 2) additional client flow meters for increased monitoring. Our goal is to increase the "real-time" digital logging of client seawater on our servers from the current 85% to approximately 95% of total seawater flows.

In the NELHA Water Quality Laboratory we upgraded or replaced the following instruments and equipment in FY 2021: 1) Biological oxygen demand incubator; 2) Handheld pH, conductivity, temperature, and dissolved oxygen meter; 3) 4 place balances; and 4) deionized lab water system with new pressure tanks and RO membranes. 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.

NELHA assisted the UH Hilo's MEGA Lab, Aqualink, and View Into The Blue to install a live underwater camera on one of our pipelines offshore of Keahole Point. We are amazed at



the critters that have been making appearances: octopus, sharks, rays, turtles, fish, and eels, to name a few. MEGA Lab compiles the best of each month in 10-minute summaries. The page can be found on YouTube by searching for "Aqualink Hawaii".

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 overall energy initiative's goal concerns nascent renewable technologies and grid modernization to further develop HOST Park as an advanced energy technology testbed. This will assist in formulating solutions to address electricity delivery and grid integration problems both within the site boundaries and to provide value to a stressed utility operating in an isolated island environment. NELHA can serve an "outdoor demonstration site" to test renewable energy technologies on the cusp of commercialization. In this regard, NELHA continued to engage in discussions with national labs, University of Hawaii, local utilities, and the private sector to formulate partnerships for new joint projects.

Major aspects of this effort included: 1) Expand efforts to assist the private sector in commercialization of OTEC; 2) Establish an energy storage systems testbed; 3) Develop an integrated energy district or microgrid; 4) Reduce our carbon footprint by adding renewable energy from solar photovoltaic panels; 5) Work with the University of Hawaii and US Department of Energy to develop a testbed for hydrogen technologies; 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 (HNEI) and the utilities.

Primary emphasis is focused on achieving energy security and resiliency for critical seawater operations in the face of increasing vulnerability (especially during natural disasters) of the electric grid, uncertainty about the cost of oil-based resources, and the availability of increasing amounts of low-cost (primarily solar) renewable energy resources and storage. Specific research and application of advanced technologies focus will include grid visualization, smart metering, energy storage, visualization and operations software, data acquisition and management, and renewable energy integration.

2020 Highlights

1. Secured grant funding for microgrid development project from South Korean government to service the 55" seawater pump station to lower or maintain energy costs.

The microgrid project contract with Encored for \$1,850,000 was signed in December 2019 but was hampered with a series of procurement challenges. All the challenges were resolved as of July 23, 2020. The project planning continued during the procurement challenge period and significant progress was made with approval of the single line drawing of the energy and control system, and the approval of a 10 percent design plan. Weekly meetings with the project engineers continued with NELHA and

Encored, contracts were executed with Encored's Hawaii based construction engineering firm and their PV panel, inverter, and battery supplier.

2. Made progress on long-term planning for renewable energy upgrades to HOST Park.

In August 2019, NELHA contracted with the Hawaii Natural Energy Institute (HNEI) for \$142,500 to provide a facility wide microgrid road map for the future. The road map will be the basis NELHA management will use to guide itself with potential future upgrades to the electrical systems at the facility, the inclusion and management of renewable resources and the strategies to implement to increase resiliency from grid related issues and emergency events. More specifically, the scope of work includes three main tasks. The first task includes mapping out the existing power systems and infrastructure in HOST Park and was completed. HNEI also started on the following task which includes identifying future power system requirements for the park and identifying technical and regulatory/policy opportunities and barriers. The final task will provide a microgrid options analysis which will help NELHA with a 10-year horizon outlook to assist NELHA in managing and engaging in new advanced energy projects. The current projects such as the 55" station microgrid project, as described below, dovetail into this project.

NELHA worked closely with HNEI's engineering staff to provide the necessary electrical infrastructure ground truthing data, and real time SCADA energy data for the background information required to provide a full analysis of the electrical grid within the NELHA Research Campus and recommendations for future planning to achieve NELHA's stated energy goals.

NELHA also worked closely with Sandia National Laboratories (SNL) and other entities, with respect to energy storage system (ESS) technologies. One of the projects, the Ecoult lead acid demonstration battery was completed. Another project, the 250kW UniEnergy Technologies vanadium flow battery demonstration in partnership with SNL, HELCO and Ulupono Initiative ran into technical issues. The ESS equipment is manufactured in China and the project was placed on hold following the COVID pandemic.

3. Secured consultant for planning of a regional seawater air-conditioning district.

Consultant was selected, and the resulting contract awarded and executed. Consultant has started work and completed the first interim progress report. The project is scheduled for completion in 2022.

4. Completed Phase One implementation of DOE SunShot grant for a solar desalination project.

In the review of progress and go/no-go milestones, DOE Program Staff were satisfied that the project should be allowed to move to the second Phase (implementation). All required submittals for that transition were submitted. DOE issued a favorable NEPA determination (Categorical Exclusion) for the project.

2021 Highlights

1. Completed long-term plan for renewable energy upgrades to HOST Park.

HNEI completed Phase I of the NELHA facility energy and infrastructure assessment report in FY 2021. This report documents the overall electrical grid at NELHA and provides information on typical loads, current renewable infrastructure, and emergency generation facilities resources. HNEI continued work on Phase II and III of the report which will include recommendations and strategies on how NELHA can implement and leverage microgrid technologies and further NELHA renewable energy portfolio into the future to meet its energy goals.

