

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of)
)
PUBLIC UTILITIES COMMISSION) DOCKET NO. 2018-0165
)
Instituting a Proceeding to)
Investigate integrated Grid)
Planning.)
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COMMENTS OF ULUPONO INITIATIVE LLC ON
THE HAWAIIAN ELECTRIC COMPANIES
UPDATED INTEGRATED PLANNING WORKPLAN - FIRST REVIEW POINT

and

CERTIFICATE OF SERVICE

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Ulupono Initiative, LLC (“Ulupono”), by and through Murray Clay, its President, and its attorneys Carlsmith Ball LLP, hereby respectfully submit their responses to the questions issued by the Commission in Order 36704 – Establishing a Procedural Schedule for the First Review Point (“Order 36704”), and provides additional comment on Hawaiian Electric’s first Integrated Grid Planning (“IGP”) review point (“First Review Point”) to aid in the Commission’s evaluation of the IGP process.

I. INTRODUCTION

As the Hawaiian Electric Companies (“Hawaiian Electric”, which refers collectively to Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawaii Electric Light Company, Inc.) continues to make progress on the State’s clean energy goals, recent innovations in the power system and a new regulatory framework now offer the utility new opportunities to create value for the customer and accelerate the State’s achievement of the 100% Renewable Portfolio Standard (“RPS”). However, accelerating the state’s energy transition will likely amplify the complexity and operational challenges of the current electric system. As such, there is a need for Hawaiian Electric’s planning process that embraces the diversity of resources on the system and is aligned with the Commission’s guidance on the utility’s planning and operations dating back to the Commission’s Inclinations. While the intent of IGP is promising, as stated in Order 35569, “the success of this new planning process depends on the details of

implementation.”¹ Hawaiian Electric’s Workplan Update and First Review Point (“First Review Point”) provides the opportunity to examine the thinking of the utility, and provide appropriate feedback to ensure that Hawaiian Electric has the necessary guidance to be successful as they continue on this new approach to power system planning. It is within this context that Ulupono provides the following responses and comments to the Commission and Hawaiian Electric.

For context, the Commission should be aware that Ulupono and Hawaiian Electric have had several discussions related to the draft inputs and assumptions later last year (October – December 2020). Included with this filing are two exhibits. The first exhibit – Exhibit 1 – is a spreadsheet that captures the evolution of questions and responses between Ulupono and Hawaiian Electric that relate to the September 25 2020 Inputs and Assumptions (“I&A Discussion Spreadsheet”). The second exhibit – Exhibit 2 – is a review of the NREL Solar and Wind Potential Study Update provided by Ulupono’s consultant, Dr. Matthias Fripp (“NREL Study Review”). The NREL Study Review was also shared with Hawaiian Electric in November 2020. Additionally, several of the responses provided below request that Ulupono have more time to review the February 18 2021 Inputs and Assumptions (“I&A”) Workbook. Ulupono was originally expecting that Hawaiian Electric would provide us with a complete set of I&A in November 2020. As the February 18 2021 I&A Workbook was provided only a week prior to the submission of this filing, there has not been enough time to conduct a more careful review. Ulupono offers these comment and the Exhibits in an effort to uphold the Commission’s desire for transparency in this proceeding.

II. RESPONSES TO THE COMMISSION’S QUESTIONS

- 1. Is the baseline set of forecasts and assumptions a reasonable starting point for IGP long-term planning? If so, why? If not, why not? If more information is necessary to answer this question, please explain. Reference: IGP Workplan Update, Exhibit A.1.**

* *Commission’s Inclinations on the Future of Hawaii’s Electric Utilities*, Exhibit A to Decision and Order No. 32052, filed April 24, 2014 in Docket No. 2012-0036.

¹See Docket 2018-0165 – Instituting a Proceeding to Investigate Integrated Grid Planning, Order 35569 at 2.

