



NATURAL ENERGY LABORATORY OF HAWAI'I AUTHORITY

FISCAL 2005

ANNUAL REPORT

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TABLE OF CONTENTS

Chairman's and Executive Officer's Letter.....	1
NELHA in the 21 st Century	3
Review of 2005.....	9
Tenant Activities.....	11
CEROS – Overview.....	20
CEROS - Funded Projects.....	21
NELHA Financial Review.....	28
NELHA Statement of Operations.....	30
NELHA Board of Directors.....	31
NELHA / CEROS Staff.....	32

Natural Energy Laboratory of Hawai'i Authority

Fiscal 2005 Annual Report

Chairman's and Chief Executive Officer's Letter:

The year just past has been an exciting and eventful one for the Natural Energy Laboratory of Hawai'i Authority. We have filled executive positions both at NELHA – a vacancy existing due to resignation – and at the Center for Excellent in Ocean Research and Science (CEROS) due to retirement. Both positions are vital to the future of NELHA in directing it forward for the benefit of the economy of Hawai'i. Funding that CEROS obtains from the United States government for research into oceanographic problems has exceeded \$70 million and directly benefits numerous companies in Hawai'i. NELHA contributes significantly to the economy by providing the infrastructure that supports an estimated 350 private jobs in commercial, research, and aquaculture industries in the Kona area.

Major impetus behind NELHA growth has been the emerging desalinated deep seawater drinking water industry. Koyo USA has begun expansion of its facility to increase its production from some 200,000 bottles per day to 800,000 to 1,000,000 bottles a day next year. Deep Seawater International, Inc. opened its initial plant at the end of July. By the end of 2005, it is expected both Hawai'i Deep Marine, Inc. and Enzamin USA, Inc. will commence operations at their plants. NELHA has given pre-commercial approval to two other companies for building and operating deep seawater drinking plants, and has been approached by others that want to conduct the same or similar operations. The drinkable seawater trend has attracted the attention of major U.S. newspapers, consumers, and others. It rapidly has become the fastest growing export from Hawai'i.

This summer, after years of construction, the deepest seawater extraction line in the world was put into operation at NELHA: the 55" line can currently produce 14,000 gallons per minutes of water from a depth of 3,000 feet. Water bottling companies desire this water for its mineral content, purity, and age. Keahole Point, where NELHA is located, is viewed as the world's premier site for the extraction of this resource. Already, based on tenant projections, expansion of this line's delivery capability will be necessary in the next several years to meet anticipated demand for this unique Hawai'ian resource, both for water bottling purposes and aquaculture.

Exhaustive analyses of delivery costs for seawater have been completed during the early part of Fiscal Year 2006. These analyses have shown that the sharply increasing cost of electrical power to produce and deliver the water to tenants has exceeded the price charged for the water. A policy has been implemented to rectify this situation in a manner that will allow tenants to adjust their operations to a much higher price for the water while still allow NELHA to function. The impact of this policy will be a significant drawdown on NELHA's special fund reserve unless aquaculture tenants can obtain subsidization from another source.

Focus on alternate energy research was the driving motivation for NELHA's foundation 31 years ago. This focus was lost during the years of low oil and gas prices. Events of

FY 2005 NATURAL ENERGY OF HAWAI'I AUTHORITY ANNUAL REPORT

the past year, especially the sharp increase in the price of oil-based fuels, have stimulated interest from a variety of sources in re-instituting energy research at NELHA. Diverse projects are being proposed for, and are under consideration by, NELHA in this regard. Some of these are expected to commence during the current Fiscal Year.

The Board of directors and staff of the Natural Energy Laboratory of Hawai'i Authority look forward with great enthusiasm to the future.

Best regards,

Richard Henderson
Chairman



Ron Baird
Chief Executive Officer



NELHA Staff

NELHA IN THE 21ST CENTURY

-- A VIEW TO THE FUTURE --

NELHA today is at a crossroads, becoming a diversified entity developing and commercializing the three most important items that humans need:

Food, Energy, and Healthcare

During the past eight months, NELHA has been engaged in an extensive and exhaustive examination of its role in the new century, its mission, and its potential. The conclusion is that this represents an important asset to the State of Hawai'i that is underutilized, has important potential to develop and commercialize the things people need, and serve to continue diversifying the Hawai'ian economy.

The State of Hawai'i has invested nearly \$70 million into the NELHA infrastructure over more than 30 years. Just about one-half of the available acreage is developed and/or leased by commercial entities. Currently, more than 87% of the 14, 400 gallons per minute of produced seawater is used by aquaculture tenants at a price of \$0.144 per thousand gallons (Kgal). These tenants' seawater purchases are subsidized by NELHA --- from its own funds -- to the tune of about \$400,000 this fiscal year. The balance of the water produced is purchased by water bottling companies who pay \$0.60 per Kgal and a charter high school that pays the actually operating cost of producing the water.

NELHA has the capability (with increased pump and motor capacity that will cost about \$5.0 million) to deliver 97,900 gallons of seawater per minute --- 58,100 gallons of surface seawater (SSW) and 39,800 gallons of deep seawater (DSW). There is, therefore, a tremendous opportunity to utilize this public investment of \$70 million to greater advantage, producing higher value products, more well-paying jobs in the private sector, and exportable products for the State of Hawai'i.

At no time has the creation of higher paying jobs, development of alternative energy methodologies, and new industries been more important to Hawai'i than now. The energy situation particularly threatens our State in an unprecedented multitude of ways. Rippling effects of higher oil prices throughout the State economy will have serious repercussions.

NELHA is in the unique position, not just in the State of Hawai'i, but the world, to be the nexus of the development and production of the three things all people need in life: food,

energy and healthcare. The agency's Board and staff are dedicated to see that this position is fully exploited to the benefit of all – tenants, Big Island residents, and the State of Hawai'i.

Healthcare

The sea, particularly the deep sea, is the last unexplored frontier for the discovery of natural organisms that can be evolved into human health care products --- medicines, drugs, and cures to improve mankind's health. The highly respected late Abraham Piianaia suggested that a careful harvesting of fish and new medicines would be a respectful use of the deep seas in line with Hawai'ian cultural beliefs. Only now is human exploration of the middle and deep ocean frontier below 660 feet beginning to be undertaken. According to David Helvarg in his work *Blue Frontier*, "Scientists estimate that there are at least a million new species of life undiscovered in the deep oceans..." Cold hydroseeps are being investigated for new kinds of pharmaceuticals and bacteria, deep sea sponges are being converted into anti-cancer drugs, and a toxin in the algae that causes "red tides" has recently been discovered to hold promise in the treatment of respiratory ailments.

The capability to produce, at the surface, large volumes of 2,000 and 3,000 foot deep seawater should be taken advantage of by NELHA as it relates to the healthcare market. NELHA proposes to approach pharmaceutical and nutraceutical companies to investigate our water for its possible medical uses. NELHA would provide companies that agree to a royalty schedule on future products with modest volumes of the water F.O.B. NELHA. These companies, in their own laboratories, would analyze the water (and any animals or plants it may contain) for possible medical products. It is expected such products, eventually produced at NELHA or from NELHA water, will be high value products. NELHA would receive royalty income from the medicines, disease cures, or whatever the companies derive from NELHA deep seawater.

Recent diverse interest has been expressed by domestic and foreign companies in using NELHA deep seawater to produce high quality cosmetics brands and lines. Some evidence exists, and is being evaluated, indicating the deep seawater when properly formulated as a desalinated product, has some distinct advantages in the manufacturing of cosmetics. People report tangible benefits ranging from having to use fewer traditional cosmetic products to softer smoother skin. Next to pharmaceuticals, cosmetics appear to be the highest value products obtainable from the seawater. A royalty and charge for the seawater commensurate with its value in such products would seem to be appropriately significantly higher than that charged current commercial water bottling tenants at NELHA.

Use of the NELHA servicemark can be expanded. This unique servicemark should not be limited just to the water produced and bottled by companies at NELHA. Its application to other products coming from NELHA lands should be encouraged. Salt, cosmetics, fish, and the like --- ought to be "branded" NELHA. This can be accomplished in several ways: "made at NELHA", "produced at NELHA", "made from the deep seas at NELHA" might all be marketing slogans that also incorporate the servicemarked logo. Building a NELHA brand would create marketing awareness much as "Maui" has become recognized on products worldwide. With five companies already in production or construction stages on water bottling plants, and three more in

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

negotiation for water bottling plant sites, building brand recognition on this base would be advantageous.

Royalty rates for various, non-drinking water, products will be determined in advance of negotiating any arrangements, so as to establish uniformity and consistency in their application.

Energy

NELHA was founded and initially funded on the premise of researching and developing alternate energy sources, primarily by using the abundant sunlight at the NELHA site and the sea. Ocean thermal energy conversion research was conducted at NELHA for about 20 years. A number of recognized advancements applicable to the production of energy and in other industrial applications were made at NELHA. All research ceased in the mid -1990's amid the perceived glut of oil and stable low energy prices for the future.

Recent increases in the cost of energy, both transportation fuel and electricity, point to the decision to cease alternate energy research and production methods at NELHA as being flawed. There is tremendous urgency to exploit alternative energy methodologies at NELHA to cap its energy costs, which have risen over 43% in the past year. More increases are likely with continued escalations in oil prices since oil is used to produce most of the electrical energy in Hawai'i.

The Department of Energy (DOE), New Mexico Institute of Technology (NMT), and others have expressed intense interest during the past eight months in a revival of energy research at NELHA. NMT has sent delegations to NELHA to discuss potential partnering on projects funded by the DOE and managed by NMT. NMT, this year, is being granted an estimated \$70 million research and development by the DOE and DOD. Specific discussions with NMT have dealt with NELHA subcontracting to NMT on NMT grants. Expansion of the NELHA staff would be required to accomplish such contracts, but it is believed their funding would be through grant rather than appropriated monies.

Potential energy-oriented tenants ranging from biomass conversion to biodiesel, a photovoltaic farm to serve NELHA's internal electrical needs, to a hydrogen fuel cell research laboratory have contacted NELHA in recent months. Several of these organizations are in the process of filing tenancy applications with NELHA to do their research at NELHA. These tenants would be pursuing energy developments for their own account, not for the benefit of NELHA or necessarily Hawai'i.

What the DOE and NMT would prefer to have happen is a reinvigoration of energy research, from fundamental investigations to the practical implementation of techniques, at NELHA. Accomplishing this as a goal would have the practical benefits envisioned when the State created NELHA some thirty years ago ---- lessen Hawai'ian dependence on foreign oil as well as meet a DOE goal of demonstrating sustainable renewable distributed energy as an alternative to massive central power stations. Funding of a reinvigorated research program at NELHA will be carried out using outside funding sources, as NELHA has not been appropriated any monies for this purpose. NELHA management is acutely aware that in the past, NELHA patentable developments were not patented, for whatever reasons. As technology and processes have value,

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

management intends to apply for patents on new energy methodologies developed at NELHA to the maximum possible extent.

