NATURAL ENERGY LABORATORY OF HAWAII AUTHORITY

An Authority of the State of Hawaii attached to the Department of Business, Economic Development & Tourism

BOARD OF DIRECTORS
MEETING MINUTES
Tuesday November 15, 2022
10:00 a.m.

An Interactive Conference Technology Meeting was held at

NELHA OceanView Conference Room
Hale Iako Building
73-970 Makako Bay Drive
Kailua-Kona, HI 96740

and via Zoom Video Conferencing Software.

Members/Designees in Attendance

Cyd Miyashiro (Gov. Appointee/Chair)
William Mielcke (Gov. Appointee/Vice Chair)
Noelani Kalipi (Gov. Appointee)
Scott Glenn (DBEDT)
Doug Adams (County of Hawaii)
Bernice Glenn (HTDC)
Alan Hilton (RAC Chair)
Neil Sims (Tenant Representative)
Dr. Phil Bossert (RAC Secretary)
Dick Jones (Tenant Representative)

Guests/Staff Present

Greg Barbour (NELHA)
Laurence Sombardier (NELHA)
Faustine Edge (NELHA)
John Cole (AG)
Stefan Sillen, Sea Dragon Energy, Inc.
Adrian Barefield, Sea Dragon Energy, Inc.
Joe Coury Sea Dragon Energy, Inc.
Alexia Akbay, Symbrosia
Avery Kramer, Symbrosia
Jen Johanssen, Cyanotech
Carston Krome, HATCH
Jeff Zimpfer, National Park Service
Monique Schafer, member of the public

Board Members Not Attending and Excused
Robert Masuda (DLNR)
Dr. Vassilis Syrmos (University of Hawaii)

- **Item 1. Call to Order.**

  The meeting was called to order by Chair Cyd Miyashiro at 10:02 a.m. Reference to Act 220.

  Chair Miyashiro asked Executive Director (ED) Barbour for a roll call of Board members and NELHA staff.

Director Scott Glenn joined at 10:04am

- **Item 2. Approval September 20, 2022, NELHA Board of Directors' Meeting Minutes.**

  Chair Miyashiro entertained a motion to approve the September 20, 2022, minutes. The motion was made by Director Mielcke and seconded by Director Hilton. There were no objections, and the minutes were approved as circulated (8-0).

- **Item 3. Approval October 18, 2022, NELHA Board of Directors' Meeting Minutes.**

  Chair Miyashiro entertained a motion to approve the October 18, 2022, minutes. The motion was made by Director Mielcke and seconded by Director Hilton. There were no objections, and the minutes were approved as circulated (8-0).

Director Phil Bossert joined at 10:09am

- **Item 4. Informational Presentation from HOST Park Clients.**

  Executive Director (ED) Barbour introduced Carsten Krome, co-founder of HATCH which runs the aquaculture accelerator at NELHA's HOST Park. ED Barbour shared recent data from Rabobank which showed that seafood is the most consumed animal protein in the world followed by poultry, pork, and beef.

Director Bernice Glenn joined the meeting at 10:23am

Mr. Krome explained that HATCH started working with NELHA in 2019 and completed two accelerator programs and an innovation studio under this partnership. The portfolio/program companies are comprised of Hawaiian, mainland and international companies. The 2020 program was remote due to COVID. Currently HATCH is open on site at NELHA.

HATCH is working on an incubator program which they plan to announce soon. This program offers entrepreneurs access to office space, expertise, and infrastructure. Additionally, entrepreneurs are connected to other entrepreneurs and investors all

without charge. HATCH believes NELHA is the perfect spot because of the micro ecosystem of aquaculture with its pristine water. In Mr. Krome's experience HOST Park provides a unique space for this kind of activity, and is second to none globally. HATCH plans to provide incubator services to Hawaiian innovators at first, followed by mainland innovators and international innovators .

Their second important project consists of raising investment/venture funds for early-stage investments in companies that will join the next accelerator program, similar to what was done with Symbrosia in 2019. Symbrosia is a a performing, growing company which is a natural fit to Hawaii. HATCH will provide companies with cash investment in exchange for equity in the company. HATCH will also work with the companies as part of the accelerator program for a period of three months, mostly on site at NELHA. Additionally, they will take business trips to Norway and Singapore where other HATCH's offices are located and where important markets for the products from the portfolio companies may exist. HATCH hopes that many of the portfolio companies will relocate to Hawaii or to NELHA (as in 2019) to contribute to the Hawaiian community. This accelerator program is expected to be announced soon.

ED Barbour asked the board if there were any questions. There were none and Director Mielcke and ED Barbour thanked Mr. Krome for HATCH's update.

- **Item 5. Old Business.**
  None.

Director Phil Bossert left at 10:49am

- **Item 6. New Business.**
  a. **Discussion and Decision-Making regarding Approval in Concept for a Seawater Extraction Demonstration Project by Sea Dragon Energy, Inc.***

Chair Miyashiro asked Deputy Director Laurence Sombardier to present. DD Sombardier presented that Sea Dragon Energy, Inc. (SDEI) is requesting an approval to utilize NELHA facilities for a five-year project to demonstrate technologies involved in producing fuels using seawater as the primary feedstock.