Ulupono acknowledges and appreciates the progress Hawaiian Electric has made in this proceeding given the inherent uncertainty that most often accompanies a new process. Upon review of Exhibit A.1, it is evident that more work must be done before the baseline set of forecasts and assumptions are approved. The biggest drivers that Ulupono believes will affect the results of long-term planning efforts are forecasts related to (1) the cost of fuel, (2) the relative costs of renewable energy and fossil fuel equipment, (3) the amount of renewable energy resources Hawaiian Electric believes to be available in future years (presently driven by the NREL study), and (4) rules about provision of ancillary services. To this end, Hawaiian Electric should further explain their preference for using proprietary forecast data for the both fuel and renewable resource costs, specifically wind, solar PV and storage.

While Ulupono is pleased that Hawaiian Electric has shared the proprietary fuel and resource cost forecasts with stakeholders in the most recent Inputs and Assumptions (“I&A”) Workbook, this does not address the fundamental issue that underlies the use of proprietary data. Ultimately, the intent of IGP – identifying gross system needs, coordinating solutions and developing an optimized, cost effective portfolio of assets² – will be compromised if initial forecasts under or over estimate costs when compared to widely used and accepted public forecasts provided by the National Renewable Energy Laboratory (“NREL”) or the Energy Information Administration (“EIA”).

Relatedly, there is a need to use a more realistic scenario for available land for solar and wind resources. To assist Hawaiian Electric on this issue, Ulupono provided the IGP team with a review of the initial NREL Study authored by Dr. Fripp. The review, attached as Exhibit 2, provides specific recommendations to develop a “most likely” scenario for available land for solar PV and wind development. If left unexamined, underestimates of available land could result in long-term resource plans that call for costly investments, such as new fossil fuel plans and synchronous condensers, that will unnecessarily saddle ratepayers. Fortunately, Hawaiian Electric has agreed to contract with NREL to conduct an additional run that is expected to address the concerns raised in Exhibit 2. Hawaiian Electric has also indicated that this run will model Distributed Energy Resources (“DER”) as a resource option

²See Docket 2018-0165 - Instituting a Proceeding to Investigate Integrated Grid Planning, IGP Report at 14.

with the ability to export and participate in grid services.³ Ulupono requests that the results from the new run replace the existing base case for RESOLVE rather than be used as a sensitivity case. Ulupono believes this is necessary as the current assumptions for RESOLVE may be prejudicial against utility-scale solar.

While additional time is needed for a more comprehensive review of the February 18 I&A Workbooks⁴, Ulupono also recommends that assumptions for several of the proposed grid services (e.g., energy reserve margin, inertia, regulating reserves) should be modified in the base case to more accurately capture the true resource potential, to ensure that RESOLVE and PLEXOS are solving for the most optimal investments over the long term. More detailed responses related to these inputs and assumptions is provided in Ulupono's response to Q3.

2. Does the First Review Point, Exhibit A.1 (i.e., the draft inputs and assumptions) sufficiently incorporate stakeholder feedback, or transparently explain why it did not, consistent with Commission guidance? If not, what stakeholder feedback should it incorporate, or explain the rejection of? Should the Company reconvene any Working Groups to further develop and incorporate stakeholder feedback? Reference: IGP Workplan Update, Exhibit A.1.

It is clear that there is still a need to incorporate stakeholder feedback to Hawaiian Electric's inputs and assumptions and the IGP process more broadly. Between October 2020 and February 2021, Ulupono and Hawaiian Electric had several productive conversations about refinements to the draft inputs and assumptions (See Exhibit 1). It is unclear why recommendations provided in November 2020 were not included as an update to Exhibit A.1 or subsequent documents/materials, or why numerous reasonable and important questions have been left unanswered. As we continue to explore this new integrated

³See Exhibit 1 – I&A Discussion Spreadsheet at F7. Hawaiian Electric Response (2/22/21) – “Further discussions with stakeholders may be needed to understand how to price this resource option within the capacity expansion model.”

