HAWAII STATE ENERGY OFFICE
STATE OF HAWAII

JOSH GREEN, M.D.
GOVERNOR

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LT. GOVERNOR

MARK B. GLICK
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Testimony of
MARK B. GLICK, Chief Energy Officer

before the
HOUSE COMMITTEE ON FINANCE

Tuesday, April 2, 2024
4:00 PM
State Capitol, Conference Room 308 and Videoconference

Providing Comments on
SB 2518, SD2, HD1

RELATING TO GEOTHERMAL ENERGY EXPLORATION.

Chair Yamashita, Vice Chair Kitagawa, and members of the Committee, the Hawai'i State Energy Office (HSEO) offers comments supporting the intent of SB 2518, SD2, HD1, which provides resources for the Hawai'i State Energy Office to conduct and administer a statewide environmental assessment for a geothermal resource characterization program under the direction of the Hawai'i Groundwater and Geothermal Resources Center of the University of Hawai'i.

HSEO affirms the noble purpose of this measure as an essential first step to inform the location and value of potential water, geothermal, and geological resources. However, HSEO respectfully suggests removing 'environment' to all references of 'environmental assessment' to avoid confusion with Hawai'i's environmental review process.

Because geothermal exploration and identification requires a significant investment by developers of upfront capital, it is appropriate for the State to provide underlying research to confirm the viability of geothermal, an important dispatchable renewable energy resource. The measure appropriately identifies University of Hawai'i's Groundwater and Geothermal Resources Center as the appropriate research organization to work with HSEO to stimulate the private sector investment for

geothermal electricity power generation. Such exploratory activities can also indicate the existence of geothermal for other uses such as direct use of steam from the ground. Data and knowledge gained from exploration can also provide information about resources such as groundwater and about soil composition for potential locations for carbon sequestration.

In 2023, HESO analyzed market gaps in firm renewable resources and long duration storage, especially geothermal and pumped hydro, and developed policies and pursued funding opportunities to fill those gaps. Geothermal energy is heat that was generated during the planet's formation and stored in rock and fluids and brought as steam to the earth's surface using deep wells. The steam drives turbines to generate electricity. Geothermal was identified as both a near-term and mid-term decarbonization opportunity in the *Hawai‘i Pathways to Decarbonization Report*, submitted to the 2024 Hawai‘i Legislature.[1]

Accordingly, HSEO believes geothermal energy has the potential to play an extremely significant role in meeting Hawai‘i's energy objectives of reliability, affordability, and diversification. That is why geothermal resources are a key part of Hawai‘i's energy strategy as an indigenous source of dispatchable renewable energy for electricity production, with the potential for any excess to be used for the production of green hydrogen.

HSEO defers to the appropriate agencies for comment on the fiscal, administrative, and regulatory impacts of this bill.

Thank you for the opportunity to testify.

[1] Hawai‘i State Energy Office. *Hawai‘i Pathways to Decarbonization*. 2023. https://energy.hawaii.gov/wp-content/uploads/2022/10/Act-238_HSEO_Decarbonization_FinalReport_2023.pdf

Email: communications@ulupono.com

HOUSE COMMITTEE ON FINANCE
Tuesday, April 2, 2024 — 4:00 p.m.

Ulupono Initiative supports SB 2518 SD2 HD1, Relating to Geothermal Energy Exploration.

Dear Chair Yamashita and Members of the Committee:

My name is Micah Munekata, and I am the Director of Government Affairs at Ulupono Initiative. We are a Hawai‘i-focused impact investment firm that strives to improve the quality of life throughout the islands by helping our communities become more resilient and self-sufficient through locally produced food, renewable energy and clean transportation choices, and better management of freshwater resources.

Ulupono supports SB 2518 SD2 HD1, which requires and appropriates funds for the Hawai‘i State Energy Office to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program under the direction of the Hawai‘i Groundwater and Geothermal Resources Center at the University of Hawai‘i.

Hawai‘i needs all viable forms of renewable energy to meet the 100% renewable portfolio standard by 2045. New data underscores the widespread support among residents for this transition. Between October 2023 and January 2024, Ulupono Initiative partnered with Anthology Research to conduct a statewide public opinion survey on energy in Hawai‘i involving 1,985 surveys across all four counties. With a margin of error +/- 2.21%, this is arguably the most extensive and comprehensive study on the topic to date. The findings are compelling.

A staggering 91% of respondents expressed their support for the expansion of renewable energy resources throughout the islands. Moreover, the importance of developing Hawai‘i’s own energy resources was emphasized across all counties by the residents. This resounding endorsement from the community underscores support is strong for continued investment and advancement in renewable energy solutions to meet our collective energy goals.

Furthermore, the Hawai‘i State Energy Office in its recently published Hawai‘i Pathways to Decarbonization Report identifies, among other things, the significant need for additional

renewable energy generation to meet broader economy-wide decarbonization goals.[1] Wind and solar alone are not enough. Firm sources, such as geothermal, will also be necessary. Hawai‘i also faces many competing demands for available land, and geothermal projects use the least amount of land per megawatt of renewable power produced. As reported by Hawai‘i Public Radio in 2019, "[r]esearch recently presented by graduate student Ted Brennis with the Hawai‘i Groundwater and Geothermal Resources Center indicates that where resources are available, geothermal is competitive with wind and solar on both cost and land use."[2] In the case of land use, this is actually an understatement, as geothermal is not merely competitive but in fact uses much less land per megawatt.

