Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – DER Forecast

No.	Stakeholder Question/Comment[2]	Response
5	• Regarding setting exclusion thresholds – "*The addressable market for residential customers included single family and multi-family homes with a maximum of four units that were owner occupied and with a high enough energy consumption to utilize at least a 3 kW PV system.*" How would this threshold change if storage is incorporated as it's expected to be in most new installations? Is this the assumed size for residential customers? If not, what is the assumed system size per customer?	• Document was modified. I&A document updated to address these questions by including a more detailed explanation of why the 3kW PV system size was used to determine the customer use threshold to exclude customers with low consumption. System size assumptions were also added to the document.
6	• How much DER PV and distributed BESS is currently in place on each island? • How much DER PV and distributed BESS does HECO forecast to be added in 2020, 2021 and 2022? • How does this compare to additions in 2018, 2019 and early 2020? • If the forecast is much different from recent experience, why is that so? What is the basis for each of these forecasts?	• I&A Document updated to provide details: As of Jun 30, 2020 the cumulative installed DER PV is as follows: HECO 702MW, HELCO 105MW, MECO 128MW. According to the forecast, HECO incremental installed capacity is approximately as follows: 2021 30MW, 2022 36MW • Near term (2020 through 2022) reflects the current pace of incoming applications and executed agreements, existing program (NEM, NEM+, SIA, CGS, GSP, CSS and ISE) subscription level and caps, feedback from the Companies' program administrators and installers, customer input and any studies or upgrades being done to address short-term hurdles (e.g. circuit study, equipment upgrades) that affect the installation pace. • Longer term are model based. To extend the DER forecast from the short-term through the full planning period, an economic choice model using simple payback considered a set of assumptions such as the installed cost of PV and battery, installation incentives, electricity price, program structure that affect the economic benefit to the customer which is the primary driver of their decision to adopt the system.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Load Forecast

No.	Stakeholder Question/Comment[2]	Response
1	• Consideration should be given to the recent PUC order providing guidance e.g., in regards to how energy efficiency and EVs are considered in the load forecast	• The SEOWG GNA report addresses this issue through proposed sensitivity analyses.
2	• Regarding underlying forecast: "*Multiple methods and models were analyzed to develop the underlying forecast as presented in the July 17, 2019 FAWG meeting.*" Additional information on the stakeholder feedback on these methods and models and how it was incorporated in HECO's decisions in developing the underlying forecast should be clearly stated in this document or a subsequent deliverable that summarizes stakeholder feedback and how it was or was not incorporated and why.	• Stakeholder feedback is referenced where applicable in the I&A document and will be captured in the Stakeholder Engagement Summary report which is in development.
3	• Regarding forecasting residential & commercial sectors: "*The residential and commercial sectors are forecasted separately as each sector's electricity usage has been found to be related to a different set of drivers.*" What are the drivers specific to each customer class? Where are those described, and from what data sources? Please provide a table of data inputs for each customer class that is driving the sales forecast.	• I&A document modified. Appendix C provides a narrative and workbook attachments to the Inputs and Assumptions document have been updated to include this information.

4	• What are the values of the loss factors used to convert loads from the customer level to the system level, as discussed on p. 30? Were these applied only to peak forecasts or also to GWh sales forecasts?	• The loss factor is unique to each island's system and is accounted for in both the sales and peak forecasts. The net-to-system factor used to convert customer sales to system level load is calculated as equal to 1/(1-loss factor). The loss factors are:
		  • Oahu: 4.43%, Hawaii: 6.38%, Maui: 5.17%
		  • Lanai: 4.39%, - Molokai: 9.07%

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Load Forecast

No.	Stakeholder Question/Comment[2]	Response
5	• The sales and peak forecasts reported in Tables 12–21 are also shown in the Oahu Sales and Peak Forecast (EXCEL) file (8/31/20) at https://www.hawaiianelectric.com/clean-energy-hawaii/integrated-grid-planning/stakeholder-engagement/working-groups/forecast-assumptions-documents. That spreadsheet also shows versions of the peak and sales forecasts looking back to 1996. • However, when we compare the "Recorded" values shown in this spreadsheet for 2006–19 to the comparable values that HECO reported on FERC Form 714 for these years, the GWh sales in the spreadsheet are all about 7.5% below the Form 714 data, and the MW sales in the spreadsheet are all about 2.3% below the Form 714 data. Can HECO say why the backcasted version of these forecasts differ from the system load reported to FERC?	• The I&A workbook will provide the load forecast data that will address this comment. • Regarding FERC Form 714, Hawaiian Electric units are reported in gross generation while IPPs are reported in net generation which may cause the data mismatch described in the comment.
6	• Some stakeholders think that a wider range in temperature and other variables should be used.	• Warming trend was further increased following feedback during the breakout session during the August 27, 2019 FAWG meeting.
7	• Are you adjusting your cooling degree days?	• We try to look for relationship between weather and hourly loads. Using the hourly models, we can vary the forecast weather (for example, typical year vs. extremes). Cooling degrees are based on temperature and as we include a warming trend, cooling degree days will also be adjusted.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Electrification of Transportation

