Appendix H:
Comments on Draft IGP Report

1 Comments on Draft IGP Report

Provided in this section is a compilation of comments received from the public, PUC staff and technical advisory panel in response to the Draft Integrated Grid Plan filed on March 31, 2023. We received comments through our website at, https://hawaiipowered.com/igpreport/, through public comments filed in Docket No. 2018-0165 and other comments through email. To notify the public of the Draft Integrated Grid Plan and invite submission of comments, we issued a press release on April 3, 2023 (available at, https://www.hawaiianelectric.com/hawaiian-electric-seeks-public-comment-on-draft-integrated-grid-plan-a-pathway-to-a-clean-energy-future) inviting the public to submit comments through April 21, 2023. We promoted the issuance of the Integrated Grid Plan on social media, and local print and news media also ran stories inviting public comments to the report.[1]

1. Public Comments

Public comments were collected through the Public Utilities Commission's online public comment tool, as well as Hawaiian Electric's online comment form on the IGP viewing website. All comments are weighted equally and Hawaiian Electric does not favor comments from one platform over the other.

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Maui has some of the most sacred, beautiful mountains and valleys in the world. Please do not place anymore wind turbines on Maui. Follow what Kauai has done (no wind turbines) in their successful renewable energy plan. Wind turbines are not only large, loud, eyesores that destroy the beauty of natural landscapes, they are responsible for killing birds, including Nene. Consider renewables like solar panels instead. Mahalo nui loa.	As we recognize the importance of such locations, we'll continue to engage communities and require developers to do so as part of the procurement process in identifying the locations and types of projects. Section 10.4 outlines some of the ways we have ensured that communities mutually benefit from large-scale renewable projects.
1. The plan should include customer incentives for demand side management. Recently, we have been asked on Hawaii Island to curtail electric use on several occasions. Customers have responded to these requests. It would be prudent to formally institute a program by which customers are rewarded for curtailing demand. 2. Incentives to customers for installing/upgrading battery systems should be expanded to ail islands. This would reduce grid demand	We are currently working with the Public Utilities Commission and other stakeholders to develop new programs that will be available on all islands and will provide incentives to customers to bring a battery energy storage system to provide services to the grid. These programs should also help to mitigate calls for conservation on Hawaii Island. We hope to introduce these new programs toward the end of this year.

[1] See for example, https://bigislandnow.com/2023/04/04/hawaiian-electric-seeks-community-comment-on-pathway-to-clean-energy-future/, https://mauinow.com/2023/04/03/hawaiian-electric-seeks-public-comment-on-draft-integrated-grid-plan/, https://www.kitv.com/video/news/hawaiian-electric-wants-the-publics-thoughts-about-its-integrated-grid-plan/video_3dd82b3a-91bf-5e32-8784-ac5e9746d2c9.html, https://www.staradvertiser.com/2023/04/07/editorial/our-view/editorial-heco-plan-needs-input-from-public/, https://www.staradvertiser.com/2023/04/04/hawaii-news/hawaiian-electric-seeks-public-input-on-clean-energy-plan/, https://www.staradvertiser.com/2023/04/19/editorial/island-voices/column-speak-up-now-on-clean-energy-grid-plan/, https://www.bizjournals.com/pacific/inno/stories/news/2023/04/04/hawaiian-electric-seeks-public-comment.html

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and could be instituted quickly and without significant planning/processing.	
I echo the concerns of affordability and reliability. When reading the executive summary, I was have more questions: - How do you build redundancy in the distribution grid? - How do you compensate people for off peak use? - Do you have a way to storage excess energy production? - What is DER? It is a significant part of the renewable energy production. - How do you address off grid production? - How do you address all the nuclear capacity on ships at Pearl Harbor?	-The distribution grid generally is planned such that if one distribution substation fails or is out of service we have sufficient capacity to supply a neighborhood with a neighboring substation. We are in the process of modernizing the grid to provide more flexibility and reliability to the distribution grid. -Currently we have a single rate for energy consumption. However, later this year, we will roll out more options for customers where rates vary based on the time of electricity use, more information is available at: https://www.hawaiianelectric.com/products-and-services/save-energy-and-money/shift-and-save -Yes. We have customer programs to store excess energy production such as Battery Bonus, we also have large-scale battery energy storage projects coming online soon. -DER stands for distributed energy resources and is typically referred to rooftop solar and/or battery energy storage. It could also include energy efficiency, demand response and electric vehicles. -Off-grid homes are not connected to the grid; therefore, we do not plan to serve those loads, we continue to encourage customers to connect to the grid which helps to keep rates affordable for all. -The ships in Pearl Harbor are not interconnected to the grid so they do not impact our planning and operations.
Assuming existing generation sources do not increase the cost of power, these sources must not go offline unless and until the new "green" source of power is online, dependable, and lower's the cost of electricity. The shuttering of the Coal Plant on Oahu is a prime example of poor planning and increasing the cost of power to Hawaii residents. Going renewable is a laudable coal, but making Hawaii electric consumers bear the cost is unacceptable!	Keeping electricity affordable is a main tenet of our Integrated Grid Plan. Currently, we believe that solar, wind and energy storage resources will help to lower cost of electricity relative to fuel oil; however, we do balance new "green" resources with cost and reliability of firm generating resources. In the case of the coal plant, state law mandated its closure by the end of 2022.
1) HECO Stage 3 Maui RFP calls for large utility grade systems to be placed at various locations in Maui. However, the minimum threshold for these projects is fixed at 2.5 MW. This is very high considering paucity of land around existing commercial businesses. 2) All Interconnection Agreements which provide some sort of credit for exported kWh is capped at 100 kW AC. This cap should be eliminated as the export credit is a billing credit and the customer should buy the power at market/retail rate during the billing period from utility to get the benefit from this export credit. 3) Standard Interconnection Agreements do not have a cap presently, but the exported kWh get no credit and thus it is a free source of power to the utility.	We work closely with energy stakeholders and the Public Utilities Commission on providing options for rooftop solar programs to customers. Our Interconnection Agreements and solar programs go through the regulatory process and ultimately approved by the Public Utilities Commission.
I like the idea but do not hear anything on the cost to us current paying our electric bills. Will the bills increase over time while this transition is happening? Will they go down once we no longer use fossil fuel? These are things to consider.	Please see Section 9 of the report. While utility rates may rise in the near-term transition to clean energy, they will be lower and less volatile than if we continue to rely on fossil fuels. Our projections show that customer bills may remain relatively stable and/or flat over the long-term.
First: You use acronyms that are not defined anywhere in the presentation making it difficult to do serious analysis, by the public. Second: You are planning for "Offshore Wind" by 2035 and that technology is suspect of causing negative environmental impacts on the US Mainland East Coast AND the ocean and sub surface structures, currents and ocean patterns have not been studied sufficiently in Hawaiian waters. Our waters are deeper, our currents are stronger and our state is in the middle of a Federal Ocean Preservation Sanctuary.	Please see the Abbreviations and Glossary section at the beginning of the report. While offshore wind is a resource that is part of the plan because of its projected cost and ability to provide high capacity factor energy; the actual projects and technologies will depend on the energy market/procurement process and community engagement. The Integrated Grid Plan is a roadmap and guide and not a definitive plan of actual projects or technologies. We appreciate your concerns with

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Third: Distributed Generation (DG) is not designed or explained in your system yet. I am a big supporter of DG, but the design specifics are critical, and currently HECO looks at roof-top and commercial PPAs for solar and DG as an asset for their benefit, not a private asset that they don't control. Fourth: Your over reliance on Solar/Battery and "Hybrid Wind" Ignore the fact that current prices for raw materials for the manufacture are finite, the costs for those systems are under-represented based on future supply/demand reality. Also missing is the plan for replacement cost or recycling of components at the end of a 20-30 year life expectancy. Fifth: You should be focusing on base-load renewables like geothermal that could be built into your planned sectors and NOT solar or wind that will need tons of permitting, easements and wasting land, and money. Solar and wind should be focused on remote communities and designed as distributed "Community" generation. The former AES Coal Fired plant could become geothermal (IN PLACE!!!) and use the steam turbine and ELECTRICAL INFRASTRUCTURE in place rather than getting new easements, environmental impact studies, etc. Lastly: The assumptions you make regarding transportation ignore hydrogen fuel cell technology, ignore the private sector cost to install chargers, recognize changes in last-mile and mode shift county plans likely to be employed with AI. Most critically, the plan ignores the need to produce aviation fuels and liquid maritime fuels, resulting in Hawaii, once again, importing large amounts of energy in the form of fuel for the military and commercial aviation and shipping (including local commercial fishing operations). Producing aviation fuel alone could add 200 MW to your firm generation requirements. I have lots more, to contribute, but this is a small box.	respect to offshore wind development. Hawaiian Electric's long-term planning to reach 100% renewable energy by 2045 has always assumed multiple technologies would be needed, potentially including offshore wind. We understand there will be many concerns, and any proposed projects will be required to undergo extensive environmental reviews. Community engagement and a thorough analysis of on-shore and offshore impacts will also be required. Please see Section 6 and 11.1. Distributed energy resources are an essential component of our future plans. Our cost projections for solar and wind are sourced from the National Renewable Energy Laboratory Annual Technology Baseline that takes into count various factors for projecting costs into the future. Regarding recycling of clean energy equipment, we address this issue in Section 2.6 of the final report. Please see new Section 6.9.5 for a discussion on future and emerging technology options. We assume electrification of light duty vehicles and electric buses in our Integrated Grid Plan. In future iteration of IGP, we will examine the impact to the electricity sector on economywide decarbonization efforts in other sectors as you mention. Those will potentially lead to significantly higher loads than studied in this iteration of the plan.
Strongly oppose.	Thank you for your time to submit comments.
So...how high are the consumer rate going to increase? Double? Triple?	Please see Section 9 of the report. While we expect utility rates may rise in the near-term transition to clean energy, they will be lower and less volatile than if we continue to rely on fossil fuels. Our projections show that customer bills may remain relatively flat over the long-term.
Why is nuclear not even mentioned? New smaller technology is coming available in this plan's timeline that is similar to the naval nuclear reactors already present in the islands. This would mitigate the land area constraints and provide a carbon free base power solution.	Although small modular nuclear reactors are a promising technology, we did not consider it in our plans at this time because Article XI, Section 8 of the State Constitution prohibits nuclear fission power generation without prior approval by the legislature – "No nuclear fission power plant shall be constructed or radioactive material disposed of in the State without the prior approval by a two-thirds vote in each house of the legislature." Accordingly, nuclear fission generation is not currently included in our plans.
Good day. I recommend you speak to us. We have brought forth new technology ideal for green grid integration. Key Attributes of Genoptic's Smart Solal Panels: Genoptic Solar Tech's division has an integrated panel with multiple design and performance attributes. In comparison with other's systems, there are significant technological innovations of the Genoptic Solar Tech system: Harvesting, housing, converter, and energy storage integrated with every panel. This permits higher efficiency and elimination of most need of a solar specialist, reducing labor cost and time,	Thank you for your comment. Our plan involves issuing competitive procurements for new resources. Through those procurements we seek proposals for developers that identify specific technologies and locations of projects that are evaluated with the potential for a power purchase agreement with the utility subject to Public Utilities Commission approval.

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just two connections and an inverter are required at the electrical panel by a junior electrician further reducing cost and time of installation, improves the efficiency by 18%, and accomplish the energy production in less space, and with fewer panels and less billable goods, and significant cost reduction. integrates batteries (1, 2 or 3) permit incremental and exact energy storage needs to be met. Competitors require additional large purchases to increase storage, whereas Genoptic can provide small incremental low-cost increases in battery capacity to meet need. Technology is integrated to handle load from major appliances such as air conditioners and hot tubs unlike some competitors. This integration extends operational life of the system significantly. Our thermal chamber testing indicates 77% efficiency after 30 years. batteries are bidirectional and permit the system owner (you) to earn an income in net metered markets. operates at maximum efficiency from -30C to +90C. Competitor's lithium batteries require optimal 15C operating temperature. Competitor battery systems are typically warrantied for 10 years. Genoptic's system is expected to have a much longer life expectancy. Much longer life expectancy of batteries significantly reduces long term system cost. the small, lightweight panels can be installed by a single person, instead of a crew, in hours, instead of days, and without craning equipment and further reducing cost. IP 68, FCC and UL Rated. The panel technology incorporates technology from Genoptic's sign division which has the most outdoor LED signs in Canada and boasts a long-term failure rate of just 2% despite extreme Canadian weather. Integrated intelligent software learns and optimizes operation for maximum efficiency. Any system failures generate a repair ticket and the system is designed for easy repair if required. Applicable to commercial, residential, and utility farm scale applications. Genoptic Solar Tech does not require thermal cooling of densely packed batteries of some systems and this improves efficiency and reduces risk of fire dramatically. Integration of componentry eliminates multiple potential failure points. Our system can is applicable to off grid locations, and may be ideal for microgrid and virtual power plant scenarios. We can create a utility, or cooperate with an existing utility with our system management software. We can provide no upfront cost solutions that integrate with your utility. Genoptic LED Inc. Darryl Copeland BSAgEc, BSGeog Business Development Lead C: 403.620.1158 O: 403.726.9260 Email: Darryl@genoptic.com Website: www.genoptic.com Solar Division: www.genopticsolartech.com Head Office: #18- 6000 72 AVE SE Calgary, AB T2C-5C3	

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Look into nuclear plants on the west coast. New ones are smaller and safer. A second area to look into is green hydrogen. The big island should expand its geothermal operations..	Although small modular nuclear reactors are a promising technology, we did not consider it in our plans at this time because Article XI, Section 8 of the State Constitution prohibits nuclear fission power generation without prior approval by the legislature – "No nuclear fission power plant shall be constructed or radioactive material disposed of in the State without the prior approval by a two-thirds vote in each house of the legislature." Accordingly, nuclear fission generation is not currently included in our plans. Green hydrogen is also a promising technology to assist in decarbonizing the State's economy. While hydrogen was not considered in our plans due to the nascent and uncertain market for production, storage, and utilization of green hydrogen, including high costs, we continue to track hydrogen technologies, drivers, and policies. We continue to engage with various stakeholders on the issues and development steps for green hydrogen in Hawaii. We have added a new Section 6.9.5 to discuss future and emerging technology options. We are open to expansion of geothermal and invite prospective developers of geothermal plants to submit bids through our competitive procurements. The next step in the Integrated Grid Planning process is to issue a competitive procurement in 2024.
The IPG states that customers and community participation is essential. HEI is the sole provider of electricity on Oahu and should lead by example. Your Kailua baseyard has had a new roof for over a year. I am still waiting for solar panels to be put up. And why can't HEI put in batteries to supplement the evening usage? If you want community participation, HEI should spearhead getting solar panels installed at competitive rates rather than what the solar companies agreed upon. At $1,000 per panel, the up front cost is too costly in this time of inflation and low wages. Many families have to decide whether to put food on the table and pay the mortgage or spend $20-40,000 for a solar/battery system. As most retirees, I don't need the tax credit and don't have that kind of monies on hand or want to go into more debt! Panels cost about $200 each and a lot of the installation is modular. In speaking with a California battery rep, they are in agreement, that only the solar companies are making money. If it was affordable like split air condition systems, I would see a whole lot more homes with solar systems especially if NEM was reinstated. HEI should ask UH for geothermal, wind and/or water turbine solutions. We have volcanos, wind and ocean currents. Let's see if we can put them to use. We constantly state that we have some of the brightest students. Why don't we tap them for ideas. Who knows, one student might have the world-wide solution but will move to the mainland after graduation. Maybe someone can improve on the solar panels and/or battery storage. With our size, we should be the leader in clean energy! Mahalo.	Hawaii Natural Energy Institute (HNEI) currently serves on our IGP Technical Advisory Panel and Hawaiian Electric personnel continues to engage with researchers at the University of Hawaii on renewable energy and grid technologies. As an example, we interface with researchers at UH's Hawaii Groundwater and Geothermal Resources Center (HGGRC) to further assess geothermal resource characterizations in Hawaii and R&D opportunities. In addition, we interface with HNEI to track ocean wave demonstrations at the U.S. Navy Wave Energy Test Site (WETS) off Marine Corps Base Hawaii, Kaneohe Bay on Oahu.
This is a comment on the IGP, 2.1.4 "Secure Reliability through Diverse Energy Sources and Technologies." The Plan barely addresses the question of how to fill in weather gaps. This is a major issue, even if the entire system never reaches	The plan identifies a firm renewable need to address weather gaps. We analyzed multiple weather years in a probabilistic analysis to determine the needs of the grid (i.e., generation shortfalls) during periods of poor weather. This is discussed in detail in Section 12. Appendix D also discusses system stability issues like inertia, and

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100% renewable. There is either a need for a lot of integrated, on-demand, generation, or, at a minimum, a guaranteed backup for a 100% loss of solar and wind production (a situation which happens at least once every winter). No matter what, HECO on Oahu will need to be able to meet 100% of peak demand, whether it is for an hour or a week. The Plan refers to unknown future firm renewable sources, but doesn't address what these might be. I don't think HE should kick the can down the road by saying it will wait and see what comes up. It is deflective to use that as an excuse for not analyzing the need and potential ways of meeting it within the timeline. In its recent RFP, HE asks for proposals which also guarantee a liquid fuel supply, an obvious requirement. The only liquid that fits the bill is biodiesel. But neat biodiesel is not a renewable fuel that will be able to power the roughly 1,500 KW of on-demand capacity needed in dire weather situations. There is biodiesel "fuel", typically 80% Diesel #2, which doesn't really qualify as "non fossil". And there is "neat" biodiesel, which is 100% produced from waste collection and purpose-grown crops. The ability to run a major power plant on neat biodiesel is still unknown, and I am unable to find one in this country that runs continuously on it. The term "biodiesel capable" is misleading to the public. It mostly applies to truck and other reciprocating diesel engines, and is always defined as 80/20 biodiesel fuel. Although it is true that some reciprocating engines are running on neat biodiesel, the number remain small and often just for backup. If HECO is going to rely on 1,500KW of neat biodiesel backup by 2045, it needs to show an analysis of that part of its Plan now. The public should not be deceived into thinking such exotic fuels such as hydrogen or fusion are going to arrive anytime soon. Beyond the physical ability to burn neat biodiesel is the issue of a reliable supply. This is a significant issue that HE cannot just pass off to would-be suppliers or assume it can consistently source, transport, and store the required amounts to run 1,500KW for a week or more, ad infinitum. The amount which can be produced locally is small and unreliable. Neat biodiesel has already been imported here from South America, a considerable logistical challenge, risking quality of the product landed in Hawaii. Thousands of containers of neat biodiesel would have to arrive in a continuous, uninterruptable chain for biodiesel to be a reliable backup. This scenario does not inspire confidence in the ability of HECO to keep the lights on in our renewable source future. Be that as it may, the future supply of neat biodiesel will certainly rely mostly on growing crops in massive acreage for that purpose, as we do today for the ethanol in gasoline. This practice has been controversial for over a decade in Congress, but the corn ethanol lobby has been able to defeat efforts to stop subsidizing it and mandating its use. The crops for biodiesel production would be soy, canola, and other oil-producing plants, grown, harvested, and refined on a scale well beyond that of ethanol, neither of which have been shown to be carbon-neutral. The likelihood of Hawaii being able to get a commitment of supply in a future biodiesel world is highly unlikely.	promising technology such as grid-forming inverters. As we learn more about inverter-based resources we will adjust our plans to ensure the grid remains stable. Also, to clarify currently our Scofield Generating Station and Airport generators run on 99.9% biodiesel.