NELHA provided comments, with the assistance of HNEI, for Phase 2 of the Public Utilities Commission ongoing Microgrid Investigation in Docket No. 2018-0163. In Act 200, the 2018 Legislature specifically found that “[t]he natural energy laboratory of Hawaii authority is recognized as having the potential to operate a microgrid and may be designated as the first microgrid demonstration project after the establishment of the microgrid services tariff” Toward that end, we commented that providing NELHA a degree of flexibility in this tariff would be reasonable, in the public interest, and in keeping with the spirit of Act 200. The opportunities for regulatory flexibility at the NELHA HOST Park that can facilitate microgrid applications to improve the resiliency of Hawaii’s energy systems. We currently envision that combining loads on the HELCO distribution circuit into a single microgrid under certain extended utility grid outage events would require the “temporary use” (limited to that period of time where the utility was unable to deliver grid power) of that section of their distribution circuit serving the several NELHA HOST Park metered accounts. The envisioned

temporary use of the HELCO segment of distribution line would appear to fall under the requirements of the Hybrid Microgrid provisions of the MGS Tariff.

The HNEI agreement was to expire on February 28, 2021, but was extended for an additional six months at no additional cost to allow HNEI to complete additional work especially with the addition of the new planned Ocean Economy Innovation Village. The project is on schedule for completion in 2021.

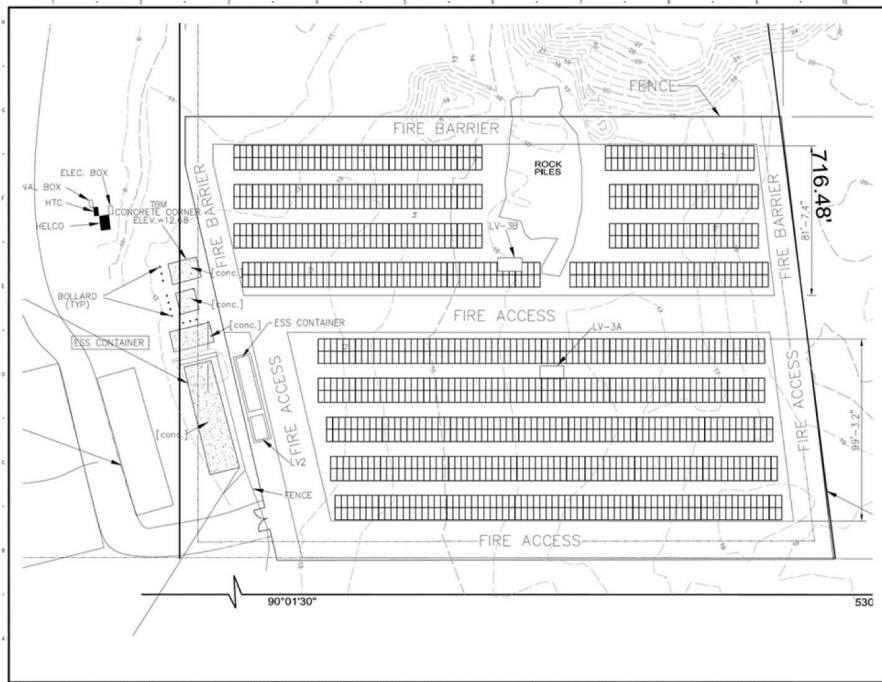
The grid-scale advanced flow battery demonstration funded by Sandia National Laboratory failed and did not perform as anticipated due to manufacturer design issues. We received full payment from Sandia for this demonstration and we are working with Hawaiian Electric and the manufacturer to have the equipment removed.

2. Planning of a regional seawater air-conditioning district.

The consultant team assembled to undertake this study includes firms with extensive experience in scoping and designing cooling districts of the type envisioned. These include several key consultants who worked on the Honolulu Seawater Cooling District project. As such they are highly qualified to undertake this work. Some unique attributes of the proposed Kona system did not initially fit within the conceptual and fiscal models the team tried to apply in this case. Although the project is delayed from the initial estimates, recent presentations by consultant give good reason to expect successful conclusion of the study in 2022.

3. Continued efforts to construct a 500-kw solar power and 750 kWh energy storage system project to service the 55" seawater pump station and serve as a testbed for artificial intelligence demonstrations of ESS devices and microgrid development.

The \$4 million project (50% funded by the Korean government) continued to be on schedule, and we are working closely with our partners to continue to push the project forward and reach the targeted completion date before June 2022. Thus far, the SMA permits, Environmental Notice, HELCO SIA permit, FAA Glare Analysis have been issued/completed. Once the 90% design plan is completed, the plan will be submitted for review by the County Department of Public Works. Long lead time equipment will be ordered upon County permit approval. Construction is still projected to start in the Fall 2021 and commissioning of the system is projected to occur in 2022.



Proposed layout of the 500kw PV farm and ESS storage at the 55" pump station.

4. Completed Phase Two implementation of DOE SunShot grant for a solar desalination project at the KSP site. Begin Phase Three.

Due to delays at the DOE (most likely pandemic related), review, and negotiation of the Phase Two budget took over 3 months longer than anticipated. The start of Phase Two was therefore delayed, and DOE issued a project time extension as a result. As the materials procurement and fabrication portion of the project got underway, the COVID pandemic and resulting supply chain disruptions and shipping bottlenecks have made it impossible to keep to the project schedule. DOE have suggested another time extension of 3 to 5 months to offset those impacts. We believe the work can be successfully completed in that timeframe. DOE continues to give the project favorable reviews and encouragement, and there is every reason to believe that upon successfully meeting the go/no-go benchmarks for Phase Two, that the project will be funded to enter the final phase which is focused on producing meaningful quantities of desalinated water from the completed system.