SDEI principals visited HOST Park in August 2022 and submitted a preliminary proposal on October 7, 2022, to seek NELHA Board approval for their project. SDEI https://www.seadragon.energy/) is a subsidiary of Global Air Logistics and Training Inc. (https://www.galt.aero/about) formed in 2020 to focus on novel energy solutions. In the past year, SDEI has completed a feasibility study for a 100 gallon per day R&D pilot facility based on Naval Research Laboratories (NRL) technology to extract CO2 and produce H2 from seawater. NRL currently operates a small prototype in Chesapeake Bay. The technology is patented and is being unclassified, publications from principal inventor, Heather Willauer from NRL and her colleagues are readily available online. SDEI aims to

commercialize the technology and the first step is to build out an R&D or demonstration unit needed to optimize the various technologies involved.

The project is complex and includes a combination of chemical processes which can be broadly categorized as CO2 extraction from the seawater, CO2 reduction, fuel synthesis and fuel upgrade to create aviation fuel. NELHA can play a critical role for the front end (i.e., the CO2 seawater extraction) component of the project. SDEI feels that the ideal situation would be for all components to be demonstrated at a single site but may choose to only demonstrate the sea water extraction part.

The project is a very good fit for NELHA given the project's need for significant amounts of pristine seawater and its focus on innovation and commercializing novel alternative energy solutions such as creating sustainable aviation fuel from seawater. The mid-Pacific location is also advantageous as one of the primary customers for the technology is expected to be the U.S. Navy.

SDEI is currently awaiting approval to proceed to the next step under an existing $3M contract with Office of Naval Research (ONR) to complete a conceptual engineering design for the R&D pilot. This contract followed a $450K ONR funded pre-feasibility study. They are at the stage of making a site selection. NELHA's HOST Park is a favored location by SDEI at the moment, but they are also looking at other alternatives in California and elsewhere.

The capital needed for construction and operation of a 100 gallon per day R&D pilot on the order of $64M. This number could fluctuate between $45M and $96M depending on the final design. It is also important to note that the project may be scaled back and only the front-end CO2 extraction from seawater component may be implemented at NELHA, in which case the project budget at NELHA will be significantly reduced. Funding for the construction and operation of the R&D pilot is expected to be through a FY 23 federal defense appropriation around December 2022.

There are a few areas that will need to be addressed before a final approval can be considered:

1) Location in HOST Park. SDEI is very interested in locating at the Destiny facility.
The NELHA Board provided a final approval for NELHA to purchase the Destiny building on October 18, 2022, and we are in the final stages of escrow for purchase. The Destiny facility is meant to serve as an expansion of the research campus which has only minimal space left for new projects. SDEI has provided a layout of that facility showing footprints of the components of their full project. If SDEI obtains full funding, they would be interested in using the entire facility for security and safety reasons. They are however willing to consider partial use, especially if their needs for space are reduced. NELHA will also need to evaluate its incubator space needs. SDEI is willing to consider other areas in the park, although none appear to be as ideal as the Destiny site.

2) Environmental impact and emissions permitting. SDEI is well aware of possible environmental impact issues and the need to perform an assessment and obtain permits for emissions. NELHA staff will work with SDEI to establish the extent to which the existing master permitting covers the project and what additional assessments are needed. The Board cannot provide a final approval until environmental impacts are addressed.

3) Seawater capacity. NELHA staff will need to work closely with SDEI to determine the extent to which NELHA can fulfill the infrastructure capacity needs of the project. Final design parameters will need to be provided by SDEI. Current estimates for peak sea water are 3,000 gpm and this peak use will be occasional for testing purposes. This kind of usage will create high demand charges for NELHA's seawater system. These charges will need to be covered by the project. In addition, NELHA will need to carefully consider other existing and new projects mauka of the 55" station to confirm NELHA's ability to deliver the required seawater. Some investment may be needed to accommodate the increased seawater demands by all the expected new clients and projects.

4) Seawater disposal. The Destiny facility has existing disposal systems however, the exact drainage capacity of the on-site dry wells is not known at this time and cannot be determined until seawater delivery capacity is upgraded.

5) Electrical Supply. The project has significant electrical requirements (1 to 5MW peak power depending on the final design). The electrical usage will also be episodic and will depend on testing schedules. SDEI may design genset backup power generation to assist with delivering sufficient electricity when needed.

6) Freshwater Usage. The project uses freshwater (estimated to be 756 kgal/month). SDEI understands the freshwater limitations in West Hawaii and will be considering recycling a well as alternative water sources (such as desalination).

It is difficult to address some of the above issues without knowing the final configuration and scope of the project. SDEI is prepared to work closely with NELHA staff to address the issues. Their funding will be expected to cover any incremental expense necessary to deliver the required utilities for the project beyond any installed and existing utility capacities.

At this time, no major deviations are expected from the NELHA boiler plate lease agreement. The project fees will use the established published and Board approved fees.

Provided that the above issues can be satisfactorily addressed, NELHA staff is supportive of this project. Staff recommends that the NELHA Board provide an approval in concept for the SDEI project, and direct NELHA staff to continue working with SDEI to address any areas of

current and future concern as necessary. If an EA is required, SDEI should request final approval only after that EA is completed.

DD Sombardier introduced the three members attending on behalf of SDEI: Joe Coury, Chief Science Officer, Adrian Barefield, Program Director and Stefan Sillen, President & COO. DD Sombardier asked Mr. Coury if he wanted to add any information to the presentation thus far.