Most residents seem to believe the Big Island is the only place in which geothermal energy can be commercially produced, and yet that assumption has never been thoroughly researched and confirmed. It's worth noting that Ulupono's 2024 survey showed that there is broad support for geothermal energy statewide, and more importantly more than 60% of respondents stated they would support the construction of a utility-scale geothermal power plant in their community if it meant a $30 per month savings per household.

Ulupono supports the work of the Hawai‘i Groundwater and Geothermal Resources Center, to further the discovery and development of geothermal resources. This bill will dedicate resources to the staffing and field work necessary for geothermal research into its potential.

Thank you for the opportunity to testify.

Respectfully,

Micah Munekata
Director of Government Affairs

[1] Hawai‘i Pathways to Decarbonization Act 238, Session Laws of Hawai‘i 2022, Report to the 2024 Hawai‘i State Legislature December 2023. https://energy.hawaii.gov/wp-content/uploads/2024/01/Act-238_HSEO_Decarbonization_Report.pdf

[2] https://www.hawaiipublicradio.org/local-news/2019-07-25/unexplored-geothermal-potential-may-offer-solution-to-renewables-reliability-problem. Report cited can be found at https://www.higp.hawaii.edu/hggrc/wp-content/uploads/2019/07/Brennis-Ted-2019.07.23-Thesis-Presentation.pdf

HOUSE COMMITTEE ON FINANCE
April 2, 2024, 4:00 PM
Room 308

TESTIMONY IN SUPPORT OF SB 2518 SD2 HD1

Aloha Chair Yamashita, Vice Chair Kitagawa, and members of the Committee:

Blue Planet Foundation **supports SB 2518 SD2 HD1**, which appropriates funding to the Hawai'i State Energy Office for geothermal energy exploration in partnership with the Hawai'i Groundwater and Geothermal Resources Center at the University of Hawai'i.

Blue Planet Foundation is a Hawai'i-based nonprofit organization committed to help Hawai'i cut its carbon emissions and avoid the worst impacts of climate change. Through our advocacy for renewable energy, energy efficiency, and clean transportation, we seek to make our communities stronger, our energy more secure, our environment healthier, and our economy more robust.

Hawai'i is fortunate to have a variety of clean energy options to meet our 100% renewable portfolio standards by 2045. While solar and wind energy face challenges of intermittency, geothermal has the potential to provide low-carbon, firm renewable energy– expanding and diversifying our local energy system as we move our islands closer to 100%.

Blue Planet supports research for geothermal for the following reasons:

> **Renewable and Sustainable:** Geothermal energy is a renewable resource, meaning it can be replenished naturally over time. In Hawai'i, where there is significant volcanic activity, geothermal energy provides a continuous and reliable source of power without relying on finite fossil fuels.
>
> **Stable and Baseload Power:** Geothermal power plants can provide baseload power, meaning they can generate electricity consistently, unlike some other renewable sources like solar and wind, which depend on weather conditions. This stability helps ensure a reliable electricity supply for Hawaii's residents and businesses.
>
> **Reduced Greenhouse Gas Emissions:** Geothermal energy is a low-carbon energy source, emitting minimal greenhouse gases compared to fossil fuels like coal, oil, and natural gas. By utilizing geothermal energy, Hawai'i can reduce its carbon footprint and contribute to mitigating climate change.

Energy Independence: Harnessing geothermal energy helps reduce Hawai‘i's dependence on imported fossil fuels for electricity generation. This enhances energy security and resilience by diversifying the energy mix and reducing exposure to volatile fuel prices and supply disruptions.

Achieving Hawai‘i's ambitious clean energy and resilience goals will require a diverse mix of renewable, local energy sources and types. This bill is a first step towards identifying where geothermal energy might be located in our state, so that further exploration and necessary community engagement can follow.

Thank you for the opportunity to submit testimony in support of SB 2518.

www.sustainableeneryhawaii.org

March 31, 2024

STRONG SUPPORT FOR SB 2518 SD2 HD1 – RELATING TO GEOTHERMAL ENERGY EXPLORATION.

Aloha Chair Yamashita, Vice Chair Kitagawa, and members of the Committees,

Sustainable Energy Hawai'i (SEH) supports SB 2518 SD2 HD1, *which "Requires and appropriates funds for the Hawai'i State Energy Office to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program under the direction of the Hawai'i Groundwater and Geothermal Resources Center at the University of Hawai'i."*

Hawai'i has unique geothermal and groundwater resources that, properly utilized, will contribute to the our **energy independence** and **economic resilience** and enable **social justice**. SB 2518 SD2 HD1 will help fund efforts to help us understand the nature of the geothermal resource across the state, an important step in the process of identifying and developing future geothermal energy production infrastructure.

More must be done to fully understand the various environmental, cultural, and economic considerations before we can realize the benefits of our groundwater and geothermal opportunities. SB 2518 SD2 HD1 will enable this understanding by investing in research and exploration efforts.