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The Plan does not address the need for "spinning generation", as defined in HE's current RFP. My understanding is that this does not relate only to on-demand backup capacity, but also to "grid inertia". The technical requirement for this is beyond me, but I believe there is a minimum requirement for generation by a "spinning machine" to keep a grid powered by inverted resources working properly. This requirement speaks to a need for a renewable fuels capability that runs constantly at some minimal level, and should be explained and forecast. The Plan does not address all future means of supplying firm renewable carbon-neutral power, probably because it is politically incorrect. However, this is at the expense of good planning and an understanding of the real issues of dependability. While it may be that someday we will have a fusion reactor here, or an endless supply of hydrogen, those are probably a century away or longer. If the reality is that at least HECO will be generating consistent power at some minimal level, up to peak demand for an unknown number of days, on fossil fuels, that should be spelled out with rigorous analysis, including the potential to replace those fossil fuels at some point in the future. The Plan states, "By adding many variable, inverter-based resources in various locations, new challenges will arise in ensuring the security of the system." An "inverter-based resource" is a low voltage DC to high voltage AC converter, which is applicable to wind, solar, and batteries. An inverter doesn't create electricity, and batteries are clearly not a utility-scale backup. This is misleading when it comes to system dependability. I do not understand how these things can be represented as "ensuring the security of the system".	
The plan outlined in the draft is intriguing and represents a significant movement towards renewable energy, which is something the planet desperately needs. This plan is one of several at the forefront of the major push towards turning energy green. The involvement of all stakeholders, from the government to homeowners, increases the chances of success for the plan. Additionally, transparency during the plan's development can help make the plan move smoothly with fewer complications in local communities. Encouraging people to install batteries and solar panels on their roofs can help reduce the grid's load during peak energy consumption times, particularly for larger homes that consume substantial amounts of energy throughout the day. However, one crucial aspect not addressed in the draft is what HECO intends to do with the waste produced from renewable energy systems in the future, such as old or unusable solar panels. Proper disposal and recycling methods must be implemented to minimize the environmental impact. Investing in research and development to improve the efficiency and longevity of renewable energy systems can also help reduce waste production in the long run.	We address recycling of clean energy equipment in Section 2.6 of the final report.
<u>Response to Section 2.1.2</u> It is encouraging to see that HECO recognizes the need for a long lead time renewable RFP. Technologies such as offshore wind will require different considerations and procurement processes than HECO's past RFPs, and they are needed to provide the resource diversity and resilience that a 100%-solar portfolio may lack.	1.The plan is to develop a long-term RFP to be issued in 2024 based on the needs identified in the IGP. 2. The 2,114 GWh of generation from the offshore wind was based on a production simulation output. In the simulation, the offshore wind was assumed to have a capacity factor of around 60% for the

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Response to Section 2.2.1 Please clarify the assumptions used to determine the 2,114 GWh of generation. For 400 MW of OSW, this would equate to a net capacity factor of about 60.3%, which is much higher than previous studies have estimated. Since on-site studies of the wind resource are still pending, it may be preferable to assume a range of NCFs from 45-55% and refer to a range or project capacities from 400-500 MW. These combinations could still yield 2,114 GWh/year and may provide more flexible expectations. Response to Section 6.9.1 Please clarify the assumptions used to estimate the CapEx projections for offshore wind. Do cost assumptions include on-shore interconnection or harbor upgrades for construction? Also why does the CapEx for offshore wind increase dramatically between 2035 and 2036. If the increase is related to the end of ITC, is there a similar impact for other technologies? Response to Section 6.9.1 It appears that Figure 6-11 (LCOE projections) is a duplicate of Figure 6-10. Unless we misread, please provide an updated Figure 6-11. Response to Section 8.1 Please clarify why, in the Land-Constrained scenario, less offshore wind capacity (400 MW) is selected relative to the Base scenario (509 MW). To address both the 400 MW and 509 MW scenarios discussed in the report, it may be more accurate to refer to range like, "approximately 400-500 MW" of OSW, where it makes sense to do so. Response to Section 8.2.2 The capacity of OSW that provides the lowest LCOE will depend on several factors, including the maximum single point of failure, capacity at the POI, the need for system upgrades. To address both the 400 MW and 509 MW scenarios discussed in the report, it may be more accurate to refer to range like, "approximately 400-500 MW" of OSW. Response to Section 11.2.3 It is encouraging to see that HECO is aware of the unique challenges of long-term resource solicitation and procurement. Firm pricing, site control, technical details, RFP schedules, and PPA terms are all important items that require tailored consideration for long-term resources such as offshore wind.	east side of O'ahu. This was based on data provided by NREL in their offshore wind study (see, page 60 of the PDF, page 48 of the report at https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/environmental-science/BOEM-2021-070.pdf). Ultimately proposals submitted by developers in the procurements will help to flush out differences in uncertain assumptions and the market. 3. The CapEx includes expenses for turbine, development, engineering & management, substructure and foundation, port and staging, array cable costs, interconnection costs, assembly and installation, and plant decommissioning. See page 45 of the above referenced report. The increase in cost in 2036 is due to the end of the ITC. Onshore Wind and Grid Scale PV also have a slight increase in their capital cost due to reductions in their ITC. 4. This figure was inadvertently a duplicate and has been updated to the correct graph. 5. In the Land Constrained scenario, it was assumed that the Offshore Wind would be limited to 400MW based on stakeholder feedback. There was no limit enforced in RESOLVE in the Base case. 6. Report revised to reflect 400-500 MW range. 7. See response to item #1
The power grid needs to have firm sources of power in order to assure the reliability of uninterrupted power. There are only a few ways to provide for firm power, namely, fossil fuels, biomass, and nuclear. Battery backup has a limited amount of power. The total cost of going to 100% renewable will bankrupt this State.	We believe that the grid will need firm renewable sources of power. We have examined this issue in detail in Section 12 of the report.
Hawaii is one of the best places in the world to use Wave Energy, a clean, CONSTANT, reliable renewable energy. Wave Energy Converters are already testing at the WETS off-shore of Marine Corps Base Hawaii in Kaneohe. This technology must be included in Hawaiian Electric's Draft Integrated Grid Plan. Due to NOAA satellites, Wave Energy can be tracked and forecasted, making it possible for the utility to make adjustments during the scant times the resource becomes unavailable. Thus Wave Energy is determined to be a "constant power source".	We support all forms of renewable energy. We encourage any technology that has a bon-a-fide proposal to participate in requests for proposals for new generation. While the Plan outlines certain technologies, the actual technologies and locations that will interconnect to the grid will be based on the market (and developers) submitting proposals through our requests for proposals that compete against other technologies on price and non-price factors. Please note that a threshold requirement in our requests for proposals is that a proposed technology must have successfully reached commercial operations in commercial applications (i.e., a power purchase agreement) at the scale being proposed. This is to

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	ensure that the technology proposed is viable and can reasonably be relied upon to meet the objectives of the request for proposals. Please also see Section 6.9.5 for a discussion on future and emerging technology options.
The current "Going Green Plan" will be a disaster for Hawaii. Just one example would be the destruction of proposed Wind Farms by a Hurricane. Not to mention when the destroyed parts make landfall. Solar blanketing potential agricultural land is another collateral damage disaster. There are other promising developments like modular nuclear and hydrogen fuel that would work for the islands. Carbon dioxide is not going the threaten the human race. The levels during the Jurassic period when life forms were so robust that their remnants became the carbon energy sources so plentiful in America today. Let's slow down, take a breath and use our logic to solve the problem.	We acknowledge that emerging technologies, such as green hydrogen, are promising technologies to decarbonize Hawaii's energy sector and economy. Therefore, we continue to assess the various issues, both technical and policy-related, and market readiness of emerging firm generation technologies. We have added a new Section 6.9.5 to discuss future and emerging technology options.
Every day we're reading about our challenges in renewable energy, reducing food imports supporting local farmers, challenges reducing fossil fuels, our carbon footprint, water usage and land for residential housing. One solution is enforcing double usage for every acre of agriculture and solar farming. It is called "AGRIVOLTAIC." Like Kaiser clinics with rooftop solar in their parking lots (double usage), agrivoltaic is the same concept. Combining land usage for ag and solar power, freeing up land for housing. Agrivoltaic's partial solar panel 'shade' reduces water consumption from excessive open farming water evaporation. Plants grown under panels draw moisture up that cool solar panels, increasing power generation vs overheated panels. Partial panel-shade result in leafy plants to search out sunshine, extending size of leaves (researched on cabbage) increasing production. Solar and Ag farmers can share land lease, reducing their lease costs, adding to their profits, perhaps taxed more to pay for costs elevating existing solar farm panels so farmers have room to grow taller vegetables besides low lying leafy vegetables. Low lying solar farms continue to pop up on ag land all over Oahu. Our State's challenges in power, land, water, food, reducing imports (carbon footprint) must be reduced by mandatory double usage of land for energy and agriculture. Agrivoltaic is being applied worldwide and UH has been actively doing research on agrivoltaic's benefits to Hawaii as well. Current solar farms need to be transitioned to Agrivoltaic farming. Immediate action is a 'must.' Let's have less talk and more action now.	We recognize the issue of limited land availability in Hawaii and the competition of this land for energy, agriculture, housing, and other end uses. While not all solar and wind projects are built on ag land, we are in favor of multiple uses of ag land where applicable to provide the highest value to our customers. Also, we encourage the use of brownfield lands for renewable energy projects in our RFPs. Regarding agrivoltaics, we encourage this type of dual use applications. In fact, the charitable foundation of our parent company, HEI, awarded a $25,000 grant in 2021 on behalf of Hawaiian Electric to the Hawaii Agriculture Research Center (HARC) to help fund HARC's "Agrivoltaic R&D Center" to conduct research that supports synergistic development of agriculture (soil and hydroponic crops) and solar generation on the same land. This center, located at the Clearway Mililani Solar I project site, works with hydroponics and crops and ground covers between and under the panels to find solutions that benefit both the agriculture and solar industries.
In the 2022-2023 Sustainability Report, under "Adding Renewables," it was stated that HECO launched a request for proposals for "firm" renewable resources such as geothermal or biofuel to guarantee predictable quantities of said resources. With the Campbell Industrial Park generating station producing biofuel in Oahu and geothermal resources on Hawaii Island from Puna Geothermal Venture, what other options are you hoping to pursue in terms of "reliability"? As oil prices hit a high in 2022, what other alternatives have been considered in order to make energy more economically accessible and less environmentally hurtful to residents of Hawaii? With 113 MW of oil generated at Campbell	The current request for proposals ("Stage 3 RFP") will allow us to test the market for firm renewable options to ensure generation reliability. We are open to all forms of viable renewable options subject to the guidelines of our requests for proposals. The Integrated Grid Plan outlines the resources and grid infrastructure (i.e. transmission and distribution) that is needed to integrate renewables and scale for growing population, housing and electrification of transportation.

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Industrial Park and a contract capacity to access 38 MW from PGV and Palailai Solar farm produces 3 MW of power, although not as ample as solar farms, these seem like dependable resources. How would alternative resources be distributed to and shared by customers on other islands without manufacturing plants? After the 1990 multi-year research project concluded that transmitting geothermal electricity from Big Island across Hawaii was feasible but at great environmental impacts, how do you suggest we share these resources? As Oahu is the most densely and largely populated island in Hawaii, do you have a target goal to raise the percentage of populous and infrastructure relying on renewable energy rather than fossil fuels?	
I strongly oppose the implementation of HECO's IGP. I believe this plan will leave Oahu vulnerable to power outages and also cause significant damage to our environment. The plan MUST incorporate the use of fossil fuel or nuclear energy as a base load and backup for renewables.	The Integrated Grid Plan identifies pathways to achieve the state mandated 100% renewable energy goal. Section 9 also demonstrates that remaining on fossil fuel may ultimately be more expensive than transitioning to 100% renewable energy.
Put a nuclear power plant on Kahoolawe. We will not meet the 2045 goal otherwise..	Although small modular nuclear reactors are a promising technology, we did not consider it in our plans at this time because Article XI, Section 8 of the State Constitution prohibits nuclear fission power generation without prior approval by the legislature – "No nuclear fission power plant shall be constructed or radioactive material disposed of in the State without the prior approval by a two-thirds vote in each house of the legislature." Accordingly, nuclear fission generation is not currently included in our plans.
Hawaii will not be able to be 100% on renewable energy as we are an island with very limited resources. Wind and sun are not fully sustainable for HECO to be able to supply the entire island. Let's be honest, nature does not belong to HECO but will somehow make a profit from it. The residents of Oahu and businesses will end up paying for IGP when we least can afford for one company to make a profit from us. Renewable energy would be great if we had it, but look around we DON'T. Our legislators need to use Wisdom and Knowledge as our Lord did in creating the Universe. Jpf	As a point of clarification, Hawaiian Electric does not profit from power purchase agreements (contracts) that it signs with independent power producers to provide wind and solar energy. The cost of the energy paid to independent power producers is passed through to customers without any "markup" or "profit" by the utility.
The integrated Grid Plan talks about creating a clean energy grid by resources from Hawaii for Hawaii by 2045, however very little of Hawaii's own resources are projected to be harnessed by 2045. Today, 4.4% of the grid's electricity comes from solar and it is projected to rise to 50.1% by 2030 – just 7 years from now. Another major change is having 17.7% electricity from offshore wind farms. I think solar generation for the smaller scale needs such as homes and communities are a great resource, although it is not truly a resource from Hawaii. However, I do not think offshore wind farms are a good resource moving into the future. They are a massive undertaking, both financially and physically. They are also subject to expensive, dangerous maintenance and repair operations. Offshore wind puts not only marine life in danger, but it can also change the face of the seabed and can potentially change migration patterns of birds. While an offshore wind turbine might pay for itself after a year, it is estimated to only last around 19 years after that. Then they must be replaced; many used wind blades from onshore wind turbines have already been laying around in various places around Hawai'I collecting dust and not being recycled, so how would this be any different? Hawaiian Electric should look closer into wave powered technology which has a significantly smaller footprint than wind turbines. For example, the Wave Energy Company is piloting a program at the port of L.A. for their Eco Wave Power. It has already been	We appreciate your concerns with respect to offshore wind development. Hawaiian Electric's long-term planning to reach 100% renewable energy by 2045 has always assumed multiple technologies would be needed, potentially including offshore wind. We understand there will be many concerns, and any proposed projects will be required to undergo extensive environmental reviews. Community engagement and a thorough analysis of on-shore and offshore impacts will also be required. We are open to new and other technologies such as wave energy. If these technologies are commercially viable and can be done at scale we encourage these projects to participate in future request for proposals to be part of our renewable energy portfolio.

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successfully used in other places around the world and could be an asset for Hawaii since the Islands are surrounded by water.	
This is why wind turbines at sea is a bad idea. We are going to lose billions like the light rail. Do''t do it. AdChoices Popular Mechanics Popular Mechanics Giant Wind Turbines Keep Mysteriously Falling Over. This Should''t Be Happening. Turbine failures are on the uptick across the world, sometimes with blades falling off or even full turbine collapses. A recent report says production issues may be to blame for the mysterious increase in failures. Turbines are growing larger as quality control plans get smaller. The taller the wind turbine, the harder they fall. And they sure are falling. Wind turbine failures are on the uptick, from Oklahoma to Sweden and Colorado to Germany, with all three of the major manufacturers admitting that the race to create bigger turbines has invited manufacturing issues, according to a report from Bloomberg. Multiple turbines that are taller than 750 feet are collapsing across the world, with the tallest—784 feet in stature—falling in Germany in September 2021. To put it in perspective, those turbines are taller than both the Space Needle in Seattle and the Washington Monument in Washington, D.C. Even smaller turbines that recently took a tumble in Oklahoma, Wisconsin, Wales, and Colorado were about the height of the Statue of Liberty. Turbines are falling for the three largest players in the industry: General Electric, Vestas, and Siemens Gamesa. Why? "It takes time to stabilize production and quality on these new products," Larry Culp, GE CEO, said last October on an earning call, according to Bloomberg. "Rapid innovation strains manufacturing and the broader supply chain." Without industrywide data chronicling the rise—and now fall—of turbines, we're relying on industry experts to note the flaws in the wind farming. "We're seeing these failures happening in a shorter time frame on the new turbines," Fraser McLachlan, CEO of insurer gCube Underwriting, told Bloomberg, "and that's quite concerning." The push to produce bigger wind-grabbing turbines has sped production of the growing apparatuses. Bloomberg reports that Siemens has endured quality control issues on a new design, Vestas has seen project delays and quality challenges, and GE has seen an uptick in warranty costs and repairs. And this all comes along with uncertain supply chain issues and fluctuating material pricing.	We appreciate your concerns with respect to wind development. Hawaiian Electric's long-term planning to reach 100% renewable energy by 2045 has always assumed multiple technologies would be needed, potentially including offshore wind. We understand there will be many concerns, and proposed projects of any technology will be required to undergo extensive environmental reviews as appropriate. Community engagement and a thorough analysis of on-shore impacts will also be required. In terms of performance of renewable projects, contracts we sign with producers of wind energy have strict performance standards and requirements and protect customers from deficiencies in performance. While our current agreements with Independent Power Producers do not address disposal of clean energy materials directly, it requires that the seller of energy, upon termination of their power purchase agreement with the Company, to remove the Company-Owned Interconnection Facilities and developer-owned interconnection facilities, if requested by the Company. The Company may not require removal if such facilities are needed to serve other system requirements.