No.	Stakeholder Question/Comment[2]	Response
1	• Regarding representative EVs – *"For Lāna'i and Moloka'i, the fuel economy from a predominant electric vehicle represented each island's average*." What are these predominant vehicles?	• For Lāna'i and Moloka'i, the fuel economy from the Nissan Leaf represented each island's average.
2	• National studies show that people who adopt PV are also adopters of EV. Inverters are being built with EV charger compatibility in mind. Permitting is getting more complicated for EV's as higher amperage chargers are requiring higher house BUS. Increasing charging on the grid increases load leading to allowing more PV without curtailment or batteries.	• Model for EV adoption recognizes that there is a correlation between PV and EV adoption. The number of PV systems are included in the Bass Diffusion model.
3	• Why is the assumption that EV charging will occur in the evenings? Is it due to customer behavior? Rate design? No workplace charging during the middle of the day? Are there any assumptions about how rates are going to change over time to modify this EV charging behavior? What about medium and heavy duty vehicles? What are their assumed charging patterns?	• Most of the EVs are personally owned vehicles and assumed to charge at home when it's convenient after coming home from work or school in the evening. The company had pilot time-of-use rates for EV charging however most EV owners did not sign up for the rates. The forecast includes a share of workplace charging however it remains fairly small compared to unmanaged charging. The forecast includes medium size vehicles such as cross overs, SUVs and light duty trucks. Except for buses, which makes up a small share of the EoT, it does not include heavy duty vehicles. The bus charging profiles are based on discussions with operators of bus fleets and assume the commercial electric bus charging facility pilot tariffs would be utilized. A managed charging sensitivity will be evaluated in the planning analysis downstream of the forecast.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Electrification of Transportation

No.	Stakeholder Question/Comment(2)	Response
4	FAWG Panel of Experts were asked to comment on main drivers & barriers for adopting electric vehicles: Barriers for Renewable Fleet Adoption: ➢ Infrastructure for large fleets is not available and the largest barrier to EV adoption. ➢ Lyft utilizes contractors for their services. Many local contractors do not own EV (they are creating a program that would provide contractors with vehicles allowing for the possibility of more EV's. ➢ Electric buses are not close to the economies of scale and are very expensive (decreasing bus ridership creates more forecast uncertainty and hesitation in future investments). ➢ Multi-modal transportation is not as effective in rural areas, which includes much of Hawaii	• Stakeholder discussion provided information that was used to validate assumptions used to develop the forecast.
5	• Does the EV forecast take rental vehicles into consideration?	• Yes, it is included in the commercial fleet.
6	• Regarding EVs on O'ahu – "Why is this such a large number in later years? Is this unmanaged peak contributions? Why is the peak contribution from EVs so high?"	• Although multiple charging profiles are used which include charging during the day, the assumption is that that most EV's are personally owned vehicles that are charged when it is most convenient for the owner resulting in most vehicles being primarily charged during the evening peak. Refer to the January 29, 2020 FAWG meeting slide deck. Developing assumptions for managed EV charging which will allow shifting to off peaks and will be done in the resource planning stage.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Direct Edits & Formatting of I&A Report

No.	Stakeholder Question/Comment[(2)]	Response
1	• An Executive Summary might help make this document more readable. The Executive Summary could be as simple as bullet point statements, with the details explaining the bullet points left in the respective sections.	• Document was modified. High-level bullet points were added listing the assumptions being presented.
2	• Regarding Input Data Sources for the Underlying Forecast Can specific source references be hyperlinked/footnoted? For example, which UHERO data on visitor arrivals was used – was it updated post-COVID data or older?	• Date of the UHERO forecast used in the underlying forecast prior to adjustments for COVID is provided in the tables of drivers in Appendix C of the Inputs and Assumptions document. Appendix C has also been updated to include explanation of COVID adjustments to the forecasts, including the date of the post-COVID UHERO forecast used to inform the COVID adjustments.
3	• Please provide specific references (for Resource Cost Data Sources).	• Links were added for the data from DOE, NREL, and IHS. There is no link for the HECO data, GE data, or Siemens data.
4	• Regarding Distributed Wind: "The capital and fixed O&M source data for distributed wind was provided by the Department of Energy's 2017 Distributed Wind Market Report. The average installed small wind costs were used from the report." Is a 2018 distributed wind report available? If so, why is HECO using legacy reports when updated data are available?	• Document was modified. Footnote was added to state that while there is an updated report in 2018, resource costs for distributed wind were last provided in the 2017 report. Noted the correction to the capital cost and the update to the O&M cost.
5	• Stakeholders suggested clarification and edits to several Figures presented in the I&A report	• Document was modified. Figures were changed to define the axis more clearly, corrected legends and some charts rescaled for clarity.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Resource Cost Forecast