Thank you for the opportunity to testify,

Noel Morin
Chair, Board of Directors
Sustainable Energy Hawai'i
noel@sustainableenergyhawaii.org

Sustainable Energy Hawai'i is a 501(c)3 non-profit dedicated to improving the quality of life for Hawai'i residents. Our mission is to enable an economic, social, and environmental revival in Hawai'i through a just transition to sustainable, locally sourced renewable energy and, to that end, the creation of a thriving clean hydrogen economy.

Citizens' Climate Lobby Hawaii
hi.ccl.lobby@gmail.com
cclhawaii.org

April 2, 2024

SUPPORT FOR SB2518 SD2 HD1 – RELATING TO GEOTHERMAL ENERGY EXPLORATION

Aloha Chair Yamashita, Vice chair Kitagawa and members of the FIN

Citizens' Climate Lobby (CCL) Hawaii supports SB2518, which Requires and appropriates funds for the Hawaii State Energy Office to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program under the direction of the Hawaii Groundwater and Geothermal Resources Center at the University of Hawaii.

CCL Hawaii comprises over 1000 members across Hawaii. We advocate for effective, efficient, and fair climate legislation. We **strongly support SB2518**.

Hawaii must develop it's abundant, ubiquitous geothermal energy resource that is available on every island. Geothermal energy is available around the clock, around the year, and just below our feet.

The oil market shocks of the Ukraine invasion is a warning that Hawaii must become energy sovereign and resilient. While continuing to add wind and solar generation Hawaii must urgently develop geothermal energy resources. Current blackouts exemplify the need to develop 24 X 7 X 365 local geothermal energy.

For consideration of the committee the table below shows geothermal generation has the lowest Levelized Cost of Energy. Dispatchable geothermal energy generation is clearly a winning choice for Hawaii's future. Support geothermal development! Support SB2518!

Table B1b. Estimated unweighted levelized cost of electricity (LCOE) and levelized cost of storage (LCOS) for new resources entering service in 2040 (2021 dollars per megawatthour)

Plant type	Capacity factor (percent)	Levelized capital cost	Levelized fixed O&M[a]	Levelized variable cost	Levelized transmis-sion cost	Total system LCOE or LCOS	Levelized tax credit[b]	Total LCOE or LCOS including tax credit
Dispatchable technologies								
Ultra-supercritical coal	85%	$48.97	$5.71	$23.64	$1.14	$79.46	*NA*	$79.46
Combined cycle	87%	$9.10	$1.68	$32.11	$1.16	$44.05	*NA*	$44.05
Advanced nuclear	90%	$57.31	$16.15	$10.71	$1.10	$85.28	-$5.07	$80.20
Geothermal	90%	$22.84	$16.44	$1.21	$1.42	$41.91	-$2.28	$39.63
Biomass	83%	$37.86	$18.10	$29.36	$1.21	$86.53	*NA*	$86.53
Resource-constrained technologies								
Wind, onshore	40%	$29.45	$7.89	$0.00	$2.74	$40.08	*NA*	$40.08
Wind, offshore	43%	$64.77	$30.58	$0.00	$2.66	$98.01	*NA*	$98.01
Solar, standalone[c]	29%	$23.42	$6.41	$0.00	$3.59	$33.42	-$2.34	$31.07
Solar, hybrid[c,d]	28%	$30.93	$13.99	$0.00	$3.71	$48.63	-$3.09	$45.54
Hydroelectric[d]	56%	$46.11	$11.85	$3.86	$2.02	$63.83	*NA*	$63.83
Capacity resource technologies								
Combustion turbine	10%	$50.84	$8.37	$52.59	$10.07	$121.87	*NA*	$121.87
Battery storage	10%	$58.93	$29.64	$21.66	$10.24	$120.47	*NA*	$120.47

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

[a] O&M = operations and maintenance

[b] The tax credit component is based on targeted federal tax credits such as the Production Tax Credit (PTC) or Investment Tax Credit (ITC) available for some technologies. It reflects tax credits available only for plants entering service in 2040 and the substantial phaseout of both the PTC and ITC as scheduled under current law. Technologies not eligible for PTC or ITC are indicated as *NA*, or *not available*. The results are based on a regional model, and state or local incentives are not included in LCOE and LCOS calculations. See text box on page 2 for details on how the tax credits are represented in the model.

[c] Technology is assumed to be photovoltaic (PV) with single-axis tracking. The solar hybrid system is a single-axis PV system coupled with a four-hour battery storage system. Costs are expressed in terms of net AC (alternating current) power available to the grid for the installed capacity.

There is clearly a geothermal opportunity for Hawaii to become the Iceland of the Pacific.

Thank you for this opportunity to testify.

Please support SB2518.

Respectfully,
CCL Hawai`i

Citizens' Climate Lobby (CCL) is a nonprofit, nonpartisan, grassroots advocacy organization focused on national policies to address climate change solutions. CCL Hawaii's 1000+ members are part of a 180,000+ global organization. For more information, visit citizensclimatelobby.org.