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With heights stretching taller than 850 feet, blades 300 feet long, and energy generation abilities ratcheting up accordingly, the bigger the turbine, the more energy it can capture. But the bigger the turbine, the more that can go wrong—and the farther it falls.	
This plan will increase the utility cost to the consumer. Taxpayers are having a difficulty paying its monthly bills for everything. I oppose this plan.	We are very cognizant to keep electricity affordable for all customers. We are exploring options and solutions for low and moderate income customers through an Energy Equity proceeding with the Public Utilities Commission. More information to participate in this proceeding can be found at: https://puc.hawaii.gov/energy/equity/ As outlined in Section 9, we also believe the Integrated Grid Plan would result in lower energy rates compared to the status quo of remaining on fossil fuel generation.
I vote NO on this plan, it makes no sense and the cost will be passed on to the consumers. I have already seen an increase in my bill since the coal plant closed, and I have a solar system on my roof. There has got to be a better way	We have several renewable projects in the pipeline that are lower in cost compared to the current cost of oil. We are focused on bringing those projects online as quickly as possible to provide some electric rate relief to customers. Please see Section 9 of the report. While we expect utility rates may rise in the near-term transition to clean energy, the new projects will help to keep rates lower and less volatile than if we continue to rely on fossil fuels.
1. The 2015 Legislature passed a law mandating that 100% of our electricity come from renewable resources by 2045. 2. Hawaiian Electric Company spent many years and decided that our electrical grid had to be improved to make it reliable. 3. Where are our state government "common sense" leaders? They decided to make a law mandating the state to accomplish this "dream". 4. Every smart citizen in our state knows that weather is unpredictable and cannot provide a reliable source of energy for making electricity yet our elected representatives passed a law to make Hawaiian Electric Company accomplish this requirement. 5. Paragraph 2.1.4 of the Draft Report states that an entire electrical system cannot be dependent on weather generating sources. An entire new clean energy source needs to be found to provide energy for making electricity. Our elected leaders are the laugh of the nation, because of their decision to mandate 100% renewable electricity for our state even though we (the ordinary citizens) know there is no technology that can do it now. 6. Why didn't our experts tell our elected representatives that we don't have any idea where we can get 100% of our electricity from renewable resources? 7. The draft report listed the dates when our fossil fuel generators will be put out of service. There is no mention, in the draft report, about how Hawaiian Electric will provide backup electrical power when all of our PV panels are destroyed by storms or war and there are no generators to provide electricity. 8. The hardening of our electrical grid, as presented in the draft report, is like building the cart before getting the horse. The grid will survive but there will be no electric source. 9. Nuclear power plants have been installed in our US Navy ships for many years and should be considered on source of power to make our electricity but the current law mandating 100% renewable energy must be repealed. Opponents to using nuclear power and fossil fuels must provide solutions instead of just complaining.	Section 7.4 discusses solar and wind plant resilience with respect to floods and sea level rise. Further evaluation in the future could include an assessment of independent power producer PV and Wind plant resilience with respect to other threats such as wind. We have acknowledged this in Section 7.4. We will also continue to evaluate ways to improve our generation reliability analyses to include extreme events as described in this comment. As future renewable technologies (i.e., "reliable source") become available we can include those in future analyses.

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10. Fossil fuels and men are essential for our armed forces to win wars. We need fossil fuel generators to back up our electrical system when our power grids are damaged. 11. Wind turbines should not be installed in the ocean because they can easily be damaged and difficult to repair while in ocean. Maintenance costs must be considered when picking any energy source for our electricity. 12. If a reliable energy source is found, I suggest that electrical cables be installed connecting all of our islands whereby another islands electrical system can provide some electricity to another island if needed.	
I feel that implementing this program is a great idea, but I could not find anything about the disposal of equipment after it's lifecycle has expired. Solar panels have a 20-30 year lifespan. What is the plan to dispose of the 27,000 acres of solar panels, plus all the rooftop solar panels needed to power Oahu? I also noticed the use of biofuels could consume as much as 10% of the power on Oahu if land is constrained. Bio fuels are renewable fuels that are made from plant matter. These types of fuel still provide carbon emissions when burned. What will the impact be from these carbon emissions? I understand carbon emissions will be reduced by 50% when using bio fuels compared to fossil fuels. Will that be enough to make a direct impact on climate change? I like the concept of having these bio fuel plants to provide firm generation of electricity when environmental and weather issues affect solar and wind generated power production. I can see firm power generation being used pretty heavily during times of no sunshine for weeks on end like it is in upper Puna district during the winter months. I also like the idea of having multiple facets of power generation. Has offshore wave powered generation been looked at as an option? eia.gov estimates that 64% of the United states power generation could come from waves. The power generation from waves around the islands could possibly produce a large amount of the power needs for the islands. I think this avenue of approach should be considered if it has not already been researched. I noticed you want to fortify the grid to allow charging stations at the workplace and at home. Who pays for the charging of cars and how would the price compare to the use of fossil fuel vehicles? What happens when there is not enough charging spaces to charge vehicles in a timely manner? I have seen lines for charging stations in California with 15 cars waiting in line for hours to charge their vehicles. Also have you thought of placing solar panels as parking lot roofs? I am not sure how many acres of parking lot space is available but that could be land that could serve a dual purpose of power generation and parking. The shade would be greatly appreciated for smoldering hot car interiors.	We address disposal of clean energy equipment in Section 2.6 of the final report. We understand that the referenced EIA statistic represents the theoretical annual energy production of waves off the coasts of the U.S. The actual potential for wave energy in Hawaii will be dependent on the pace and scale of wave technology development (currently at the demonstrate stage) and availability of suitable project sites, including factors such as the wave resource available at the sites and ability of wave energy project developers to secure applicable permits and interconnection approvals. We are open to new and other technologies such as wave energy. If these technologies are commercially viable and can be done at scale we encourage these projects to participate in future request for proposals to be part of our renewable energy portfolio. Under most circumstances, electric vehicle (EV) drivers are responsible for paying to charge their vehicles. The fuel cost per mile for an EV relative to the fuel cost per mile for an internal combustion engine (ICE) vehicle depends on many factors, including the price of electricity, the price of gasoline, and each vehicle's fuel efficiency. As a useful reference, the Idaho National Laboratory's Advanced Vehicle Testing Activity offers a chart (https://avt.inl.gov/sites/default/files/pdf/fsev/costs.pdf) comparing the energy costs per mile for electric and ICE vehicles. While many EV drivers choose to charge at home, others rely heavily on public charging infrastructure to support their charging. For the latter group, there may be times where the available public chargers are either in use, under repair, or simply not available. In those instances, drivers typically wait for a charging station to become available, or travel to another nearby station. As a best practice, drivers are encouraged to charge their vehicles whenever, and wherever they find an available charger – even if their battery is not depleted. By charging opportunistically, drivers can minimize the likelihood of finding themselves desperately in need of a charger in case one is not immediately available.
Your plan to go so called 'completely green' is ill founded and devoid of any scientific merit. The Earth has gone through an untold eras of heating & cooling off; it will continue to do so. Tell me how many degrees that the climate will cool by from your actions of ridding fossil fuels in Hawaii; for that matter in all the US. Fact is you can't. Plans to rush in with poorly thought out solutions is a joke.	Our plans are guided by the state mandated goal to achieve 100% renewable energy by 2045, and the state target to achieve 50% carbon reduction by 2030 and net negative carbon reduction by 2045 across the entire economy. We believe that the Integrated Grid Plan could achieve those goals at lower cost compared to alternatives. The Integrated Grid Plan is also a flexible roadmap that we can adjust as circumstances change.

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I suggest you wake up to the realities. All that you your plan is set out to do will be far reaching economic damage and imperil our once great country… this while the rest of the world continues to build coal fire plants and the like. Hi our playing with fire	
Aloha, Every year before hurricane season our leaders say we should prepare for the worst and hope for the best. Converting our grid to only wind and solar will leave us terribly vulnerable in the event of a hurricane. And if china cant or refuses to sell us more panels to rebuild the grid think of the negative repercussions we are intentionally subjecting ourselves to. We closed the coal plant which supplied about 18% of our electricity. Can anyone tell us what measurable impact it had on our climate? It might feel good but it accomplished absolutely nothing. Think also how you are going to charge all the cars for the condo owners on the island. Will it be by appointment only? what if someone doesn't remove their car on time. Who settles that dispute? Can the grid actually supply the energy to charge the cars at night when people are home in addition to the existing power needs? What is the plan to dispose of solar panels when they need replaced? and the EV batteries for cars when they expire after 5+ years. where are we going to put them? It appears this forced change will put us into a worse experiment than the $3.5 billion train fiasco we have been going through for the past 15 year–- only worse. It's another case of Ready, fire, aim..""There are too many questions to answer before we proceed but some politicians are hell bent on telling us they did something even though it doesn't and can't work with the existing information. It would be better to think nuclear than solar at this time.	A key part of our plan reflects that we cannot solely rely upon wind and solar resources. We must take advantage of energy storage resources and firm generation in order to ensure reliability. This is outlined in Section 12 of the report. We also recognize that we will need more generating resources to ensure that we are able to charge all of the electric vehicles we expect customers will adopt in the next 20 years, and have evaluated those scenarios in our report; for example the high load scenario. We also plan to introduce electric rates that encourage customers to charge their vehicles during times when the grid is not stressed (i.e., during the daytime when there is an abundance of solar available.). We address disposal of clean energy equipment in Section 2.6 of the final report. Although small modular nuclear reactors are a promising technology, we did not consider it in our plans at this time because Article XI, Section 8 of the State Constitution prohibits nuclear fission power generation without prior approval by the legislature – "No nuclear fission power plant shall be constructed or radioactive material disposed of in the State without the prior approval by a two-thirds vote in each house of the legislature." Accordingly, nuclear fission generation is not currently included in our plans.
Achieving 100% dependence on renewables is unrealistic and guarantees that we will experience interrupted power. Wind farms are a blight on the environment and kill birds, there isn't enough land for solar without covering the whole island, and battery technology is too expensive. Stick with a mix of fossil fuel with some solar and biomass.	Our plan outlines a mix of diverse resources to ensure that we are not dependent on a single source like wind or solar. We recognize a diverse portfolio will include forms of firm generation to ensure reliability. We acknowledge the sensitivities to wind turbines and have set up processes within our procurements and with our developers to continue to engage communities prior to development of any future projects.
The climate on earth has been changing in cycles for billions of years. we know of 5 ice ages with the internal combustion engine and the populace and animals do better in the warm cycles. CO2 levels have been higher and lower than they are now. CO2 is essential for plants to grow and give us oxygen to breathe. In the many books I have read o this the last CO2 level from Mauna Kea was 444 parts per million which is satisfactory. Should the level decrease to around 150 parts per million all plant life on earth dies! If you look around your house an office you would be hard pressed to find items not made from oil in some form. Furniture, computers, phones, furniture, articles in your car, clothing, printers, glasses, etc. Let's not jump the gun and get us in a rut again like we did with the train. One big storm here and we are in big trouble.	We are actively working to make the grid more resilient. We have outlines our initial plans to adapt the climate change and harden the grid in Section 7 of the report.
RESPONSE TO THE HECO INTEGRATED GRID PLAN March 2023	We are guided by state policies such as state mandates for the electric utility to achieve 100% renewable energy by 2045 along with a statewide goal for the entire economy to achieve net negative carbon emissions by 2045. However, notwithstanding those policy

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The basic concern with the plan is the overall assumption that a carbon-less electrical generation system is the scientifically appropriate policy goal for Hawaii to combat changes in our climate. Hawaii needs to take a closer look at and analysis of the science that led to this assumption. This document will highlight some of the facts relative to this issue and will then discuss each in more detail. It will end with recommendations for HECO and the State of Hawaii to consider. What we know today: 1. Average global temperatures (AGT) have been slowly rising, more noticeably since the start of our industrial revolution. The rise has been decreasing in the last 2 decades. 2. The concentration of carbon dioxide (CO2) in the atmosphere has been rising steadily during the same period at a relatively constant rate. 3. While there have been periods of some correlation between the AGT and CO2, data and actual observations have not indicated any causal relationship--changes in CO2 that cause a predictable and similar change in AGT. 4. Catastrophic predictions based on the output of climate models have not occurred. 5. Discussions criticizing the use of fossil fuels have focused almost entirely on the emission of CO2 into the atmosphere and have ignored the benefits that the use of fossil fuels have provided humanity. Rising Global Temperatures 1. Global temperatures are increasing, but because of many different causes: natural variations in earth's orbit around the sun, changes in solar and cosmic radiation reaching the earth, volcanic eruptions, ocean temperature variations (some caused by extremes like El Nino and La Nina), and changes in the concentrations of greenhouse gases in the atmosphere. 2. Water vapor (H2O) is the primary greenhouse gas (absorbs infrared radiation emitted by the earth towards space and retransmits some of it into space and some back towards earth). Water vapor is the primary greenhouse gas and represents 1-5% of our atmosphere. a. There is approximately 100 times more H2O in the atmosphere than CO2. Carbon dioxide is, basically, a trace atmospheric gas. The amount of methane, another greenhouse gas, in the atmosphere, is even smaller. b. The greenhouse effect is essential to life on Earth. Without it, our average temperature on earth would approximate -18oC (-0.4oF). 3. Changes in the greenhouse effect caused by variations in CO2 concentrations are relatively insignificant and immeasurable when compared to it's natural, cyclical variations. 4. The gradual warming of the earth over the last few centuries is natural. Geologically, we are still recovering from a mini ice age and temperatures are supposed to increase. Rising concentrations of Carbon Dioxide in the atmosphere 1. Concentrations of CO2 have been rising steadily, more so after the industrial revolution.	goals, our Integrated Grid Plan demonstrates that using other forms of generating resources, such as, wind, solar, battery energy storage, and firm generation, can make electricity more affordable for customers compared to the Status Quo of relying on imported fossil fuel. In Section 12, we assess the risks of relying on only solar and wind resources and show that other forms of generation will be needed such as firm renewable sources.

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2. There are a number of reasons for the rise, only one of the many is CO2 emissions resulting from human activity, i.e., the burning of fossil fuels. 3. Properties of Carbon Dioxide a. CO2 represents less than .04% of the total atmosphere or about 450ppm (parts per million) --97% is natural and 3% due to human activity. b. Hawaii's CO2 emissions are 0.4% of US emissions and less than 0.1% of the world's emissions. c. HI's emissions impact less than 1% of temperature variations—insignificant when looking at the global temperature variations that occur naturally. d. Water vapor, not CO2, is the major greenhouse gas. The impact of water vaper is many times greater than the impact of carbon dioxide. e. CO2 is not a pollutant—it is the building block for plants and, indirectly, becomes food for animals as well. If global CO2 concentrations fall to about 150ppm or 0.02%, plants will not be able to survive. f. Some of the benefits of increased CO2 in our atmosphere that we have already witnessed are greater plant growth, increased agricultural productivity and food supplies, and less human deaths attributed to climate (more people die from cold rather than hot weather). Correlation/Causation between AGT and CO2 Concentrations 1. Changes in the CO2 concentrations in the atmosphere will have an insignificant and almost unmeasurable effect on our global temperature and on changes to our climate. 2. Lots of data available today verify that while concentrations of CO2 have been steadily rising since the start of the industrial revolution, there has not been a similarly consistent rise in global temperatures. a. If we go further back in time, there are many periods where there is little correlation between carbon dioxide concentrations and global temperatures. b. Also visible in that data is what is called the "lag in CO2 concentrations"—many periods show that increases in carbon dioxide follow increases in temperature, not the other way around. 3. Bottom line: while there have been periods in history when the rises in AGT and CO2 have seemingly increased together, those periods of correlation do not indicate causation. There is no evidence that changes in CO2 concentration cause a corresponding change in global temperatures. Predictions of Catastrophic Events due to CO2 -Driven Climate Changes 1. Over at least the past 2-3 decades, many individuals and organizations have predicted catastrophic events—species extinction, increases in tropical cyclones (hurricanes, typhoons, willy willies), massive rises in sea levels, etc. None have occurred that can be correlated to CO2 concentrations using real data and observations. 2. Essentially all of the predictions are based on the output from computerized climate models that even the developers of the models admit over-forecast temperatures. Some of those	

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developers also admit that models needed to be "adjusted," at times, to produce "better" results that comply with the climate-based conclusions that were desired. 3. Those models are based on the "presumption" that CO2 increases that result from human activity (use of fossil fuels) cause like increases in AGT with catastrophic results. a. It should not be surprising that models built with that presumption would naturally conclude that CO2 was the problem. b. Most of those models have predicted temperature changes that have not occurred. Those models had to be mathematically modified to produce results that were more consistent with the hypotheses that the developers were trying to prove. These procedures are not consistent with normal scientific methodology. 4. With the unreliability of climate model output, it should not be surprising that the predicted catastrophes have not occurred. Use of Fossil Fuels 1. Drawbacks from burning fossil fuels: a. Air Pollution. The burning of Fossil Fuels has produced air pollution in the past. The use of coal was the primary culprit. Recent changes in coal plants have significantly reduced the amount of atmospheric pollutants. b. US use of coal as a fuel is decreasing in favor of natural gas, a much "cleaner" fuel. As the US moved to use more and more natural gas, American CO2 emission levels have lowered even as the use of natural gas increased. c. Increased human use of fossil fuels has led to increased CO2 emissions. 2. Benefits from using Fossil Fuels—Human Flourishing and Climate Mastery a. Cheap, reliable source of energy that is cleaner as we reduce use of coal and increase use of natural gas. The availability of fossil energy sources has allowed humanity to flourish and has enhanced our quality of life. b. Energy from fossil fuels has made possible the significant advances in technology, industry, transportation and agriculture that we have experienced, especially since the start of the industrial revolution. c. Medical innovations have also depended on the availability of cheap, reliable energy available from the use of fossil fuels. Climate related deaths, worldwide, have been dramatically reduced. d. Our developed nations have been able to adapt to changes in the climate because of the availability of cheap, reliable energy. Using fossil fuels has made possible our "mastery" of climate and its changes. e. There is no reason to believe that humanity cannot continue to use fossil fuels to mitigate and adapt to the impacts of climate changes. Implications for Hawaii's Energy Policies. Hawaii's energy planning and HECO's IGP are based on the assumption that increasing the concentration of CO2 will cause catastrophic increases in global temperatures. As a result, they have set the reduction of CO2 emissions as the requirement to reduce the impact of our ever-changing climate.	