Mr. Coury explained there are number of efforts around the world taking electrical power and generating chemical potential energy, specifically in the form of sustainable aviation hydrocarbon fuels. This project aims to understand if this new CO2 extraction technology is capable of delivering the carbon that's necessary to generate synthetic aviation fuel. SDEI is working closely with the Office of Naval Research and Ms. Willauer from NRL. All these power fuel processes require a number of critical technology elements: hydrogen generation, CO2 extraction, reduction of CO2 and CO, taking synthesized gas CO and H2 and converting to hydrocarbons and then upgrading those hydrocarbons to aviation fuel. SDEI is proposing they place these processes at sea, a much more difficult proposition that placing on land. SDEI plans to integrate a small scale version of each of the critical technology elements on the ground, possibly at HOST Park, as an initial step.

The approximate $60 million budget figure that DD Sombardier mentioned is an informative estimate for the Navy to decide whether or not to move forward with the project. Mr. Coury feels HOST Park is an ideal site for the project because the pristine seawater will not need to be filtered. NELHA would also provide the seawater and possibly identify a place to discharge. This would save the Navy a huge amount of capital. At this point, SDEI's main goal is to be able to rule in or rule out HOST park and is asking for pre-approval as a possible candidate site.

DD Sombardier then turned over to Director Hilton for the Research Advisory Committee (RAC) review and recommendation. Director Hilton explained NELHA staff have reviewed a proposal received from Sea Dragon Energy, Incorporated (SDEI), an R&D company and subsidiary of Global Air Logistics and Training (GALT), Inc., currently positioned to leverage prior experience and successes in government-funded research aimed at extracting and reprocessing CO2 from seawater to generate liquid fuel substitutes for fossil-derived fuels, in particular for use in the aviation sector. The overall process is chemically complex and somewhat akin to what takes place at a conventional fuel refinery. The component involving efficient extraction of CO2 from seawater is the highest priority of the preliminary proposal received from SDEI, which resulted from a site visit to NELHA by company principals in August 2022, but the potential to include other elements of the overall process at a single site is also of interest, and would correlate to the overall project funding. The advantages cited for such a project taking place at NELHA are the access to pristine seawater and the concentration of U.S. military operations in the state (which represents a potential customer base of significant interest for this project). As a stepwise activity that is part of a larger research and commercialization effort, the phase of the project anticipated for NELHA as proposed would take place over the course of five years. Preference has been expressed for exclusive use of

the former Destiny Deep Seawater site (building and related improvements recently purchased by NELHA for multi-use purposes), although other sites at NELHA might also be deemed suitable depending on the overall scope of the final project. Summary of RAC member inputs: A RAC review of the SDEI preliminary proposal and NELHA staff recommendation was requested by the NELHA ED. Six current RAC members responded to this request for review, with their inputs summarized below. The NELHA staff recommendation for approval-in-concept of the preliminary proposal at this stage is consistently supported by all RAC reviewers, in particular, with the caveats identified by NELHA staff that will need to be addressed in a final proposal before project work could proceed. The six such areas identified (site location, potential emissions/environmental impact, seawater capacity and disposal, electrical requirements, and freshwater usage) are all important areas that will need further assessment before an approved lease agreement can be considered. RAC reviewers found that the company appears well positioned for organizational and financial support through its connections to existing grants from the U.S. defense sector (Office of Naval Research – ONR) and a source of overall project funding expected under the pending federal defense appropriation for FY2023. The principals in the project team, including the inventor of the enabling technology, have sufficient experience and successful track records in the relevant fields involved, and the proposed technology is well aligned with the NELHA 'ocean energy' mission and appropriate use categories. Also worth noting is Hawaii's geographic isolation, far from the production and distribution infrastructure for the global conventional fuels industry, which may not be commonly perceived as a vulnerability among the local civilian population in our islands, but is certainly not lost on the minds of military planners and logisticians who already see (in the form of DoD investments to date) the value in potential alternatives that are not only "clean" but can be produced from an effectively inexhaustible local resource. Additional positive comments from RAC members noted the following:

- This is an interesting and innovative proposal and could be one of many that we see for development of liquid fuels using novel technologies. The proponents are clearly in the business of developing new technologies and potentially have substantial financial backing to support the high-risk period of development, refinement, and demonstration of their proposed technology. The proposal makes appropriate utilization of NELHA's technology and is consistent with NELHA's mission to facilitate R&D of new energy technologies.
- At first glance, Director Hilton was concerned as this seems a rather tall order and one unlikely to reach a reasonable degree of commercial potential. The physics is daunting and the power requirements seemingly overwhelming. As I considered further, I noted that Sea Dragon sees only one potential customer: the US Navy. Further, they want to make the system adapted to shipboard use. Clearly, the goal here is to eventually put this system on military vessels at sea and make aviation fuel from seawater and be a very useful addition to the fleets capabilities . From this perspective, the proposal makes great sense. The use of NELHA is justified for the pristine seawater. As this is a national defense project, it is clearly in the public interest, with funding is secured from the Defense department … Director Hilton supports the decision to grant 'Approval in Concept'.

- Director Hilton stated that the Sea Dragon Energy project is very exciting and interesting; having an ONR-funded project on site is probably a plus, and this is a very different "energy from the sea" type project than NELHA has hosted in the past.