Several potential avenues exist to create a sustained energy research effort at NELHA. These include: grant monies, private [individuals or companies]/public [NELHA] partnerships, possible sale of seawater for energy research with the proceeds being redirected into research, as well as donations.

With the vast potential water pumping capabilities now existing at NELHA, a 1,000,000 watt (1 megawatt) Ocean Thermal Energy Conversion (OTEC) plant could be constructed. Integrating new technologies into a demonstration plant like this would very probably result in processes and techniques that NELHA could patent and subsequently license to other parties interested in building OTEC plants around the world. All island nations in the Pacific face the same challenge Hawai'i does: how to lessen their dependence on fossil fuels produced in turbulent areas of the world – OTEC and solar energy could provide at least part of the answer.

A favorable site exists on NELHA for the installation and operation of a solar photovoltaic array. Preliminary investigation leads us to believe as much as 15 megawatts of solar power could be installed and operated at NELHA, providing tenants, itself, and other power users with environmentally clean, cost-capped electrical energy. In Hawai'i, photovoltaic and geothermal energy are the only potentially viable methods for the production of hydrogen for a hydrogen economy as being advocated by the US Department of Energy. Experiments using photovoltaic power to split seawater into hydrogen for fuel and oxygen for atmospheric release could be carried out at NELHA unlike anywhere else in the world.

Development and operation of a microgrid at NELHA, demonstrating that different energy sources can be integrated into a smoothly operating grid system serving numerous users has been suggested. Electrical demands range from quite small loads to megawatt sized loads at several tenants as well as NELHA itself for operating seawater pumps.

General Electric, Ormat, Puna Geothermal Partners, DOE and others attended a meeting at NELHA in late July specifically to discuss microgridding concepts that could be demonstrated on the Big Island and at NELHA. The logical steps to developing the concept are to install such a grid at NELHA, operate it, expand the technique to the Big Island, and then beyond to the mainland and other countries. Action is awaiting assessments by each company as to how it might participate in such a demonstration project and from where the funding might come to finance it.

Other companies and organizations, both from the mainland and foreign countries, have visited NELHA recently to discuss the possibilities of using NELHA to demonstrate their efforts toward development of a hydrogen economy.

Food

The production of food began at NELHA during the demise of energy research and construction of the various water lines from the ocean. Presently, 14 companies produce sea-based products using water supplied by NELHA. These range from

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

abalone and seahorses to seaweed, flounder and shrimp. This production was encouraged by inexpensive land leases, below-cost seawater deliveries, and percentage rent agreements that basically result in no income to NELHA. Some of these products are valuable high priced items. The majority, however, appear to be commodity products for which premium pricing is either not possible or the companies may be in the process of buying market share, thus selling their products inexpensively. Development of additional food production on land at NELHA will likely involve either very high value seafood products (such as certain ornamental fishes or highly prized seaweeds for export) or beverages.

Five water bottling companies have signed leases to build plants at NELHA. The largest, Koyo USA, is producing 200,000 bottles of deep seawater per day and plans to more than double its production in the next year. Another plant is in pilot operation. Two more are nearly completed in terms of their construction. The fifth is in the financing stage. Five other entities have approached NELHA in the past four months evincing their desires to build water bottling plants at NELHA. Three are in the process of completing lease applications. One or two of these may result in a Koyo scale plant when ultimately built out.

The water bottling plants represent a high value use of the water NELHA produces. The Board has set the price of water delivered to the bottling companies at \$0.60/Kgal whereas the aquaculturalists at present only are paying a \$0.144/Kgal rate. The cost of deep seawater to the bottling companies is not believed to be a significant cost factor in their business models.

Besides paying a premium price for the seawater, the water bottling companies that produce and bottle water at NELHA are allowed to use NELHA's registered servicemark logo on their product. As regards this royalty/servicemark, in the past four month NELHA has achieved:

- All the companies to sign a uniform royalty rate agreement (previously, the rates ranged from \$0.005/liter and one-half bottle to \$0.0004/bottle).
- Is developing a certification program, based on work done in NELHA's water quality lab that shows water can be proven to come from NELHA.
- Caused one foreign company to agree to stop selling "deep seawater from Hawai'i".
- Department of Agriculture agreed that only NELHA will attest to water being Hawai'ian deep sea water.
- Requested the Attorney General to prosecute companies saying they are producing Hawai'ian deep sea water when the companies are not located at NELHA.

Other than seawater delivery charges, the royalty rate is the only item NELHA has the ability to change without re-opening land lease agreements. The royalty was developed for the intended purpose of certifying the "brand" and the fact the water was from NELHA. Using the royalty income to promote the "brand" will help build its recognition, expand that recognition to future products manufactured at NELHA, and create a more reliable revenue stream for NELHA.

Expansion of the use of desalinated deep seawater into products using it as a base will be in NELHA's long term benefit. Some indications are that a health spa, production of

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

cosmetic items, or beer brewery might be future high value uses. Other uses that have been discussed are the water as an ingredient in processed foods.



REVIEW OF 2005

Fiscal Year 2005 was a definite year of change for NELHA. The previous Executive Director resigned in September, the Acting Director resigned in December, and an Interim Director was in place until the new Chief Executive Officer came on-board in mid-April.

Among other things, NELHA immediately began an intensive and thorough examination of the rate at which it sells seawater to tenants. Pumping, labor, Comprehensive Environmental Monitoring Program expenses, and other factors were scrutinized in the first definitive analysis of seawater delivery costs. This examination is continuing today, with the objective of honing the price structure more exactly as to the cost of water delivery at different elevations across NELHA, elevations which range from 10 feet above sea level to 110 feet – the latter requiring multiple stage pumping to provide tenants with the water they need for their processes.

What has been determined regarding water rates is that the cost of electrical power from the public utility has in fact been out-stripping the rate of increase in the tenant price of seawater. NELHA actually, at the end of fiscal year 2005, was in a position of subsidizing more of the tenants' usage than it was at the start of the year.

A differential cost structure for the water has been implemented since the close of the fiscal year. Aquaculture tenants are being charged \$0.144/ Kgal, compared to a \$0.1086/Kgal blended rate for FY 2005. A fuel cost adjustment on a monthly basis was also instituted. The Board of Directors affirmed this policy as being the stated policy until aquaculture, in perhaps two years, pays the actual delivery cost of the seawater it uses. Commercial and industrial tenants, (right now consisting of water bottling companies), are being charged \$0.60/Kgal plus a fuel cost adjustment. All future tenants, public service entities, and tenants whose leases are renegotiated are to be charged the actual water delivery cost, currently estimated at about \$0.299/Kgal. Present aquacultural tenants that exceed their 2005 water usage will be charged the actual water delivery cost as well.

While this action has been somewhat controversial, it is necessary to enable NELHA to achieve the goal of self-sufficiency on an operating basis, while not endangering the future of much of Hawaii's aquacultural industry.

The United States Patent and Trademark Office issued a Certification of Registration for the NLEHA logo.

Service mark licensing agreements for the use of NELHA's logo and certification of the deep seawater as being truly Hawai'ian deep seawater are in the process of standardization. All companies that produce and bottle water at NELHA have signed letters of agreement standardizing the royalty rate. Formal documents have been sent all companies finalizing this standardization. The royalty is designated as being for the certification of the water and the protection of the NELHA brand. In the past six months, one foreign company agreed with the State to stop branding its water as Hawai'ian in nature as a result of this program. Other imitators are being investigated. The NELHA logo and its use on other items produced at NELHA is currently being examined.

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Presently underway is a comprehensive review of the entire NELHA lease policy. This includes land rent rates, option policy, a seawater allocation policy, and other factors. It is expected this review will be completed by calendar year end and a new policy presented to the Board of Directors for consideration early in 2006.

A landmark event occurred in late August when operation of the 55" deep seawater pipeline commenced. This is the deepest pipe in the world, bringing up water at about 41 degrees Fahrenheit, for use by NELHA tenants. Capable of pumping 14,000 gallons per minute of deep seawater in its current configuration, the line is supplying two aquaculture tenants and all the water bottling companies currently in operation and those under construction. Its expansion within the next two years is imperative, based on tenant projections of their need for deep seawater. Tenant growth will be stopped if the pumping capacity is not enhanced.

The Gateway Energy Center was dedicated in October, 2004. It is slated to become an energy education resource for the community and visitors, once funding is secured with which it can be furnished. Friends of NELHA, a 501(c)3 volunteer organization has agreed to staff the facility for use as an energy education center for public education about the energy situation in Hawai'i and the nation. Public reception to this use of the facility has been very positive.

25 years of faithful recording of weather information was recognized by the U.S. Department of Commerce, through the National Oceanic and Atmospheric Administration and the National Weather Service, in May.

Evaluation of a proposal to outsource water quality laboratory services is underway. Results are expected in the near future.

Planning and design work for the badly required re-building of the Main Pump Station at Keahole Point is underway. Requesting construction bids should commence shortly after the start of calendar 2007.



TENANT ACTIVITIES

The following section, arranged in alphabetical order, provides a brief description of each tenant's activities at NELHA.

BIG ISLAND ABALONE CORPORATION

The Big Island Abalone Corporation (BIAC) capitalizes on global demand for fresh abalone products and its expertise and experience in abalone culture and production. The NELHA Board first approved BIAC's proposal in FY97, allowing the company to commence pre-commercial research phase activities in early FY98. BIAC has continued to optimize commercial production on its 10-acre state-of-the-art abalone aqua-farm in the HOST Park, now the largest single abalone production facility in the world outside of China. With a design capacity of 100 tons/year, BIAC's aqua-farm has performed exceedingly well, growing inventory rapidly. The company keeps over 1 million *Ezo awabi* abalone in stock and ships this highly prized species to seafood markets in Japan. Proprietary production methods have made the BIAC nursery one of the highest yielding in the world. BIAC ships *Ezo* to local, Asian and domestic US markets.

The company operates a sales office in Nara, Japan, to actively sell live abalone in Japan. Main markets have been in Tokyo and Osaka, with sales growing rapidly. In 2002, sales totaled 22 tons of live abalone, about 26% of total US exports. In FY03, sales reached 37 tons, and in FY04, 70 tons, of which 95% was exported, making up 40% of total US exports. At this rate, BIAC will soon be the largest single exporter of live abalone to Japan among other countries such as Australia, South Africa, USA, China, and Iceland within the next couple of years. BIAC will continue marketing efforts in Japan, the prime market for this valuable and delicious product.