⁴See “Draft Oahu Inputs Workbook 1 (EXCEL) (Updated February 18, 2021)” and “Draft Oahu Inputs Workbook 2 (EXCEL) (Updated February 18, 2021)”, at <https://www.hawaiianelectric.com/clean-energy-hawaii/integrated-grid-planning/stakeholder-engagement/working-groups/forecast-assumptions-documents>

approach to planning, Uluono hopes the Commission will take note of the updated NREL study Hawaiian Electric has agreed to commission with modifications suggested by Dr. Fripp. While Uluono remains appreciative of Hawaiian Electric’s willingness to collaborate with Uluono on several aspects of IGP, including the recent reform of the Stakeholder Council, we hope Hawaiian Electric becomes acutely aware of the impacts that additional delays will ultimately have on the IGP process.

3. Please explain if the Commission should approve, reject, or modify the IGP inputs and assumptions presented in the First Review Point, and specifically identify any modifications that should be required before approval. Reference: IGP Workplan Update, Exhibit A.1.

Uluono recommends that the Commission modify and/or seek additional information on the following inputs and assumptions provided in Exhibit A.1 prior to approval.

RESOLVE Day Weights, Daily Loads and Sample Days. Uluono is in agreement with the Technical Advisory Panel (“TAP”) on the need for a better understanding of daily load and resource profiles.⁵ Prior to modifying this input/assumption, more information is needed from Hawaiian Electric.⁶ Uluono also recognizes there is a need to plan for the “worst-case” scenario, and recommends that Hawaiian Electric incorporate the most difficult day to the 30 day sample with appropriate weights and re-run RESOLVE.

Resource Cost Forecasts. Uluono remains concerned that Hawaiian Electric continues to use proprietary forecasts for certain resource costs, including PV, Wind and Storage, instead of a widely used, public, benchmarked forecast such as the NREL Annual Technology Baseline (NREL ATB). Hawaiian Electric states the preference for using the IHS Markit Forecasts is related to the (1) data granularity⁷ and

⁵See IGP First Review Point, Exhibit A.3 – Technical Advisory Panel Review at 4. “While not explicitly covered in the presentation, HECO and TAP were in agreement that an important component to the load forecast is a better understanding of daily load profiles. This includes uncertainty in peak demand and potential control of [DER]. The pattern and timing of load, including but not limited to peak demand is important for ensuring enough resources are available for reliability.”

⁶See Exhibit 1 – I&A Discussion Spreadsheet at G1.

⁷See Exhibit 1– I&A Discussion Spreadsheet at A20 – G20. Hawaiian Electric notes that IHS is preferred for several reasons, including, (1) the forecasts are adjusted for Hawaii based on EIA location factors and (2) IHS

(2) resource specific equipment category/cost breakdowns, which provide helpful estimates to determine the costs to pair PV+BESS systems. Upon review, Dr. Fripp acknowledges the usefulness of the additional data, but notes that cost estimates for paired PV+BESS systems could also be achieved by either (1) dividing the NREL ATB forecasts into module and balance of system (inverter) cost based on the current day allocation of the resource costs or (2) requesting the specific data from NREL. More importantly, the use of IHS Markit Forecasts may compromise the accuracy of the overall resource cost forecasts. For example, the IHS Markit forecasts for the cost of utility-scale solar and offshore wind are about 40% lower than the NREL ATB forecast, while the IHS Markit forecasts for residential solar is about 60% higher than the NREL ATB (after 2030).⁸ We understand the desire to use forecasts with a more detailed allocation between solar modules and balance-of-system. However, this feature will have no value if those forecasts introduce large errors in the total resource cost. Additionally, Ulupono does not understand why the September 25 2020 I&A Resource Costs and the February 18 2021 I&A Resource Costs differ from one another. Ulupono recommends Hawaiian Electric adopt the NREL ATB for all resource cost forecasts or explain why they believe IHS Markit is more accurate. If Hawaiian Electric continues to use the IHS Markit forecasts, we also request that they explain why their forecasts differ between the September 25 2020 I&A Resource Costs report and the February 18 2021 I&A workbooks.