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1. We need to stop hypothesizing that the reduction of CO2 emissions is the action needed to negate changes in the climate. That relationship is not supported by data. Reducing emissions to keep our environment cleaner and reduce pollution can be a reasonable goal for Hawaii's policies, but we should not include the stopping of climate change as an expected benefit of those policies. 2. Net "0" goals and reduction of CO2 emissions should no longer be expected to impact global temperatures and changing climate. 3. Our policies should focus on: a. Cheap energy. Keep the costs down for the public. Look at all of the costs when evaluating energy sources. Industry and tourism also thrive from using cheap energy. b. Reliable energy. i. Solar and Wind are not reliable energy sources. Battery storage capacity is not close to what we would need even with projected storage projects. Also, there are factors like the amount of land required, installation and maintenance costs, infrastructure, connectivity, etc. ii. In addition, "greener" energy sources (except for nuclear, hydro-electric, and geothermal) need to be backed up by fossil fuel generation to keep energy availability reliable. Simultaneously maintaining and operating two or more different types of energy sources is inefficient and expensive. Taxpayers will bear the cost of those policies. c. Renewable Energy i. OK if the goal is keeping the environment cleaner. We should not expect that what we do will significantly change our climate. ii. We should not dismantle our fossil fuel capabilities in favor of renewables until we have the renewable systems in place that can produce energy as reasonably and as reliably. BOTTOM LINE: REDUCING OUR CO2 EMISSIONS WILL NOT IMPACT GLOBAL TEMPERATURES OR THE CHANGING CLIMATE. WE SHOULD, THEREFORE, NOT FOCUS OUR POLICIES ON CONTROLING CO2 EMISSIONS SHOULD, INSTEAD, FOCUS ON PROVIDING ENERGY THAT IS CHEAP, RELIABLE, AND AS GREEN AS PRACTICABLE.	
I support plan I for and implementing a clean /renewable energy plan for our state. I have read various reviews and commentaries of HECO's proposed IGP. Most recently info from the Practical Policy Institute of Hawaii and have serious concerns about HECO's IGP. I agree that the IGP as it stands today is not practical, reasonably achievable or affordable. I urge the State Gov., HECO and qualified private sector organizations to go back to the table and come up with a different plan that can succeed for the people of Hawaii.	We acknowledge that our plan is ambitious, the Integrated Grid Plan provides a "target" for us, collectively, as a state to accomplish that also complies with state policies. We are also aware of some of the practical realities that may arise with regards to issues like land use and have also evaluated scenarios like the "Land-Constrained" scenario on Oahu as described in Section 6.8 and Section 8.
I support all types of energy not just green energy, otherwise we will be priced out of Hawaii. Thank you	Thank you for your comment.
Since the critical raw materials (metals) necessary to manufacture initial global demand and future replacement of solar, wind and battery systems are insufficient we should be looking to develop geothermal on all islands, starting with Hawaii Island.	Further geothermal project development is heavily dependent on identifying and characterizing the geothermal resource (heat and/or hot fluid and associated permeability). Further assessment of the geothermal resource of all the Hawaiian Islands is needed to support

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The foregoing statement can be supported by data provided by the Geological Survey of Finland and specifically in this presentation made by the report's author at the University of Queensland in Australia in August of 2022. https://smi.uq.edu.au/event/session/11743	geothermal energy development. The University of Hawaii's Hawaii Groundwater and Geothermal Resources Center has done geothermal resource characterizations across the islands and continue to seek more funding to do follow-on assessments, including well drilling. For more information, see HGGRC's "Hawaii Play Fairway Project" website at: https://www.higp.hawaii.edu/hggrc/projects/hi-play-fairway/
Adding solar and offshore wind will devastate the ecological beauty of this island, use much arable farmland and ruin rate payers financially. I'd rather you hang tight for 5 more years and get on board with mini nuke plants or fusion or more scrubbers for your existing power plants	We are not planning to transition to 100% renewable energy overnight, there will be future opportunities to integrate newer technologies in the future as they become available. Hawaiian Electric's long-term planning to reach 100% renewable energy by 2045 has always assumed multiple technologies would be needed, potentially including offshore wind. We understand there will be many concerns, and any proposed projects will be required to undergo extensive environmental reviews. Community engagement and a thorough analysis of on-shore and offshore impacts will also be required. Although small modular nuclear reactors are a promising technology, we did not consider it in our plans at this time because Article XI, Section 8 of the State Constitution prohibits nuclear fission power generation without prior approval by the legislature – "No nuclear fission power plant shall be constructed or radioactive material disposed of in the State without the prior approval by a two-thirds vote in each house of the legislature." Accordingly, nuclear fission generation is not currently included in our plans.
Basics weather we like all the challenges and consequences or not.... We have to make a huge changes. And it's going to cost a lot. It needs to be firm long-term energy structure. Viable firm sources Geothermal Hydroelectric THATS IT Every option has large start up costs for projects. After that these 2 stay have the lowest costs of operation and lowest cost per kw. Why have every lawmaker and policy maker looking at our big trouble not seen this? cate I am a very strong solar advocate but the long term solution is just these two!	Geothermal energy is a clean firm generation option for Hawaii; however, further commercial project development is highly dependent on the identification and characterization of the geothermal resource, including locations that can be developed for projects. We are aware of the work that the University of Hawaii's Hawaii Groundwater and Geothermal Resources Center is doing in this area. We are also tracking the development of emerging geothermal technologies and potential application in Hawaii. Hydroelectric generation is a potential renewable energy resource in Hawaii. How "firm" this resource can be is dependent on the availability of the water source and flows. Based on Hawaii's current water resources, the potential for inline hydroelectric generation is somewhat limited. Pumped storage hydroelectric is a commercial technology that can provide multiple hours of stored energy. Project development in Hawaii will be dependent on suitable geology, available water sources, and availability of permittable project locations.
1. The 100% standard should be explained more clearly. What does it include/exclude (e.g. transportation sector)? Does achieving 100% of renewable electricity generation by 2045 mean that oil-burning plants will be completely phased out by then? 2. What is the penalty (and to whom) for not achieving this 100% renewable standard by 2045? 3. What is the comparative cost of renewables to carbon-based generation? 4. The report generally is very well done. Please identify the report authors. 5. The feasibility and likelihood of the attaining the 5-year targets should be clarified -- e.g. additional onshore and offshore wind.	The 100% renewable energy standard is codified in State law under Hawaii Revised Statute § 269-92. All electric generation provided by Hawaiian Electric must be renewable by 2045, with incremental steps in 2030 and 2040. Pursuant to this law, oil-burning plants and other fossil fuels would not be allowed after 2045. Under State law, the Public Utilities Commission has the authority to impose penalties on Hawaiian Electric for non-compliance with the renewable portfolio standard law.

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How realistic is the attainment of these targets? There should be a more detailed schedule of actions needed (and by when) to attain targets, including who is responsible for implementation. 6. Is there is minimum amount of firm energy (renewable or otherwise) required for grid stability? Conversely, is there a maximum amount of non-firm renewables that can be accommodated on a grid (to account for the variability and unreliability of renewables such as wind and solar)? What are these minimums and maximums, perhaps expressed as a range if there is not a set percentage. 7. For many of the important figures which are pie, bar or line graphs, please add labels or accompanying tables. While the graphics look nice, it's hard to associate the color legend to the graphic line, bar or slice. Examples include Fig. 1-4, Fig 2-2, 2-3, 6-10, 8-4, 8-5. Thank you for the opportunity to provide comments.	In Section 9 of the report, we project the cost of fossil fuel generation compared to the Integrated Grid Plan. Our plan is projected to lower cost compared to the Status Quo continuing on fossil fuels. Our plan is ambitious over the near-term; however we recognize other scenarios are possible such as the Land-Constrained scenario discussed in Section 8. In Section 12, we discuss the amount of firm energy that is needed in our future plan. We believe firm energy is a key component to ensuring reliability over the long-term.
Thank you for the opportunity to comment on HECO's IGP. My impression is that the plan is impractical, and many of the impacts would be unacceptable. My comments and questions pertain to the O'ahu portion of the plan. SCENARIO/PLAN DESCRIPTIONS: A clear description of the two O'ahu scenarios (and the NI plans) would be very helpful to have early in the IGP report. LARGE-SCALE SOLAR FARMS: The Plan states that 20,700 acres (32.3 sq. miles) of land on O'ahu will be needed for large-scale solar farms by 2050. Using this much land for solar farms is unrealistic, especially given the policy by the North Shore Neighborhood Board in opposition to solar farms on good farmland. Why is there no map of the lands being considered for solar farms? Presumably, the 20,700 acres is for the Base Scenario. What is the acreage for the Land-Constrained Scenario, and why was it omitted? Given the large amount of land that would be used, why is there no discussion of the impact on residential development and housing prices, farming, ranching, views, etc.? ROOFTOP SOLAR: Table 6-18 indicates that there is a theoretical potential of over 4,934,292 acres available for rooftop solar on O'ahu. This is 12.9 times the area of the entire island (382,490 acres). Was the incorrect 4.9 million acres used in any calculations in developing the IGP? What is the correct figure? Regarding the Land-Constrained Scenario, Figure 2-3 and Section 8.2.4.2 indicate a gradual and realistic increase in rooftop solar up to 2040. But in the 10-year period from 2040 to 2050, there appears to be over a 3.5-fold increase in capacity (the actual increase can't be calculated because the 2040 data is missing from the summary). Is this 10-year increase realistic? ONSHORE WIND TURBINES: Why is there no information provided on the proposed locations of wind farms, the number of wind turbines, heights, visual impacts, etc.? OFFSHORE WIND TURBINES: Why is there no information provided on the proposed locations of offshore wind farms, numbers of wind turbines, heights, etc.? Currently, large 15-MW turbines are over twice as high as the tallest buildings in Honolulu, and would	Section 6.8 and Section 8.2 provide descriptions of the two Oahu scenarios. Section 3.5 earlier in the report also provides a description of the two Oahu scenarios. Section 6.9.2 discusses the types of land that have been excluded from our analysis for large-scale solar farms, which include Important Agricultural Land, Soil ratings of Class A and 90% of Class B and C land. The acreage of rooftops for the rooftop solar potential was corrected in the report due to a typo. The capacity for the rooftop solar potential was not affected. The Land-Constrained scenario reflects that in order to comply with 100% renewable energy in that scenario a lot of rooftop solar is needed by 2045. However, as we move toward 2045, there may be other technology advances that will allow us to comply with 100% renewable energy in 2045 with a different generation technology that does not require large amounts of land. The Plan allows us to adjust as we learn more about our renewable energy options in Hawaii. The Integrated Grid Plan provides directional guidance on achieving 100% renewable energy. The actual locations and types of technologies that will interconnect to our grid will depend on the actual requests for proposals and competitive procurements where developers will propose projects for Hawaiian Electric to consider. The Plan is not prescriptive on the types of technologies or locations. We also note that as described in Section 10.4 and 10.5 we have been working to engage communities and have set requirements for developer to engage with communities as project types and locations are identified. Land use for biofuels depends on the type of biofuel; however, if more solar, wind and energy storage resources can be brought online than future biofuel usage may be less than the amount of fossil fuel consumed today. Section 9 compares the cost of Status Quo to continue fossil fuel use versus our proposed plan. Costs shifts due to customer programs was not evaluated in the IGP. The Public Utilities Commission has other on-going proceedings that may examine those issues in more detail for example, the

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be very visible even if located 12 miles offshore. Why is there no discussion of the impact on views, whales, shipping and boat travel, submarine travel and detection, fishing, etc.? BIOFUELS: My understanding is the biofuels are expensive, use far more land than solar farms to generate the same amount of energy, and the processing facilities emit unpleasant odors. For the two O'ahu scenarios, how much land and water would be required to produce biofuels? Where would the feedstock be grown? What would the impact on growing food and other crops on O'ahu? For the HECO power plants, what is the projected cost of burning biofuels versus fuel oil or LNG? Why aren't these issues addressed in the IGP? LNG: Would LNG be cheaper than oil to fuel the HECO the power plants? If yes, then how much cheaper? Also would greenhouse-gas emissions be reduced if LNG were to be used? If yes, then how much less? Since LNG is widely used elsewhere, why is there no discussion of this option? SHIFTING OF COSTS: To what extent are costs being shifted to home and business owners to pay for rooftop solar, and to taxpayers to finance subsidies for alternative energy? If these costs are significant, then the projected rates HECO will charge its customers reflects only a portion of the full costs to be paid by them. Why aren't the full costs provided in the IGP? CLIMATE: If fully implemented, would the IGP affect local and global temperatures and climate? If yes, by how much? Given Hawai'i's relatively small contribution to greenhouse gases, would the impact of the IGP on climate be large enough to be detected? GUIDING PRINCIPLES: There is agreement that the production and delivery of energy should be affordable, reliable, and clean. But net-zero carbon emissions by 2045 and 100% generation of energy from renewable resources should not be achieved at the cost of our land and water environment, especially if there is no measurable impact on temperatures and climate. Why aren't the tradeoffs discussed? Should more realistic goals be developed for carbon emissions and the generation of energy from renewable sources?	performance-based regulation, distributed energy resources, and/or energy equity proceedings. We did not perform a global temperature impact analysis as part of the Integrated Grid Plan; however, we do assess the environmental impact of our proposed plan relative to Hawaii's historical carbon emissions in Section 9.5. Our plans are guided by state policy to achieve net negative carbon emissions by 2045. We therefore evaluate tradeoffs within the confines of state policy.
Renewable resources - 100% - by 2045? No way. Consider the Stadium project, the Convention Center projects, the Rail project. The pace at with things get done in this state means Renewable Resources will not be up-and-running by 2045. So... PLEASE keep all remaining fossil fuel electrical generators online until renewables are up-and-running! AND for emergencies between now and then, restart the AEC plant a Campbell Industrial Park and keep it running at 10-20% of capacity, so it is ready to go when needed. Thank You.	We intend to retire generating resources, including fossil fuel plants, only once sufficient replacement resources are proven reliable and integrated onto the grid. This is to ensure that we will continue to deliver reliable electricity during the transition to 100% renewable energy.
The following comments pertain to Page 33 of the Draft IGP; see follow-on insert of text from our Star-Advertiser article of April 19, 2023 for related comments, notably relative to the Neighbor Islands' preferred generation plans. While not stated anywhere in the Draft IGP, we view the pie charts on page 33 as begging a critical question: is 100% renewable power on Oahu feasible, considering land constraints, community	We acknowledge that our plans are ambitious and we also evaluate alternative pathways as pointed out in the comment. To that end, we outline external actions and risks that will need to be mitigated in Section 2.3 and Section 2.4 to successfully implement our Integrate Grid Plan. We have set forth a plan that we believe to be the lowest cost pathway based on current technologies.

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acceptability, reasonable DER assumptions, and affordability? Our view is that this is not a minor issue, but a fundamental one that cuts to the practicality of the 100%-renewables-by-2045 law. The comments which follow reference the percentages in the "pies" on page 33, in descending order of what we view are source-of-power "gaps" in the preferred plan generation mixes. 2022 Actual 2045 Base 2045 Land-Constrained A. Utility Solar Farms 5.5% 52.6% 20.7% 1. Issue: Acreage required to reach anywhere near 52.6% in 2045, considering conflicting land-use policies, cost considerations, and community acceptance. 2. Source of power gap: 31.9% 3. Determined by 52.6% in the Base Plan minus 20.7% in the Land-Constrained Plan. B. Offshore Wind 0% 21.7% 21.6% 1. Issue: Community acceptability; the significant backlash to land-based windmills might be exceeded by backlash to floating or ocean floor-spouting windmills, due to visual blight and marine issues. 2. Source of power gap: 21.6% 3. Based on Land-Constrained Plan C. Customer DER 14.1% 17.1% 37.9% 1. Issue: Reasonably achievable? 2. Source of power gap: 9.7%, perhaps more 3. Current 37% rooftop penetration equates to 14.1% DER; doubling current penetration (perhaps unlikely in view of low-hanging fruit already "picked") to 74% would presumably equate to 28.2% (9.7% derived by 37.9% minus 28.2%). D. Affordability 1. To assure continuation of reliable electricity, current oil-fired generation plants won't be able to be retired until there are replacement power sources. The three source-of-power gaps listed above total a staggering 63%. It is clear that the extent of the diminishing "Non-Renewables" slices of the pie on page 33 is unreasonable. Thus, a discussion in the final IGP should address both affordability and extent-of-CO2 emissions issues relative to the likely options: a. Assuming that the 100% Renewables law is inviolable: i. Biomass ii. Biofuel iii. Hydrogen iv. Other b. Should amendment to the 100% Renewables law be considered: i. Coal ii. Oil/Diesel iii. Natural Gas 2. The current "firm renewable" RFP process should bring to the fore both the cost of the various alternatives listed in 1.a. above	We are also open to other technologies that may resolve some of the potential issues described in this comment. We have added a new Section 6.9.5 to discuss future and emerging technology options.