Big Island Abalone Corporation has been recognized for its growth by being selected as the Governor's New Exporter of the Year for 2002 and as the Governor's overall Exporter of the Year for 2003.

BLACK PEARLS, INC.

During FY04, Black Pearls, Inc. expanded into 1.25 acres adjoining its present site at NELHA for the finfish division of its operations. BPI's finfish affiliate, Kona Blue Water Farms, has developed culture techniques for a number of valuable finfish species, including: ulua (also known as Giant trevally or *Caranx ignobilis*), opakapaka (rosy snapper, *Pristipomoides filamentosus*), flame angelfish (*Centropyge loriculus*), deep water grouper (hapu'upu'u, *Epinephelus quernus*), another rare native grouper, the giant or king grouper, *E. lanceolatus*, Kona Kampachi™ (amberjack), omilu (bluefin trevally), uku (green snapper), and a number of aquarium-fish species. BPI's NELHA site provides

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

hatchery support for a new offshore cage culture fish farm for a Kona coast location well outside of NELHA's ocean use corridor.

CYANOTECH CORPORATION

Cyanotech Corporation has specialized in developing and commercializing natural micro-algae-based products at NELHA since 1984 and has 90 acres of land in commercial production. The well-established company, with annual revenues in excess of \$12 million, produces a variety of high-value products for the nutritional supplement and immunological diagnostics markets, in addition to micro-algae-based products for the aquaculture feed/pigments and food coloring markets. Products include BioAstinR natural astaxanthin, a powerful antioxidant with expanding applications as a human nutraceutical; NatuRoseR natural astaxanthin for the aquaculture and animal feed industries; Spirulina PacificaR, a nutrient-rich dietary supplement; and phycobiliproteins, which are fluorescent pigments used in the immunological diagnostics market. Cyanotech also operates a Japanese business unit officing in Tokyo. Cyanotech currently markets its products in the United States and thirty other countries through a combination of retail, wholesale and private label channels. Cyanotech was the first micro-algae company in the world to receive third party organic certification as an ISO9002 Registered Quality System.

DEEP SEAWATER INTERNATIONAL, INC.

Deep SeaWater International, Inc. (DSWI) is a multi-faceted company utilizing the natural and abundant resource of the pristine, pathogen free, 3000' deep ocean water accessed from the Natural Energy Laboratory of Hawaii, Authority (NELHA) at Kona, Hawaii. American-owned DSWI's first product is a superior quality, deep sea drinking water, KONA DEEP. This product will be produced in both a 1.5 liter bottle and a 500 mil bottle. The first bottling facility of DSWI was completed and in production on July 28, 2005. Construction for the second bottling facility is scheduled to begin in early 2006. In future phases of development, other products will be introduced from this unique deep seawater source.

ENZAMIN USA, INC.

Enzamin USA, Inc. is a company with origins in Japan where it has a well-established product line based on *Bacillus natto*, a bacterial strain derived from fermented soybeans, or *Natto*, a food item reputed to have many health benefits and popular in Japan since the 17th century. In September 2000, the company received NELHA approval to commence pre-commercial research at NELHA to develop health drinks, health foods, dietary supplements and skin care products utilizing water and minerals derived from DSW. The company has been transitioning from pre-commercial research status to full commercial status and moved into its commercial facilities in the summer of 2005.

FRIENDS OF NELHA

The Friends of NELHA (FON) is a non-profit organization whose sole mission is to support the education/ outreach and public relations needs of NELHA. Its members are community volunteers who serve as specially trained NELHA docent "Ambassadors," making twice weekly presentations about NELHA to interested visitors. The West Hawaii Sea Grant Extension Agent from the University of Hawaii at Manoa, whose office is also located at NELHA and who provides weekly outreach presentations for NELHA, supervises the docent training program. FON will staff the Gateway Energy Center once it is open to the public.

HAWAI'IAN ISLANDS HUMPBACK WHALE NATIONAL MARINE SANCTUARY

Education/Outreach - Working out of the sanctuary's NELHA office, the sanctuary's West Hawai'i coordinator has been actively participating in marine conservation and education on the Big Island through a variety of outreach projects. These include public presentations on humpback whales and other marine mammals, the yearly Sanctuary whale count, hands on education with children and teens in local communities and schools and participation in local community events. Over the past year we have worked with 7 different schools and had the great opportunity to share and learn with more than 500 Big Island kids.

Research- The NELHA-based sanctuary coordinator also assisted local research groups in efforts to learn more about the humpback whale and their habitat. The coordinator actively participated in research cruises and then shared the research findings with the local communities and ocean users. In addition, the coordinator worked with NELHA aquaculture tenant Kona Blue Water Farms to develop a shore based monitoring program for their open water fish pens. The monitoring program is an effort by both Kona Blue and the State of Hawai'i to ensure that the pens don't negatively impact the humpback whales.

Marine Mammal Stranding Group- The sanctuary office has assisted Hawai'ian Islands Stranding Response Group (HISRG) in establishing and coordinating an on island response team made of community volunteers to assist in marine mammal strandings.

Resource Conservation/Monitoring- The NELHA sanctuary office assisted state and federal agencies in monitoring Big Island marine resources. This has included monitoring the Hawai'ian Monk seal population on island and assisting with photo identification, bleach marking, and tagging, as well as community outreach and education at high profile pupping sites. In addition, the staff has been trained for marine mammal disentanglements and with its emergency response inflatable boat, serves as a first response team when necessary.

HAWAI'I DEEP MARINE, INC.

Hawai'i Deep Marine, Inc. commenced the transition to full commercial status during 2005, moving into its new facility in October. In April 2004, HDMI entered into a 30-year sublease with NELHA for 4.5 acres of commercial property. HDMI had been the first company with an interest in developing deep seawater-based products, becoming a NELHA tenant in 1999 and pioneered the test-marketing of a number of products including desalinated water, nigari, sea salt, salt spray for food use, and others since then.

HAWAI'I DEEP OCEAN WATER LLC

Hawai'i Deep Ocean Water (HDOW) LLC has been conducting pre-commercial research and development since 2000 using NELHA deep seawater resources. The company has been renting a small research site at NELHA. A strong parent company based in Gifu Prefecture, Japan, for over 20 years provides support and a well-developed production, marketing, and sales system in which the new products are being test-marketed. The company embarked on its commercial production phase at NELHA during FY05, with the intention of building a bottling plant facility on NELHA properties.



HA broodstock--big and healthy--produced from a biosecure culture facility at NELHA.

HIGH HEALTH AQUACULTURE, INC.

High Health Aquaculture (HHA) supplies certified Specific Pathogen-Free (SPF) brood stock to the world's shrimp hatcheries. "The world's leading shrimp breeder and supplier of SPF Brood stock", High Health's shrimp breeding technology is based on many years of practical shrimp growing experience combined with state-of-the-art breeding, genetics and marine biotechnology. HHA has operated a bio-secure shrimp breeding facility at NELHA since 1995 and has made significant contributions to improving the shrimp production industry worldwide. All SPF stock is certified by the Hawai'i State Department of Agriculture.

INDO-PACIFIC SEAFARMS, INC.

Indo-Pacific Sea Farms' mission is to develop and commercialize innovative technologies for sustainable production of reef-dwelling organisms. IPSF cultures photosynthetic molluscs and cnidarians as well as other marine species for the aquarium industry. The pristine seawater supply at NELHA provides an ideal environment for these organisms. Cultivation requirements for the plant-animal symbionts are similar to those of free-living micro-algae and include ample tropical sunlight, warm surface seawater and a carefully controlled concentration of deep seawater to control temperature and supplement essential inorganic nutrients. IPSF products are currently in high demand in the aquarium industry.

KONA BAY MARINE RESOURCES, INC.

Kona Bay Marine Resources, Inc. is a marine biotechnology company using advanced technology in the production of SPF (Specific Pathogen-Free) and SPR (Specific Pathogen Resistant) shrimp brood stock and disease-free bivalve seed. Kona Bay supplies the global aquaculture industry with high quality, certified pathogen-free seafood products, which are produced in a land-based, proprietary, state-of-the-art, bio-secure facility. The Company markets SPF and SPR shrimp brood stock in Asia, US Mainland and Hawai'i and certified disease-free clam seed in the US mainland, Europe and Mexico. In the last year, Kona Bay has become the leading exporter of SPF and SPR shrimp brood stock in Hawai'i, earning the Governor's Exporter of the Year Award for 2004. Kona Bay has developed a global brand and reputation, and is recognized throughout Asia as the leading provider of SPF and SPR shrimp brood stock. The Company completed an expansion that increased production by 50% recently and in 2005, began ground clearing for a further expansion of its production capacity.

KONA COLD LOBSTERS LTD.

Kona Cold Lobsters Ltd. (KCL) utilizes the deep cold seawater supplied by NELHA to create a habitat for live Maine lobsters and live Dungeness crabs. KCL imports live lobsters and crabs from the natural fisheries and rejuvenates them in cold seawater holding pens for distribution throughout the Hawai'ian Islands and select Asian destinations. KCL is therefore able to provide the freshest, most stable supply of live Maine lobster in the Pacific basin. Currently KCL services over 50 customers on five

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Hawaiian Islands, including supermarkets, restaurants, and resorts, meeting their specific size and quantity requirements on a daily basis. KCL also has the expertise and experience to culture Maine lobsters in a multidisciplinary system.

KOYO USA CORPORATION

Koyo USA Corporation is currently in the process of building Plant 3 which will house new state-of-the-art equipment for water bottling to supplement production presently being done in Plants 1 and 2 (for 500 ml and 1.5 L bottles respectively). Capital investment for this expansion is estimated to be between \$35 to \$40 million.

Starting this year, Koyo, which had been exclusively exporting its products to Japan, opened its sales to the domestic market for 1.5 L and 500 ml bottles of Ma Ha Lo brand deep sea drinking water. To showcase its products and to make it available to local consumers, Koyo opened the Mahalo Showroom/Water Bar at the Waikiki Shopping Plaza in the Waikiki District of Honolulu, Hawaii on November 20, 2005.

Since increases in both export and local sales are expected, production inputs are also projected to be on the uptrend.

MERA PHARMACEUTICALS

Mera Pharmaceuticals has been a tenant at NELHA since 1995. Specializing in marine biotechnology, it has been a global leader in the development of proprietary, cost-effective, photobioreactor technology for commercial scale production of pure cultures of micro-algal species, and in re-search and development of high-valued products derived from micro-algae. Mera has capitalized on its new 3-acre Hawaii Research, Development and Production (HRDP) Facility, constructed during FY99, allowing its staff scientists to conduct R&D on new micro-algae products on the lab bench and then ramping up from laboratory-scale culture flasks to fully computerized mass production, all in the same location. The cornerstone of the micro-algae-based business and key to this versatility is the company's proprietary and economical photobioreactor technology, the Aquasearch Growth Module (AGM) which the company says creates ten-fold increases from previous production capacities.