Fuel Price Forecasts. Ulupono would prefer that Hawaiian Electric use publicly available fuel forecasts for fuel prices. Although Hawaiian Electric has provided the FGE Brent Forecast (“FGE Forecast”) in the February 18 2021 I&A Workbook, this does not fully remedy our initial concern. As such, Hawaiian Electric should provide a detailed response regarding why the FGE Forecast was chosen over the publicly available AEO Brent Forecast (“AEO Forecast”), and to the extent possible, provide specific reasons why the FGE Forecast is a more accurate forecast than the AEO Forecast. Ulupono stresses the need for a response on this topic, as the FGE Forecast begins 21% below the AEO Forecast in

provides more granular data for specific resource costs, including PV and storage, which provides a breakdown of the development and equipment costs for each resource.

⁸ Ulupono applied tax credits, location-specific costs and inflation to the NREL ATB forecasts when making these comparisons, to make them as comparable as possible to the Hawaiian Electric forecasts.

2021, and ends 40% below the AEO Forecast by 2040. Ulupono remains concerned that if the FGE Forecast is less accurate than the AEO Forecast, its lower prices will bias the RESOLVE results to overly favor thermal generation capacity. It also appears that Hawaiian Electric has had to arbitrarily extend the FGE Forecast beyond 2040, while the AEO Forecast extends to 2050. Hawaiian Electric has reported that they prefer the FGE forecast because it is better suited to forecast the final cost of fuels delivered to Hawaii.⁹ However, this explanation seems to conflate two issues. For the IGP, Hawaiian Electric needs to (1) estimate how fuel costs in Hawaii vary in response to Brent Crude, based on contract terms and historical data, and (2) apply those adjustments to a forecast of future Brent Crude prices. Using the EIA forecast instead of FGE for part (2) of this process will not affect part (1). So we recommend that Hawaiian Electric adopt the widely used AEO Forecast of Brent Crude prices, or else explain why they think the FGE forecast of Brent Crude prices will be more accurate.

Distributed Energy Resources. Ulupono recommends that Hawaiian Electric implement programs that purchase exports from distributed PV systems at a fair price (e.g., the avoided cost from other sources) and allow for RESOLVE to model the uptake of distributed PV on this basis. In addition, the RESOLVE modeling should include the possibility of deploying the full technical potential of distributed PV, not just the amount that Hawaiian Electric has determined is likely to be adopted (economic) under their current tariffs. Ulupono is still seeking clarification from Hawaiian Electric on several other questions related to distributed PV, e.g., how the economic uptake and additional technical potential will be represented in RESOLVE, why the RESOLVE inputs show distributed PV reducing loads only during the day despite the de facto requirement for storage, how hourly profiles were developed for DER, and how degradation of panels is modeled for the full DER portfolio vs. individual sites.¹⁰

⁹See Exhibit 1 – I&A Discussion Spreadsheet at E18.

¹⁰See Exhibit 1 – I&A Discussion Spreadsheet at G6, G13, G27 and G33.

Proposed Grid Services. Modifications for Energy, Energy Reserve Margin, and Inertia.

- i. **Energy.** The February I&A Workbook requires utility scale solar to have exactly four hours of storage. Uluono recommends that RESOLVE be allowed to optimize the amount of storage needed for both stand-alone and paired with Solar PV sites.
- ii. **Energy Reserve Margin.** While Uluono looks to Hawaiian Electric for more detailed responses to our initial questions in Exhibit 1¹¹, Uluono recommends that Hawaiian Electric adopt a reserve margin in later years that is tied to a reliability analysis. Uluono does not believe it is appropriate to assume that a 30% reserve margin will be needed for the system's load based on the assumption of "poor weather days for renewables." Dr. Fripp notes that poor weather days are already addressed by the requirement that RESOLVE and PLEXOS select resources to keep the power system consistently balanced, including a regulating reserve margin. Including the worst-weather day in the RESOLVE optimization will ensure that the system has a least-cost design that provides enough power at all times. Consequently, it is not appropriate to apply an ERM as an additional, arbitrary mechanism to achieve generation adequacy. We recommend that Hawaiian Electric eliminate the ERM calculation and margin. Alternatively, if there are reliability factors that are not addressed adequately by the hourly energy and reserve balancing in RESOLVE and PLEXOS, Hawaiian Electric should demonstrate that using analysis and data, and should use a more targeted calculation to achieve reliability.
- iii. **Inertia.** Uluono recommends that Hawaiian Electric modify their current assumptions for inertia, and assume that batteries and curtailed renewables will be able to provide virtual inertia when needed.¹² Under Hawaiian Electric's current assumptions, it is likely that RESOLVE will be biased and strongly favor large synchronous condensers and thermal generators.