Testimony to the Committee on Finance
April 1, 2024
House Conference Room 308 via Videoconference

SB 2518 SD2 HD1

Dear Chair Yamashita and Committee Members,

Elemental Excelerator is in **strong support of SB 2518**, which appropriates funds for the Hawaii State Energy Office to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program under the direction of the Hawaii Groundwater and Geothermal Resources Center at the University of Hawaii.

Elemental Excelerator is a Honolulu-based non-profit organization that supports climate positive startup companies that help address Hawai'i's most urgent climate resilience issues. Each year, we select 15-20 companies that best fit our mission and fund each company with up to $1 million in investment. To date, we have awarded over $70 million to 160+ companies, and additionally supported more than 100 new tech demonstration projects right here in Hawai'i & the Asia Pacific.

As a clean energy resource that works around the clock, geothermal power can serve as a critical component to decarbonizing the most challenging parts of the energy sector. Sourced from heat generated by the Earth's core, geothermal energy is clean, available 24-7, is virtually unlimited and can provide energy sovereignty for communities. Geothermal power, which currently accounts for less than 1% of utility-scale electricity generation in the U.S., has had significant technological advancements in the past decade. Understanding the history of geothermal energy development in Hawaii is important, and Elemental is supporting new geothermal technologies in other states at the moment in order to ensure that appropriate technology is available to Hawaii communities should they choose to explore geothermal energy as an option.

We support SB 2518, to conduct a statewide assessment for a geothermal resources characterization program.

Thank you for the opportunity to testify.

TESTIMONY BEFORE THE HOUSE COMMITTEE ON FINANCE

SB 2518, SD2, HD1
Relating to Geothermal Energy Exploration

Tuesday, April 2, 2024
4:00 PM
State Capitol, Conference Room 308

Greg Shimokawa
Director, Renewable Acquisition
Hawaiian Electric

Dear Chair Yamashita, Vice Chair Kitagawa, and Members of the Committee,

My name is Greg Shimokawa and I am testifying on behalf of Hawaiian Electric in support of SB 2518, SD2, HD1, Relating to Geothermal Energy Exploration which seeks to appropriate funds for the continued exploration of geothermal resources in Hawaii and community outreach activities.

Hawaiian Electric supports continued exploration of geothermal resources and community outreach to help accelerate the development of renewable energy projects, support the State's Renewable Portfolio Standards ("RPS") requirements, reduce reliance on imported fossil fuels, stabilize and reduce volatility of customers' bills, reduce greenhouse gas emissions, and assist with post-pandemic economic recovery.

Hawaiian Electric defers to policy makers and those impacted on the appropriateness of funding allocations stipulated in the bill, yet generally supports the intent of exploring and identifying the State's geothermal resources and renewable energy potential. Accordingly, Hawaiian Electric supports SB 2518, SD2, HD1.

Thank you for this opportunity to testify.

Indigenous Consultants, LLC

Mililani B. Trask, Principal

P.O.Box 6377 ❖ Hilo, HI 96720

mililani.trask@icllchawaii.com

Date: Tuesday, April 2, 2024
Time: 4:00 pm
Place: Conference Room 308
House Committee: FIN

Re: SB 2518 - Relating to Geothermal Energy Exploration
Requires and appropriates funds for the Hawaii State DBEDT to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program to explore the commercial viability of utility-scale geothermal production as a base-load firm power generation resource and in particular on Hawaii Island.

Aloha Finance Committee Members,

Indigenous Consultants (IC) is a Hawaii based, indigenous LLC owned and operated by Native Hawaiians. It was created to assist indigenous peoples in developing their renewable energy resources in ways tat are: Culturally appropriate, environmentally green and sustainable, socially responsible and economically equitable and affordable. For several years the IC has worked with Innovations Development Group in New Zealand and indigenous Maori developing geothermal resources, which are trust assets of Maori Land Trusts. In addition, the IC has acted as a consultant to other indigenous people in Hawaii and Asia who are addressing development of their trust renewable energy resources in ways that; directly benefit their people, bring in revenues, create small business opportunities and ensure fair & affordable rates to consumers, including themselves and their communities.

Testimony in Strong Support

Hawaii is the most energy insecure State in the Union. Hawaii is currently experiencing a crisis in energy among the many issues affecting our state from water and food security, affordable housing and the devastating impact of the recent fires in Maui. Our energy crisis is due largely to the fact that Hawaii exports billions of dollars a year for fossil fuel and a lack of infrastructure to support firm, renewable generation. These revenues are not being made available for growth and expansion of our economy because they are diverted to pay for fossil fuel despite the fact that Hawaii has a great bounty of indigenous renewable energy, including geothermal energy that is a ‘mineral’ and an asset of the public trust. The State and its agencies & regulatory bodies, including the PUC,

have a trust & fiduciary obligation to inventory & develop these renewable assets in a way that benefits the public and Native Hawaiians who are the beneficiaries of the public trust.

One of the primary barriers to Hawaii's energy self-sufficiency is the conflict of interest that exists because the electric utility that owns & manages the grid is also in the business of energy generation using fossil fuels and facilities that can only be run on fossil fuels of their own bio-fuel plants. These facilities cannot interface with geothermal or other renewable energy sources.