The Aquasearch Growth Module is a commercial-scale closed photobioreactor

MOANA TECHNOLOGIES LLC

Moana Technologies, Inc. has been a NELHA tenant since 2001, specializing in shrimp brood stock genetics using traditional breeding techniques. The company came to NELHA with a strong technical team and solid financial backing. The company also operates a facility on Oahu which serves as a quarantine site to screen all genetic stock prior to introduction at the company's NELHA Keahole Point site. These animals are routinely transferred to the NELHA research site from Moana's Oahu quarantine facilities following strict bio-security protocols. At NELHA, animal grow-out cycles are closely monitored and access to the site is limited only to company personnel with bio-security clearance.

OCEANIC INSTITUTE

Oceanic Institute (OI) entered into a long term sublease in FY04 for a four-acre parcel in the HOST Park section of NELHA. OI is a private research organization headquartered at Makapuu, Oahu, that “applies new technologies in marine science, biology, and chemistry to remove obstacles to the culture of significant commercial and depleted species.” OI has a federal grant to develop the facility with matching funds from the state, administered through NELHA.

OCEAN RIDER, INC.

Ocean Rider, Inc. has been a tenant at NELHA since 1998. Citing the pristine quality of the seawater supply as the primary reason for choosing this location, the company has established a commercial facility using proprietary systems for the care and feeding of seahorses. The company targets the live ornamental fish industry outside of Hawai'i. During FY 04, the company enjoyed its first full year of production at its new commercial site in the NELHA Small Business Compound. Sales of seahorses have continued to increase, and satisfied customers worldwide continue to report gratitude for the high quality services and products from this innovative company. To protect Hawai'i's pristine natural resources, Ocean Rider does not sell its prized exotic seahorses locally, but only to out-of-state locations around the world.

PACIFIC PLANKTRONICS

Pacific Planktonics, a new tenant in fiscal 2005, is using USDA /SBIR and HTDC grant funds to improve methods for aquaculture of larval reef fish. Activities include standard fish hatchery procedures, using surface sea water. Some species of fish or ornamental shrimp may be produced in large enough quantities to use them for test marketing within the first 6 months of the project.

Goals include developing methods to produce ornamental marine fish and shrimp profitably. Initial SBIR grant objectives include optimization of live first feeds for larvae. Early production and test marketing is planned for a few species that have already been reared, i.e., harlequin shrimp, cleaner shrimp, and flame angelfish. Further expansion into many other species is planned.

The proposed research will develop sustainable production of highly valued ornamental reef fish by examining methods to improve technology and reduce costs for producing these organisms. Success in this project may also contribute to reduced fishing pressure on Hawai'i reefs, and may also spread to other tropical reefs as other companies enter the market. The fish grown are not intended for human consumption, but add to the quality of life by bringing a small part of nature into people's homes.

Capital requirements for this project are minimal for the first 6 to 12 months. As of October 2005, the company has spent approximately \$43,000 developing its NELHA site. Buildings will not be needed until the shipping and packing stage. Expansion of initial facilities will be primarily plastic tanks, with shade cloth. An agricultural loan may be sought to cover the cost of new tanks and buildings, estimated at less than \$300,000 for five years. Production in the 2nd or 3rd year is expected to reach about 100,000 fish per year, with gross revenue of about \$200,000 to \$300,000. Total costs are not expected to exceed one half of the gross revenue.

PACIFIC OCEAN VENTURES, LLC

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Pacific Ocean Ventures is continuing research in the development of land based production of moi (Pacific threadfin) and kahala (*Seriola rvioliana*). To date, its fingerling production has had great success in survival percentages in both recirculating and flow-through technologies. Concurrently, POV is investigating land based grow-out in flow-through systems monitoring feed efficiency and water quality parameters in relation to stocking densities. Pacific Ocean Ventures is also developing technology for partial recirculating systems to reduce the use of water supplied by the Natural Energy Laboratory of Hawaii Authority. POV is continually developing brood-stock management and quarantine guidelines to supply consistent egg production.

ROYAL HAWAII'AN SEA FARMS, INC.

Royal Hawaiian Sea Farms, Inc. (RHSF) has been in business at Keahole Point since 1987, commercially producing limu, or edible sea vegetables. Sales of these popular nutritious delicacies have consistently reached over two tons per week. A pickled ogo (*Gracilaria*) product is being processed under the "Waimanalo Ko-Ko" brand. In addition to limu, RHSF also produces salt water tilapia (*Tilapia*) and milkfish (*Chanos*). Intensive applied research is being conducted to investigate the potential of commercially producing edible sea cucumbers (*Stichopus*), the Hawaiian limpet, opihi (*Cellana*), and warm water abalone (*Haliotis*).

SAVERS HOLDINGS LTD

Savers Holdings Ltd. became a commercial tenant at NELHA during FY04, leasing six acres of commercial property in the HOST Park. The company will develop deep seawater-based bottled water products for the Korean market. Capital investment in the next two years is estimated to be on the order of \$15.0 million.

TAYLOR SHELLFISH

Taylor Shellfish–Kona is a subsidiary of Taylor United, a family-owned company reputed to be the largest commercial shellfish producer in the U.S. Headquartered in Quilcene, Washington, since the late 1960s, Taylor achieves maximum marketing flexibility by operating a range of nursery and grow out locations for several varieties of shellfish. One of these sites is a nursery at NELHA where both Manila clams (*Venerupis japonica*) and Pacific oyster (*Crossostrea gigas*) "spat" enjoy a "Hawaiian grow out vacation" during their early months of growth. The company's shellfish "seed" or "spat" start life in a hatchery in the Pacific Northwest. When only about 250 microns in size, soon after settlement from the swimming, or planktonic stage, they are brought to the Kona facility. After about three months of growth on screens and sand-filled raceways, they reach about 5-6 mm, and most are returned to Washington state for 1-4 years of grow out to market size in Taylor's facilities.

The NELHA nursery annually produces 100-120 million oyster seed and 200-300 million clam seed. Some of these are also sold to other oyster and clam farms around the world, including destinations as far away as South Africa. The Kona nursery makes good economic sense to Taylor since the unique NELHA dual seawater supply enables the company to maintain the precise temperature regimes required by the delicate early stages of growth for very low cost, and Hawaii's winterless climate allows year-round productivity instead of only seasonal production. During FY04, Taylor Shellfish–Kona continued to work on developing an expansion of its facilities to meet growing market demand for its high quality products.

PACIFIC LIGHTNET INC.

Operates an antenna on the administration building rooftop in NELHA's Research Compound to provide wireless Internet access to NELHA's tenants and clients in the Keahole area. This brings high speed Internet service to NELHA's properties without the need for costly underground cabling infrastructure.

UNLIMITED AQUACULTURE CORPORATION

Unlimited Aquaculture Corporation is a Canadian-based company developing Hawaii's first coldwater halibut and black cod ("butterfish" or sablefish) aquaculture farm to service markets throughout the Pacific Basin with fresh product. The company prepared to sign a Facilities Rental Agreement for a one-acre lot in the NELHA Farm Compound for the first phase of its production facilities, with long range plans for further expansion.

UNIVERSITY OF HAWAII—INFRASOUND LABORATORY OF HAWAII

The Infrasound Laboratory of Hawaii (ISLA) is a project of the University of Hawaii at Manoa's Hawaii Institute of Geophysics specializing in atmospheric infrasound monitoring. A unique project that collects and analyzes data from infrasonic signals (pressure disturbances whose frequencies are below the hearing range of the human ear) in the atmosphere, ISLA became a NELHA tenant in March 2000. Initially supported through U.S. Department of Defense funds, ISLA is part of an international network dedicated to monitoring compliance with the Comprehensive Nuclear Test Ban Treaty (CTBT). The CTBT seeks to eliminate the proliferation and use of nuclear weapons and to ensure complete global disarmament under strict international control. ISLA operates and maintains IS59, or KONA, a 4-element infrasound array located on the forested slopes of Mt. Hualalai, as well as two other arrays outside of Hawaii. The Kona array has exceptionally low ambient noise levels and acoustic detection thresholds and can detect low-frequency atmospheric sound waves generated by natural and man-made sources such as explosions, volcanic eruptions, meteorite impacts, and severe weather and thus may provide advance warning of potential threats to Hawaii. ISLA can analyze various aspects of infra-sonic wave propagation, source characterization, and event location. Ongoing research concentrates on infrasonic tracking of storms systems, modeling sound wave propagation over thousands of kilometers, characterizing the ambient infrasonic field in the Pacific, optimizing wind-noise-reducing systems, and ray-tracing of wave paths from atmospheric meteor entries.

UNIVERSITY OF HAWAII—SEA GRANT EXTENSION SERVICE

The University of Hawaii Sea Grant Extension Service program promotes responsible stewardship for the area's marine and coastal ecosystems using a multi-level, multi-generational education/outreach approach including the general public, schools, resorts, and collaboration with several agencies and NGOs. The West Hawaii Extension Agent, Sara Peck, with a part-time assistant, maintains an office as a tenant at NELHA, and provides outreach services to NELHA.

Sea Grant West Hawaii generates approximately \$150,000 annually in federal, state, and private funding to maintain its current programmatic level. Funding and program partners include: Harold K.L. Castle Foundation, Hawaii Community Foundation, The Nature Conservancy, Pa'aPono Foundation, Community Conservation Network, DBEDT/CZM, Division of Aquatic Resources, NOAA, National Fish and Wildlife Foundation, National Fisheries Service, The Kamehameha Investment Corporation

FY 2005 NATURAL ENERGY OF HAWAI'I AUTHORITY ANNUAL REPORT

(Bishop Holdings), The Kona Reefers Dive Club, the Kona Underwater Photography Society, the Hawai'i Island Recreation SCUBA Association, the National Park Service, and many others. The UH Sea Grant program continues to provide NELHA with a public information and presentation program. The Sea Grant office allocates approximately 25% of staff time toward building the Friends of NELHA organization, providing training for volunteers, scheduling public presentations, fielding inquiries, marketing and giving the presentations.

UWAJIMA FISHERIES, INC.