Food Security and Aquaculture



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 aquaculture companies from around the world are currently operating at NELHA. Several 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.

Several recent developments in the global aquaculture industry 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.

In this regard, NELHA, several State agencies and the University of Hawaii (UH) formed a partnership to undertake a concerted and collaborative effort to raise Hawaii's global visibility in marine aquaculture and to capitalize on the commercial opportunities available globally.



HATH cohort graduation ceremony

This effort included the establishment of a Hawaii aquaculture accelerator, and a related investment fund is an effort to demonstrate the State's commitment to developing Hawaii's commercial aquaculture industry and to focus entrepreneur and investor interest on Hawaii as a location for globally relevant aquaculture companies. In addition, NELHA and UH selected Hatch Inc. (HATCH) to operate the accelerator and investment fund. They provided proof-of-concept and commercialization services to start-ups in Hawaii's aquaculture cluster and attracting new investment to Hawaii. Finally, the initiative will also be focused on attracting investor capital and a follow-on fund for aquaculture in Hawaii to develop technical and intellectual property that can benefit a global industry.

2020 Highlights

1. Managed contract for the operation of the accelerator with Hatch Accelerator Fund Management LLC.

The responsibility to manage the HATCH aquaculture accelerator project was transferred from HSDC to NELHA in the fall of 2019. The pilot accelerator program had a successful start. Thirteen startups participating from the US, Ireland, Portugal,

Argentina, Thailand, Singapore, and Norway were selected for the first cohort. One to three members of each company participating in the cohort flew into the HATCH accelerator facilities at NELHA to start their intensive program on August 26, 2019. Each of the cohort companies were selected for their potential for significant global impact in the field of aquaculture. More than 40 mentors, investors and corporate representatives coached the teams over the course of the program which started in Hawaii for the initial six weeks and then continued at HATCH's other locations in Singapore and Norway for an additional seven weeks. The start-ups interacted well with each other, and two Demo Days took place on October in Hawaii and December in Singapore to present the companies to investors. A similar accelerator program is planned for fall 2020 and HATCH has started its recruiting efforts for this new cohort.

2. Worked with UH and managed EDA grant to assist in the operation of aquaculture accelerator.

NELHA entered into a memorandum of understanding (MOU) to receive and disburse the remaining UH funds for the HATCH project. The UH funds served as the majority of the \$350,262 cost share required by EDA for the \$275,000 capitalization grant for the aquaculture accelerator project. The remaining cost share was provided by NELHA personnel as "in-kind".

3. Managed limited partnership agreement for follow-on venture investment funds with Hatch Accelerator Funds LP for successful business coming out of the aquaculture accelerator.

A follow-on fund was established starting with a \$1,850,000 million from the State of Hawaii. HATCH was able to grow the total amount of funds raised to \$8,395,000. The initial closing of partnerships took place in April 2019, with the latest closing in January 2020. HATCH invested in the 13 selected cohort companies and owns on average an 8% stake in these promising companies. Three of the HATCH portfolio companies are now based in Hawaii.

4. Organized NELHA and NELHA clients' participation in the World Aquaculture Conference in February 2020 at the Hawaii Convention Center and arranged for pre- and post-tours of NELHA and its operations.

Three of NELHA staff and four of HATCH's staff participated in the World Aquaculture Conference at the Hawaii Convention Center in Honolulu in February 2020. NELHA

helped organize two sessions at the conference. One session focused on NELHA success stories and what NELHA had to offer to potential aquaculture companies. Another session focused on the HATCH program. Eight NELHA and HATCH companies were highlighted in these sessions. NELHA also operated a trade booth during the meeting. Following the conference, a day of tours was made available, and a special bivalve breakout session was organized and held. NELHA staff also co-authored a review paper on the Hawaii aquaculture which was published for this conference.

2021 Highlights

1. Managed contract for the operation of the accelerator with Hatch Accelerator Fund Management LLC. Worked with Hatch to assist with the challenges of a virtual accelerator during the global pandemic.

The pilot aquaculture accelerator entered its third and final year. Despite the pandemic challenges, HATCH was able to run a virtual cohort in the fall of 2020 bringing the number of startups that have received \$100,000 seed funding through this program to a total of 21. Twenty percent of the cohort companies were either Hawaii based or moved to Hawaii. For the last and final year of the pilot accelerator project, HATCH prepared for an Innovation Studio to focus on developing the pipeline of new startups forming in Hawaii. Recruitment for this final session is in progress and the program to take place in August 2021.

2. Worked with UH and managed EDA grant to assist in the operation of aquaculture accelerator.

NELHA continued to work with UH to disburse the remaining UH and EDA funds for the HATCH project. We provided all required progress reports and the final report to EDA for the EDA grant which ended in December 2020. All grant funding was expended, and EDA accepted the final report. This grant has been closed.

3. Managed limited partnership agreement for “follow-on” venture investment funds with Hatch Accelerator Funds LP for successful business coming out of the aquaculture accelerator.

NELHA participated in quarterly/semi-annual meetings with Hatch and the 11 other limited partners for this investment fund to review financials and audit reports. We also participated in advisory board meetings to discuss changes in the accelerator

program due to COVID-19 issues, portfolio updates and deal flow. Many of the portfolio firms successfully engaged in follow-on funding conversations and hitting operational milestones.

