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Testimony of
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before the
SENATE COMMITTEE ON ENERGY, ECONOMIC DEVELOPMENT, AND TOURISM
AND
SENATE COMMITTEE ON AGRICULTURE AND ENVIRONMENT

Wednesday, February 15, 2023
1:00 PM
State Capitol, Conference Room 224 & Videoconference

Providing COMMENTS on
SB 1002

RELATING TO AN ATMOSPHERIC CARBON CAPTURE PLANT.

Chairs DeCoite and Gabbard, Vice Chairs Wakai and Richards, and Members of the Committees, the Hawai‘i State Energy Office (HSEO) provides comments on SB1002, which directs HSEO, in conjunction with the Hawai‘i Natural Energy Institute (HNEI), to develop and submit a strategy to the legislature by 2025 for the construction of at least one atmospheric carbon capture plant in the State by 2030.

HSEO’s comments are guided by its mission to promote energy efficiency, renewable energy, and clean transportation to help achieve a resilient, clean energy, decarbonized economy.

HSEO appreciates the opportunity to investigate and pursue the use of atmospheric carbon capture and sequestration technologies activities further. However, HSEO notes before the construction of any atmospheric carbon capture plant, the facility and technology chosen must undergo not only a thorough environmental review but should also undergo robust lifecycle emissions analysis to determine the efficacy of the plant itself due to the substantial energy requirements of atmospheric carbon capture, also known as direct air capture technology.

Per Act 238, Session Laws of Hawai‘i 2022, HSEO has been working with the University of Hawai‘i (UH) Climate Resilience Collaborative (CRC) on evaluating carbon sequestration and carbon utilization opportunities for the state of Hawai‘i. As a part of this work HSEO and UH CRC have been collaborating on a white paper, which HSEO plans to publish and submit as an appendix to the Act 238 legislative report. As a part of the white paper, HSEO has evaluated the space and energy requirements of a facility similar to the Orca facility in Iceland. The facility in Iceland was chosen for comparison due to Hawai‘i’s similar basalt geology required for the sequestration of carbon dioxide (CO_2) after direct air capture.

As additional background information, HSEO notes that annual emissions from Hawai‘i’s energy sector (excluding international bunker fuels) were the equivalent of approximately 17,640,000 metric tons of carbon dioxide annually.[1] Comparatively, the annual amount of atmospheric carbon dioxide captured and sequestered in Iceland was 4,000 metric tons, less than one percent of Hawai‘i’s energy sector emissions.

The energy requirements for a direct air capture facility can generally be divided into two categories: 1) the energy required for mechanical components such as the fans to collect the CO_2 from the air and 2) the energy required to adequately heat the CO_2 collected and desorb it from the surface of the collection adsorbents (carbon filters).

Estimated energy requirements for CO_2 capture using the DAC technology used by the first net-negative facility Orca in Hellisheiði, are about 500 kilowatt-hours (kWh) per ton CO_2 for electricity, not including the electricity consumption for CO_2 compression, and 1,500 kWh per ton CO_2 for heat (for temperatures around 100 degrees Celsius).[2] This equates to approximately 2,000 megawatt-hours (MWh) per

1 ICF and University of Hawaii Economic Research Organization (UHERO). “Hawaii Greenhouse Gas Report for 2017 Report.” Hawaii State Department of Health, April 2021. https://health.hawaii.gov/cab/files/2021/04/2017-Inventory_Final-Report_April-2021.pdf.
2 Terlouw, T., Treyer, K., Bauer, C., & Mazzotti, M. (2021). Life cycle assessment of direct air carbon capture and storage with low-carbon energy sources. Environmental Science & Technology, 55(16), 11397-11411

year of mechanical energy, excluding the energy used for compression, and approximately 6,000 MWh of energy annually for heating.

For perspective, solar energy facilities throughout Hawai‘i generate a comparable amount of electricity annually. In 2020, Kalaeloa Renewable Energy Park (5 MW, approximately 20 acres) generated 7,812 MWh of electricity. The newly completed Mililani I solar project (39 MW plus 156 MWh storage, 150 acres) is estimated to generate 93,121 MWh of electricity per year,[3] exceeding the energy requirements of a carbon capture system similar to Orca. Energy requirements also vary based on the configuration and energy sources for the DAC system. Depending on the configuration and the host island's grid portfolio, the energy production may provide more carbon benefits if the energy used goes directly to the grid and displaces carbon-intensive fossil fuel use. However, the lower the carbon intensity of the grid, the less of a concern this becomes, making the construction of a facility such as a carbon plant is more beneficial on islands where the grid has lower carbon intensity (or higher renewable penetration).

The draft whitepaper also explores the estimated space requirements, as well as the water-use and permit requirements for geological sequestration. Utilization opportunities after Direct Air Capture were also researched, these opportunities include the use of captured carbon in concrete and building materials, as well as the use of the carbon captured to produce alternative power-to-fuel technologies, also called e-fuels.

Various carbon dioxide removal technologies, such as direct air capture, are a critical component to achieving Hawai‘i's net negative goals; however, they should not be construed as the fix-all solution. Carbon dioxide removal is not an alternative to reducing emissions through energy efficiency, renewable energy development, electric vehicle adoption, and alternative and active transportation mechanisms. Additionally, carbon removal technology is not an alternative to maintaining and increasing natural

3 Application of Hawaiian Electric Company for Approval of Power Purchase Agreement for Renewable Dispatchable Generation with Mililani I Solar, LLC. (2018, December 31) Docket 2018-0434.

sinks through measures such as reforestation and afforestation, and soil carbon sequestration or regenerative agriculture.

HSEO recommends that, while general research and attention to carbon capture continue, the specific tasks envisioned in this bill be delayed to a future time when Hawai‘i’s grids have an excess of zero-carbon energy available.

However, if the Committee does decide to proceed with this measure, HSEO requests the following revisions to clarify the intent of SB 1002.

1) Section 1, Section 2, and Section 3 of SB 1002 should clarify if the evaluated construction date of the plant should be 2028 or 2030. Sections 1 and 3 list the construction date as 2028, while Section 2 lists 2030. HSEO believes that 2030 is a more appropriate time frame, although the most appropriate construction date is determined by the overall carbon intensity of the grid, as described above.
2) Section 1 should clarify whether the Hawai‘i State Energy Office will be evaluating a Direct Air Capture facility only, or if the strategy should also be inclusive of a facility that sequesters and/or geologically stores the carbon dioxide after it is captured. These facilities are often referred to as direct air capture with carbon storage facilities (DACCS). Storage and/or utilization after direct air capture are technologies separate from atmospheric carbon capture and the pathways for carbon dioxide utilization or storage after collection differ and require varying levels of analysis, environmental review, and permitting dependent upon the chosen pathway.

Thank you for the opportunity to testify.