Geothermal energy development should be a key component of Hawaii's Renewable energy future. The technology is mature, having been implemented successfully around the world in countries like New Zealand (Aotearoa), Iceland and the Philippines among others. Geothermal is also a clean, renewable, firm power capable of being a baseload for our electricity needs here in Hawaii.

This bill is needed in order to facilitate the immediate exploration of the States geothermal public trust assets in light of the energy needs Hawaii is facing due to the requirements of the Hawaii Clean Energy Initiative. Exploration for geothermal resources capable for energy development is the first step that is needed to determine what can be done here in Hawaii in a safe, responsible and equitable manner. Forty years ago, Hawaii's statutes anticipated that the State of Hawaii would expend millions of dollars testing the viability of our geothermal resources so that the State could then determine which lands were suitable for geothermal development, and thereafter designate these areas as 'geothermal sub-zones' for private sector development. Now is the time to make good on that promise.

Sincere Regards,

Mililani B. Trask – Indigenous Consultants LLC

4/1/2024

Roberta Cabral
5184 Iroquois Ave
Ewa Beach, Hawaii 96706

Testimony of
Roberta Cabral of Innovations Development Group, Inc.

SB2518
Relating to Geothermal Energy Exploration
Requires and appropriates funds for the Hawaii State DBEDT to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program to explore the commercial viability of utility-scale geothermal production as a base-load firm power generation resource and in particular on Hawaii Island.

Dear,

Chair Yamashita, Vice Chair Kitagawa, and the Members of the Committee on Finance:

On behalf of Innovations Development Group, Inc. and myself, I am submitting this testimony in **STRONG SUPPORT** of **SB2518**, relating to **GEOTHERMAL ENERGY EXPLORATION**.

Hawaii is the most oil dependent & energy insecure state in the United States. We rely heavily on imported fossil fuels for our energy needs and pay the highest electricity rates in the country.
The State of Hawaii has made a commitment to changing our energy reality and to become leaders in clean, renewable energy through a bold energy agenda, by achieving 100 percent clean energy by the year 2045. Along with reducing our islands' dependency on fossil fuels and increasing efficiency measures, the clean energy plan is also contributing to the state's economic growth.

Fortunately we are blessed with ample geothermal power on Hawaii island. As you know, we have already invested in a great deal of research into understanding the nature of what Pele has provided and how best to access her energy for the good of all.

This measure promotes geothermal energy as the most reliable & affordable source of FIRM power for Hawaii, and lays a clear foundation to ensure that this source of firm power will be developed in a manner that benefits those who are the legal beneficiaries of the public trust.

Today, we all recognize that geothermal renewable energy resources are “minerals” under State law & as such are assets of the Public Trust. The time has come for the State of Hawaii to prioritize the development of these precious resources in order to ensure that our State can become energy self-sufficient and independent in future years. In addition, the IDG believes that Public Trust energy resources should be developed in a way that brings direct and tangible benefits to the ‘consumers’ of our State who also happen to be the beneficiaries of the public trust.

Geothermal energy is an asset of the public trust. It is defined as a mineral by Hawaii statutes, and as such is a public energy resource. Although the State owns the resource, the State has never managed & developed it as a ‘trust asset’. Rather, geothermal energy has been developed on private land to the benefit of private parties with the State receiving only mineral royalties. The time has come for the State to prioritize the development of geothermal energy (and all other renewable energy resources of the trust) pursuant to its trust obligation that requires that the State develop these resources for the benefit of the State and its public & native Hawaiian beneficiaries.

The State of Hawaii is facing a serious energy & fiscal crisis. We badly need to expedite the development of our own State renewable resources and to ensure that the manner in which these precious and invaluable resources are developed brings a direct benefit to those who own the resources.

Today, more than ever, Geothermal should be a critical component of Hawaii‘s sustainable energy future. It is a clean, reliable, mature, firm base-load energy technology that will be key to Hawaii‘s sustainable energy mix.

I urge you to pass SB2518 and finally clear the way for Hawaii to build an energy secure future, reducing our dependence on fossil fules that is built on firm, baseload renewable energy found in abundnace in our islands that is available for all people, from keiki to kupuna, that is culturally appropriate, environmentally sustainable, and economically sensisble for present and future generations.

SB-2518-HD-1
Submitted on: 3/31/2024 7:32:52 AM
Testimony for FIN on 4/2/2024 4:00:00 PM

Submitted By	Organization	Testifier Position	Testify
Alice Kim	Individual	Support	Written Testimony Only

Comments:

Hawaii should utilize its rich volcanic resources. Geothermal energy can offer lower electricity prices, energy security, job opportunities, and education. Geothermal research can improve Hawaii's sustainability and reveal Hawaii's groundwater resources.

Currently, the Kilauea East Rift Zone on Hawaii Island is the only geothermal system in the Hawaiian archipelago from which geothermal electric power is being produced. Preliminary research by the University of Hawaii shows that all of the major Hawaiian Islands hold geothermal potential and that much of Hawaii's geothermal resources is unknown. More research is needed to uncover these geothermal resources.