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and, in addition, engender discussion and debate on the extent of "green" and land-use implications. Burning coal again would appear to be a non-starter. Should the Legislature refuse to amend the 2015 law, it is likely that we will slip towards 2045 with the least-optimal combination of cost and emissions: highest-emitting oil/diesel in combination with highest-cost thermal renewable option from 1.a. above. But this only highlights that the Legislature and the previous Governor have taken off the table an option that emits 30% less CO2 than oil and is likely to be less expensive than the 1.a. options above: natural gas, brought to Hawaii in the form of LNG. HECo stated, in 2016, that LNG could "save customers as much as $3.7 billion over 30 years, depending on future commodity prices." But Gov. Ige was in opposition, causing withdrawal of the LNG proposal. Perhaps amend the law with respect to 1.b.iii only? 3. We've pointed out before that decarbonizing is a matter of trade-offs between "green" and affordability. In view of Hawaii's ever-exacerbating cost of living, we ask, "to what extent should we keep increasing the financial burden on our citizens?" In summary, our comments and analysis above speak more to what's not stated in the IGP, but what should perhaps be reported back to the PUC by HECo. And by the PUC to the Legislature. HECo is caught in a tough spot; how can HECo possibly speak out that 100% renewable simply won't work on Oahu when it has no choice but to follow the mandates of the PUC and the Legislature. But it would certainly be refreshing if the final IGP were to "tell it like it is."	
The plans call for 400MW of offshore wind on O'ahu by 2035 is based on a feasibility study., which was deeply flawed for several reasons: Offshore wind infrastructure was only spec'd for Category 4 storms. With an increase in the intensity of storms, that the predictive models show will increase in the future, infrastructure should only be approved if they can withstand Category 5 storms. The impacts of endangered species (whales and seabirds) was no accessed. It is well known that wind turbines "take" endangered seabirds and bats in Hawai`i. There are ecological and financial implications of this. No offshore wind infrastructure should be approved without an associated plan to minimize and mitigate take of endangered species. Any take of birds by offshore wind infrastructure would also be a violation of the migratory bird act. Recent scientific research has shown that humpback whales use the ocean floor to exfoliate and remove parasites. No offshore wind infrastructure should be approved prior to scientific studies to determine whether or not the infrastructure will impact such whale behaviors. Impacts of offshore wind infrastructure on traditional and customary fishing practices of Native Hawaiians has not been assessed. The plan should not be approved until that is done, and the projects are shown to not have a negative impact on these T&C practices.	We appreciate your concerns with respect to offshore wind development. Hawaiian Electric's long-term planning to reach 100% renewable energy by 2045 has always assumed multiple technologies would be needed, potentially including offshore wind. The federal government agreement with the state of California to develop areas on the Western Outer Continental Shelf to bring up to 4.6 gigawatts (4,600 megawatts) of floating offshore wind online is significant. We understand there will be many concerns, and any proposed projects will be required to undergo extensive environmental reviews. Community engagement and a thorough analysis of on-shore and offshore impacts will also be required.
The integrated plan is a good first step in reaching important goals for clean energy production. That being said this plan fails to address the costs of switching to renewable energy sources and seems overly ambitious as to when HECO expects to meet these	We acknowledge that our plan is ambitious. We outline some of the risks and changes needed to ensure successful implementation in Section 2.3 and 2.4. We also look at different scenarios to achieving

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goals. I don't think reducing the carbon emissions of Hawaiian energy production by 70% in the next 7 years is feasible. This feels more like an attempt to gain public approval rather than a serious proposal. Reaching this goal has a huge dependence on the expansion of mostly solar power from both HECO and its customers. Considering the shortage of qualified solar installers on the island, it is unlikely that this vast expansion in solar capacity will be met. The other thing that's not addressed in this proposal is the cost of solar over its lifespan. Yes, it provides lower emissions than petroleum but it is not without costs. There is significant resource extraction that must be done to produce the aluminum, glass, and rare metals which are used t in photovoltaic panels. Each of these extractive industries is heavily reliant on fossil fuels and pose risks to the environment. In addition, solar panels have a lifespan o fondly about 30 years meaning in the near future, there will be thousands of useless photovoltaic panels that we currently have no plan to deal with. They are difficult to recycle and often expensive for people to dispose of. If our energy needs expect to be met long term largely by photovoltaics, we need to develop better systems for the disposal and recycling of panels. This plan seems overly dependent on "distributed energy resources". Hawaii already has a huge problem with the cost of living, worsened by a high percentage of low-income households. These people cannot afford to invest in these future energy systems. Where does the $1.4 billion come from to pay for the distribution upgrades and renewable energy zone enablement costs? Should that cost fall on the consumers? Why is there no mention of a plan to reduce overall energy needs and use? Surely this must be an important part of achieving a sustainable future. It also seems like a big oversight of such a plan to not address the energy uses involved in transportation. That makes up a significant portion of Hawaii's emissions and will need to be addressed. I hope some of these comments are useful during your revision process. Thank you for taking the time to consider my thoughts and thank you for your efforts in moving Hawaii towards sustainability.	our carbon reduction goals in Section 3.5 and Section 8; for example, the Land-Constrained case on O'ahu. We address disposal of clean energy equipment in Section 2.6 of the final report. We agree that energy efficiency and conservation is key component to achieving our goals. We outline this important part of our plan in Section 2.1, "Widespread adoption of energy efficiency" which also includes conservation measures. We also outline efforts to advance energy equity and options for low income customers in Section 10 of the report. We will continue to explore options and solutions as part of a separate energy equity proceeding with the Public Utilities Commission. You may learn more information, including how to participate in this equity proceeding at: https://puc.hawaii.gov/energy/equity/
There is little reason to rely on fossil fuels at all. Jack Here said if 5% of the country is dedicated to growing hemp, we would have more than enough energy to meet our needs. But we don't need 100% of our energy, just a small amount relatively to the past. Right now we are getting energy from trash to energy. We could just as easily burn hemp and hemp oil. May be burnable in that old coal plant? Definitely could be burned in the trash to energy plant. Hemp oil could be burned in existing oil to energy plants. I do not know why we have to pay extra because we do not meet our goals. Hemp can easily make this up so why not do? Makes a lot more sense than burning slow growing trees.	We encourage any renewable energy resource that has a bon-a-fide proposal to participate in requests for proposals for new generation. While the Plan outlines certain technologies, the actual technologies and locations that will interconnect to the grid will be based on the market (and developers) submitting proposals through our requests for proposals that compete against other technologies on price and non-price factors.

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So why isn't this being considered? I do not consider it to be against the federal law to be a valid reason. Hemp and marijuana were made illegal, not because they are a health problem, but the competition it offered to the alcohol business, the nylon industry, and the paper industry. So you along with all the other energy businesses should be pushing the federal government to end its stupid law against hemp and marijuana.	
Aloha: Please accept these comments from DKK Properties, LLC. We operate warehouses on Oahu and Maui and we are concerned that the draft IGP will not adequately control the cost of electricity in the short and medium term. Comments: There is a lot to like in the draft IGP once you get down to the level of the plan itself, including: The concept of REZs; The proposal for a standardized community benefit rate to allow projects to be compared on an apples to apples basis (but see comment below for additional details) The commitment to making new purchases from IPPs at fixed prices; The generation mixture planned to achieve the RPS requirements; and The substantial community outreach by Hawaiian Electric that accurately identified affordability as the biggest concern of the company's customers. With regard to item b above, it is not enough to simply say "$ 3,000 per MW". Are we saying storage only projects are not required to provide community benefits? If a project were to use thin film solar the footprint to provide a Megawatt of electrical output will be much larger than standard pv. If the community benefit payment in connection with solar pv is due to view impacts, the footprint should factor into the analysis. The reality is that it would be far more helpful for the Company or the Commission to adopt a written list of standard assumptions or best practices that would cover the following topics: sizing to be DC; sizing to be adjusted based on inverter limits; minimum setbacks from neighbors; any adjustments for sites proposed on hillsides; accepted models for output and visual impacts; any inflation adjustments for the $ 3,000 figure; which neighbors would receive formal written notice of the project; and whether the community benefits fee would apply to offshore projects the same way as onshore projects. Off Grid Customer Migration needs to be discussed. Company admits that 1 in 20 of its potential customers are already meeting their energy needs elsewhere (Section 1.3) The migration of existing customers off the grid is not adequately addressed in the IGP. Will the company propose exit fees or other measures to keep enough customers on the grid to pay for all the grid improvements needed to connect more DER? The reality is that most community groups are not qualified to comment on such a detailed technical plan. If the company is	The community benefits outlined in Section 10.4 are an initial starting point. As we learn more from how these benefits are implemented, we intend to make adjustments to improve the process. This topic may also be further explored in the Public Utilities Commission's energy equity proceeding (https://puc.hawaii.gov/energy/equity/). Note that storage only projects are held to the same $3,000 per MW minimum per year requirement. The impacts of off grid customer migration are not explored in depth in the Integrated Grid Plan; however, Hawaiian Electric continues to assess these impacts, including in other relevant proceedings, such as through standby charges in the Microgrid Services proceeding, and through advanced rate designs (the Company's proposed modifications to the standby charge were not adopted for the Advanced Rate Design TOU Pilot but the Company maintains that standby charges should still be considered in advanced rate designs). Exit fees may be part of the mechanisms to ensure protection for customers. Hawaiian Electric clarifies that it has not requested, and is not looking for, any "super priority" status; nor is the Integrated Grid Plan a substitute for approval of individual projects and applications that Hawaiian Electric must submit to the Commission. Rather, Hawaiian Electric requests approval of the Integrated Grid Plan as a guiding strategy that all stakeholders, including the Commission, can work from for the near-term and as a way to measure our collective progress toward our goals. The Plan seeks to keep all stakeholders on the same page and provide a frame of reference for the many interrelated ongoing dockets, applications and future proceedings to allow all parties involved to agree upon, or at the very least understand, the basis for inputs, assumptions, and the future direction of grid plans. In regards to fuel purchases, our fuel is sourced through a competitive RFP process where the companies select the lowest cost option. Our pricing is also indexed, so as world oil goes up and down, so does our pricing. As a result, we are obtaining fuel at the lowest cost available to us. Generally, linking the IGP plans to PBR ensures that the correct incentives are in place to bring new resources from the planning stage into the development. Otherwise, financial incentives may be misaligned and incentivize a different set of actions than what was planned or that is consistent with state policy and the Commission's priorities. While some renewable projects from the recent RFPs withdrew, this was due to extraordinary circumstances arising from supply chain issues caused by a global pandemic. Lessons learned from this event could be used to tweak the alignment between PBR and IGP through ongoing revisions to the PIMs. The Integrated Grid

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serious about additional community input, some entity would need to provide funds to allow groups to hire engineers or other grid experts. This is a situation where Hawai'i lags other states in providing funds to groups involved in ratemaking and other PUC proceedings. The Biggest Problem with the IGP is how the Company Proposes to Use it. At the level of policy and structure, the proposed docket 'superpriority' for the IGP as a "foundational element" of other dockets is misguided. This plan does not deserve the requested superpriority status because it lacks any serious plan to reduce costs in the next few years. The Company went out of its way to obtain community feedback. The feedback was consistent across the islands. Affordability is the number one issue for customers. But the IGP refuses to incorporate smarter purchasing of oil into the plan even though in the short term it is the obvious way to lower customer bills. (a) Other businesses are involved in a transition similar to what Hawaiian Electric is doing. For example, Ford and GM have both indicated they are transitioning their product line away from fossil fuels. To understand what is missing from the IGP it might be easier to make an analogy What would the shareholders of GM and Ford say if they were told 'from now on we are focusing only on the EV business and we don't care about whether the remaining ICE business makes a profit anymore'. They would not accept such a plan, of course. Linking to the Performance Based Regulation docket is a mistake. The Company wants to link IGP to the Performance Based Regulation (PBR). With the benefit of hindsight it now seems clear that as a tool to control customer costs, the original PIMs were ineffective during the pandemic and the oil shock that followed the invasion of Ukraine. The PIMs previously approved by the Commission seem likely to require a redo. For example, no one can be proud that the utility well over $ 1 million to sign RFP contracts for big solar projects that were never built. Why link IGP to PBR at this point in time? Baked in TOU rates are a Mistake. The Company has used TOU rates as the default assumption in the IGP, but the pilot TOU rates from the Company have all been designed to benefit retired people over those still working. The Company suggests that evening rate (with its punitive costs) should apply until 9am the next morning. Working families can't just choose to sleep in for better electric rates. People who are struggling to survive balancing multiple jobs do not have the luxury to change the time of day when they cook or do laundry to get a different rate on their electricity. Some day appliances will provide the functionality to automatically adjust to price signals from the Company, but in today's world the TOU approach so far from the Company has helped affordability for the retired at the expense of those still working.	Plan also outlines infrastructure needs that may be considered more broadly in future multiyear rate plans. Based on guidance provided by the Commission and stakeholders, time of use impacts were incorporated for customers with EV and DER and for non-DER/EV customers. The majority of peak reductions were assumed to be provided by customers with DER and EV that have the capability to load shift via a battery energy storage system. Much smaller peak load reductions were forecast to be provided by customers without these enabling technologies (i.e., behavioral changes). Further, the degree of time of use impact embedded in the forecasts varies. The base case assumed a more moderate time of use rate structure that the Company proposed; only the low load case assumed the more aggressive time of use rate that more closely corresponds to the Commission's current direction to implement 1:2:3 ratio time of use rates.
Aloha Commissioners and Staff, The Public Utilities Commission ("Commission" or "PUC") opened the Hawaiian Electric	In response to foundational and "super priority" please see above response.

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Companies ("HECO") Integrated Grid Planning ("IGP") proceeding on July 12, 2018.1 The IGP proceeding replaces the previous planning proceedings: Integrated Resource Planning ("IRP"), and Power Supply Planning ("PSP"). The HECO Draft IRP Plan ("Draft Plan") was filed with the Commission on March 31, 2023. (Unless specified otherwise, references to the Draft Plan refer to Book 1). Comments are due by April 21, 2023. Life of the Land ("LOL") is a Hawai`i non-profit public interest organization that emerged as an organization in February 1970, one month after the National Environmental Policy Act became the law of the land and two months before the first Earth Day. Life of the Land has been active in over five dozen PUC proceedings over the past half century. Life of the Land asserts that every energy project has positive and negative economic, environmental, social, cultural, geographic, greenhouse gas, taxpayer and ratepayer impacts, and Life of the Land is concerned with the impacts, externalities and unintended side-effects of energy projects and programs. Life of the Land asserts that HECO`s Draft Plan has both positive aspects and the need for clarifications and amendments for other parts of the IRP Plan. <u>Positive Aspects</u> The Draft Report covers a wide range of complex issues.2 The layout of the Draft Plan allows a reader with utility knowledge to easily read through the document as the document is clear, has varying and readable print size, and contains clearly marked columns, tables, colors, pictures, boxes, and summaries. The document includes a table with nearly 100 abbreviations and a glossary that increases readability for readers with utility knowledge. Over the course of the past four years, HECO, with guidance from the PUC, created conditions that allowed for greater two-way flow of information. This is a step in the right direction. The first page of the Executive Summary notes that we are all in the transformation to a fundamentally new reality. We envision a clean energy future where customers have more choices, more reliable power, and more stable rates. By 2045, clean energy will be there when we need it: behind every light we turn on, each meal we share, and all the ways we get around. Electric	Hawaiian Electric is not aware of any laws, rules, or Public Utilities Commission orders indicating that approval of the Integrated Grid Plan would shift the burden of proof from the applicant to intervenors in future Commission proceedings. Regarding Affordability, the Integrated Grid Plan, provides pathways that are lowest cost over the long-term based on the inputs and assumptions that have been approved by the Public Utilities Commission. The lowest cost scenario is compared to the Status Quo of continuing to rely on fossil fuel in Section 9 of the report. Specific programs related to low and moderate income customer participation in Hawaii Energy's energy efficiency programs and community based renewable energy are possible topics to consider in the energy equity proceeding. With respect to energy efficiency programs, Hawaiian Electric does not administer the energy efficiency programs. For community solar low and moderate income projects, Hawaiian Electric may work with the subscriber organization of these projects to determine the amount of low and moderate income customers the program has the potential to reach. This may be reviewed as part of the individual project PPA application request for approval. Consistent with the Framework for Competitive Bidding, our requests for proposals are overseen by an Independent Observer (IO), and in some cases, an Independent Engineer (IE), who report to the PUC. It is the role of the IO and IE to ensure that the RFP is undertaken in a fair and unbiased manner, including monitoring all steps in the competitive bidding process as well as reviewing our proposal evaluation methodology and the evaluations themselves. The acreage of land identified in the report represents the available land and renewable capacity that can be developed when constrained by high level screens for federal, state, and important agricultural lands. At the initial input development phase of IGP, it wasn't clear how community acceptance may reduce the available potential so we took the approach that in the technical analyses, the less constrained potential would be used to identify the renewable energy zones and any integration costs. We also evaluated a scenario on Oahu reflecting stakeholder feedback that land constraints may prevent the technical potential for large-scale development. Undergrounding transmission lines are extremely costly compared to hardening existing overhead facilities and would result in a small fraction of hardening completed for the same amount of spending. On the mainland, targeted undergrounding of overhead lines has shown to be a cost-effective extreme event hardening solution in heavily wooded areas with single-phase lateral taps. This is why the Companies proposed a targeted undergrounding program for four miles of distribution laterals on Oahu to validate cost assumptions and assess the cost-effectiveness of targeted distribution lateral undergrounding in Hawaii. The same cannot be said of undergrounding transmission lines. For example, a 2009 cost-benefit study prepared for the Public Utility Commission of Texas found that undergrounding transmission lines in the region would be extremely costly and would not be cost effective. These findings were reported despite the analysis considering the previous ten years of storm