4. Applied for EDA grant to extend the Aquaculture Accelerator operations until 2025.

Based on the pilot aquaculture accelerator project accomplishments and successes from 2019 and 2020, NELHA applied for another EDA grant to continue the HATCH aquaculture accelerator for another four years. An award of \$1,800,000 was made by EDA in May 2021 using EDA 2019 East rift zone lava disaster funds. With cost share (mostly provided by HATCH), a total of \$3,100,000 will be available to develop a long-term self-sustaining aquaculture accelerator at NELHA to benefit global and Hawaii aquaculture over 4 years. It is expected that about 75 companies will benefit from the extended accelerator program and 25 companies will benefit from associated incubator activities. HATCH will also aim to raise an \$40,000,000 associated “follow on” venture fund. The new EDA grant is set to start on October 2021.

Development, Leasing and Marketing

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 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.

NELHA's leasing and marketing efforts continued to show strong growth and strength in FY 2020 and FY 2021. NELHA's limited marketing efforts support the facility with social media, magazine articles, newspaper articles, newsletters, press releases and special events.

2020 Highlights

1. Secured funds from FEMA to rebuild buildings destroyed by lava eruption in Puna. Worked with Hawaii Emergency Management Agency, State Risk Management and Puna Geothermal Ventures (PGV) to determine insurance coverage for buildings. Worked with FEMA for funds to rebuild buildings at HOST Park in Kona.

Made significant progress and FEMA approved NELHA damage estimates and \$3,447,333.03 in Federal funds were obligated to NELHA. NELHA successfully completed negotiations with the State of Hawaii insurers, and they have agreed to a minimum of \$1,991,243.46 in damages and funds due to NELHA. NELHA continued discussions with other insurance companies regarding value of damages.

2. Continued efforts for an exploratory well for new potable water resources for NELHA.

The Burial Council delegated the decision to relocate the existing burial to the family of the deceased. The family members agreed amongst themselves to the relocation and reinterment and a reinterment plan was carried out successfully.

- Burial Council delegated decision to relocate the existing burial to the family of the deceased; family members agreed amongst themselves to the relocation and reinterment; reinterment plan carried out successfully;
- A final archaeological data recovery report was submitted to DLNR State Historic Protection Division (SHPD) for review and acceptance. SHPD accepted the final data recovery report and the archaeological monitoring plan (for construction);
- Requested extension of the DLNR Commission on Water Resource Management review period for the well drilling permit in order to allow for (a) discussions regarding a request made by Department of Hawaiian Homelands for an allocation of water credits from the new well, and (b) discussions and planning to address

concerns from the National Park Service relating to establishment of new wells in North Kona and their potential effect on groundwater dependent resources in the Kaloko-Honokōhau National Historical Park; and,

- Negotiated the cost for a 2-year project time extension with the construction contractor to account for delays incurred due to items 1, 2 and 3 above.

2021 Highlights

1. Extended deep seawater system within 80-acre Ocean Center Piece to North end of HOST Park along Kahilihili Street.

A procurement solicitation to install a 4,200 foot-long 12-inch HDPE deep seawater lateral along Kahilihili St was prepared and issued. A resulting contract for \$349,500 was awarded to ITC Water Management. The contracted work has been successfully completed on time and under budget.

2. Secured funds from FEMA and insurance companies to rebuild buildings destroyed by lava eruption in Puna. Worked with Hawaii Emergency Management Agency, State Risk Management and Puna Geothermal to determine insurance coverage for buildings. Worked with FEMA for funds to rebuild two buildings at HOST Park. Completed environmental assessments for two new sites in HOST Park. The two new buildings planned for HOST Park are a new visitor center at the north end of existing Wawaloli Beach Park facilities and a new Innovation Village to complement the Research Campus and provide room for expansion.

NELHA successfully secured \$3,447,333.03 from FEMA in 2020 for the damages by the 2018 Kilauea volcanic eruption to our facilities. After very extensive negotiations which lasted several years, NELHA secured an agreement for full compensation of \$2,983,556 from the 11 insurance agencies involved, for the damages. As of June 30, 2021, NELHA received payments totaling \$2,685,200. (Note: \$298,336 was received on July 28, 2021.) As such, NELHA received a total of \$6,430,889 for the damages.

In November 2020, NELHA began procurement to hire a firm to plan and design expansion of the existing research campus which is at 100 percent occupancy with a new "Innovation Village" as well as a new visitor center. The work will include the design development of a new office building/innovation complex and new visitor center and all associated construction documents, special entitlements, and permits.

NELHA selected WRNS Studios from a list of 15 firms and executed a contract for approximately \$1 million in March 2021 for these services. NELHA completed a survey of businesses in HOST Park regarding desired features for the innovation village, completed a design charrette and received a draft master plan for the new village and visitor center by June 30, 2021.

3. Continued efforts for an exploratory well for new potable water resources for NELHA. Worked to obtain final permits required for construction and begin construction of well in conjunction with HHFDC and DHHL.

This project has been on hold for several years and NELHA is still awaiting a permit from the Commission on Water Resource Management (CWRM) to begin drilling the exploratory well. All other work has been completed. Due to delays, the contractor requested cost increase for their services, and NELHA executed a supplemental agreement with funds from HHFDC.

This permit request was discussed by the CWRM Board of Directors, and they deferred a decision and requested additional input from representatives of Native Hawaiian traditional and customary (T&C) practitioners and to hold a symposium to discuss “T&C” knowledge, history, and perspective of water resource use impacts on “T&C” practices along the West Hawaii coastline. Due to COVID-19 restrictions, it has so far, not been possible to schedule this symposium. NELHA continues to invest significant time and effort working with CWRM staff, well development partners HHFDC and other stakeholders in keeping the process moving forward. NELHA continues to explore alternative options.