¹¹See Exhibit 1 – I&A Discussion Spreadsheet at A37 to G37.

¹²See [Green Tech Media - 'Solving the Renewable Energy Grid's Inertia Problem'](#), August 7 2020.

- iv. **System Balancing Reserves.** Ulupono also notes that we have not yet received clear explanations from Hawaiian Electric about a number of system-balancing rules that will significantly affect the system design, such as requirements for regulating reserves for renewables, fast frequency response and inertia.¹³ As such, additional review and discussion with Hawaiian Electric is needed before these assumptions can be approved.

NREL Solar and Wind Resource Potential Study. As discussed in Q1, Ulupono is appreciative that Hawaiian Electric has agreed to contract with NREL for an additional “run” using recommendations from Exhibit 2, which include but are not limited to: (1) allowing utility-scale solar on land with slopes below 10%; (2) allowing wind on land with slopes below 20%; allow development on land zoned "Country District"; (3) exclude development on golf courses; (4) use a less restrictive filter for sea level rise, e.g., 2% risk of flood with sea level rise expected by 2050; (5) do not pre-filter land for wind farms based on 6.5 m/s threshold; (6) possibly allow utility-scale solar on patches down to 1 hectare; (7) assume 38 MW per square kilometer for solar arrays consistent with existing projects; and (8) exclude wind in setbacks from roads, buildings and transmission lines. To this end, Ulupono recommends Hawaiian Electric use the updated results as the base case for RESOLVE rather than a sensitivity case as previously discussed. Additionally, Ulupono suggests that Hawaiian Electric also work with the appropriate stakeholders to determine whether the following types of land should be considered for solar or wind development before conducting the new resource study:

- i. Department of Defense lands;
- ii. National Guard lands;
- iii. P-1 Restricted Preservation District;
- iv. Federal Lands (i.e. U.S. Fish & Wildlife Service Lands); and/or
- v. Class B and/or C agricultural land (Land Study Bureau).¹⁴

¹³See Exhibit 1 – I&A Discussion Spreadsheet at G38 to G39.

¹⁴As the likelihood for solar PV development on ag lands increases, the treatment of this assumption in a resource plan is will be very important. Ulupono recommends that assuming zero B & C lands are available for development versus all B & C lands are available may be ok for a sensitivity analysis, but it is likely that there will be a need to

IPP Contract Terms. In the October 2 SEOWG presentation, Hawaiian Electric states that existing Power Purchase Agreements (“PPA”) and Grid Service Purchase Agreements (“GSPA”) are assumed to expire at the end of their current contract term and their capacity is allowed to be reoptimized in RESOLVE. The current contract term Hawaiian Electric assumes for renewable and storage technologies is 20 years. Noting that recent Power Purchase Agreements (“PPAs”) are most often approved for 20 to 25 year terms, Ulupono recommends that Hawaiian Electric assume a 30 year PPA term or consider a lower cost replacement resource to be available at the end of the 20 year contract for an additional five to ten years. This is an important issue as assuming 20-year contracts with full cost replacement needed after 20 years would effectively overstate the cost of solar. Regardless of whether the Commission or the Consumer Advocate prefer shorter term PPAs (20 years vs. 30 years) is a separate issue than what should be assumed for RESOLVE as the model sees costs as absolutes. As such, in order to get accurate costs in RESOLVE, Hawaiian Electric should either assume 30-year contracts as the life of the Solar PV system, or assume 20-25 with 5-10 year extensions (not rebuilds) that will be available at lower costs. Hawaiian Electric is open to this approach.