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cars and buses will get us where we need to go, with a backbone of vehicle chargers at the workplace and community centers. At home and at work, energy efficient appliances and equipment will electrify our daily lives. This clean energy transformation will advance social equity and benefit all customers and communities. Enhanced grid capacity will support growth in residential and commercial development, empowering a statewide expansion in affordable housing. In places with new energy facilities, host communities will thrive with benefit packages from developers. The future grid will look unlike any before, with customers playing a vital role in generating and storing energy. Customer-scale generation and battery storage in customers' homes and communities will seamlessly connect to largescale generation through a modernized transmission system, providing a consistent stream of energy that can adapt to fluctuations in use. Sourcing energy from a diverse array of local, renewable resources will fortify Hawai'i against global swings in oil prices, stabilizing utility costs for customers. [emphasis added] <u>Concerns, Clarifications & Questions</u> "The Integrated Grid Plan is the culmination of more than 5 years of partnership with stakeholders and community members across the islands."5 HECO took five years to develop the IRP Plan and to write the 900+ page report. The public has three weeks to review the report and file comments. Life of the Land`s critique of the IRP Draft Plan: (A) IS THE DRAFT PLAN FOUNDATIONAL? (1) Foundational References (2) Burden of Proof (B) CUSTOMERS (1) Affordability (2) Energy Equity (3) Community Benefits Packages (4) Defection, Migration, Off-Grid (C) TRANSMISSION GRID (1) Hardening The Transmission Grid (2) Renewable Energy Zones (3) Terminating Existing Renewable Energy Projects (D) PROCESSES (1) The IRP, PSIP, IGP Process (2) HECO`s Key Policies: Climate Change, Bioenergy (3) Public Trust, Public Interest & Trust Properties (4) Streamlining (5) Greenhouse Gas Analysis <u>(A) IS THE DRAFT PLAN FOUNDATIONAL?</u> HECO asserts that a modern grid is foundational to the IGP process, and that the IGP process is foundational to everything else. "We are also actively pursuing a grid modernization program that is foundational to realizing this Integrated Grid Plan."	impacts on restoration and societal costs in Texas, which included eight tropical storms, three Category 1 hurricanes, two Category 2 hurricanes, and two Category 3 hurricanes between 1998 – 2008. The Companies intend to analyze the cost-effectiveness of undergrounding transmission lines in Hawaii using their hurricane resilience model that is currently being developed with Pacific Northwest National Labs. As outlined in the IGP, we will need both large-scale and small scale renewables to meet our goals, especially in a fully decarbonized economy. Therefore, we do not prefer one over the other; rather, we need both at-scale and low cost to ensure that electricity must remain reliable. Part of developing renewable energy zones is to enable the integration of large-scale resources while advancing energy equity as described in Section 10. With respect to rooftop solar we have also conducted analysis (Section 8) to determine distribution capacity upgrades needed to integrate higher amounts of rooftop solar. We make a planning assumption that projects with an existing Power Purchase Agreement in the planning horizon expire and allow the model to re-optimize, because there is no guarantee that the existing resource will be able to continue. This is to ensure we are adequately planning the system. Renewal of an existing PPA could occur through a competitive procurement which ensures that we are able to negotiate the best prices for our customers or through negotiations to amend its current PPA. The procurements will largely determine the actual type of technology and location of projects; whereas the Integrated Grid Plan provides a roadmap on how to achieve 100% renewable energy. H-Power is not assumed to expire because it is a firm renewable source that also serves a larger societal benefit by diverting trash from the landfill. Other solar and wind PPAs were assumed to expire at the end of their contract term to allow the models to re-optimize the resource mix if a different resource could better meet grid needs in future years. Offshore wind is a valuable resource in a land constrained scenario as well as in the base scenario because it provides a high capacity factor resource at a relatively low cost of energy. The Technical Advisory Panel prepares technical feedback and recommendations based on materials and analysis that the Company presents. The notes provided by the Technical Advisory Panel reflect the panel's views and is not prepared by Hawaiian Electric. As shown in figure below, the majority of the Panel's members are non-utility members; including, experts from industry organizations, national laboratories and academia.

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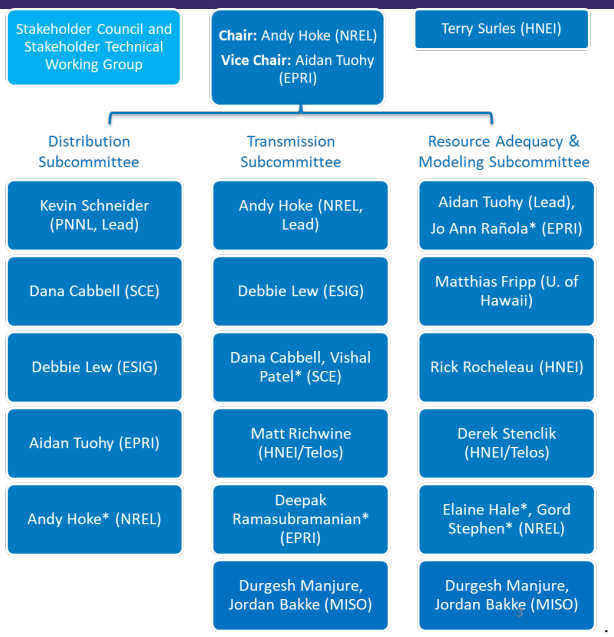
"Operating the 50- to 75-year-old O'ahu fleet, for example, with increased load ramping, low-load operation, and offline cycling accelerates the aging process, which has led to and will continue to cause increasing rates of forced outages and/or derations of firm capacity on a daily basis. [] These reliability risks must be urgently addressed—this is foundational to achieving the State's decarbonization and renewable energy goals." "Preventive measures are considered foundational to ensure that critical transmission lines, substations, and distribution circuits withstand threats to ensure that critical customers and facilities have power and facilitate rapid system recovery for all customers." "Hawaiian Electric's Initial T&D Resilience Program, shown in dark blue, represents the first phase of foundational hardening investments to increase the resilience of the system." "Hawaiian Electric's initial Transmission and Distribution Resilience Program (Docket 2022- 0135) represents the first phase of foundational system hardening investment of approximately $190 million across the islands we serve, with the potential for a 50% match of federal funding." In addition to foundational grid hardening discussed above, there is a need to incorporate greater grid operational awareness, control, and automated switching flexibility to enhance resilience and reliability." [emphasis added] HECO asserts that IGP trumps everything else. "A multitude of ongoing proceedings are currently before the Public Utilities Commission, in collaboration with Hawai'i energy stakeholders, intended to carry out the legislature's policies. The Integrated Grid Plan is foundational to these interrelated proceedings because it sets forth a well vetted common set of assumptions and lays out future pathways as we move toward our decarbonization goals." [emphasis added] <u>(A1) Foundational References</u> Life of the Land searched the Commission`s Data Management System ("DMS") to figure out whether HECO had previously raised the issue that this filing would be foundational, and thus controlling over other proceedings and applications. HECO used the term on two other occasions: "The Companies are committed to seeing through the IGP process to establish foundational plans and then running its next set of procurements based on these results." [emphasis added] "These reliability risks must be urgently addressed—this is foundational to achieving the state's decarbonization and renewable energy goals." [emphasis added] We found only a few documents by any other entity that used the term foundational within this proceeding:	 With respect to the procurement process, an Independent Observer and Independent Engineer oversee the Company's process to ensure a fair process is conducted. The Independent Observer and Independent Engineer are chosen by the Public Utilities Commission. The list of key policies in Table 5-1 is not meant to be an exhaustive list of energy policy in Hawaii; but key policies that guide our planning processes and assumptions. However, we have added a couple of the policies to Table 5-1 as suggested in the comments. As an initial matter, HRS § 225P-5 applies to the State and State agencies, not to private companies; however, Hawaiian Electric takes mitigation and adaptation to climate change seriously. It has submitted an application to the Public Utilities Commission to adapt to climate change by hardening grid infrastructure as outlined in Section 7 and climate mitigation through its Climate Change Action Plan described in Section 1.2.1. These efforts will help the state make substantial progress toward meeting the requirements of HRS § 225P-5. Importantly, the Plan seeks to achieve the goals of § 225P-5 by achieving at least 50% GHG reduction by 2030 and net zero by 2045 compared to 2005 levels. With respect to GHG emissions and the Commission's obligations under HRS § 269-6, we believe that the environmental analysis provided in Section 9.5 are sufficient for purposes of the Plan as supplemented by environmental analyses for individual projects. In the next steps of the Integrated Grid Planning process, such as issuing competitive procurements, developing projects, and seeking approval for individual projects, stakeholders and the commission will be afforded further opportunities to ensure alignment with HRS §§ 269-6 and 225P-5. We agree with Life of the Land that streamlining is not intended to bypass any community or stakeholder engagement or processes, rather finding ways to be more efficient in the development and implementation of procurements and projects.

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"Commission Order 35238 Guidance -- The commission directs the Companies to continue to embrace VoS [Value of Service] as a foundational component of the Companies' future planning and procurement efforts." [emphasis added] "The Consumer Advocate would like to [] advance efforts to unbundle the costs of service into relevant, disaggregated detail. These unbundling efforts will be a foundational and integral part of evaluating various alternatives, whether it be supply side, demand response, energy efficiency, transmission, distribution, or any electric service, as part of the IGP process." [emphasis added] The IGP Report presents a high-level outline [] These comments, therefore, address the IGP Report at a similarly high level, focused on foundational principles and concepts." [emphasis added] "These comments discuss several foundational elements of integrated grid planning that are necessary to achieve a more customer-centric outcome, including: • Allowing meaningful outside review and input [] • Emphasizing DER procurement methods [] • Prioritizing flexibility." [emphasis added] "Taking time to engage with stakeholders to get the foundational inputs right has been time well-spent, especially given that IGP represents a course shift from Hawaiian Electric's previous utility planning processes" [emphasis added] <u>(A2) Burden of Proof</u> HECO appears to be implying that once the PUC has accepted the IGP as the foundational base, then if HECO files an application that is based on the IGP, anyone who intervenes to protect their interests will have the burden of proof to show that the IGP is not reasonable or that conditions have changed. "To move from planning into implementation, we ask that the Public Utilities Commission: Approve the Integrated Grid Plan to serve as a foundational element for Hawaiian Electric and regulatory actions, including in interrelated dockets in the near term." This idea of foundational supremacy is not new. HECO floated the idea in the Hawaii Clean Energy Initiative ("HCEI") Energy Agreement ("Energy Agreement") signed in October 2008. "In 2008, a memorandum of understanding between the State of Hawai'i and DOE launched the Hawaii Clean Energy Initiative, which laid out the foundational elements to achieving Hawai'i's clean energy future. It envisioned that 60% to 70% of future energy needs would be provided by renewable energy, including energy efficiency." The Energy Agreement, if it had been accepted by the PUC, would have required the utility to file tri-annual Clean Energy Scenario Plans (CESP) with the PUC. "If the Commission rejects all or parts of the CESP, there should be an explanation for non-approval and the implications of that non-	

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approval on the utility's asset investment and strategic choices for the upcoming three-year period. In order to continually reassess the CESP plan on a regular and timely basis, it is suggested that if the PUC has not issued a decision within a defined period, the plan is automatically deemed 'approved`." HECO could choose which projects to advance. If an application submitted to the PUC could be loosely connected to the CESP, it would be presumed to be needed and the PUC permitting process would be expedited. The burden of proof would be shifted to intervenors to show that the application was not in the public interest. * Life of the Land asserts that the IGP Draft Plan is a HECO-centric, time-sensitive, snapshot of current assumptions and analysis is a rapidly changing environment. The Commission should treat the current HECO desire for a foundational document like how the Commission treated the concept in the 2008 era. HECO`s foundational concept should simply reflect HECO`s desires and not PUC policy. <u>(B) Customers</u> HECO`s Executive Summary states, "This clean energy transformation will advance social equity and benefit all customers and communities. [] The future grid will look unlike any before, with customers playing a vital role in generating and storing energy." <u>(B1) Affordability</u> "Again and again throughout the planning process, we heard that affordability and reliability are of top concern and interest to our customers, echoing the comments in multiple customer surveys and focus groups conducted for the company." There is no Modeling Scenario for Affordability, that is, for determining the future based with a primary emphasis on affordable rates. There are ten Modeling Scenarios: Base Electricity Demand, (2) Land Constrained, (3) High Electricity Demand, (4) Low Electricity Demand, (5) Faster Technology Adoption, (6) Unmanaged Electric Vehicles, (f) DER Freeze, (8) Electric Vehicle Freeze, (9) High Fuel Retirement, and (10) Energy Efficiency Resource. Doug McLeod, the former Energy Commissioner County of Maui, submitted comments on April 10, 2023. "The Biggest Problem with the IGP is how the Company Proposes to Use it. At the level of policy and structure, the proposed docket 'superpriority' for the IGP as a "foundational element" of other dockets is misguided. This plan does not deserve the requested superpriority status because it lacks any serious plan to reduce costs in the next few years. The Company went out of its way to obtain community feedback. The feedback was consistent across the islands. Affordability is the number one issue for customers. But the IGP refuses to incorporate smarter purchasing of oil into the plan even though in the short term it is the obvious way to lower customer bills."	

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HECO asserted, "Although utility rates will rise in the transition to clean energy, they will be lower and less volatile than if we continue to rely on fossil fuels." "Our projections show that the transition to clean energy may reduce the overall energy burden for the typical residential customer on each island through 2050, compared to today's energy burden." "Stakeholders stated that residential TOU load shift scenarios should be included in the IGP base forecast and bookend forecasts even if impacts are relatively small because it is likely that TOU rates will be implemented." "In collaboration with stakeholders, as documented in the March 2022 Inputs and Assumptions Report, we developed several scenarios to identify a range of potential grid needs. The scenarios test whether given uncertain futures the resource mix and direction of the lowest-cost portfolio would change. Table 6-16 describes the various scenarios we analyzed and presented in this report." * Life of the Land asserts that one scenario that should have been examined is how low rates could be, if that was the primary goal of IGP. This would be useful in comparing alternative scenarios. <u>(B2) Energy Equity</u> "We have recently selected CBRE projects (also known as the Shared Solar program) through a competitive procurement for LMI community-based solar projects. [] While these projects may not provide an opportunity to every LMI customer that desires to participate in the renewable transition, it represents a start that will enable us to improve on and expand programs and choices for customers in the future." Over the years Life of the Land has raised the issue of differentiation: a program may be open to everyone, but everyone can't be part of the program. This is true for rooftop solar and for CBRE. * What percent of LMI customers currently participate in any HECO or Hawaii Energy program related to renewable energy, clean energy, and/or energy efficiency program? * What percent of LMI customers could be served by the CBRE projections that exist and/or are in the pipeline? <u>(B3) Community Benefits Packages</u> "By 2035, our plan calls for up to 1,640 MW of new renewable resources across our service territories." "On O'ahu alone, we will need nearly 3,200 MW of large-scale solar generation by 2050, built on 20,700 acres of land." HECO is requiring renewable energy developers to include a Community Benefits Package ("CBP") proposals. There are approximately two dozen required components in the CBP. HECO will review all proposals using a proprietary black-box model.	

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"Developing renewables and transmission will require community support and streamlined regulatory reviews, permitting, and execution." A major risk occurs if HECO`s focus is placing large systems in rural residential and agricultural places conflicts with community values. Under what conditions can the community say NO. How is HECO treating the CPB. * Allowing non-competitors to see the inner workings of the non-price black box would go a long way to easing community concerns. (The Commission rejected one approach suggested by Life of the Land.) * Large number of acres is confusing to many people. How many square miles of land are needed? What percent of non-conservation-zoned, non-military land is needed? (B4) Defection, Migration, Off-Grid As alternative energy and storage sources continue to advance, there will be a tendency for large entities to self-generate relying on cheaper options and/or less polluting options while the utility continues to be bogged down with costly legacy equipment and overhead. The HECO Draft IGP limits the defection analysis to one reference for one commercial customer on Lāna`i. "No resort load scenario resource plan, year 2029 -- In this resource plan, it is assumed that a big part of system load will be off grid." * The IRP Plan should include estimates for the percentage of customers and the percentage of the load that is currently off-grid, and how this may change due to the IRP Plan. (C) Transmission Grid "The future grid will look unlike any before." (C1) Hardening the Transmission Grid HECO started to underground lines in urban Honolulu in the 1920s. The backbone of the O`ahu grid is the 138-kV Transmission lines. The first 138-kV line was installed in 1958. Today, the 138-kV transmission grid contains both overhead and underground lines. The PUC issued Decision and Order No. 10620, on May 8, 1990: "The Commission agrees that laying transmission lines underground promotes aesthetics and preserves scenic views. However, the utility has the responsibility to minimize the cost to ratepayers in providing reliable electric service.... [T]he cost of placing transmission lines underground is very high and the burden of that cost ultimately falls upon the ratepayers. Thus, unless (1) there is a compelling reason (which outweighs the costs) to place the lines underground or (2) there is a stated public policy requiring the lines to be laid underground or (3) the ratepayers as a whole consent to bear the high cost of putting the lines underground, we do not believe that we should require HECO to place the transmission lines underground.	