No.	Stakeholder Question/Comment[2]	Response
1	• HECO reports that they applied the annual percent change from the NREL ATB for floating offshore wind in 2033–2050. HECO's nominal offshore wind capital costs fall by 27% from 2033 to 2050. However, in the NREL ATB 2020, floating offshore wind costs in this period fall by about 21% in real dollars, which would be an 11% rise in nominal dollars, assuming 2%/year inflation. Using a similar calculation, in the NREL ATB 2019, floating offshore wind falls by only 15% in nominal dollars in 2033–50. Can you explain why HECO offshore wind costs fall much faster than NREL ATB offshore wind costs? Are there total project price differences in Hawaii compared to US mainland coastal states that have continental shelves or European sites that have basically shallower seas? If so, are those costs higher? What impact would these costs, if higher, have on the offshore wind project development costs?	• The offshore wind costs have been updated to include federal ITC changes passed in December 2020, update to the 2020 NREL ATB, and correct for real $ costs (instead of nominal $ costs) in the source NREL study. • Separately, NREL is working with BOEM and Hawai'i State Energy Office to conduct a Hawai'i specific offshore wind study that will provide more specific costs to use in the resource planning.
2	• Regarding Grid Services RFP – " *Table 65 - O'ahu Variable Renewable, Storage, and Grid Service Resources: Grid Services RFP."* Are these grid services already procured? If so, what accounts for the long timeline?	• The grid services have a partial in service in 2021 and ramp to their full capacity by 2023.
3	• Why is distributed storage modeled as only having two hours of depth? Wouldn't 4–8 hours be more appropriate?	• IHS characterized residential storage as having two hours of depth as part of the resource cost assumptions.
4	• The cost of a 55 MW simple cycle CT in Table 78 is approximately double the cost of a 100 MW CT in the PSIP. Can HECO explain why this is?	• Estimates for both the 153MW combined cycle power plant and the 55MW simple cycle CT included additional plant costs that were based on recent costs incurred by the Company to install similar sized units.

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Resource Cost Forecast

No.	Stakeholder Question/Comment[2]	Response
5	• Why did HECO use IHS Markit for the cost forecasts for the main utility-scale generation and storage technologies, instead of a public source such as the NREL Annual Technology Baseline? The IHS Markit forecast differs significantly from NREL ATB; is there reason to expect it to be better? We have a preference for publicly available data.	• IHS provides much more granular data for the resource costs. For PV this includes breakdowns of the module, inverter, balance of system, installation and development costs for fixed tilt and single axis tracking systems. For storage, similar category breakdowns are provided along with cost streams for multiple duration systems. The category breakdowns are also helpful for estimating cost reductions for co-locating paired PV+BESS systems.
6	• Has HECO consulted with pumped hydro developers, e.g., Pacific Hydro, about the likely cost for pumped hydro storage? We have heard estimates about 20% lower than the ones shown here.	• HECO did not consult with pumped hydro developers in developing the PSH estimate. The PSH costs are based on the 2016 PSIP which used an average of costs from past PSH studies. However, if a need for long duration storage was identified, a PSH developer could bid in to meet that need. The purpose of the grid needs assessment which will use these cost inputs is not to specify specific technologies but rather identify grid needs and allow various technologies to compete to meet those needs.
7	• Regarding *"…upcoming projects that will add storage to the (HECO) resource mix, paired with solar or as a stand-alone resource."* Are these resources assumed to be online in the RESOLVE and PLEXOS models, or is the model allowed to optimize these as potential resources along with other solutions?	• These resources are assumed to be online in the RESOLVE and PLEXOS models by the start of the planning horizon in 2025. These resources are either existing resources that are currently online or have had an application submitted for their approval (Stage 1 and 2 RFP projects).

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Stakeholder Feedback Summary

Selected I&A Stakeholder Feedback – Cost Assumptions

No.	Stakeholder Question/Comment[2]	Response
1	• Regarding IGP Resource Capital Costs Why are all tech costs increasing over time? (Appendix A seems to show costs declining over time.)	• See slides 15 and 16 in this powerpoint deck for the latest capital costs in nominal dollar terms.
2	• Regarding Off Shore Wind – "*The source data for the offshore wind estimate was developed in collaboration with stakeholders.*" What input did stakeholders provide on this assumption and how was it incorporated?	• Stakeholders provided the reference NREL study to use as the basis for offshore wind resource costs.
3	• Regarding BESS – *"Battery Energy Storage - Location Adjustment: The capital costs for balance of system and modules were converted to Hawai'i costs using a 32% EIA factor."* Is this applicable for both distributed and grid scale?	• The location adjustment factors for grid-scale storage were applied to distributed storage due to limited data for location adjustments for residential PV and BESS. We're open to further stakeholder input to modify this assumption as needed.
4	• Tables 32–38 show outage rates for Waiau 3–10, Kahe 1–6, CIP-CT, Airport DSG and Schofield 1–6, H-POWER and Kalaeloa for 2021–2050. Does this mean HECO thinks these plants can stay in service this long? Please specify the capital and O&M expenditure that would be required if each plant is retired in each year between 2021 and 2050 (e.g., What would be required to keep Kahe 5–6 in service until 2030? What would be required to keep them in service until 2040?). Please also provide similar data for plants on other islands.	• Maintaining thermal units that are only getting older is a challenge. The Company is currently looking into the long term economics of maintaining these units but as of now do not have firm numbers.

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Next Steps

- Issue second draft of I&A document
- Issue comment tracker with disposition and response to feedback received
- Any additional comments or questions?