RAC members also provided some additional comments on concerns and open questions that align with those raised by NELHA staff. These should be addressed if this project moves forward in the form of a final proposal with these items being considered as needed. These comments include the following:

- As in any new technology development endeavor, there are a large number of questions that could be raised regarding the details of the process and the potential impacts, but not able to identify any that would, at this early stage of the proposal, preclude approval in concept. The questions that may need to be considered or addressed as a proposal is developed for final Board approval might include:
- Although they do mention the generation of potentially beneficial non-product (and excess product) streams that could be utilized by other tenants, they don't provide enough detail on their process chemistry to determine whether oxygen could be another possible side stream of interest to the tenants or other business interests in Kona.
- Final location and possible proximity to areas of public use, or use by large numbers of occupants (e.g., school), where sensitivities to hypothetical threats posed by the process chemistry or product generated would be amplified should be considered.
- Disposal of their effluent stream: in the proposal it is noted that the effluent stream would be a mixture of fresh (alkaline) and saline (acidic) water with a net neutral pH and a density somewhat less than the original seawater. This lower density stream, if discharged into a shallow sump, may not allow the water to fully pass through the shallow basal freshwater system into the underlying saline waters before passing below the shoreline and could, potentially, result in elevated nutrient discharge in the near shore waters.
- In summary, approval in concept is appropriate but careful collaboration with NELHA staff will be required in the development of a final proposal to avoid both real world engineering issues as well as public perception issues.
- There are certain unknowns as the Defense department might cancel the project at any point, they feel it is not a good option. For this reason, NELHA needs to look at contingencies very carefully and monitor progress for potential unexpected shutdowns. That said, this is a good project and is clearly within the NELHA mandate and should be supported.
- Appears to need a lot of resources – not only the seawater but also lab and production space that would pretty much use up all of the Destiny site that NELHA has just acquired. I suppose it is great to have the new space sold out from day one from a financial standpoint; but it will constrain NELHA's ability to entertain multiple smaller new start-ups for which the Destiny site was envisioned.
- The elephant in the room is if NELHA can provide all the water eventually needed for them. I hope plans are in place to provide it. Pumping uphill is expensive and a significant cost.

RAC reviewers support the NELHA staff recommendations for approval-in-concept at this stage, with the expectation that staff will continue working with the SDEI team to address the areas of current concern along with any that come up in the future. RAC reviewers further support the staff position that if an Environmental Assessment (EA) is required, final approval should only be considered after that EA is completed.

Chair Miyashiro thanked Director Hilton and the RAC for their time and review of the proposal then opened the floor for questions.

Director Scott Glenn spoke in strong favor of this motion and is very encouraged that the proposal has come forward. As the Chief Energy Officer, Director Glenn is concerned that Hawaii is extremely vulnerable to global supply chain issues. His office is looking at potential new technologies including power to fuels also called "electro fuels" as an alternative to bio-based sustainable aviation fuel to reduce our fossil jet fuel dependence. One approach with respect to jet fuel is to de-fossilize while on our way to decarbonizing. This is exactly what Sea Dragon is proposing. Director Glenn continued to explain that the two major pillars of the State of Hawaii's economy (tourism and military) depend on jet fuel. The jet fuel in Hawaii came primarily from Russia until the embargo, and now mainly comes from Argentina and to some degree Libya.

Director Glenn acknowledges and understands that there are some local impact concerns that need to be examined, but from an energy security point of view there is value to any project that may help create the conditions for Hawaii to generate its own jet fuel. Similarly if the military can generate their own jet fuel for the Indo-Pacific Command, Hawaii's security is further enhanced. Director Glenn urges the board to vote in favor of this project. Director Glenn closed noting that Red Hill on Oahu is primarily a jet fuel storage location (and to some degree JP-5). We will have more control over our energy future as an island archipelago, if we can address new fossil fuel replacements and renewable jet fuel solutions.

Mr. Coury responded that remote island states and nations will be interested in their demonstration. SDEI is interested in working with the State of Hawaii as they see many synergies between their technology and other electro-fuel technologies. SDEI is also working closely with Newport shipping to ensure their technology works in real world scenarios.

Director Addams thanked the RAC for their efforts and helpful work. He noted the Toxic Substance Control Act (TSCA) might apply for this project and compliance may take time. Mr. Coury assured Director Addams that SDEI has experience with TSCA and other federal environmental regulations from previous work in Texas, West Virginia, Idaho, and Oklahoma. While he realizes each state has its own additional requirements, he continued to explain that the 30 years' experience in putting new chemical processes on the ground will be helpful. SDEI will also work closely with NELHA and its Hawaii contacts and consultants to help SDEI understand the local permitting processes.

Ms. Johansen asked why SDEI is not using existing sources of refinery generated CO2. Director Glenn responded that the State won't have fossil CO2 available after 2045. We need to start sourcing CO2 from air and ideally the ocean to meet our industrial, economic and energy CO2 needs. Mr. Coury added they are open to other CO2 sources such as methane from landfill, CO2 from breweries and CO2 fuel gasses.

Chair Miyashiro opened the floor to comments and questions.

Director Kalipi thanked the RAC and expressed her full support of Hawaii becoming a player in this type of technology. She also fully understands the military support and national security aspect. At the same time, she understands this is a demo project on land for application at sea. It is fundamentally important that the freshwater issues, particularly how they relate to this part of the island, as well as discharge issues are addressed very carefully even though these may not be issues on a widespread application out on the ocean. The right sensitivity needs to be given to the environmental and cultural issue. This might be a good opportunity to work with cultural practitioners who understand the aquifer, water table, and ocean.