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That placing the transmission lines overhead may obstruct one's view plane, in and of itself, is not sufficient cause to require the ratepayers to bear the cost of laying the lines underground." HECO asserted in their grid hardening docket that there is more than one way of hardening the transmission grid. Reinforcing overhead lines and burying lines are two methods. HECO did not compare the two for cost, reliability, and/or resilience, now and in the future. Rather, 99% of HECO`s plans are reinforcing the overhead system. How underground compares with overhead hardening matters both in the short-run and in worsening conditions in the long-run. <u>(C2) Renewable Energy Zones</u> As defined by HECO, a Renewable Energy Zone ("REZ") is an area that may or may not have renewable energy but could have additional terrestrial-based, ground-based, commercial-scale, renewable energy systems based on existing or potential terrestrial transmission lines. Thus, REZs exclude large commercial shopping centers, parks, schools, and rooftops in urban areas as well as excluding ocean-based renewable energy systems. "A core part of the Integrated Grid Planning process was identifying potential future locations for renewable generation facilities and transmission and distribution infrastructure to power the grid with 100% clean energy. Hawaiian Electric partnered with the National Renewable Energy Laboratory (NREL) to estimate the potential for large-scale solar, wind, and distributed rooftop solar developed based on available land, potential capacity, and potential electricity generation for sites across the five islands." "If determined to be directionally cost-effective then developing renewable energy zones may be pursued further." Large sections of the public have problems with utility efforts that focus most heavily on centralized generation instead of rooftop solar systems and localized ground mounted small wind turbines. The public perception is that the utility analysis favors large commercial systems based on HECO`s self-imposed limitations on what land can be included in the analysis. Rooftop solar has different cost structures, greenhouse gas emissions/kWh, employment, grid infrastructure requirements, and equity impacts when compared to centralized systems. <u>(C3) Terminating Existing Renewable Energy Projects</u> HECO presents various scenarios. According to HECO, existing O`ahu wind and solar units total nearly 200 MW would be removed.  * Why remove and add renewable energy systems? Why not keep the non-controversial ones that currently exist? * Various scenarios include offshore wind of approximately 400-500 MW that could be added to the O`ahu grid. Is the need for offshore wind dependent on whether existing renewable energy contracts are renewed?	

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* "H-Power, New Firm" could be dispatched at 102 MW with a capacity of 211 MW. What is the unstated justification for considering the retirement of all older renewable energy projects except for H-Power? <u>(D) Processes</u> HECO asserted, "The Integrated Grid Plan is rooted in customer and stakeholder input. We endeavor to create customer value by: [] Coordinating solutions that provide the best value on a consolidated basis." HECO stressed that an "independent" entity would assess the IGP process. "Technical Advisory Panel. This group provided an independent source of peer assessment for the technological and engineering considerations of planning for a Hawai'i Powered future." Life of the Land has often questioned what is meant by "independent." Several other groups also questioned what "independent means." " Hawaiian Electric' approach of using a Technical Advisory Panel to provide "independent review" of the IGP process is inadequate and fails to leverage best practices and lessons learned in the IRP proceedings. First, unlike the diverse Advisory Group that the Commission solicited and selected in IRP, the Technical Advisory Panel is comprised of Hawaiian Electric's self-selected members that overly represent utility perspectives. Second, unlike the Independent Entity established in the IGP Framework, there is no independent body responsible for overseeing the stakeholder engagement process and for ensuring that IGP proceeds in a `timely and transparent` manner. Without these previously established and proven protective measures in place, there can be little confidence in the IGP process." The PUC established the Independent Observer to oversee the company`s procurement process. "`Independent Observer` means the neutral person or entity retained by the electric utility or Commission to monitor the utility's competitive bidding process, and to advise the utility and Commission on matters arising out of the competitive bidding process." "An Independent Observer is required whenever the utility or its Affiliate seeks to advance a project proposal (i.e., in competition with those offered by bidders) in response to a need that is addressed by its RFP, or when the Commission otherwise determines. Unless otherwise determined by the Commission, an Independent Observer will monitor the competitive bidding process and will report on the progress and results to the Commission, sufficiently early so that the Commission is able to address any defects and allow competitive bidding to occur in time to meet the utility's Grid Needs." * Life of the Land asserts that the Independent Entity can provide assurance to the PUC that the RFP process was fair. However, the public will have no assurance that the projects chosen will optimize state policies and/or minimize impacts. <u>(D1) The IRP, PSIP, IGP Process</u>	

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The PUC issued Order No. 35569 ("Opening Order") on July 12, 2018, "Instituting Proceeding to Investigate Integrated Grid Planning." "Electric utilities use resource planning to identify long-term investments that can reliably meet electricity demand and public policy goals at reasonable cost." "Resource planning for electric generation began in the late 1970s during an era of transition with declining electricity demand, rising costs, and new federal environmental regulations. The resource planning process provides forum for regulators, electric utilities, and stakeholders to evaluate the economic, environmental, and social benefits and costs of different investment options." [emphasis added] "Concerned about significant fluctuations in demand and energy growth rates, rising consumer energy prices in spite of relatively stable fuel costs, the emerging importance of environmental issues and cost-effective technologies and our unabated heavy dependency upon fossil fuel oil, the commission opened proceeding in January 1990 to implement integrated resource planning in the State of Hawaii." [emphasis added] The IRP process was transformed into "Power Supply Improvement Plans" ("PSIP") in the 2014-2017 era. Then PSIP was then transformed into Integrated Grid Planning. On March 1, 2018, the HECO Companies filed an IGP Report with the commission. The IGP Report proposes an ambitious leap forward from traditional system planning. The HECO Companies propose to merge three separate planning processes generation, transmission, and distribution while simultaneously integrating solution procurement into this merged process, with the goal of identifying gross system needs, coordinating solutions, and developing an optimized, cost-effective portfolio of assets." "With their IGP Report, the HECO Companies propose an ambitious and holistic new approach to power system planning. If implemented successfully, this new IGP process could accelerate the State's progress towards clean energy future." "The HECO Companies broadly categorize these inputs as: (1) Planning Requirements [] (2) Input Assumptions [] (3) Fixed Assumptions [] and (4) Customer Needs and Policy Goals." "The commission reaffirms the suspension of the IRP Framework requirements for the HECO Companies. At this time, the commission does not intend to order the HECO Companies to begin new IRP cycle. The commission is encouraged by the process proposed in the IGP Report, which builds upon efforts in the PSIPs and elsewhere to more fully integrate planning functions and reduce costs to customers, consistent with prior commission guidance. This evolution of traditional resource planning is necessary in light of the substantial changes underway in the electricity industry." [emphasis added]	

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"Forecasts represent the foundation of the planning process. They allow planners to quantify the gaps between expected demand and supply that inform investment priorities to ensure the lights stay on. In addition to their central role in resource planning and rate cases, forecasts also influence the design of rate structures, customer programs, public policy, and utility risk mitigation strategies." [emphasis added] "`Grid Needs Assessment` means the process step in the IGP where the technical analyses are conducted to determine the generation, transmission, and distribution grid service(s)needs to meet state policy objectives, reliability standards, among other goals, and presented to the Commission for review and approval or acceptance." [emphasis added] (D2) HECO's Key Policies HECO provided a table of the "Key State Policies and Legislation That Drive Energy Planning." HECO included 12 laws and two concurrent resolutions. A few laws were excluded from the table: Climate Change Two laws formed the basis of Hawaii Supreme Court decisions re climate change (Hu Honua 2019, Gas Company 2020). Excluded from the summary was Act 109 (2011) which required the PUC to "explicitly consider, quantitatively or qualitatively, greenhouse gas emissions," and Act 234 (2007) that addressed greenhouse gas leakage in a global context. Bioenergy Also not included was Act 272 (2001) initiated the Renewable Portfolio Standard ("RPS"), and Act 162 (2006) altered the definition or renewable energy established in the RPS metric. In 2001, the definition of renewable energy included "biomass including municipal solid waste, biofuels or fuels derived entirely from organic sources." To lure ethanol production to Hawai`i, the definition of renewable energy was broadened to include bioenergy made almost entirely from fossil fuel. Under this law, coal and petroleum-derived biofuel is considered 100% renewable energy. The utility has opposed fixing this corrupted definition. (D3) Public Trust, Public Interest & Trust Properties HECO recognizes the climate change threat: "The frequency and intensity of hurricanes are expected to increase because of climate change. The effects of these threats are amplified by the significant geographic remoteness and isolation of Hawai'i." HECO recognizes the need to urgently address climate change: "The 2021 international summit on climate change made clear that the actions we take this decade will determine whether humanity can slow or stop the warming of the planet." The HECO focus is preventing damage to electricity infrastructure: "Our work to modernize and decarbonize the grid has never been more urgent as the effects of climate change escalate and existing	

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electrical facilities and infrastructure age." "Extreme weather hazards are projected to increase in frequency, intensity, and duration because of climate change. Failure to prepare for such events could result in power interruptions, damage to electricity infrastructure, significant economic disruption, and disruption to critical government and private-sector services." * The Draft Plan does not mention "public trust," "public interest," or "trust properties." * The Draft Plan does not mention HRS §225P-5: "A statewide target is hereby established to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045; provided that the statewide target includes a greenhouse gas emissions limit, to be achieved no later than 2030, of at least fifty percent below the level of the statewide greenhouse gas emissions in 2005." [emphasis added] The Hawai`i Supreme Court state in 2017: "We therefore conclude that HRS Chapter 269 is a law relating to environmental quality that defines the right to a clean and healthful environment under article XI, section 9 by providing that express consideration be given to reduction of greenhouse gas emissions in the decision-making of the Commission." The Hawai`i Supreme Court state in 2022: "The statutes [] – HRS §§ 269-6(b) and 269-145.5(b) - reflect the core public trust principles: the State and its agencies must protect and promote the justified use of Hawai'i's natural beauty and natural resources. Thus, when there is no reasonable threat to a trust resource, satisfying those statutory provisions fulfills the PUC's obligations as trustee. But when a project poses a reasonable threat, the public trust principles require more from the PUC: the commission must assess that threat and make specific findings about the affected trust resource." * Life of the Land asserts that climate change impacts will be felt by all sectors of Hawaii. HECO seeks to minimize damage to its system and to comply with 2030 and 2045 legal requirements. HECO ignores HRS §225P-5. The Draft Plan will reduce GHG emissions, however, it is unclear whether the reduction is as "quickly as practicable." <u>(D4) Streamlining</u> Streamlining can be good when unnecessary redundancy is eliminated. For example, the City and County of Honolulu required a separate permit for each of dozens of concrete platforms for a single energy storage project. But streamlining is often meant to mean expedited processes, automatic approval, and certainty for developers at the expense of the community and the environment. High-level streamlining statements without specificity or details is a threat to the public and the public interest. HECO asserted, "Decarbonizing the electric grid by 2045 will depend on many conditions, actions, and policies beyond Hawaiian Electric. External conditions and actions that will support successful implementation include: [] Policies and Regulatory Conditions [] Policies that remove barriers to siting and permitting large-scale renewable	

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projects and transmission infrastructure. For example, a separate process or entity that coordinates or has the authority to approve a variety of permits needed to execute a renewable project. Flexibility in air permitting and mandates to manage reliability and transitions to renewable resource replacements." Any effort by the utility to encourage public comments is commendable. But efforts to limit or stop community intervention in regulatory proceedings fly in the face of efforts to involve communities in equity issues. HECO needs to shed its long history of centralized decision-making and to recognize that we must move forward together. <u>(D5) Greenhouse Gas Analysis</u> HECO applied the 2030 requirement to the 2045 requirement: HECO: "Our grid planning is guided by laws and policies enacted by the Hawai'i State legislature, along with the multitude of interrelated proceedings before the Public Utilities Commission. Hawai'i continues to lead the nation in climate and environmental policies, particularly in the electricity sector. Overarching State policies that guide our grid planning include 100% renewable energy by 2045 and statewide greenhouse gas reductions of 50% by 2030 and net negative by 2045 compared to 2005 levels." "Customers continue to stress the importance of affordability, and the State has set ambitious decarbonization targets to achieve economy-wide 50% carbon emissions reduction by 2030 and net negative carbon emissions reductions by 2045 compared to 2005 levels." State Law: "Considering both atmospheric carbon and greenhouse gas emissions as well as offsets from the local sequestration of atmospheric carbon and greenhouse gases through long-term sinks and reservoirs, a statewide target is hereby established to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045; provided that the statewide target includes a greenhouse gas emissions limit, to be achieved no later than 2030, of at least fifty per cent below the level of the statewide greenhouse gas emissions in 2005." <u>Certificate of Service</u> I hereby certify that a copy of the foregoing document was e-filed with the Commission and emailed to the parties and participants on the [refer to original doc for contact information]	
Dear Honorable Commissioners, Blue Planet Foundation, by and through its counsel Earthjustice, Hawai'i PV Coalition, and Hawai'i Solar Energy Association (the "Joint Parties") hereby submit comments on the Hawaiian Electric Companies' ("Hawaiian Electric's") Integrated Grid Plan ("IGP") Draft Report, filed on March 31, 2023.	The IGP working group meetings have functioned as public meetings. The initial working group members were made up of individuals with subject matter expertise on the specific working group issues but were not closed to others from participating. We have incorporated DER Parties' feedback throughout the process, particularly with respect to DER. For example, our initial DER forecasts were substantially revised to reflect recommendations by the DER Parties to expand the pool of customers that could adopt DER leading to an expansion of the DER forecast and DER market, updates to assumed DER system costs, and future incentives. We also

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The IGP Draft Report Fails to Incorporate Stakeholder Feedback for Leveraging DERs At the start of the IGP proceedings, Hawaiian Electric proposed that IGP working groups be open to a "limited number of people,"^ and then prevented interested stakeholders from participating in their desired working groups. After receiving requests to expand stakeholder access to the IGP proceedings,^ the Commission ordered Hawaiian Electric to provide all parties the opportunity to attend each IGP working group meeting.^ The Joint Parties have participated substantially in pertinent working group meetings, providing input along the way, yet many of our key recommendations and concerns have been largely rejected, particularly with respect to DERs. Although the IGP Draft Report includes significant improvements over prior planning efforts in this and other dockets, it continues to fall short of fully embracing and enabling customer DERs, as the Joint Parties have consistently urged and the Commission directed and envisioned nine years ago in the "Inclinations on the Future of Hawaii's Electric Utilities." The IGP Draft Report Fails to Accurately Account for and Optimize BYOD Programs Hawaiian Electric's inputs and assumptions do not accurately reflect the development costs or capacity services offered by Commission-approved BYOD programs. Additionally, the RESOLVE model is unable to select and build additional cost-effective BYOD resources. Although the inputs and assumptions do include a DER Aggregator PV + Storage resource, this reflects the entire anticipated development cost to the DER customers and results in an estimated cost per kW over a ten-year period of $6,433 more than the DER Parties' Phase 2 proposed pricing for BYOD Level 1 and 2, and $5,723 more than BYOD Level 3 in the DER docket. Similarly, the cost of utility-scale batteries is more expensive than the DER Parties' proposed BYOD pricing. These factors create modeling inaccuracies and result in more expensive plans that fail to recognize and capture the benefits that BYOD programs can provide to the ratepayers. Hawaiian Electric should rerun the RESOLVE model to include Commission-approved BYOD capacity across all scenarios and allow the model to select additional BYOD capacity at the DER Parties' proposed pricing for BYOD programs. The resources that RESOLVE selects within this initial optimization run would then be included within all scenarios at the capacity levels selected by the model. Following this initial optimization step, Hawaiian Electric could continue with the current practice to "hand select planned resources" for their desired resource mix based on the scenarios as well as system stability analysis, and allow the model to build additional resources. By not including BYOD as a selectable resource and forcing the model to build new additional resources at capacities and dates selected by Hawaiian Electric, all scenarios are artificially constrained and not truly optimized. The PLEXOS Model Improperly Allows for Curtailment of DERs	added a Faster Technology Adoption scenario as suggested by the DER Parties and directed by the Commission. Additional details can be found in the IGP Input and Assumptions. The IGP report and resource plans are based on achieving affordable and reliable electricity at the lowest cost. DER is present in significant amounts as a forecast layer (through customer investment). For Oahu, we are forecasting DER load reductions of ~13,000 GWh by 2030 and ~37,000 GWh by 2045.Additionally, we modeled DER as a system resource that could be further optimized holistically as a system resource that can meet grid needs alongside other customer and supply side options. By treating DER as a system resource, with the ability to be dispatched, the IGP models and plans fully embrace its capabilities. We also note that with respect to BYOD programs, Hawaiian Electric has been fully engaged in the DER Docket proceeding in evaluating additional modeling scenarios and details to propose new program designs for future programs. These forecasts include the cost of the resource itself plus other capex costs, including interconnection costs, embedded in NREL's Annual Technology Baseline (https://atb.nrel.gov/electricity/2022/definitions#capitalexpenditures). Costs for REZ enablement were separately included as part of RESOLVE's optimization (i.e., cost adder) so that the model would be able to build out lower cost renewable energy zones first. Forecasted DER, modeled as a resource, includes customer sited BESS. Additional customer sited BESS could be built through the DER aggregator option that was available in RESOLVE. Managed charging of EVs was considered through the load forecast as a base assumption as suggested by the DER Parties. Section 2.1.4 also notes that as part of our Action Plan is to develop vehicle to grid standards. Two classes of DER were captured in PLEXOS when modeling DER as a resource. Existing DER was modeled as non curtailable. Future DER was modeled as controllable / curtailable under the expectation that future DER will need to provide similar dispatchability as large-scale resources. However, despite having this capability, the future DER is minimally curtailed.