Uwajima Fisheries, Inc. (UFI) operates a facility at NELHA for growing *hirame*, a flounder highly prized by the Japanese markets for *sashimi* and *sushi*. Uwajima Fisheries markets its 1.5 to 2 pound *hirame* through a Honolulu distributor who supplies the Oahu *sushi* market. UFI manages the maturation and spawning of its brood-stock for year-around production of eggs. UFI also utilizes NELHA surface and cold deep seawater for the semi-intensive polyculture of marine shrimp, milkfish and the edible seaweed, *Gracilaria spp.*, also known locally as *ogo*, and the popular finfish species Pacific threadfin (*moi*) for local markets.

U.S. COAST GUARD

Since December 2000, the U.S. Coast Guard has been operating a radio direction finding (DF) antenna on the NELHA Laboratory Building at Keahole Point to aid mariners in distress. NELHA is a perfect site due to its unobstructed views, low RF noise, and accessible power and phone lines. NELHA provides electrical service and access for maintenance to the Coast Guard at no cost as a public service.

VERIZON WIRELESS

Verizon operates two roof-mounted antennas installed atop the NELHA administration building. During FY03, NELHA negotiated a new rental rate for a proposed antenna pole and small area adjacent to the Research Compound. Verizon planned to install three antennas of its own and reserved the right to sub-sublet space on the pole to other users on the condition that NELHA participate in rental negotiations with any secondary users. The antennas installed at NELHA allow Verizon to provide commercial wireless telephone service for Keahole and the surrounding areas of Kailua-Kona.

WEST HAWAI'I EXPLORATIONS ACADEMY—PUBLIC CHARTER SCHOOL

The West Hawai'i Explorations Academy (WHEA)—Public Charter School, the first charter high school in the State of Hawai'i, has been a tenant at NELHA since May 2000. In 2005, the school was named recipient of the Intel-Science Foundation School of Distinction in Science Award, in competition against about 3,500 high schools throughout the United States.

WHEA-PCS is an independent school in which its student body ranging from 7th through 12th grade spend a full academic year at NELHA working on projects related to the resources available at Keahole Point. WHEA student projects have included educational presentations to thousands of elementary, middle and high school students each year; a solar car prototype; design and construction of an electric car; hydroponic and cold-water agriculture; and numerous aquaculture projects.

CEROS

solicits and supports innovative technologies for national maritime military applications and sustained technology-based economic development in Hawai'i.

CEROS is a State program entirely supported by federal funds. The program started in 1993, with a \$5 million Department of Defense appropriation. Federal support for CEROS comes to the State through a Cooperative Agreement with the Defense Advanced Research Projects Agency (DARPA), the principal technology development agency for the Department of Defense. DARPA provides technical and administrative guidance to assure that the program remains responsive to the needs of the federal defense establishment while helping the technical commercial base develop in Hawai'i. Since 1993, CEROS has provided advanced technology to SUBPAC, PACFLT and SOCOM and supported creation of over 120 technology-based jobs in Hawai'i.

From the start, DARPA sought an efficient CEROS organization to turn the federal funds, which are appropriated annually, into funded contracts in as short a period as possible. Thus, CEROS runs annual competitive solicitations for technical projects and handles the entire process from initial announcement (in October) to contract negotiation and commitment (usually in the following June). Since 1993, CEROS has funded 189 technical projects for about \$71,986,214.

Five technical topic areas are identified in the legislation that originally funded CEROS:

- Ocean Environment Preservation Technology;
- New Ocean Platform and Ship Concepts;
- Shallow Water Surveillance Technologies;
- Ocean Measurement Instrumentation; and
- Unique Properties of the Deep Ocean Environment.

CEROS Program Priorities

- Focus on Core technical program on maritime military technology needs
- Emphasize innovative technical development and demonstrations
- Solicit and support technically important projects with transition potential
- Enhance sustainable commercial technology capabilities in Hawai'i
- Maintain program quality, control costs and deliver results.

The CEROS program operates on less than 8% administrative overhead (i.e. 92% of the federal funds go into the Core technical program). The CEROS personnel list is 5: Technical Director, Fiscal Assistant, Program Manager for Outreach and Administration, Contracts and Grants Administrator and Research Administrator. CEROS maintains a Projects Office at NELHA headquarters in Kailua-Kona and a Contracts Office in Honolulu.

CEROS point of contact: Jacquie Brewbaker, Program Manager for Outreach & Administration, jacquieb@ceros.org. For more information about CEROS, please consult, www.ceros.org.

FUNDED PROJECTS:

Aero Union Corporation -- Marine Air-Deployed Rescue Vehicle (FY04 - \$310,000)

Aquaculture Technology Incorporated -- Naturally Occurring Antibodies From Marine Algae *Chaetoceros* (FY94 - \$171,000); Naturally-Occurring Antibacterial And Antifungal Substances From Marine Algae *Chaetoceros*, *Nitzschia* And *Thalassiosira* (FY95 - \$207,000); Continuous Production Of Marine Algae *Chaetoceros* Spp. in an Open System (FY97 - \$240,000)

BAE Systems Spectral Solutions -- Single Camera Multispectral Imager Study (FY05 - \$341,044)

Band, Lavis & Associates, Inc. -- Application Of Techniques And Comparative Effectiveness Of Non-Toxic Anti-Fouling Surfaces To Immersed Nettings Used In Naval And Aquaculture Industries; (FY97 - \$227,198); *Subcontractor:* [Black Pearls, Inc.](#), Honolulu, HI

BBN Technologies -- A Proposal to Develop HYDROFIST: A Nonexplosive Means for Generating Intense and Focused Underwater Shock Waves; (FY99 - \$999,819; FY00 - \$817,969); *Subcontractor:* **Navatek Ships, Ltd.**; (a subsidiary of Pacific Marine), Honolulu, HI; Implement and Demonstrate ASW Targeting and Weapon Control Using Non-Organic Sensors: Netted Combat Control System (Netted CCS); (FY01 - \$1,112,450); A Proposal to Implement and Demonstrate ASW Targeting and Weapon Control Using Non-Organic Sensors: Netted Combat Control System (Netted CCS) – Year 2; (FY02 - \$799,987); A Proposal to Implement and Demonstrate a NetCentric Air-Deployed, Portable Range; (FY03 - \$879,000); A Proposal to Advance a Submarine Combat Control System Trainer and Support and Demonstrate Anti-submarine Warfare (ASW) Capabilities with COMSUBPAC, Pearl Harbor; (FY04 - \$524,948); TREDS Software Interface for Net Centric Portable Range; (FY04 - \$99,789); Infrasonic Remote Sensing of Breaking Ocean Waves in the Surf and Littoral Zones; (FY04 - \$349,979)

Black Pearls, Inc. -- Probiotic Bacteria: The Key To Expanded Use Of Deep Seawater In Tropical Aquaculture And The Solution To A Growing Industry Problem; (FY97 - \$121,392); A Continuous-Culture Closed-System Deep Seawater Photobioreactor for Microalgal Culture for Hatcheries and Pharmaceuticals; (FY00 - \$173,201); Developing a Sensitive, Sessile Monitor for Non-Point Source Heavy Metal Pollution for Tropical and Sub-Tropical Indo-Pacific Waters; (FY01 - \$138,097); Refining and Broadening the Use of Pearl Oysters as Sensitive Biomonitors for Heavy Metal Contamination; (FY03 - \$119,920); Extending Technology for Probiotic Cultures in Deep Seawater to Enhance Marine Finfish Hatchery Efficiencies; (FY04 - \$157,360)

Cellular Bioengineering Inc. -- Neural Matrix Chips for Chemical and Biological Weapons Detection; (FY04 - \$309,326); Neural Matrix Chips for Chemical and Biological Weapons Detection; (FY05 - \$557,243)

Concurrent Analytical, Inc. (formerly Detection Limit Technology, Inc.) -- Development Of Fiber-Optic Chemical Sensors (FOCs) For Remote In-Situ Monitoring Of pH And Carbon Dioxide In Seawater; (FY93 - \$237,000); Development Of A Fiber-Optic Based Autonomous Buoy For In-Situ Monitoring Of pH, pCO₂, Temperature, O₂,

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

And Water Quality In Seawater; (FY94 - \$332,000); Solution Plus In-Situ Ocean Sediment Chemical Analyzer; (FY96 - \$320,000 ; FY97 - \$360,000); PCB Analyzer for Shallow Ocean Water; (FY98 - \$380,000); Automated SERS Immunoassay Detection System: Detection of an Aquaculture Virus and "Dog Nose" Sensor for TNT Detection; (FY00 - \$439,937); Improved Extrinsic Raman Labels (ERL) for Real-Time Ocean TNT Detection and Quantification; (FY02 - \$350,000); Improved Resolution in Fourier Transform Spectroscopy; (FY03 - \$325,443); Improved Resolution in Fourier Transform Spectroscopy; (FY04 - \$434,700); Hawai'ian Blot™ Biowarfare Detection Capability Development; (FY04 - \$265,440); Improved Virus Detection Capability Development; (FY05 - \$314,574)

Cox Environmental Systems -- Water Properties Miniature Optical Sensor Project; (FY00 - \$215,004)

Edward K. Noda & Associates, Inc. -- Hurricane Risk Analysis and Modeling Of Coastal Flooding for the Hawai'ian Islands; (FY93 - \$214,000); Modeling of Hurricane-Induced Coastal Flooding for the Hawai'ian Islands; (FY98 - \$182,345)

Gateway Technologies International, Inc. -- Radar/Sensor Signal Processing Research of Shallow Water Surveillance Technologies; (FY93- \$386,000); HIRADSIM Workstation Development Project - Continuation of Existing Work Advanced HIRADSIM Small Target - Time Domain - Maritime Radar Mode; (FY94 - \$250,000); Personal Emergency Lifesaving System (PELS); (FY98 - \$240,920)

Guide.Net, Inc. -- Using Software Agents to Acquire and Visualize Environmental Information for ASW Surveillance; (FY98 - \$305,000 ; FY99 - \$360,000); Workflow Paradigm for ASW by Reliable METOC Data and Tasks; (FY00 - \$397,510)

IBM/Loral Federal Systems; Kewalo Basin Marine Mammal Laboratory -- Acoustic Analysis Tool Kit; (FY93 - \$480,000)

Innovations Hawai'i -- Extended Source Apparent Motion (E-Sam) Lighted Signals for Protection Of The Marine Environment; (FY93 - \$241,000 ; FY94 - \$177,000)

Lidar Pacific Corporation -- The Use of Texel 3D Imaging for Shallow Water Bathymetric Measurements; (FY05 - \$401,218)