4. Is it reasonable the way the Company is treating unmanaged and managed electric vehicle charging assumptions? Reference: IGP Workplan Update, pages 5-6.

Similar to the Joint Parties position, Ulupono finds Hawaiian Electric’s approach to be broadly reasonable. Our main concerns are (1) in a high-renewable power system, it is much more valuable to have EVs charge during the day rather than late at night, so Hawaiian Electric should account for that possibility to reduce required investments in grid-connected storage; and (2) there should be some

determine a “most likely” assumption which considers that some level (likely no more than half) of B & C lands can be used for solar. Ulupono notes that there should be no restriction for wind as there is no real impact to the productivity of the agriculture land with wind farms.

feedback between the pricing, programs, and EV adoption. (i.e., if EVs can charge more cheaply at certain times, that should increase adoption of EVs.).

5. Is it appropriate that the Company wait until the next IGP cycle to include energy efficiency, DER, or electrification of transportation tariffs and programs from ongoing commission dockets? Reference: IGP Workplan Update, page 9.

Ulupono recognizes that there is a chicken-and-egg problem with modeling pricing and programs in IGP before they have been defined in other dockets. However, this problem cuts both ways — it is equally as difficult to determine whether ratepayers will benefit from new pricing and programs in other proceedings, unless they are first evaluated in IGP or something identical to it. Therefore, Ulupono recommends the best approach is for IGP modeling to include a best-estimate - not conservative, not status-quo - of the types of services that can be provided from pricing and programs and the cost of obtaining those services. This approach will ensure that the rest of the portfolio is designed correctly around the resources likely to be available and will help to identify the programs worth developing. If Hawaiian Electric is interested, they should also run scenarios where new pricing and programs are omitted, in order to estimate the value of pursuing specific or new programs.

6. Should the Company source solutions via procurements before considering pricing and programs? Should the Company compare solutions sourced through pricing, programs, and procurements simultaneously? Reference: IGP Workplan, page 10, 30.

The referenced sections do not appear to provide an accurate description of how IGP was intended to work. Since the outset of this proceeding, IGP was described as a planning process that took a holistic view of what should be added and what should be retired, rather than preserving the status quo and identify incremental changes from an old starting point. Further, the RESOLVE modeling as currently described does not identify generic services that are needed. It selects among a specific slate of technological options with specific costs in future years, to build a portfolio of resources to keep the system balanced. These choices are co-optimized — e.g., price-responsive demand can reduce the need for storage to complement solar, which in turn could shift the optimal choice away from wind and

towards solar. Therefore, it is apparent that taking options off the table can be expected to alter the plan in favor of the options that are included in the model, and can also lead to a misidentification of the amount of services needed. Ulupono further notes that available technologies should be somewhat tethered to reality (e.g., specific generating and storage technologies). Although it is hard to characterize the demand side on that level of detail yet, it is possible to use a generic representation of the services that could be available rather than being limited to existing tariffs.

7. Would retrospective evaluation of IGP deliverables by the newly formed Stakeholder Technical WG provide benefits commensurate with the additional time spent?

Reference: IGP Workplan Update, page 12.

Ulupono respectfully disagrees with Hawaiian Electric's response to the Commission's guidance provided in Order 37419 regarding the "re-invigorated" Stakeholder Council's review and evaluation of completed IGP deliverables. The mere fact that a restructuring of the Stakeholder Council took place highlights the shortcomings of the previous process and the need for more engagement with stakeholders. Over the last two months, Ulupono believes the restructuring has improved the effectiveness of the Stakeholder Council and is supportive of the Commission's suggestion. However, noting Hawaiian Electric's timeline concerns, Ulupono recommends that the Commission provide a short list of completed IGP deliverables for the Stakeholder Council to prioritize for review and evaluation. To ensure coordination, the Commission should also ask the Stakeholder Council to provide a brief summary of the strategic issues that are currently or soon to be considered by the Stakeholder Council. Providing the Commission with this additional perspective may assist the Commission in the development of the short list. Ulupono also believes (1) the inputs and assumptions addressed in these responses (above), (2) the attached Exhibits, and (3) the new NREL resource plan need to be fully addressed by the Stakeholder Council as well. While Hawaiian Electric is moving in this direction, there is more work to be done that meets the stakeholders' expectations of the IGP process described at the outset of this proceeding,