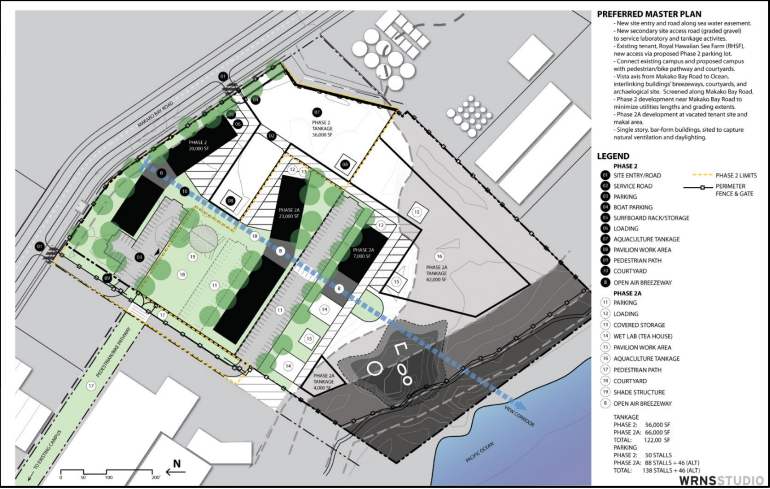
4. Completed pre-scoping for comprehensive offshore EIS to facilitate and provide a path for expedited approval of short-term, small-scale, non-commercial demonstration or research projects that exhibit and test innovative conservation, energy, offshore aquaculture, or ocean monitoring concepts.

NELHA secured the services of a consultant in 2020 to assist us in completing the pre-scoping survey. NELHA completed interviews and data gathering to assess range of pre-commercial aquaculture/conservation/monitoring/energy activities (coastal and offshore). A final pre-scoping document was received from the consultant in June 2021 and included a description of activities to be covered by the EIS; description of the types of environmental/natural resources in the preferred area and the types of

impacts which are anticipated to need to be addressed in the EIS; and anticipated scope of the EIS.

RESEARCH CAMPUS EXPANSION TO INCLUDE NEW INNOVATION VILLAGE

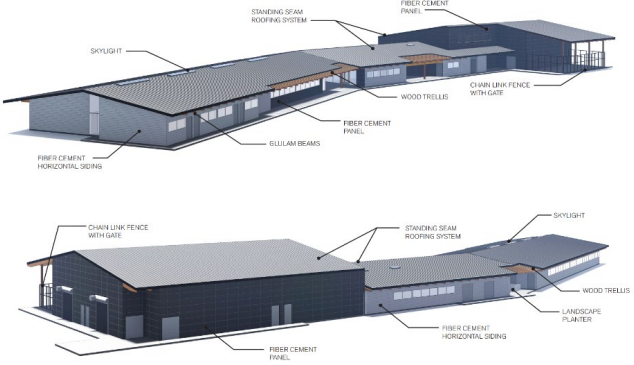
Initial planning and design for the new HOST Park Innovation Village consisting of additional buildings, lab and open space to support innovative ocean projects is now complete. The next step, which is the permitting process, has commenced. The village will be located on 7 acres approximately 1,000 ft south of the existing research campus which is currently 90% full. The goal is to complete construction of Phase 2 by end of 2024.



RENDERING - INNOVATION CENTER



PREFERRED OPTION

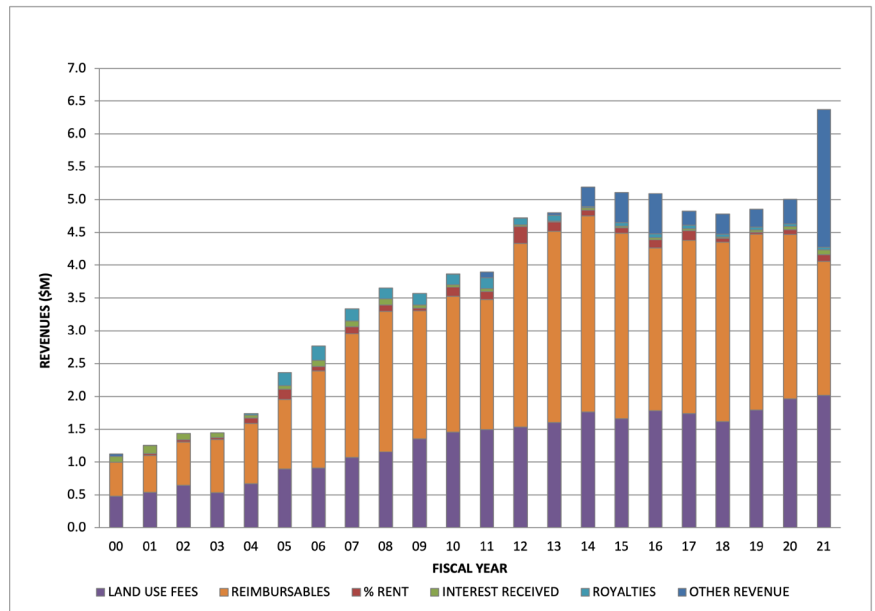


HIGHLIGHTS

Revenue – including reimbursables

- Total revenue has increased by approximately 65% between FY2011 and FY2021.
- However, FY2021 is an anomaly due to a one-time infusion of insurance proceeds and grants.
- Excluding “Other Revenue” it is important to note:
 - Reimbursables (shown in orange) which is mainly seawater sales, has declined from 60 percent to 50 percent of total in the past 9 years.
 - This is mainly due a combination of changes in the price of electricity; increases in pump efficiency; and lower demand for seawater.