Lockheed Martin ORINCON Defense (formerly ORINCON Defense) -- Underwater Echolocation for Object Recognition; (FY93 - \$770,000 ; FY94 - \$653,000 ; FY95 - \$697,000); *Subcontractor: Hawai'i Institute of Marine Biology*, Kailua, HI; Advanced Real-Time Signal Processor (ARTS) and ASW Commanders Workstations (ADM-3); (FY95 - \$862,000 ; FY96 - \$872,000); Submarine-Launched, Two-Way, Fiber Optics-Linked Communications Buoy; (FY96 - \$160,000); *Subcontractor: Sippican, Inc.*, Marion, MA; Antisubmarine Warfare Commander's Workstation Upgrades and Advanced Real-Time Signal Processor for CTF-12 Applications; (FY97 - \$500,000); An Improved Acoustic Intercept Receiver for Submarine Applications; (FY97 - \$450,000 ; FY98 - \$560,000); An Integrated System for Detection, Classification, Localization, Tracking and Reporting of Submarine Contact Data; (FY97 - \$700,000); An Upgraded ARTS Processor for Maritime Patrol Aircraft Applications; (FY98 - \$373,000); Situation Awareness System (SAS) Processor for Submarine Applications, Phase 2 and At-Sea

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Evaluation; (FY 98 - \$171,777 ; FY99 - \$775,864); Automation and Integration of Environmental Factors into ASW Tracking; (FY99 - \$497,415); Mission Reconfigurable Signal Processing System; (FY00 - \$749,504); Passive Assured Access System; (FY01 - \$749,203); Theater-Wide Situational Awareness for Decision Wall; (FY01 - \$150,000); Portable and Improved Mission Reconfigurable Signal Processor (PIMRSP); (FY02 - \$440,000); Safety-of-Ship System (SOSS); (FY02 - \$350,000); Safety-of-Ship System Phase 2; (FY03 - \$585,996); Combined Optical Acoustic Tracking System (COATS); (FY03 - \$200,000); Autonomous Passive Acoustic Classification System (APACS); (FY04 - \$654,334); Doppler-Compensated Interarray Broadband Cross-Correlation for Sonar Contact Geo-Localization; (FY05 - \$585,277)

Makai Ocean Engineering, Inc. -- Cost-Effective GPS-Based Sensor For Measurement Of Heave, Pitch, Roll And Heading On Oceanographic Platforms With 0.3 Degree Resolution; (FY93 - \$230,000 ; FY94 - \$235,000); An Automated Control System For Deployment of Small Diameter Cables and Towed Bodies-a Cable Lay Simulator; (FY94 - \$325,000); Design, Construction, and Operation of a Fifty Kilowatt Closed Cycle OTEC Plant and Application Of Results To The Design of a One Megawatt OTEC Plant; (FY94 - \$450,000 ; FY96 - \$200,000); Loop Avoidance Control During the Deployment and Retrieval of Submarine Cables; (FY96 - \$287,000); *Subcontractor: [Knapp Engineering, Inc.](#)* (new name is Structural Solutions), Aiea HI; Internet-Enabled Engineering Tool for Dynamically Analyzing and Planning World-Wide Subsea Cable and Array Installations; (FY98 - \$379,985); Improving Flow from Deep Water Pipeline; (FY00 - \$388,950); Remote Monitoring and Expert Control of Submarine Cable and Array Installations; (FY00 - \$345,737); Computation of Submarine Towed Array Shapes and Dynamics Based on Array Sensors, Indirect Current Sensing and In-Situ Drag Coefficient Measurements; (FY02 - \$479,513); Real-Time, Dynamic Modeling of Multi-Line Towed Array Systems; (FY03 - \$450,000); Validation of Towed Array Shapes Using At-Sea Data and Smart Beamforming; (FY04 - \$475,000); Development of a Simplified ADS Deployment Approach; (FY05 - \$359,949); A Deep Ocean Anti-Neutrino Detector near Hawaii; (FY05 - \$625,000)

Mission Research Corporation -- Ocean Doppler Lidar; (FY95 - \$381,000)

Navatek Ltd. -- Design and Testing of a High Efficiency, Lifting Body Integrated Propulsion Pod with Polymer Drag Reduction and Electric Drive; (FY05 - \$640,698)

Neptune Technologies, Inc. -- Diver Homing Device; (FY95 - \$200,000; FY97 - \$39,000); A Secure Homing System for ASDS Seal Teams; (FY04 - \$310,000)

Nextwave Engineering -- Snap-To Amphibious Footwear System; (FY01 - \$75,700)

NovaSol (Innovative Technical Solutions Inc.) -- Temporally Enhanced Adaptive Multi-Spectral (TEAMS) System for Detection of Underwater Objects; (FY01 - \$34,950); Temporally Enhanced Adaptive Multi-spectral (TEAMS) System for Detection of Underwater Objects; (FY03 - \$700,000)

Ocean Engineering Consultants, Inc. -- SWATH Motion/Structural Software Development; (FY94 - \$121,000); SWATH Motion/Structural Software Development and Verification; (FY95 - \$168,000); Flow Simulation and Visualization for SWATH Ships; (FY96 - \$161,000); SWATH Ship Software and Verification; (FY00 - \$164,954); SWATH Ship Motion Software; (FY03 - \$172,200)

FY 2005 NATURAL ENERGY OF HAWAI'I AUTHORITY ANNUAL REPORT

Oceanic Imaging Consultants -- The DiVRS (ROVer's) Eye Terrain Database Visualization as an Aid to Underwater Navigation; (FY98 - \$239,652; FY99 - \$275,482); Smart Sonar Suite Test and Evaluation; (FY04 - \$450,000)

Oceanic Institute -- Cultured Fish as Biological Indicators of Pollution; (FY99 - \$216,766); *Subcontractor: Associated Laboratories*, Orange, CA

Oceanit Laboratories, Inc. -- Low-Cost Prebuckled Cylindrical Pressure Hulls; (FY93 \$343,000 ; FY94 - \$91,000); Computational and Physical Modeling of the Hurricane Tower Desalination System; (FY97 - \$150,000); Three Dimensional Cloud Height Indicator for Marine Application (3D-CHIMA); (FY01 - \$400,000); Three Dimensional Cloud Height Indicator for Marine Application (Phase II - System Marine Testing);(FY02 - \$360,390); Portable Three-Dimensional Cloud Height Indicator and Visibility Sensor for Marine Application; (FY05 - \$427,630); Real-Time Tactical Bioluminescence Detector; (FY05 - \$403,330)

Oceantek, Inc. -- An Ocean Bottom Span Analyzer for Survey Planning and Installations of Submarine Cables and Pipelines; (FY99 - \$188,000; FY03 - \$94,563)

Oceantronics, Inc. -- Submarine Electronic Charting System; (FY99 - \$193,000); Awarded for completion of the project "Submarine Electronic Charting System", in accordance with guidance provided by CINCPACFLT staff; (FY01 - \$200,000); IFF Modification Kit; (FY04 - \$160,500)

Pacific Environmental Technologies LLC -- Development of a Miniaturized Mass Spectrometer-Based Sampling System for In Situ Measurements of Dissolved Gas and/or Solutes in Marine Waters, and for Protein Characterization that Leads to Microbial Identification; (FY99 - \$141,743); Capillary Electrophoresis-Mass Spectrometry and Other Instrumental Enhancements for In Situ Measurement of Dissolved Gas and Solutes in Marine Waters, Atmospheric Gases and Aerosols and Large Organic Compound Identification; (FY00 - \$171,864); AQUASENSE: a Low-Power, High-Sensitivity, Portable Mass Spectrometer System for In Situ Measurement of Dissolved Gas and Solutes in Natural Waters, Atmospheric Gases and Aerosols, and Large Organic Compound Identification; (FY03 - \$153,690)

Pacific Marine & Supply Company, Inc. -- Tri-Strut Ship Research and Development; (FY94 - \$366,000); Design, Construction and Sea Trials of a 30-Foot Manned Test Model of a Midfoil SWAS; (FY95 - \$500,000 ; FY96 - \$280,000); CFD Code Validation and Improvement Using Large Scale Tests: Optimization of Design for High Froude Number Underwater Body Operating at Near Surface (Midfoil and Slice) and Subsequent Construction and Testing of Optimized Underwater Body; (FY97 - \$654,000); Development, Fabrication, and Demonstration of a Patentable Combination Propeller-Pump Jet Integrated Propulsion Pod with Boundary Layer Suction (FY98 - \$300,000 ; FY99 - \$800,000); Large-Scale Producibility Demonstration of CEROS-Developed Three-Dimensional Lifting Bodies for Use in the U.S. Navy's Littoral Support Craft (LSC) Program; (FY00 - \$980,000); Flapping Foil Technology for Motion Stabilization of Novel High Speed Vehicles; (FY01 - \$250,000); Modification of a Whole Ship Design Synthesis Model to Accept Ship Designs Employing Advanced Lifting Body Technology; (FY02 - \$356,000)

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Raytheon Systems -- (formerly Hughes Aircraft, formerly Alliant Techsystems); High-Resolution Bottom-Penetrating Acoustic Sensors and Signal Processing Algorithms for Reduction of False-Alarm Probability in UXO Hunting; (FY 94 - \$981,000); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#); High-Resolution Bottom Penetrating Synthetic Aperture Sonar Using Multi-Vertical Row Array and Subbottom Classifier Sonar; (FY95 - \$990,000); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#); High-Resolution Bottom Penetrating Synthetic Aperture Sonar for Use in Buried UXO Hunting; (FY96 - \$996,000); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#); Integrated Sensor System for Search and Classification of Subbottom Objects; (FY97 - \$758,000); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#); Multi-Spectral, Interferometric Synthetic Aperture Imaging Sonar; (FY98 - \$550,034); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#); Frequency Agile Sequential Transmission Synthetic Aperture Sonar (FastSAS) - Risk Reduction Technology Demonstration for NetTORP; (FY99 - \$865,631); *Subcontractors:* [University of Hawai'i School of Ocean and Earth Science Technology \(SOEST\)](#), [INTECH, Inc.](#), [Sea Engineering, Inc.](#), [Honolulu Shipyard, Inc.](#)

Science Applications International Corporation (SAIC) -- Web-Based Processing for State-of-the-Art Large Aperture Multi-Dimensional (SLAM) Array; (FY99 - \$500,000); Web Based Propagation & Noise Effects on Signal Processing; (FY00 - \$650,000); Web Based Simulation, Modeling and Signal Processing; (FY01 - \$399,868); Modeling Multi-Hull Stability in Insular Littoral Waters; FY04 - \$150,000); A Shallow Water Concept Demonstration for Signal Measurements; (FY05 - \$445,796); Development and Demonstration of Articulated Motion Control Fins for a Prototype Underwater Vehicle; (FY04 - \$664,000)