Mr. Coury acknowledged and understands the sensitivity of freshwater issues in Hawaii. SDEI has been looking at reducing the freshwater requirements of the processes. The results strongly suggest they can recycle 80-90% of water, purging just enough of highly alkaline water to neutralize the pH of seawater. The freshwater needs are critical and could potentially be the dealbreaker for the project.

Director Sims commended SDEI on this exciting technology. His concern is about the best and highest use of NELHA's assets, and the Board's commitment of the purchase of the Destiny building with a vision of it being an incubator facility of other small companies that will come to NELHA. Currently, the existing research compound is full as the NELHA team has done a wonderful job of promoting NELHA. New prospective clients are being turned away because we just don't have the space. Director Sims asked ED Barbour if a project of this size is the best and highest strategic use of the new building. Does SDEI require a facility that is ready to go or will they consider the open lava-real estate.

ED Barbour answered he and DD Sombardier are also concerned about leasing the entire site that has just been purchased, and they have been speaking with SDEI about it. DD Sombardier answered that SDEI's two major concerns are safety and security for their project. Currently, the facility is larger that SDEI's initial conceptual need, but their project is evolving, and they are refining the projected space needs. SDEI understands we prefer a partial use so we can grow other businesses in the park. Mr. Coury responded the new building easily checked all their boxes. But it isn't a dealbreaker if they don't have that space.

Chair Miyashiro asked if there were other questions or comments from the board or public. There were none. Director Hilton moved to approve in concept a seawater extraction demonstration project by Sea Dragon Energy. Director Scott Glenn seconded. There were no

objections. ED Barbour mentioned Director Bossert left and did not vote. AG Cole confirmed that because there weren't any opposing votes, a role call was not required. The motion was approved (9-0).

Item 6b. Discussion and Decision-Making regarding Approval in Concept for a 10-to-15-acre Commercial Macroalgae Production Facility by Symbrosia Inc.*

Chair Miyashiro turned over to DD Sombardier to present.

Symbrosia Inc. is seeking approval in concept for a commercial macroalgae production facility on a 10-to-15-acre site.

Symbrosia Inc. (https://symbrosia.co/), a startup established in 2018, was one of the twelve companies selected by HATCH for their first cohort in fall 2019. They completed that program and stayed on after the program ended in NELHA's research campus to continue to utilize HATCH facilities where they utilized some laboratory space and approximately 1,500 square feet of outdoor space to grow macroalgae using HATCH facilities.

In early 2020, Symbrosia explored the possibilities of expanding their project initially at the HDMI building (since sold to Blue Ocean Mariculture) and then onto the 6-acre site leased and graded by "Savers" for approximately 10 years beginning around 2005. The Board had reviewed and approved but due to the uncertainties brought upon by the COVID pandemic, neither lease was executed. This site was recently leased to Blue Ocean Barns. As an alternative, in 2021, Symbrosia moved to the Sea Salts of Hawaii facility to utilize existing algae grow out infrastructure under a services agreement to continue their R&D work and proceed with fundraising activities. In 2022, they completed their Series A funding round, and raised $9M. As such, they are moving forward with expansion efforts. Symbrosia aims to cultivate a local species of red macroalgae (*Asparagopsis taxiformis,* locally known as limu kohu) at scale to produce a livestock feed additive which has health benefits for the animals as well as potentially reduces up to 80% of the methane emissions when used as a feed supplement at 0.5% inclusion rates. Symbrosia has cultivated and demonstrated the benefits of their product at small scale and believe they are ready to scale production.

Symbrosia is working with a local species which has previously been and is currently cultivated at NELHA. Therefore, compliance with Hawaii Department of Agriculture requirements is straightforward.

In past presentations to the Board, our biggest concern was Symbrosia's ability to raise sufficient capital. But they have since well exceeded their initial goal of $4M. The Symbrosia team has grown to 18 employees and now includes Avery Kramer as Chief Operations Officer. Mr. Kramer has significant experience in building algae growth systems at NELHA (Aquasearch and Cellana).

Symbrosia initially plans to build a basic grow out module which fits on approximately 7 acres (700' x 430'). If successful, they plan to rapidly double that to 2 modules, thus the need for approximately 15 acres. Their favored site selection is currently on the south and mauka area above the Kings trail and adjacent to Makako Bay Drive. This area is part of a 41-acre area providing the company room to grow assuming no other projects move in first.

There are a handful of companies seeking to commercialize *Asparagopsis taxiformis*. One of Symbrosia's main competitors is Blue Ocean Barns, Inc., an Elemental Excellerator portfolio company, also located at NELHA and in the process of expanding. The Symbrosia project is expected to employ 30 individuals by end of 2023. The company has already engaged deeply with communities in Hawaii including startup communities, local cattle farmers to revitalize the industry, and native Hawaiian marine initiatives for limu restoration. They have provided over 10 internships to local Hawaii high schools, colleges and universities. Symbrosia is receiving modest amounts of funding from Kamehameha Schools and Mana Up.