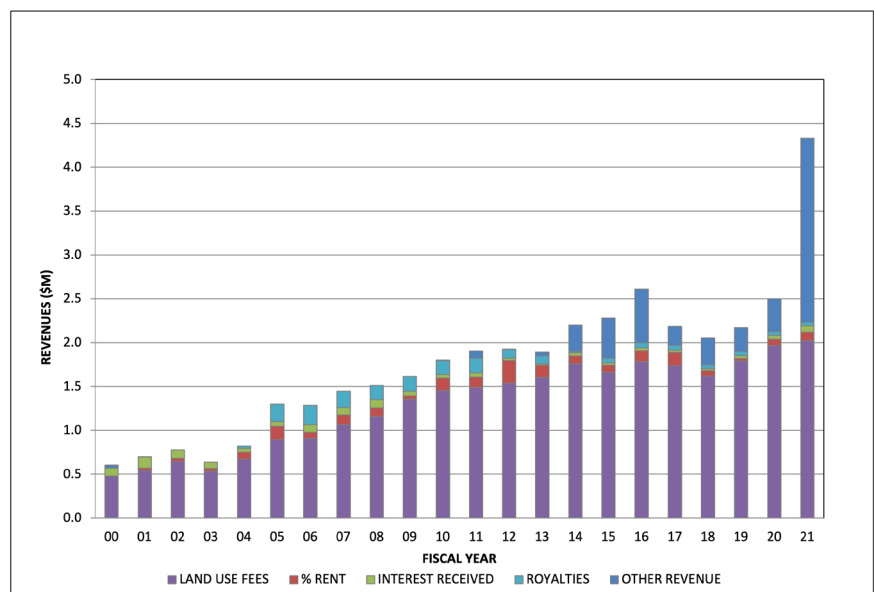
Total Revenues



Revenue – without reimbursables

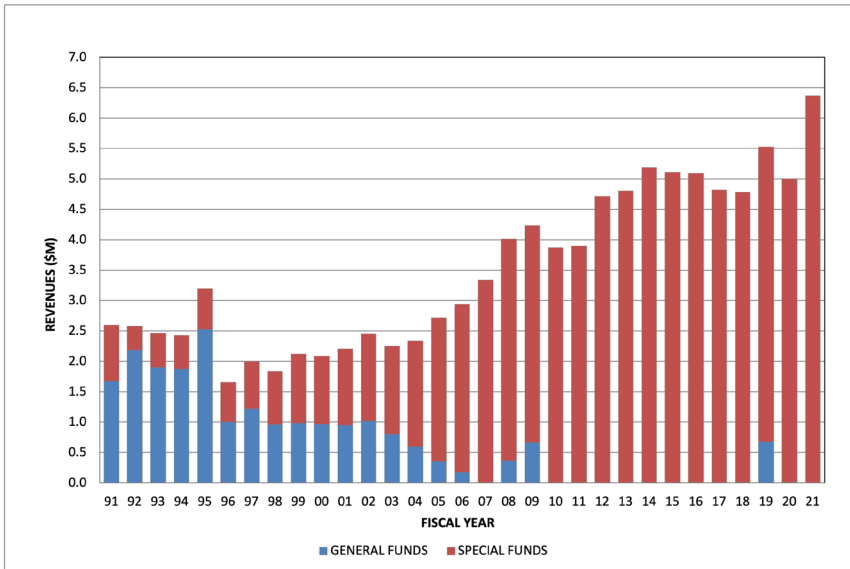
- Excluding “Other” revenue, the total has increased by 22 percent in the past 10 years.
- The majority of total revenue is land use fees and has increased by 25 percent in the past 10 years.
- Other revenue, mainly grants and special projects, has also increased significantly in the past several years and the large increase in FY2021 is due to insurance proceeds from the destruction of property and buildings in Puna due to the Kilauea volcanic eruption.

Revenues



HIGHLIGHTS

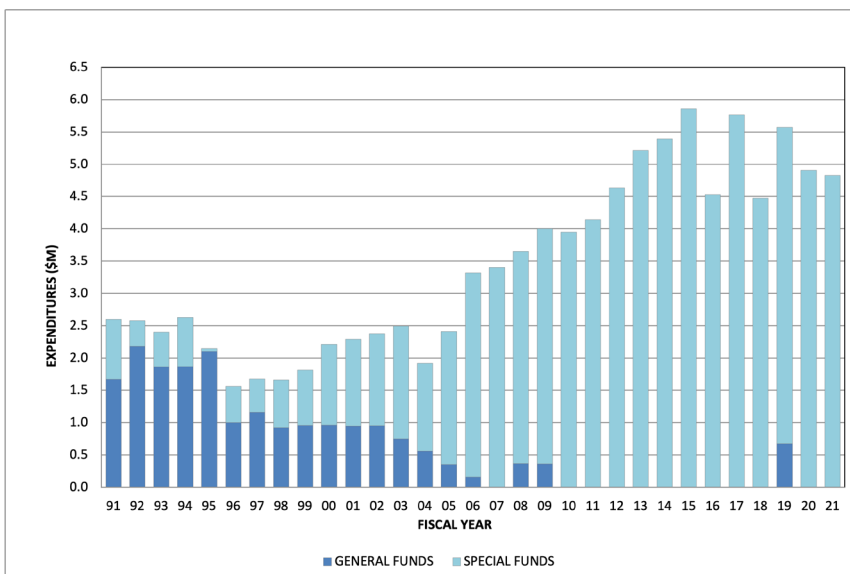
General and Special Funds



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 twelve years
- NELHA received \$500,000 in general funds in FY2019 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 FY2014 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 2020
(Fiscal Year - July 1 to June 30)