Science & Technology International (STI) -- (formerly SETS Technology, Inc.); Hyperspectral Remote Sensing for Maritime Applications; (FY93 - \$692,000 ; FY94 - \$648,000); Dual Mode Fluorescence Imaging for Maritime Applications; (FY95 - \$795,000 ; FY96 - \$996,000 ; FY97 - \$100,000); *Subcontractor:* **SAIC**, Woods Hole, MA; Grazing Angle Imaging Lidar For Organic Mine Countermeasures; (FY96 - \$698,000); *Subcontractor:* **SAIC**, San Diego, CA; Undersea Fanbeam Spectral Imaging (FSI) Risk Reduction Technology Demonstration; (FY98 - \$398,895)

Scientific Solutions, Inc. -- Implementation of an Ocean Acoustic Laboratory at PMRF; (FY01 - \$150,392; FY02 - \$500,000); Ocean Acoustic Laboratory at PMRF-Continuation: Model and Data for Acoustic Observations at PMRF; (FY02 - \$450,000); Data Assimilation, Productization and Dissemination for the Ocean Acoustic Laboratory at PMRF; (FY03 - \$210,500)

Sea Engineering, Inc. -- Development of a Technique to Identify Pollutant Sources and Impacts in Coastal and Oceanic Waters; (FY94 - \$146,000); Development of a Broadband FM Sub-Bottom Profiler for Seafloor Imaging and Sediment Classification; (FY93- \$292,000 ; FY94 - \$224,000); *Subcontractor:* **Precision Signal, Inc.**, Boca Raton, FL; Development of a 3-D, Forward/Aft Sweeping High Resolution Buried Object Imaging System; (FY97 - \$389,000 ; FY98 - \$421,200); *Subcontractor:* **Precision**

FY 2005 NATURAL ENERGY OF HAWAI'I AUTHORITY ANNUAL REPORT

Signal, Inc., Boca Raton, FL; On-Site, Preliminary Analysis of Sediment Core Samples; (FY97- \$103,000); *Subcontractor*: [Jet Propulsion Laboratory, California Institute of Technology](#); Development of an Ultra-High Resolution Non-Destructive Technique for Stress Detection for Marine Applications; (FY98 - \$319,154); Development of an Enhanced Resolution Filter for Improving Sonar Imagery; (FY99 - \$148,287); *Subcontractor*: **MultiSpec Corporation**, Cherry Hill, NJ

SEE/RESCUE Corporation -- Life/Float the One-Person Survival Craft; (FY9 - \$70,000); Enhanced Sea and Land Rescue Visibility System; (FY99 - \$253,839); *Co-contractor*: **TerraSystems, Inc.**, Honolulu, HI; Emergency Supplemental Floation System (ESFS); (FY02 - \$45,007); Evaluation of LIFE/FLOAT Technology for Special Operations; (FY04 - \$13,700); Emergency Pocket Water Desalinator (EPWD); (FY04 - \$50,300)

Structural Solutions (Knapp Engineering) -- Low-Cost Prebuckled Cylindrical Pressure Hulls; (FY93 - \$414,000 ; FY94 - \$571,000); *Project partner*: **Oceanit Laboratories** (Honolulu, HI); 3-D Finite Element Design of Cables; (FY96 - \$145,000 ; FY97 - \$190,000); Smart Scuba; (FY98 - \$319,000 ; FY99 - \$366,000); A Probe for In Situ Characterization of Marine Carbonate Sands and Other Sediments; (FY98 - \$220,000); Modeling of Cable Fatigue; (FY00 - \$190,000) ; Experimental Investigation of Cable Fatigue; (FY01 - \$192,000); Structural Modeling of Synthetic Fiber Ropes; (FY02 - \$195,000); STARS - Computer-Aided Design of Synthetic Fiber Ropes; (FY03 - \$205,000); Computer-Aided Design of Complex Umbilical Cables; (FY04 - \$210,000)

Synthetic Technology Corporation -- Bioactive Marine Isonitrile Compounds from Hawai'ian Sponges as Models for Synthetic Nontoxic Antifoulant and Antibiotic Agents; (FY95 - \$155,000); Bioactive Marine Isonitrile Compounds from Hawai'ian Sponges as Models for Synthetic Nontoxic Antifoulant and Antibiotic Agents Synthetic Analogs, Paint Formulations, and Mechanisms of Action; (FY96 - \$327,000 ; FY97 - \$300,000); *Subcontractor*: [Pacific Biomedical Research Center of the University of Hawai'i](#)

TerraSystems, Inc. (Acquired by Science & Technology International, Inc. in 2001) -- Development of an Underwater Video Camera for Optical Contrast and Range Enhancement Using Spectral Stretching; (FY96 - \$247,000); *Subcontractor*: [Sea Engineering, Inc.](#), Waimanalo, HI; Development of an Underwater Compositional Mapping (UCM) System; (FY98 - \$351,177); *Subcontractor*: [Sea Engineering, Inc.](#), Waimanalo, HI; Enhanced Sea and Land Rescue Visibility System; (FY99 - \$253,839); *Co-contractor*: **SeeRescue Corporation**, Honolulu, HI; vSAR: Video Search and Rescue; (FY01 - \$337,123); *Subcontractor 1*: **vSAR Corporation**, Honolulu, HI; *Subcontractor 2*: [ORINCON Corporation](#), Kailua, HI; Award for exploration of a surf zone reconnaissance system; (FY01 - \$35,000)

Thermal Energy Storage, Inc. -- Development and Testing of a Clathrate Desalination Research Facility; (FY96 - \$250,000); *Subcontractor*: **Makai Ocean Engineering**, Kailua, HI

Trex Enterprises -- Development of a Sensor for Pesticide Monitoring Based on Porous Silicon Optical Biosensor; (FY00 - \$537,000); Porous Silicon Biosensor; (FY01 - \$499,826)

FY 2005 NATURAL ENERGY OF HAWAII AUTHORITY ANNUAL REPORT

Varian Associates -- Laser Heterodyne Imaging for Shallow Water Surveillance; (FY95 - \$300,000; FY97 - \$396,000); *Subcontractor (FY95):* **Oceanit Laboratories**, Honolulu, HI

WeatherGuy.com - Feedback Planning: Fundamentally Improving Undersea Warfare Acoustic Mission Planning Through Event Reconstruction and Analysis for U. S. Navy Maritime Patrol and Reconnaissance Force; (FY03 - \$332,595); *Subcontractor (FY97):* **Detection Limit Technologies, Inc.**, Honolulu, HI; Feedback Planning: Fundamentally Improving Undersea Warfare Acoustic Mission Planning Through Event Reconstruction and Analysis for U. S. Navy Maritime Patrol and Reconnaissance Force; (FY04 - \$399,000)