A full business plan and more details are required before final approval can be provided by the Board for a long-term sublease. In particular, the following areas will need to be addressed:
1) Financial projections. None were provided in the preliminary proposal. In the past year, Symbrosia has become revenue positive and is expected to receive recurring revenues as they prepare for expansion. But projections for the expansion will be needed.
2) Implementation schedule and Budget. An aggressive schedule was provided for the first module. More details regarding the development of the entire parcel would be appropriate. More details will also be needed on the project budget to evaluate how realistic it is.
3) Building and processing details. The business plan will need to provide more details on intended construction, building types, algae growth systems, algae processing structures and waste streams. A more thorough description of the process will be expected.
4) Utility needs. NELHA staff will need to work closely with Symbrosia to determine the extent to which NELHA can fulfill the project seawater requirements. The proposal estimates over 800 gpm deep seawater will be needed after 5 years. This is not insignificant, especially if added to other new project needs in the area. Final utility requirements will need to be provided by Symbrosia. Some investment may be needed on NELHA's side to accommodate the increased seawater demands by all the expected new clients and projects.
5) Project emissions. During the review process for Blue Ocean Barns which works with the same algae, the RAC asked about the possibility of emissions of bioactive compounds from the algae during processing. Symbrosia will need to demonstrate awareness and willingness to address any issues associated with working with this particular seaweed species.
6) Exact project location and biosecurity. Low elevation land is now limited at HOST Park. In the past year, NELHA staff has explored various options for the Symbrosia project. Although at higher elevation, the location shown is the preferred location, but this may change. Biosecurity concerns with neighboring projects will be addressed once a final location is established. It is not expected that the current proposed location will provide any biosecurity concerns as most of the land adjoining this parcel on the south, east and west sides is vacant. The only adjoining property that is currently leased is the West Hawaii Explorations Academy school. This project

is very much in line with NELHA's mission and is exactly what was hoped for when establishing the aquaculture accelerator (HATCH) at NELHA to produce a pipeline of startups focusing on technologies with global impact and possible expansion into the HOST Park. This approval in concept allows Symbrosia to secure space at NELHA for commercial scale up as they work on sales commitments and agreements.

This project is very much in line with NELHA's mission and is exactly what was hoped for when establishing the aquaculture accelerator (HATCH) at NELHA to produce a pipeline of startups focusing on technologies with global impact and possible expansion into the HOST Park. This approval in concept allows Symbrosia to secure space at NELHA for commercial scale up as they work on sales commitments and agreements.

Staff recommends that the NELHA Board grant "approval in concept" to Symbrosia's request for a 10 to 15-acre commercial project and that NELHA staff continue to work with Symbrosia to develop a business plan for final approval at a later time.

DD Sombardier asked Alexia Akbay, Symbrosia CEO, for additional comments. Ms. Akbay explained Symbrosia came to HOST Park 3 years ago starting with HATCH. The last couple of years have been focused on the research and development needed to commercialize a native seaweed crop. The company has grown from three founding members to 18 employees. Most of their employees are on site at NELHA. Symbrosia has moved from the research park to leasing part of the Kona Sea Salts facilities. Noticing that most of the park was quickly being leased out and they have decided to move forward with expansion of their facilities along with obtaining the finances for the expansion. They pride themselves in being a local minded company. They work locally with Parker Ranch on their livestock feed additive and also with national companies such as Organic Valley. Ms. Akbay believes there is an opportunity to support the local livestock industry as well as exporting this premium product.

DD Sombardier asked if there were any questions. Hearing none, she asked Director Hilton to present RAC's review of the project.

Director Hilton explained that the RAC has reviewed a proposal received from Symbrosia Inc., a startup company which became established at the NELHA Research Campus in association with their selection in the HATCH Accelerator's first cohort in 2019. The company pursued subsequent continuation of their R&D for commercially viable cultivation of red macroalgae (Asparagopsis taxiformis, locally known as limu kohu), initially at the Research Campus and subsequently through a services agreement with other NELHA tenant, Sea Salts of Hawaii, while simultaneously pursuing additional investor funding from multiple sources to commercialize, with good results to date on both fronts. The current proposal is for a lease of 10-to-15 acres at NELHA with a goal to scale up and commercialize production of limu kohu at volumes and forms suitable for use as ruminant feedstock additives with significant methane-sequestering properties (as per prior research results -- demonstrating up to 80% reduction with as little as 0.5% additive to cattle feed) and other health benefits. Symbrosia would be

the second tenant at NELHA (after Blue Ocean Barns) pursuing this sector of rapidly increasing interest as a climate mitigation strategy that would apply to large scale cattle ranching and dairy operations worldwide. Also of note is Symbrosia's outreach efforts with local Hawaiian sheep, dairy, and cattle farmers such as Parker Ranch, Kuahiwi Ranch, Maui Cattle Co., and O'oma Dairy, for marketing opportunities that would reduce their emissions and create value-added products benefitting these sectors of the local economy.

Director Hilton continued with a summary of RAC member inputs:

- A RAC review of the Symbrosia proposal and staff recommendation was requested by the NELHA ED. Six current RAC members responded to this request for review, with their inputs summarized below. The NELHA staff recommendation for approval-in-concept of the Symbrosia project proposal is consistently supported by all RAC reviewers. Reviewers found that the proposal is well aligned with the NELHA mission and appropriate use categories, leveraging the success of an existing tenant along with an opportunity to promote advancement in the increasingly competitive market for new companies poised for success in the global aquaculture and mariculture products market in general, and the commercialization of production and products from limu kohu in particular. Additional positive comments from RAC members noted the following:
- Strong support ' Approval in Concept' for the expansion of the Symbrosia Operation. This company has done very well , now employs 18 people and has received 7 million dollars in start-up funding. This is a real vote of confidence from the commercial sector . Perhaps even more significant is that some of this funding is coming from Hawaiian sources , in particular Kamehameha Schools. This is an indication that the project is consistent with Hawaiian values. The company has partnered with Hawaiian beef producers and is using Hawaiian fishermen to restore limu grounds. The company has a very viable intern program to help develop the next generation of talent in the area. The staff and management of Symbrosia are very talented and have had a good track record since the company was founded in 2018. Use of NELHA facilities is well justified in terms of past successes at the site as well as the history of algal cultivation in Hawaii. The idea of better differentiating Hawaiian beef through this algal feed is clearly in the State interest -- I think Symbrosia clearly meets all the criteria for NELHA use and should be assisted in its path onward.
- Very much in favor of moving forward with the Symbrosia project since they have been with NELHA since their time at the HATCH incubator – They do seem to have the right team to make it happen and the money to move ahead – as well as some initial customers already on board. And they can pretty much start next month.
- This proposal is the second of its type at NELHA. The issue that they are endeavoring to address with their product is one that has received increasing attention both nationally and internationally (https://www.politico.com/news/2022/10/20/new-zealand-farmers-cow-burp-protest-00062675). It is quite possible that the proposed production of methane inhibiting natural products could become a significant industry in Hawaii (if it can be done in an economically competitive way). The proponents have demonstrated that they can produce the macroalgae – through their participation in the HATCH program on site and appear to have a capable team to proceed. They have raised significant seed-capital for

their grow-out and production facilities and have developed partnerships locally with potential buyers of their product. The proposal makes appropriate utilization of NELHA's technology and resources and is consistent with NELHA's mission to facilitate RD&D of new aquaculture products.

- Symbrosia has full support. Their proposal is well written and addresses all appropriate topics. I doubt that they will be profitable but breaking even will be a success. It will be interesting to see if they or Blue Ocean Barns will be the one to make it, hopefully both. While the Symbrosia proposal has overall RAC support for approval-in-concept to proceed, some comments on wider issues were raised during the review, and are similarly cited in the NELHA Staff Recommendation as well. The comments below from RAC members address these issues that should be given the necessary review in due course, as this project and others like it advance with NELHA in the near future.
- It does look like they will need a lot of resources – fresh and sea water, electricity – as they scale up to full production over the five years; so, the staff's caution about NELHA's ability to meet their demands in the future is the key concern.
- The company may face commercial competition from other companies trying to do similar work at the NELHA site and elsewhere. We do not see this as a problem. The market is big enough for several operators. Further, it is not NELHA's role as a site manager to guess future commercial success of a venture that is well thought out and has good justification for its projected path forward.
- There are no significant environmental impacts that are fundamentally different from other tenants at NELHA although, as noted in the write-up, the production of bioactive compounds during processing of the product needs to be considered for mitigation if significant impacts arise.
- Given the high demand on the deep seawater resources that NELHA has available, the only question that might be posed during development of a final proposal is whether co-production of another product that is compatible with limu kohu could improve the economics of the overall effort.
- The only number from the proposal is $16 per pound for Organic Valley and that seems low.
- The elephant in the room is if NELHA can provide all the water eventually needed for them. Plans should be in place to provide it. Pumping uphill is expensive and a significant cost.

RAC reviewers support approval-in-concept of the Symbrosia proposal for the 10-to-15 acre parcels in the location noted, and recommend the continued due diligence by NELHA staff in addressing the resource questions and wider issues noted above as the project advances.

Chair Miyashiro opened the floor to questions.

Director Adams thanked the RAC and chair. His question was on the metrics he has seen that 80% of methane is inhibited with use of this product. How is that number determined, and what is the method to measure? Ms. Akbay explained there are a few ways to measure methane coming from livestock. They use a methane mini laser which was developed by the oil and gas sector to detect methane leaks. The laser instrument measures the amount of

methane coming out of the animal before and after using feed additive, and is a measurement approved by carbon verifiers. They just completed a study with UH Hilo using that device and did a compatibility test for Hawaii-based cattle. Director Addams mentioned from a county perspective they are looking at their climate mitigation adaptation planning to see where our gashouse green emissions are being produced. Ms. Akbay commented she would be interested in any details about the carbon credit plan which is in development at the State level.

Chair Miyashiro asked if there were other questions. Director Hilton asked if two parcels that have been leased are graded or bare. DD Sombardier answered the lava is raw and has not been leased before.

Chair asked for other questions. Hearing none, Director Addams moved for approval in concept for a 10-to-15-acre Commercial Macroalgae Production Facility by Symbrosia. Director Kalipi seconded. Hearing no objections, the motion was approved as presented (9-0).

- **Item 7. Financial Report: Approval and Decision Making.**

  Chair Miyashiro asked ED Barbour to present this agenda item. ED Barbour presented an overview of the first three months of the year, 1st quarter 2022., July through September.

  Revenue

  - Total revenue is up 25%, $250,000.
  - Overall, seawater demand continues to decline. Seawater demand went down by 7%. The sea water revenue increase is due to cost of electricity and the surcharge we charge to make the seawater system break even.
  - Overall lease rent is up by $100K. HOST Park outside the research campus is up two-thirds of that and inside the research campus we are at 100% capacity right now (with only tiny parcels and a small office which opened up).
  - Percent rent increase is due to Kona Cold Lobster paying their arrears before they sold their property to Blue Ocean Mariculture.
  - Labor services down a little bit by $10,000.
  - Electric reimbursements are up due to electrical costs.