As Hawaii is the only U.S. state without an official geological survey, the University of Hawaii (UH) contributed a bulk of what we know about Hawai'i's geology. As a UH research unit, the Hawaii Groundwater and Geothermal Resources Center (HGGRC) is well equipped for groundwater research. Through HGGRC, the state's most prominent earth scientists are researching Hawaii's groundwater resources. HGGRC obtained land access for research from dozens of landowners across the state. For research equipment, HGGRC has access to $1 million worth of geophysical equipment and a $3 million drill rig.

HGGRC has provided students and new professionals hands-on research experiences and education. Over the years, HGGRC sponsored employment of dozens of employees, and HGGRC scientists provided academic advising for undergraduate and graduate students.

Geothermal energy will help Hawaii reach its 100% renewable source mandate by 2045. Please invest in Hawaii's geothermal development.

SB-2518-HD-1
Submitted on: 3/31/2024 9:52:15 AM
Testimony for FIN on 4/2/2024 4:00:00 PM

Submitted By	Organization	Testifier Position	Testify
Keoni Shizuma	Individual	Oppose	Written Testimony Only

Comments:

Aloha Chairs, Vice Chairs, and members of the committee,

I stand in opposition to SB2518.

This is not the time to appropriate funds to the exploration of geothermal. With the financial burden of the wildfires, along with our ailing infrastructure, dilapidated public schools, and biosecurity threats to our environment, now is NOT the time to appropriate funds to exploring geothermal.

Please use our funds more wisely, caring for our people (wildfire victims, rebuilding of Lahaina), the education of our keiki, and our environment (biosecurity, invasive species).

Also, there are less destructive and less invasive forms of clean energy (wind, waves, solar) that do not cause permanent destruction and change our ‘āina forever.

Mahalo,

Keoni Shizuma

Statement of
Brigadier General Stanley J. Osserman Jr. (USAF Ret.), President
Tigershark, LLC
Before the
Senate Committee on Finance
2 April 2024
4:00 pm
State Capitol Conference Room #308
In consideration of
SB2518 SD2 HD1
Relating to Renewable Energy

Chair Yamashita 31 March 2024

Vice Chair Kitagawa and Distinguished Committee Members:

I stand in strong support of this bill.

As the former director of the Hawaii Center for Advanced Transportation Technologies (HCATT; 2013 to 2019), Hawaii Department of Business, Economic Development and Tourism (DBEDT), I continue to serve our state by promoting clean, renewable energy solutions. This testimony is NOT being given for compensation of any kind by any corporate or commercial entity. I am presenting to you today as a concerned "Life-Long" citizen of the State of Hawaii with extensive professional experience in energy systems, retail and wholesale business, military matters, international commerce, aviation, construction, maritime operations, and public safety, among others. My goal is to help our government leaders make good strategic choices.

As a senior member of the Hawaii National Guard, I am highly experienced in military support to civil authorities and the State level response to major disasters, natural and man-made. From my perspective, one of the biggest oversights in planning for the RPS in 2045 is the lack of attention needed to modify our power grids on all islands to become survivable after a major disaster. One of the critical modifications needed is the ability to have integrated, yet distributed power generation. This includes the need for isolated communities to be microgrids, and parts of the grid to be able to isolate themselves to preclude the entire grid from going into what is called a "Black Start".

In 2014, while I was the Director of the Hawaii Center for Advanced Transportation Technologies (HCATT), a federally funded program administered by DBEDT, I worked to design a fully renewable microgrid for the Hawaii Air National Guard and the US Air Force. I learned a great deal from this effort and almost a decade later that project is functional and will be

commissioned within the next 45 days. Three of my main "lessons learned" from this project are:

1) Grid operators of all sizes report (and US Dept. of Energy agrees) that having more than 25% "intermittent renewables" (solar and wind power primarily) is extremely difficult, due to a variety of technical challenges. In addition, including more than 35% of "intermittent renewables" causes serious frequency and power fluctuations that destabilize the grid beyond acceptable limits.
2) Modern societies will need MORE electricity than is currently anticipated, and HECO has not addressed several "demand side" issues that will exacerbate this issue in Hawaii.
    a. Electrification of virtually all ground transportation (including hydrogen fuel cell), farm equipment, material handling equipment and other heavy equipment and public transportation.
    b. Production of "Drop-in" synthetic liquid fuels for aviation and maritime (including interisland barges and commercial fishing fleets, and possibly cargo and cruise ships).
    c. Data centers that will manage Artificial Intelligence and Bitcoin mining.
3) The need to make future "grid systems" resistant to disasters and resilient in design by incorporating microgrids and "Distributed Generation".

In short, We cannot solar/wind/and battery our way to 2045 and beyond, we need a substantial percentage of clean, firm "base-load" electricity, and from my research only nuclear and geothermal can fit the bill in Hawaii, and geothermal is the logical "dollar for dollar" choice. The chart below shows the levelized cost of several technologies under consideration, and I direct you to the "Capacity Factor" and "LCOE" columns. "Capacity Factor" tells you how much of the time the technology will be in service, and LOC is the overall cost to build and operate (per MWh). Geothermal gives you the most generation time for the lowest cost over time. If handled properly this could be the solution for reducing costs as demand increases, because the actual source of our energy is the heat from under our islands.