NELHA FINANCIAL REVIEW

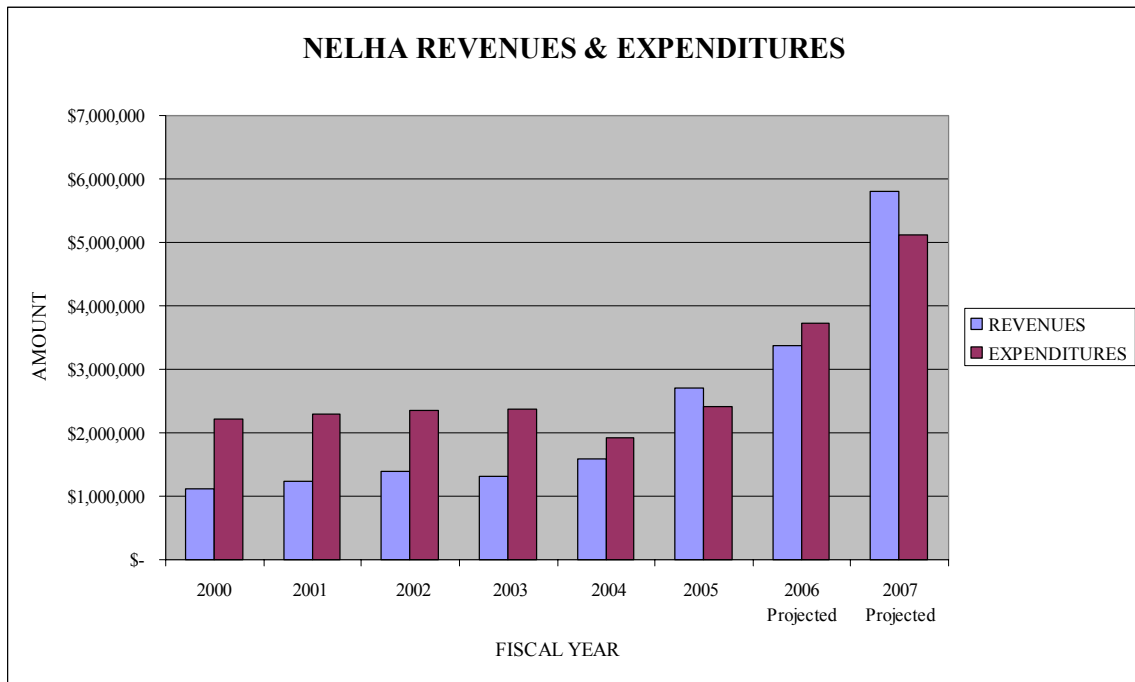


Figure 1.
NELHA Revenues vs. Expenditures, FY 2000 – FY 2007

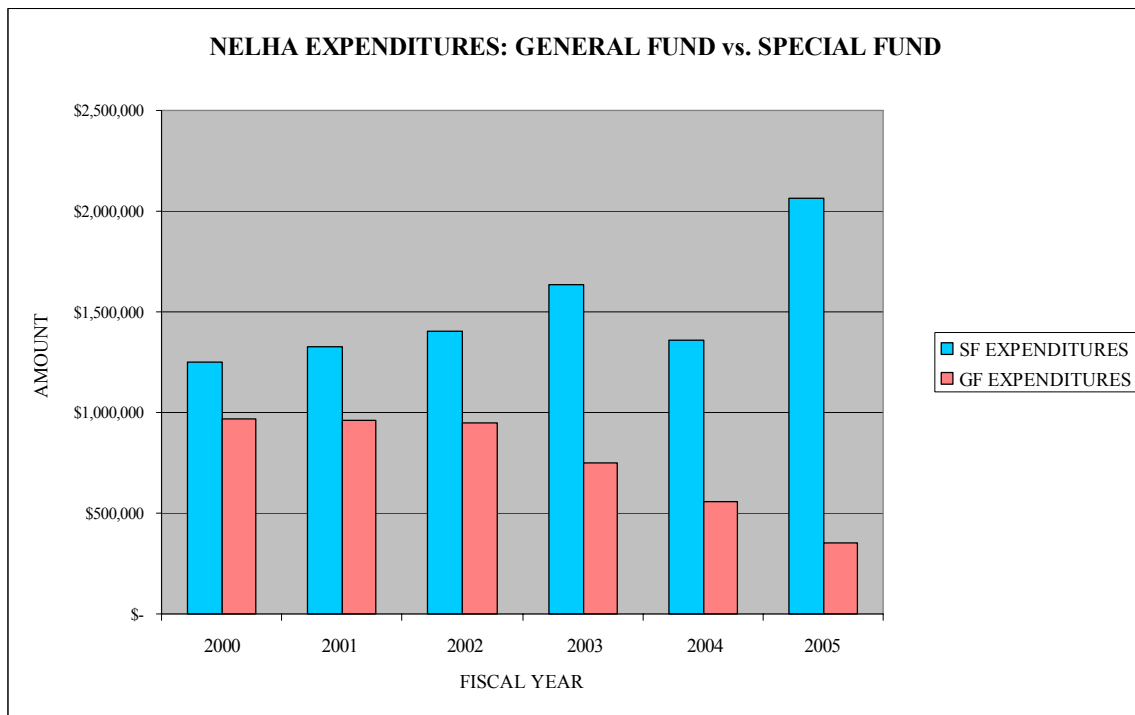


Figure 2.
NELHA Expenditures: General Fund vs. Special Fund, FY 2000 – FY 2005

FY 2005 NATURAL ENERGY OF HAWAI'I AUTHORITY ANNUAL REPORT

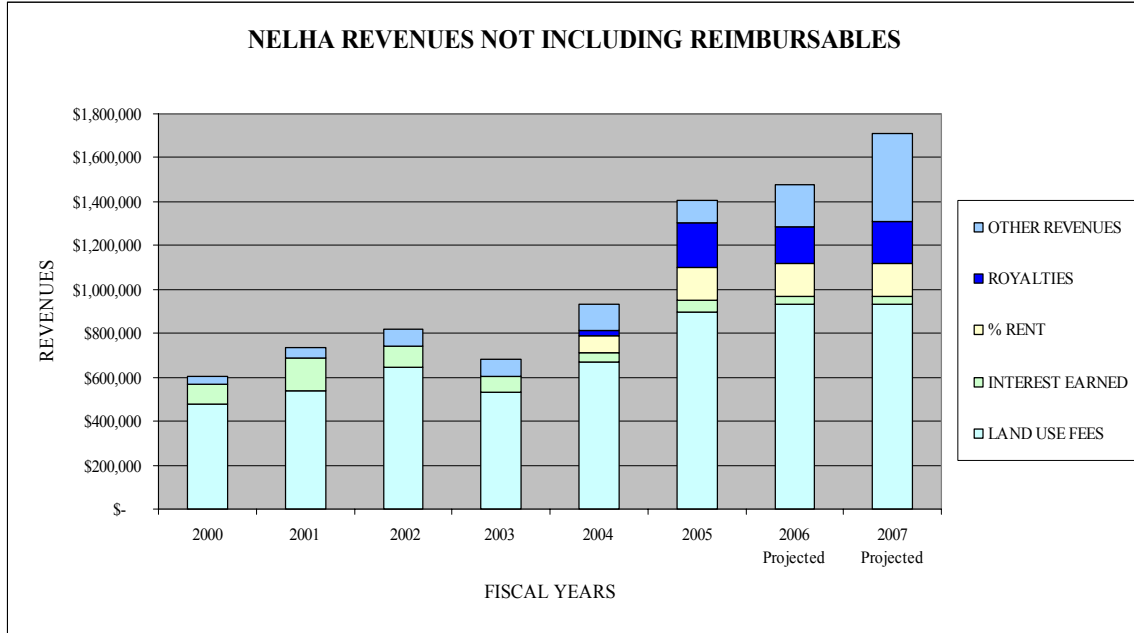


Figure 3.
NELHA Revenues Not Including Reimbursables, FY 2000 – FY 2007

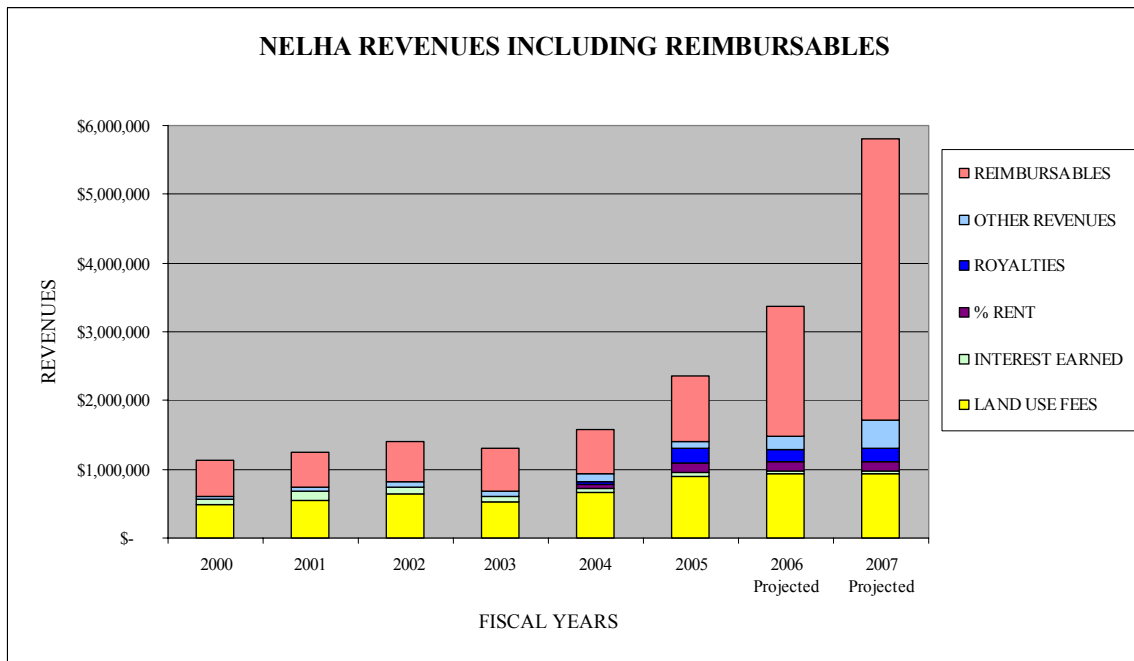


Figure 4.
NELHA Revenues Including Reimbursables, FY 2000 – FY 2007

STATEMENT OF OPERATIONS

(For the period July 1, 2004 to June 30, 2005)

REVENUES

General Funds	\$351,850.00
State Funds	\$351,850.00
Subtotal	<u>\$351,850.00</u>

Special Funds (Revenue)

Land Use Fees	\$896,985.62
Royalties	\$201,356.50
Reimburseables	\$1,060,911.54
Interest Received	\$53,631.87
Percentage Rents	<u>\$149,806.47</u>
Subtotal	\$2,362,692.00

TOTAL \$2,714,542.00

EXPENDITURES

General Funds	
Salaries	\$304,869.10
Kona Operations	\$45,634.77
Subtotal	<u>\$350,503.87</u>

Special Funds

Salaries	\$679,796.00
Operations	<u>\$1,382,222.42</u>
Subtotal	\$2,062,018.42

Total Expenditures \$2,412,522.29

FINANCIAL POSITION

Special Fund Cash Balance July 1, 2004	\$1,561,715.00
State General Fund Appropriations	\$351,850.00
Special Fund Revenues	<u>\$2,362,692.00</u>
	\$4,276,257.00

General Fund Expenditures	\$350,503.87
Unrequired G/F Returned to St Treasury/DBEDT	\$1,346.13
Special Fund Expenditures/journal entries	\$2,062,018.42

Transfer to State General Fund From Special Fund	\$0.00
Transfers to OHA-Ceded land	\$243,648.06
Prior year adjustment	\$0.00

Ending Special Fund Cash Balance 6/30/05 \$1,618,740.52

NELHA Board of Directors

Richard Henderson, Chairman of the Board

*The Realty Investment Company, Ltd.
At Large-Governor's Appointee; term expires June 30, 2008*

Tom Whittemore, Vice-Chair

*Parker Ranch Trustee
At-Large, Governor's Appointee from July 1998; second term expires June 30, 2006*

John Corbin

*Director, Aquaculture
Development Program
Department of Agriculture
Also Research Advisory Committee Secretary*

Donald Thomas, Ph. D.

*Center for the Study of
Active Volcanoes
University of Hawai'i at
Hilo
Also Research Advisory Committee Chairman*

Maurice Kaya

*Energy, Resources, and Technology Division
Department of Business, Economic Development & Tourism
Representing Ted Liu, Director, Department of Business, Economic Development & Tourism*

Harry Yada

*Land Division, Department of Land and Natural Resources
Representing Peter Young, Chairman, Board of Land and Natural Resources
Hawai'i Natural Energy Institute, University of Hawai'i
at Manoa*

Patricia Cooper

*School of Ocean & Earth Science & Technology
University of Hawai'i
Representing David McClain, President, University of
Hawai'i at Manoa*

James LaClair

*Vice President – Network Operations
High Technology Development Corporation (HTDC)*

Edward H. W. Young

*HTDV Project Manager
Hawai'i Strategic Development Corporation (HSDC)*

Carl L. Simons

At-Large Governor's appointee; term expires June 30, 2007

NELHA Staff

Ron Baird, *Chief Executive Officer*

Karen Appleby, *Fiscal Clerk*

Tom Kelly, *Operations Supervisor/Electrical Engineer*

Chad Debina, *General Laborer*

Richard Robinson, *Vehicle Construction Equipment Mechanic*

Monica Dunse, *Microbiologist III*

Georgette Espinueva, *Secretary III*

Tom Pierce, *Utility Electrician*

Karin Haleamau, *Groundskeeper II*

Gisela Hetherington, *Chemist III*

Anna Schulte, *Administrative Assistant*

Sheryll Kaniho, *Fiscal Officer*

Vacant, *Leasing & Tenant Relations Specialist*

Anthony Mitchell, *Maintenance Mechanic I*

Cilly Gibo, *Maintenance Mechanic I*

Jeff Nichols, *Engineering Projects Coordinator*

Eugene Pierce, *Electrician II*

Rosalind Newlon, *Chemist III*

Jan War, *Operations Manager II*

CEROS

Bill Friedl, *Acting Technical Director*

Lee Fausak, *Research Administrator*

Jacquie Brewbaker, *Program Manager for Outreach & Administration*

Corinne Giles, *Fiscal Assistant*

Donna Mau, *Contracts & Grants Administrator*



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