	Fiscal Year 2020
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REVENUES

Land Use Fees	1,965,137.93
Seawater Royalties	40,876.25
Reimbursables	2,503,552.38
Interest Received	46,440.79
Other	375,940.13
Percentage Rent	72,738.84
Subtotal	5,004,686.32

EXPENDITURES

Salaries	2,035,335.15
Operations	2,466,684.31
OHA (Ceded Lands Transfer)	405,399.97
Subtotal	4,907,419.43

FINANCIAL POSITION

Special Fund Cash Balance (July 1)	411,505.25
Prior Year Unrequired claims	-
Prior Year Transfers	-
Special Fund Revenues	5,004,686.32
Subtotal	5,416,191.57
Special Fund Expenditures	4,502,019.46
OHA (Ceded Lands Transfer)	405,399.97
Encumbrances	177,964.01
Special Fund Cash Balance	330,808.13

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

NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY
FINANCIAL STATEMENT - FISCAL YEAR 2021
(Fiscal Year - July 1 to June 30)

	Fiscal Year 2021
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REVENUES

Land Use Fees	2,020,053.14
Seawater Royalties	36,785.76
Reimbursables	2,041,989.51
Interest Received	72,631.18
Other	802,516.05
Insurance Claims-Puna Volcanic Destruction	1,297,324.00
Percentage Rent	101,133.84
Subtotal	6,372,433.48

EXPENDITURES

Salaries	1,938,009.60
Operations	2,466,684.31
OHA (Ceded Lands Transfer)	423,369.61
Subtotal	4,828,063.52

FINANCIAL POSITION

Special Fund Cash Balance (July 1)	331,977.70
Prior Year Unrequired claims	-
Prior Year Transfers	-
Special Fund Revenues	6,372,433.48
Subtotal	6,704,411.18
Special Fund Expenditures	4,099,019.84
OHA (Ceded Lands Transfer)	423,369.61
Encumbrances	1,211,160.84
Special Fund Cash Balance	970,860.89

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

NELHA Board of Directors

Linda Rosehill, Chair (FY 2020 and FY 2021)

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

William F. Mielcke, Vice-Chair (FY 2020 and FY 2021)

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

Cyd Miyashiro (FY 2020 and FY 2021)

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

Dr. Vassilis L. Syrmos, Ph.D. (FY 2020 and FY 2021)

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

Diane Ley (FY 2020)

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

Ron Whitmore (FY 2020)

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

Douglass Adams (FY 2021)

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

Riley Saito (FY 2021)

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

Dr. Gerry Cysewski, Ph.D. (FY 2020 and FY 2021)

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

NELHA Board of Directors

Neil Sims (FY 2020 and FY 2021)

Founder and CEO, Ocean Era LLC
Ex-Officio – Tenant Representative

Michael McCartney (FY 2020 and FY 2021)

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

Randall Tanaka (FY 2020)

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

Chung Chang (FY 2021)

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

Robert Masuda (FY 2020 and FY 2021)

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

Alan Hilton (FY 2020 and FY 2021)

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

Dr. Phillip J. Bossert, Ph.D. (FY 2020 and FY 2021)

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

**The NELHA Team
FY 2020 and FY 2021**

POSITION TITLE	INCUMBENT
Executive Director	Barbour, Gregory
Senior Secretary (2020)	Burge, Stacey
General Laborer II	Debina, Chad
Secretary III	Espinueva, Georgette
Maintenance Mechanic II	Gibo Jr., Celestino
Water Quality Specialist	Madden, Pamela
Account Clerk III	Rasmussen, Jennifer
Business Manager	Miranda, Jerrae
Electrician II (2020)	Thompson, Allon
Electrician II (2021)	Aceret, Paul
Administrative and Projects Manager	Leonard, Alexander
Maintenance Mechanic II	Mitchell, Anthony
Engineering Project Coordinator	Babbitt, Bryan
Chief Science Officer	Olson, Keith
Utility Electrician (2020)	Pierce, Thomas
Maintenance Mechanic II (2021)	Tapley, Kevin
Deputy Director	Sombardier, Laurence
Operations Engineer	Towle, Dean
Chief Operating Officer (2020)	War, Jan
Chief Operating Officer (2021)	Thompson, Allon



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 desalinate 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 independent economic impact study regarding HOST Park. Results indicate economic impact and job creation was much higher than previously thought and at almost \$90 million annually and 600 jobs. Completed update of Master Plan which began in 2009 and Strategic Plan was updated. Completed program audit with State auditor which began in 2010. Federal grants totaling almost \$3.5 million received for renovation of main administration building and micro-grid