8. Is [the] response from the Technical Advisory Panel sufficient to provide independent review? Reference: *IGP Workplan Update, Exhibit A.3 (pp. 200-207)*.

This appears to be as good an independent review as the process is likely to receive considering the design of the TAP. This is a very complex process, using cutting-edge tools to address problems that other utilities have not had to face. Although it's likely to be difficult to find experts that are able to take the time to understand the full modeling process. However, given the cutting-edge nature of the problem, Uluono is concerned that the panel is heavy on industry-affiliated members who may to a large extent share traditional views on how the problem should be approached. As such Uluono offers the following experts for consideration: Jesse Jenkins (Princeton), Amol Phadke (LBNL), Max Brown (NREL), Joe DeCarolis (NCSU), Chris Clack (Vibrant Clean Energy), and Jaquelin Cochran (NREL).

III. CONCLUSION

Uluono appreciates this opportunity to submit its comments on the IGP First Review Point.

DATED: Honolulu, Hawai'i, February 25, 2021.

/s/ Murray Clay
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Uluono Initiative LLC

/s/ Gerald A. Sumida
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Exhibit 1 - Assumptions and Inputs Discussion Sheet

[Excel spreadsheet -filed separately]

Exhibit 2 – Review of NREL Solar and Wind Potential Study Update

Review of “Assessment of Wind and Photovoltaic Technical Potential for the Hawaiian Electric Company” by Nick Grue, Katy Waechter, Travis Williams, Jane Lockshin, National Renewable Energy Laboratory, October 1, 2020 (NREL report)

Matthias Fripp

In order to do long-term planning, HECO must identify a most likely scenario of the amount of utility-scale wind and solar capacity that could be developed, and possibly optimistic and pessimistic estimates. This in turn depends on the amount of land available for wind and solar facilities on each island. The NREL report shows many scenarios, but none of them can be considered “most likely”, or even simple optimistic or pessimistic scenarios. Below, we suggest how to develop a main, plausible scenario of available land. In cases where there are open questions about assumptions, they could be set to upper and lower values to create optimistic and pessimistic scenarios. The comments below particularly focus on Oahu, where underestimates of available land could drive HECO toward unnecessarily costly plans. However, they can also apply to other Hawaiian islands.

Solar power on land with slopes below 10%. Some NREL scenarios allow solar development only on land with slopes below 5% or even 3%. Either of these are overly restrictive; as we reported to HECO during the PSIP process in 2016, developers have reported that costs do not rise significantly for slopes up to 10%. Other NREL scenarios allow slopes up to 40%. This is overly permissive. We strongly recommend that HECO develop a scenario where slopes up to 10% can be used for solar development. It would also be helpful to consider slopes up to 20%, applying a higher development cost. If there is not enough land with slopes below 10% to meet requirements on Oahu, then solar on steeper land (slopes between 10 and 20%) is likely to be more cost-effective than other options, primarily biofuels. So omitting medium-slope land will give incorrect results. (Restricting development to slopes below 5% reduces solar potential by 37–60% compared to 10% or 20% thresholds.)

Wind power on land with slopes below 20%. The NREL report includes scenarios with wind development on land with slopes below 20% or below 40%. We recommend using the 20% limit.