  ED Barbour asked if there were any questions on revenue. Hearing none he continued with expenditures.

  Expenditures

  - Total expenses are up slightly about 10%, $100,000. Of note are the following:
  - Seawater costs increased by $250,000 because we are putting more resources into repair and maintenance costs that we put off for a while. With the additional funds this year, we bought parts needed and are installing those parts

now. Also, we had a contract with a company to install some holddowns on the new shore pipelines (another project we've been putting off for a while). They are supposed to have those installed in about 30 days at a cost of $60,000.
- We paid a $100,000 insurance premium earlier than is typical this year. This is not an increase, simply an earlier payment.
- The water well expenditure we had last year is not in the expenditures this year.

ED Barbour asked if there were any questions. Hearing none, he continued to Special Funds and Arrears.

Special Fund and Arrears

- As of September 30, there was about $80,000 in arrears. It increased slightly by $35,000 over first three months. If we collected all arrears our special fund balance would be approximately $800,000.
- This morning ED Barbour received a new report and arrears have decreased to $40,000. ED Barbour thanked Ocean Era for bringing their arrears way down. There are no real issues with arrears, and we are in good shape financially.
- ED Barbour asked if there were any questions. Hearing none Chair Miyashiro asked for a motion to approve the financial report.

Director Mielcke motioned to approve the financial report. Director Hilton seconded. Motion carried as presented (9-0).

- **Item 8. Executive Director's Informational Status Report on ongoing projects including: new leases; seawater system maintenance; offshore deep seawater pipe removal planning and design; regional seawater air conditioning planning and design; new potable water supply update; aquaculture accelerator and investment fund initiative; design of expansion of research campus and visitor center; renewable distributed energy resources initiative for microgrid; and, solar desalination.***

Chair Miyashiro asked ED Barbour to present this agenda item.

ED Barbour provided data on electricity costs through end of October. Looks like costs are declining back to April rates (41¢) with a peak of almost 50¢ in June 2022.

ED Barbour stated that over the past several years, specifically during the pandemic and times of economic uncertainty, we have seen that the sectors we target are resilient and can stand up to economic weaknesses. Over the last two years, virtually all of the accessible sites at

HOST park are leased, under construction, or have been approved in concept. The last available site was approved in concept to Symbrosia today. More sites are needed, and we are looking into the possibility of opening up other sites at the park.

Solar Project. This project adds PV and battery adjacent to the 55" pump station. Grading of the site has started, and we appear to be on track to have the 500kw System and 750 kWh battery completed in the next six months. Director Glenn offered any assistance if any shipping and supply chain issues that might arise. ED Barbour thanked him and let him know equipment is from LG who are partners in the project. He believes panels are on the water already.

Offshore Project. These are the deep seawater pipelines abandoned 25 years go. Work is in progress; the ship has been out over the past four days. Dr. Leonard is onboard. Three of the six surveys have been completed.

Seawater Rate Analysis. This project will begin within the next month or so.

Desalination Project. This project has been completed, and they are writing the final report. It was a success as desalinated water was produced as proposed to DOE. Barbour believes the Department of Energy was happy with the results that were received. Trevi Systems' next step other that seeking more funding is unclear at the moment.

Regional SWAC. The planning design is just finishing up, and we expect to report on it later this fiscal year.

HATCH. Going well on both the contract for accelerator work and raising future venture funds. There are three funds: 1) an $8.4 million fund from 2019. The State of Hawaii provided about $2 million of those funds, 2) a new $10 million Hawaii Only Fund which includes local investors such as Kamehameha Schools and others. HATCH is requesting from HTDC a match to the $5 million they have. They plan to initially secure $10 million for this fund and hope to go to $15 million, and 3) a Blue Revolution Fund which has a $40 million first round, heading to $75 million. The Nature Conservancy and other ocean conservation type groups are participating. HATCH's work is very exciting.

New Research Campus Extension. We are expecting to get 90% of the design completed in the next two months. We hope to reach out to possible private sector partners for this project through an RFP. We would discuss any plans with the board prior to issuing the RFP.

New Building Purchase. We paid the 10% down last week and received funding advance from FEMA which is in our checking account. We signed the purchase order for final payment of

$4.275 million yesterday and plan to deliver the check to Title Guaranty tomorrow. We're hoping to close by the end of the week. We heard today about Sea Dragon's interest in leasing this facility, and there is another company interested in half of the building. Royal Hawaiian Movers is currently leasing space outside for storage of containers and trucks, and they would like to continue leasing.

Potable Water Well. Since this is a legal concern (we have a contested case hearing with DLNR) and this cannot be commented on publicly.

EIS. CIP funds have been allotted by Governor Ige and the next step is to work on procurement.

Customer Satisfaction Survey. This should be released very soon.

ED Barbour concluded his report. Chair Miyashiro commented NELHA and it is impressive and exciting, the projects and work at NELHA and HOST Park.

- **Item 8. Announcements.**

  Chair Miyashiro noted that our next meeting is scheduled for January 17, 2023, at 10:00am.

  Chair Miyashiro asked ED Barbour for new announcements. ED Barbour thanked Director Bill Mielcke for the seven years he served on NELHA's board, and stated that this meeting might be his last. Both ED Barbour and Chair Miyashiro expressed their appreciation for his service stating that NELHA, NELHA's staff, and the Board enjoyed working with him.

- **Item 9. Adjournment.**

  Chair Miyashiro adjourned the meeting at 11:37 a.m.

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