- infrastructure for the Research Campus. Received \$1.8M in CIP funds for deep seawater pipeline repairs.
- 2013 HOST Park economic impact surges by 40 percent since 2010. Received \$2.3M in CIP funds for seawater system upgrades and interconnection of seawater between two systems. Completed deep seawater pipeline repair (\$5M) to extend life of pipeline by 15 years. Received \$10M for new road construction. Over \$30 million in private/public projects underway.
- 2014 NELHA receives \$2.5 million in CIP funding for new exploratory water well. National Lab relationships strengthened. Completed first Vision paper for NELHA to define specific strategic target areas for future growth of HOST Park. NELHA received the 2014 DBEDT “Team of the Year” award for the Deeps Seawater Pipeline Repair project. Further developed strategic partnerships with Sandia National Laboratory, Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory, and the National Renewable Energy Laboratory. Entered into a MOU with the County of Hawaii, and Hawaii Electric Light Company to develop and energy storage system test bed at HOST Park. Completely revamped the NELHA website.
- 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. Completed major revision to the NELHA Aquatic Species Health Management Program which includes NELHA biosecurity polices and guidelines. Released RFI for a prime site for commercial development in the Ocean CenterPiece development area. Organized a 2-day national conference for energy storage systems. Completed a detailed archeological survey of the entire upper half of HOST Park to identify any unknown sites.
- 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. Began formulating the concept for a Hawaii Center for Aquaculture Sustainability at HOST Park and hosted Statewide aquaculture industry summit. Began extensive

renovation of Hale Kaa which will complete renovation of the 6-acre research campus which included renovation of 9 buildings, covered storage, upgrades to the electrical system, wastewater system, design for new fire suppression and hydrants, walkways, and security enhancements in the research campus over in the past five years. Signed lease with Hawaii Natural Energy Institute to develop a hydrogen production, storage, and filling station in the research campus. Received the 2017 Mahalo Award from the Hawaii Community College at Palamanui and the 2017 Community Service Award from ThinkTech Hawaii.

2018 Received \$1.928M grant from the US Department of Energy for solar desalination demonstration project. Received \$4.9M in CIP funds for upgrades to seawater system. Kicked off Aquaculture Accelerator project with strategic partnership with Hawaii Strategic Development Corporation, University of Hawaii, and UH Ventures LLC to undertake a concerted and collaborative effort to raise Hawai'i's global visibility in marine aquaculture and to capitalize on the commercial opportunities available globally. Held second national conference on energy storage systems. Received \$142,500 from the State Energy Office to develop a 10-year plan to increase renewable energy for NELHA's seawater system and develop microgrids. Completed all studies and obtained all approvals for exploratory water well development except for a final permit from the Commission on Water Resource Management.

2019 UH, HTDC and NELHA selected HATCH as the best candidate to operate the Hawai'i aquaculture accelerator and run the \$8.4M investment fund and completes first cohort of 13 companies. Received \$275,000 in grant funds from EDA for this project. Notified by the Korean Institute of Energy Technology Evaluation and Planning that we were selected as a participating organization for a grant award of \$1.73M USD for microgrid development at the 55" pumpstation. Signed a \$1.85M agreement with Encored was executed to construct the microgrid at the 55" pumpstation. SCADA system expanded to monitor in real-time 85% of total seawater flows with 116 devices online. Completed installation of 178kW of additional solar panels in the Research Campus. Completed installation of a 100kW/400kWh advanced flow energy storage system at the Gateway Center for demonstration purposes. Executed agreement with Trevi Systems as the main contractor for the solar desalination project. Completed tenant satisfaction survey with results showing 94% very satisfied or satisfied with NELHA services and 86% indicated that NELHA services meet their needs very well or extremely well. Completed damage

assessments from the buildings destroyed by the Kilauea volcanic eruption and submitted request to FEMA and insurance companies for \$7.6M. Resumed semi-annual newsletters.

2020 Successfully navigated the 3-month lockdown in the March – May timeframe due to the COVID-19 pandemic. Maintained strong contact with all tenants and no issues were reported with traffic control during the lockdown. NELHA staff resumed 40-hour work hours on site on June 1 with a strong focus on adequate safety precautions and ample sanitary gear. No positive cases of COVID-19 were experienced by NELHA staff in 2020. FEMA approved NELHA request for \$3.447M for damage to the Puna buildings and funds were obligated. Successfully secured, after very extensive negotiations, \$3M from the 11 insurance companies involved in the Puna damage. Began procurement to select a planning and design firm for the expansion of the research campus which is at 100% occupancy, using the funds from the insurance companies.

2021 Continued to make progress on energy efficiency for the seawater system with a 4.43% increase in efficiency for the fiscal year ending June 30, 2021. With increased automation overall efficiency has increased by 15% over the past 5 years. Completed 10-year road map for renewable energy and microgrid development in HOST Park. Consultants selected for the plans and design of strategies to address the long-term status of the abandoned deep seawater pipelines by Ocean Farms Hawaii in the 1990s. Completed design and all approvals for the microgrid project except for a building permit from the County of Hawaii. Completed the third and final year of the pilot aquaculture accelerator project successfully and obtained a \$1.8M grant from the US EDA to extend the accelerator for an additional four years. Began master planning and design for the expansion of the research campus towards a new 9-acre Innovation Village. Master plans were completed and building design plans are at 60% completion. Continued to work on entitlements and environmental assessment for the Innovation Village. Completed updated vision for HOST Park to lead development of the ocean economy in Hawaii with a strong focus on ocean energy, food security (aquaculture), ocean technology and ocean conservation.

In Memoriam



Syd Kraul
Founder - Pacific Plantonics
1945 - 2019
Aquaculture researcher in
hatchery technology

Warren Pai
1959 - 2021

Warren worked for Cyanotech for 26 years cultivating and harvesting Spirulina and Astaxanthin product microalgae. For his efforts and dedication he was recognized by the Algae Biomass Organization (ABO) in 2020, and was a recipient of the "Unsung Hero Award."



**NATURAL ENERGY
LABORATORY of HAWAII
AUTHORITY**

2020-21
Annual
Report