SB 2518 SD2 HD1 is a step in the right direction to get the critical "players" in our electrical generation and distribution process to re-shape our current grid design to meet future load requirements and attain resiliency! SB 2518 SD2 HD1 can help us speed up the necessary design and business model changes needed to shape HECO into a utility that can provide electrical generation, distribution AND integration with distributed systems within their network. SB 2505 is an important part of achieving that goal!!! Geothermal is the right option, the Pono option and the best option for everyone living in Hawaii!

Table B1b. Estimated unweighted levelized cost of electricity (LCOE) and levelized cost of storage (LCOS) for new resources entering service in 2040 (2021 dollars per megawatthour)

Plant type	Capacity factor (percent)	Levelized capital cost	Levelized fixed O&M[a]	Levelized variable cost	Levelized transmis-sion cost	Total system LCOE or LCOS	Levelized tax credit[b]	Total LCOE or LCOS including tax credit
Dispatchable technologies								
Ultra-supercritical coal	85%	$48.97	$5.71	$23.64	$1.14	$79.46	*NA*	$79.46
Combined cycle	87%	$9.10	$1.68	$32.11	$1.16	$44.05	*NA*	$44.05
Advanced nuclear	90%	$57.31	$16.15	$10.71	$1.10	$85.28	-$5.07	$80.20
Geothermal	90%	$22.84	$16.44	$1.21	$1.42	$41.91	-$2.28	$39.63
Biomass	83%	$37.86	$18.10	$29.36	$1.21	$86.53	*NA*	$86.53
Resource-constrained technologies								
Wind, onshore	40%	$29.45	$7.89	$0.00	$2.74	$40.08	*NA*	$40.08
Wind, offshore	43%	$64.77	$30.58	$0.00	$2.66	$98.01	*NA*	$98.01
Solar, standalone[c]	29%	$23.42	$6.41	$0.00	$3.59	$33.42	-$2.34	$31.07
Solar, hybrid[c,d]	28%	$30.93	$13.99	$0.00	$3.71	$48.63	-$3.09	$45.54
Hydroelectric[d]	56%	$46.11	$11.85	$3.86	$2.02	$63.83	*NA*	$63.83
Capacity resource technologies								
Combustion turbine	10%	$50.84	$8.37	$52.59	$10.07	$121.87	*NA*	$121.87
Battery storage	10%	$58.93	$29.64	$21.66	$10.24	$120.47	*NA*	$120.47

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

[a] O&M = operations and maintenance

[b] The tax credit component is based on targeted federal tax credits such as the Production Tax Credit (PTC) or Investment Tax Credit (ITC) available for some technologies. It reflects tax credits available only for plants entering service in 2040 and the substantial phaseout of both the PTC and ITC as scheduled under current law. Technologies not eligible for PTC or ITC are indicated as *NA*, or *not available*. The results are based on a regional model, and state or local incentives are not included in LCOE and LCOS calculations. See text box on page 2 for details on how the tax credits are represented in the model.

[c] Technology is assumed to be photovoltaic (PV) with single-axis tracking. The solar hybrid system is a single-axis PV system coupled with a four-hour battery storage system. Costs are expressed in terms of net AC (alternating current) power available to the grid for the installed capacity.

Aloha,

Brigadier General, Stanley J. Osserman Jr. (USAF Ret.)

President, Tigershark, LLC

SB-2518-HD-1
Submitted on: 4/1/2024 8:04:27 AM
Testimony for FIN on 4/2/2024 4:00:00 PM

Submitted By	Organization	Testifier Position	Testify
Paul Bernstein	Individual	Support	Written Testimony Only

Comments:

Aloha Chair Yamashita, Vice Chair Kitagawa, and Committee Members,

I'm writing in support of SB2518 SD2 HD1. If we as the state of Hawai'i are to achieve 100% renewable power while also having a reliable grid, then we need to greatly increase the amount of electricity produced from geothermal. This bill will put us on the path to this combined goal. In addition, deriving power from locally produced geothermal means more jobs in the state of Hawai'i.

Please pass SB2518 out of your committee for the benefit of our economy and our environment.

Mahalo,

Paul Bernstein

SB-2518-HD-1
Submitted on: 4/1/2024 8:48:55 AM
Testimony for FIN on 4/2/2024 4:00:00 PM

Submitted By	Organization	Testifier Position	Testify
Glen Kagamida	Individual	Support	Written Testimony Only

Comments:

STRONG SUPPORT.

MAHALO!

SB-2518-HD-1
Submitted on: 4/1/2024 10:52:21 AM
Testimony for FIN on 4/2/2024 4:00:00 PM

Submitted By	Organization	Testifier Position	Testify
Richard Ha	Keoki and Malia	Support	Remotely Via Zoom

Comments:

I strongly support SB2516

Currently, the Kilauea East Rift Zone on Hawaii Island is the only geothermal system in the Hawaiian archipelago from which geothermal electric power is being produced. Preliminary research by the University of Hawaii shows that all of the major Hawaiian Islands hold geothermal potential and that much of Hawaii's geothermal resources is unknown. More research is needed to uncover these geothermal resources.