Department of Defense Lands. These are allowed for wind and solar development in some NREL scenarios and excluded in others. It would be helpful for HECO to describe the current use of these lands and assess whether they are suitable for wind and solar development. (13% of Oahu land in PV-2-HS scenario)

National Guard Land, Oahu “P-1 Restricted Preservation District” land and “Other Federal Lands”. Wind and solar development are allowed on these lands in all the NREL scenarios. It would be helpful for HECO to describe the current use of these lands and how HECO decided they are suitable for wind and solar development. (35% or more of available land)

Exhibit 2 – Review of NREL Solar and Wind Potential Study Update

U.S. Fish & Wildlife Service Lands. Wind and solar development are not allowed on these lands in any of the NREL scenarios. It would be helpful for HECO to describe the current use of these lands and how HECO decided they are not suitable for wind and solar development.

“Most agricultural areas.” The NREL report states that in all scenarios, wind and solar development are excluded from “most agricultural areas”, but it does not explain what this means. It would be helpful for HECO to explain which areas this refers to and why they were excluded.

Oahu land zoned “Country District.” This is excluded from all NREL scenarios. We recommend including it as an option. (Small effect.)

Golf courses. These are allowed to receive renewable energy development in all NREL scenarios. We recommend excluding them. (Small effect.)

Class A, B and C agricultural land (Land Study Bureau). State law (HRS §205-4.5) currently prohibits any solar development on Class A agricultural land and allows full development of Class B and C land with a special permit. Solar can also cover up to 10% of Class B or C parcels without a special permit. Some NREL scenarios allow full solar development on all three classes and some allow development of 10% on all three. We recommend including all Class B and C land and excluding all Class A land. Alternatively, HECO could hold stakeholder discussions on how to treat all three classes if they believe the State may change this law or if the potential for obtaining permits for Class B or C land is uncertain. (Class A makes up 16% of potential land for solar; Class B and C make up 37%).

Sea level rise. The NREL report indicates that some land is excluded from wind and solar development due to potential sea level rise. This is not explained in the report but appears to exclude all regions that may experience flooding every 500 years if sea level rises 6 feet. We recommend that HECO explain this further and possibly use a less restrictive filter, e.g., areas that have a 2% risk of flood over the next 30 years.

Minimum wind speed. All scenarios exclude wind farm development on land with average wind speeds below 6.5 m/s. The NREL report is intended to focus on technical limits, but this is an economic limit. We recommend that the NREL scenario include potential wind production on all available land, regardless of average wind speed, and then HECO should choose which resources are worthwhile to develop as part of its economic modeling. (The 6.5 m/s filter excludes approximately 60% of available land, but these are low-priority sites.)

Minimum parcel size for solar. The NREL report uses a minimum contiguous size of 10 hectares (25 acres), which can hold 3.5 MW of solar on a single patch. This is reasonable but somewhat conservative, since adjacent patches can be aggregated. (Reduces solar resource by 20%.)

Exhibit 2 – Review of NREL Solar and Wind Potential Study Update

PV array density. The NREL report assumes 32 MW of single-axis tracking solar per square kilometer. This is reasonable, but somewhat conservative. Existing solar arrays in Hawaii hold 38 MW per square kilometer. (Reduces solar resource by 16%.)

Wind setback from roads, buildings and transmission rights-of-way. Some NREL scenarios exclude wind development within 173 meters of roads, buildings and transmission rights-of-way and some do not. We recommend excluding wind from this land.

Other elements. Other elements of the NREL report appear reasonable. These include the modeling of rooftop solar potential and exclusion of national and state parks, wetlands, lava flow areas, flood zones, Important Agricultural Lands, urban areas and tsunami evacuation zones.

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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing ULUPONO INITIATIVE LLC'S COMMENTS OF ULUPONO INITIATIVE LLC ON THE HAWAIIAN ELECTRIC COMPANIES UPDATED INTEGRATED PLANNING WORKPLAN - FIRST REVIEW POINT was duly served upon the following parties electronically to the e-mail addresses below pursuant to HAR § 16-601-21(d), as modified by Order No. 37043 Setting Forth Public Utilities Commission Emergency Filing And Service Procedures Related To COVID-19, filed on March 13, 2020.

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DATED: February 25, 2021, Honolulu, Hawaii.

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