As Hawaii is the only U.S. state without an official geological survey, the University of Hawaii (UH) contributed a bulk of what we know about Hawai'i's geology. As a UH research unit, the Hawaii Groundwater and Geothermal Resources Center (HGGRC) is well equipped for groundwater research. Through HGGRC, the state's most prominent earth scientists are researching Hawaii's groundwater resources. HGGRC obtained land access for research from dozens of landowners across the state. For research equipment, HGGRC has access to $1 million worth of geophysical equipment and a $3 million drill rig.

Hawaii will sit over the "hot spot" for1-2 million years. Drill down and the steam is free practically forever. Green hydrogen is made from green electricity. Hawaii has a major advantage to the rest of the world in making hydrogen. The Hawai'i geothermal steam is practically infinite while other fossil fuel sources are finite.

Aloha

Richard Ha

[redacted]

April 1, 2024

SB2518
RELATING TO GEOTHERMAL ENERGY EXPLORATION.

Requires and appropriates funds for the Hawaii State DBEDT to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program to explore the commercial viability of utility-scale geothermal production as a base-load firm power generation resource and in particular on Hawaii Island.

Chair Yamashita & Vice Chair Kitagawa, and the Members of the House Committee on Finance,

I am submitting this testimony in **STRONG SUPPORT** of **SB2518**, relating to **GEOTHERMAL ENERGY EXPLORATION**.

Hawaii is the most oil dependent & energy insecure state in the United States. We rely heavily on imported fossil fuels for our energy needs and pay the highest electricity rates in the country.

The State of Hawaii has made a commitment to changing our energy reality and to become leaders in clean, renewable energy through a bold energy agenda, by achieving 100 percent clean energy by the year 2045. Along with reducing our islands' dependency on fossil fuels and increasing efficiency measures, the clean energy plan will also contribute to the state's economic growth.

Today, more than ever, Geothermal should be a critical component of Hawaii's sustainable energy future. It is a clean, reliable, mature, firm base-load energy technology that will be key to Hawaii's sustainable energy mix.

I believe in the need for a whole new collaborative approach to energy independence and compliance with the Hawaii Clean Energy Initiative through meaningful policy changes, committed long-term investment by all stakeholders, real cultural protections and equitably shared profits while bringing access to global industry experience, cleaner technologies, enhanced environmental awareness, and a commitment to sustainable energy development & community participation.

The State of Hawaii has a responsibility to all its residents to provide affordable and clean electricity for all by utilizing its natural resources to support the development of clean, safe and affordable renewable energy. Energy security is a core tenet of life in an island-based economy and for far too long have the residents of Hawaii suffered unnecessarily.

I urge you to pass SB2518 and for Hawaii to finally take the tangible steps needed to clear the way to build an energy secure future, reducing our dependence on fossil fules that is built on firm, baseload renewable energy found in abundnace in our islands that is available for all.

I hope I can count on your support.

SB2518
Relating to Geothermal Energy Exploration

I am submitting this testimony in **STRONG SUPPORT** of **SB2518**, relating to **RELATING TO GEOTHERMAL ENERGY EXPLORATION**. Requires and appropriates funds for the Hawaii State DBEDT to conduct a statewide environmental assessment for, and subsequently administer, a geothermal resources characterization program to explore the commercial viability of utility-scale geothermal production as a base-load firm power generation resource and in particular on Hawaii Island.

Hawaii has every reason to be proud of its commitment to moving to 100 percent renewable energy by 2045. But we have much to do to get there. The recent blackouts throughout Oahu once again highlight Hawaii's need to supplement the availability of another firm renewable energy power source.

Fortunately we are blessed with ample geothermal power on Hawaii island. As you know, we have already invested in a great deal of research into understanding the nature of what Pele has provided and how best to access her energy for the good of all.

Today, more than ever, Geothermal should be a critical component of Hawaii's sustainable energy future. It is a clean, reliable, mature, firm base-load energy technology that will be key to Hawaii's sustainable energy mix.

I believe in the need for a whole new collaborative approach to energy independence and compliance with the Hawaii Clean Energy Initiative through meaningful policy changes, committed long-term investment by all stakeholders, real cultural protections and equitably shared profits while bringing access to global industry experience, cleaner technologies, enhanced environmental awareness, and a commitment to sustainable energy development & community participation.

To achieve that understanding we must have a robust community outreach campaign that gives everyone a chance to listen, learn and voice their concerns. The community needs to know that we understand and will be properly responsive to any concerns they might raise.

The State of Hawaii has a responsibility to all its residents to provide affordable and clean electricity for all by utilizing its natural resources to support the development of clean, safe and affordable renewable energy. Energy security is a core tenet of life in an island-based economy and for far too long have the residents of Hawaii suffered unnecessarily.

I urge you to pass SB2518 and finally clear the way for Hawaii to build an energy secure future, reducing our dependence on fossil fules that is built on firm, baseload renewable energy found in abundnace in our islands that is available for all people, from keiki to kupuna, that is culturally appropriate, environmentally sustainable, and economically sensisble for present and future generations.