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We have come to understand from our participation in working group meetings that Hawaiian Electric is "optimizing'" DERs by allowing the PLEXOS model to curtail behind-the-meter DERs. Hawaiian Electric has similarly claimed in their DPS Phase 3 modeling results in the DER docket that the value of BYOD 3, offering load build and load reduce capacity services, can be based on the IGP DER Freeze case, which assumes that behind-the-meter DERs are providing these services for free. Existing DER programs as well as the new Smart DER programs do not allow for curtailment, as Hawaiian Electric has allowed in its modeling, and this inaccurate assumption will limit the value of BYOD services and produce questionable resource optimization results. Hawaiian Electric should rerun the PLEXOS model without the assumption that all customer DERs can be curtailed. The IGP Draft Report's Resource Assumptions Do Not Include Interconnection Costs of Utility-Scale Resources It appears that Hawaiian Electric's cost assumptions for utility-scale resources do not include Renewable Energy Zone and site-specific interconnection costs, which artificially lowers development costs for these resources and skews the modeling against customer BYOD programs. While we can understand that utility-scale development costs will vary by location, it is unreasonable to not include any of these costs in the inputs and assumptions. The IGP Draft Report Does Not Account for Customer Standalone Storage or EVs as Potential Resources There appear to be no assumptions for customer standalone storage or EV to home/grid services, which is unrealistic given the potential for resource adoption. The Inflation Reduction Act has expanded tax credits for standalone batteries and EVs. Moreover, while the current BYOD programs are targeting batteries that charge from onsite renewable generation, there will likely be future opportunities to expand BYOD programs to standalone batteries and EVs. Thus, Hawaiian Electric should consider customer adoption of these resources and how Advanced Rate Design can spur adoption of these technologies for grid and ratepayer benefits. We appreciate the opportunity to submit comments on the IGP Draft Report and look forward to continued engagement on these issues.	
I strongly oppose the IGP on Oahu because of the negative environmental impacts of the plan and the unreliability of the electric grid once completed. Oahu will see power interruptions and ugly development of our scarce land areas for transmission lines, solar farms, and windmill turbines. We must include firm electric generation including some fossil fuel plants and nuclear plants for base and peaking loads. The transition to all electric cars will be impossible without interim firm power provided by fossil fuels.	Hawaiian Electric recognizes that each community has a distinct character and resources are exceptionally valued to support island sustainability. We've learned the value of providing opportunities for impacted communities to share their views on projects and participate in effective community dialogue. We view firm generation as an essential part to assuring reliability as we transition to more intermittent resources. We analyzed this topic in Section 12 of the report.
I look forward to seeing Hawaii move away from the use of non-renewable energy and rely more on renewable energy sources. With the increasing changes that come with climate change I feel it is vital for countries or states such as Hawaii who are at the	Thank you for your comment. We agree that community engagement is vital to achieving our goals. We outline some of the things we are doing to engage communities in Section 10. We will

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frontline of this crisis to be the trailblazers for decarbonization. The Hawai'i Powered project has great goals in order to decrease carbon emissions however community involvement is crucial to achieve all the set goals. It is important to show how the government or local agencies will help the people make the switch to renewable energy.	continue to engage the community as we move forward with our plans to achieve 100% renewable energy.
This plan will only increase utility rates. I oppose. PUC members should be replaced.	We believe that compared to the Status Quo of remaining on fossil fuels that our proposed plan may keep rates relatively flat and stable in the long-term. This is further described in Section 9.
The integrated grid plan with focus on 100% renewable energy for Oahu is not an achievable goal without destroying Hawaii"s natural beauty. This is our golden egg for tourism. Surrounding a portion of the islands with inefficient, eye sore windmills will destroy the view plane of all sunsets tourists come to see. Stand at Kahuku High School, and get a panoramic view of how windmills have destroyed an entire communities view plane. Hundreds of people were arrested trying to prevent (albeit too late) these turbines to be brought too tall, too close to our beloved Kahuku community. They received NOTHING in return. I adamantly oppose ANY new windmill, on shore or offshore. We need to evaluate if a 2045 100% renewable date, which was "arbitrarily selected with NO economic basis on the cost /benefit. I say any supporter of wind publicly state he will put the first wind turbine in his own yard before he destroys the landscape of others. Not going to happen. We need to evaluate EXACTLY what the economic trade offs are to go 100% renewable when there is NO plan proposed that makes economic sense with out destroying our aina.	Hawaiian Electric recognizes that each community has a distinct character and resources are exceptionally valued to support island sustainability. We've learned the value of providing opportunities for impacted communities to share their views on projects and participate in effective community dialogue. Hawaiian Electric continues to update its community engagement and cultural resource preservation requirements using community feedback through our own engagement efforts. We heard from community members who wanted the company and developers we work with to improve transparency and community engagement from the start of the energy project development process. We also believe early and frequent engagement will help improve the success of renewable projects, and help us collectively achieve our state's renewable energy and carbon neutrality goals. On islands, particularly in densely populated areas on O'ahu, utility-scale infrastructure and renewable projects are often sited close to homes and communities. Site selection is currently determined by landowners and developers reaching an agreement and bidding into a competitive bidding process. Hawaiian Electric supports processes and studies that help raise awareness of energy policy issues that must be addressed in order to meet the state's renewable portfolio standard (RPS). For future projects where communities are accepting of renewable projects, we are now requiring developers to provide financial community benefits to the surrounding communities as described in Section 10.4. This is a starting point and hope to improve on community benefit packages in the future. Time must be spent upfront communicating, building relationships and developing trust to get as comprehensive a view of the community as possible.
The report states that communities that bear the burden of hosting energy infrastructure, both in the past and future, should receive benefits. What may these benefits look like? How might they be funded? Providing an example of this might be helpful in order to make the report stronger. The report states that since 2010, the company has nearly tripled the amount of renewable energy they generate. Is this in exact terms or relative to the electricity produced? The report brings up the existing fossil-fuel generators on Hawai'i Island, Maui, and Oahu and the fact that they are 55 to 75 years old. Is there a plan to phase out these generators? Will these	As outlined in Section 10.4, we will be requiring developers of large-scale projects, to provide financial benefits to the surrounding communities. For community benefits to be meaningful, time must be spent upfront communicating, building relationships and developing trust in order to get as comprehensive a view of the community as possible. On islands, particularly in densely populated areas on O'ahu, utility-scale infrastructure and renewable projects are often sited close to homes and communities. Some communities shoulder more of the infrastructure than others. We recognize each community has a distinct character with unique resources. We've worked hard to ensure that impacted communities have opportunities to share their views on projects and participate in effective community dialogue.

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generators be used for something else when they are no longer supplying the islands with electricity? When discussing cuts in carbon emissions until 2030, emissions in 2005 are used as a baseline. The report states that a goal is to cut emissions by 70% by 2030, compared to 2005 levels. Using 2005 as a baseline year can make it hard to relate to. It was almost 20 years ago, during a time before the Iphone was invented and our reliance on electricity looked completely different. It might be more relevant to set the baseline year closer to today's date. The report states that technology advancements are necessary in order to achieve net zero emissions. While this might be true, it is also pushing the problem of sustainable electricity production onto future generations and relying on the potential of something changing. I don't think we should rely on solutions that are not yet created to help solve a problem that was to a large extent created using that same train of thought. We shouldn't take potential future solutions into account when creating mitigation strategies, instead we should see them as a bonus that will help us solve a problem that we already made a plan for using the resources that are currently available to us. I think one big thing that I didn't see in the report is the need for changes to our behavior in terms of electricity consumption. It is great to have technology that conserves energy but at the end of the day, if we consume less electricity, we can produce less electricity and thus automatically reduce carbon emissions. I think the report makes a strong case for what consumers can do in terms of small-scale electricity production to help this transition; however, I think the report needs to put more emphasis on the choices consumers make with the amount of electricity they use.	The amount of renewable energy as a percentage of the total energy produced has tripled since 2010. Yes, we have a plan to phase out some of our oldest generators and replace them with a mix of resources that includes solar, wind, energy storage, and firm generation. An overview is shown in Figure 2-1 of the report. We agree that energy efficiency and conservation is key component to achieving our goals. We outline this important part of our plan in Section 2.1, "Widespread adoption of energy efficiency" which also includes conservation measures.
I'm writing to share my opinions about HECO's strategy to use only renewable energy by 2045. As a concerned citizen, I find HECO's dedication to sustainability encouraging and commend the business for its initiatives to lower carbon emissions. I am aware that there are a number of obstacles to overcome before we can succeed in this endeavor. The significant technical, economic, regulatory, and social challenges mentioned in your plan must be met head-on by all parties involved. Regarding technical difficulties, I value HECO's emphasis on energy storage and grid modernization. For the integration of renewable energy sources, a dependable and stable grid infrastructure is essential. Furthermore, the intermittent nature of renewable energy sources like wind and solar can be addressed with the development of energy storage technologies. The transition's economic difficulties are also noteworthy, and I am aware that substantial investments will be needed to create new infrastructure and technology. The cost of renewable energy is, however, going down, which gives me hope that this trend will continue as technology advances. Regarding the difficulties in obtaining the necessary licenses and approvals for new renewable energy initiatives and grid infrastructure upgrades, I am aware of Hawaii's complicated regulatory environment. I implore HECO to cooperate with oversight organizations in order to overcome these obstacles and fulfill its sustainability objectives.	We plan to continue our engagement with stakeholders external to Hawaiian Electric and rely on our stakeholder council to help us achieve our goals. We realize that this will take a tremendous effort by many people and organizations in the State to make 100% renewable energy a reality.

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Finally, I commend HECO for its efforts to encourage public awareness of renewable energy sources and energy-saving technologies. I support HECO's dedication to raising public awareness because I think that in order to meet the goal of 100% renewable energy, a cultural shift toward sustainability is required. In conclusion, I think that HECO's goal of using only renewable energy by 2045 is a step in the right direction. I implore HECO to keep addressing the issues mentioned in its plan and to cooperate with interested parties in order to realize this objective.	
I think this report has a reality and provides great insight into the future of Hawai'i's electricity. However, I have several questions about when Hawai'i, especially the Big Island of Hawai'i experiences a catastrophic natural disaster. I believe the Big Island is well known for its active volcanoes, which are capable of producing lava flows and ash, which potentially could dramatically affect the power generating equipment for solar energy, wind power, and geothermal energy plants. In case of such an emergency, how will the electricity be generated and provided to the public? Other than the volcanic activities, Hawai'i gets hit by hurricanes once in a while, which could damage solar panels or the wings of the windmills. If these damaged parts fly away and damage private property, such as houses and cars, would there be any compensation for the damage and repair? If the solar panels were owned privately, though were constructed as part of this plan, would the responsibility be on the owner's side or will any incurred fees be covered by Hawaiian Electric?	As part of our resilience efforts, we will evaluate ways to improve system resilience for both generation resources and transmission and distribution infrastructure. Section 7 outlines several initiatives that we plan to address. In the near-term, Hawaiian Electric has identified several no-regrets actions to harden the grid infrastructure on Hawaii Island (Section 7.4).
In the event of a tropical hurricane directly impacting the island of Oahu, a number of major existing generating units and solar units will be negatively impacted due to tidal surges in tsunami inundation zones where there are located (Kahe PP, CEIP, Kalaeloa). We are fortunate to have one fossil fuel generation station active and protected from tidal surges at Waiau PP located in Pearl Harbor; albeit in the process of being decommissioned. Additionally, the former Honolulu Power Plant building (located in Honolulu Harbor and adjacent substation is still available despite being decommissioned but w/ present technology, can be reactivated. Both of these units will provide firm electrical power to the island of Oahu. HECo made a major error by proposing/enacting the destruction of both environmentally protected units	We may deactivate or retire generating units at our existing facilities, especially those protected from natural disasters; however, that does not preclude future generation from being sited at these locations. This is a topic that Hawaiian Electric will continue to evaluate, especially with respect to resilience and the opportunity to leverage existing grid infrastructure.
LANA'I, 98% owned by one entity presents a unique challenge to residents. I am clear the plan does not fully address our unique needs.	We continue to work with the majority landowner and communities on Lāna'i to identify the best path forward for the island. Our stakeholder council which we meet with throughout this process (Section 4.1) includes representation from the Lāna'i community. Please also see Section 1.4.4.
Relying on intermittent renewable energy sources is a short-sighted strategy to mitigate carbon emissions. I is very likely these systems will not retain an affordable replacement cost as the entire planet competes for a supply that cannot meet even a single generation of demand. Having directly asked HEI about whether there has been any research into the sustainability of these systems' economic viability into 2nd generation replacements, the answer was "No, we haven't."	We address disposal and recycling of clean energy equipment in Section 2.6 of the final report.

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My own research, which prompted the question, shows that the known recoverable supplies for the critical raw materials needed to manufacture these systems cannot meet the projected demand of a GLOBAL grid network needing that is racing to replace fossil fuels today and will need to begin the process of replacing these systems in between 15 years (for batteries) and 20-25 years (for PV panels) and 15-20 years (for wind turbines). As these systems are just being built, the option to recycle them in the future does not yet exist. Mining is the only viable source for their source materials. To be responsible, we must look at whole systems, their sustainability, their life cycles and the associated economics as we chart an unalterable course toward electrifying our economy into the future. Solar, Wind and batteries may be the popular, fast approach to decarbonization, however, our ability to continue doing that without risking the functionality of our economy in just one generation suggests that we look at systems with longer term life cycles such as geothermal power. If this commentary resonates at all, I am willing and able to back up my statements with credible data, for which this is not an appropriate forum. I encourage you to follow up with the necessary research to ensure we are preparing for our broader longterm need vs. a siloed goal based on a single metric, carbon emissions.	
Dear Commission Members: The Grassroot Institute of Hawaii would like to offer its comments regarding Hawaiian Electric Co.'s proposed "Hawaii Powered Draft Integrated Grid Plan. The Institute acknowledges that the state's renewable energy goals are well intended, but this plan would likely further raise Hawaii's high cost of living. Specifically, the plan calls for investing more than $15 billion in capital expenditures on Oahu, compared to the $7 billion it estimates that it would cost to maintain the status quo. Since Hawaii already has the highest electricity costs in the country, we are concerned that this additional infrastructure spending could cause Hawaii families significant financial harm. Additionally, we are concerned that limiting energy options could increase energy prices in Hawaii. HECO projects its plan could lower electricity rates, but that would be true only if oil prices increase dramatically over time, as the plan assumes. It is, however, possible that oil prices could decrease over time, which would leave residents with higher energy bills under the proposed plan. If this plan is to go forward, we suggest that HECO, the Public Utilities Commission and other stakeholders convene a working group to identify regulations that block deployment of new clean-energy technologies, such as slow permitting processes, excessive land-use restrictions and taxes that discourage new technology	In Section 2.3, we have identified similar policies or actions to identify regulations or processes that can potentially slow down deployment of clean-energy technologies. We hope to work with stakeholders to identify ways to improve processes. We also are cognizant that new technologies may come along in the future. In order to ensure a reliable and low cost energy system, we must ensure those technologies have been commercially scalable and reliable and lower cost compared to alternatives. Through our competitive procurements and requests for proposals we encourage prospective developers to present proposals that can ultimately benefit our customers and communities.

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startups. Removing such barriers and allowing clean energy sectors to take hold more naturally could help mitigate the cost of these proposed power grid changes. Thank you for the opportunity to submit comments.	
As I am reading this proposal a few things immediately come to mind. First of all I would like to show appreciation for acknowledging that every industry needs to participate in this integrated plan. That being said, this document solely talks about what customers should do and how you should be doing things yourself to give back to the grid. Very little is said about policy implementation on large companies using large amounts of electricity. What should they be doing to decrease their consumption? If you wish for us to be "putting back into the grid" then those corporations better be paying us, except they will most likely be paying you for our power. Under "External Actions and Policies for Successful Implementation," no specific suggestion is given for quite a large factor of Economic Conditions and Actions. How will we ease the supply chain and inflationary pressures? After 100% renewable energy is achieved, it certainly will happen, but what will be done until then? Another section that got my attention was the Climate Change Action Plan. "Statewide decarbonization will require collaboration across sectors, with transportation, agriculture, and other industries working to reduce and offset emissions." (P.41) I assume this excludes the emissions from around 150 mainland flights departing and coming into the islands as well. I also assume you are excluding the emissions from the 170 average daily inner island flights. That is around 62,000 flights a year travelling solely between the islands. There is around 109 pounds of CO_2 per passenger on a 200-mile flight. And you're telling non-commercial consumers that we need to pull up our bootstraps. More pressure should be put on the travel industry to find a more sustainable way to travel. And the way to reach net zero carbon emissions by 2045 is not to save up to buy carbon credits for an offset.	Large customers have an equal role to play in achieving 100% renewable energy. We used assumptions that are consistent with a statewide study to identify energy efficiency potential. Many efficiency measures have been identified for large, commercial customers, which is available at: https://puc.hawaii.gov/wp-content/uploads/2021/02/Hawaii-2020-Market-Potential-Study-Final-Report.pdf We have been monitoring supply chain and inflationary effects on equipment pricing. Unfortunately, that is largely out of our control; though, part of the Integrated Grid Plan is to continue to issue request for proposals so that we can get the best competitive pricing for new energy resources. The Integrated Grid Plan focuses on decarbonization of light duty vehicles and buses. We recognize that there are other sectors of the economy, particularly in aviation and marine transportation that must also decarbonize to meet state goals. We have started work to identify how decarbonization of those sectors may affect the electricity sector and will have more analysis on this topic in future iterations.

1.1 Public Utilities Commission (PUC) Comments

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
Chapter 1 – Executive Summary		
At 12, 13, 17, 22, & 25	Helpful use of defining key terms (e.g., equity, energy equity, LMI) and speaking to frequently suggested alternatives/solutions (e.g., solar on all rooftops)	Acknowledged
At 14, Figure 1-1	Figure 1-1 is a great breakdown of today's renewable energy resources, and it could be useful to add a scale to indicate the size of the renewable portfolio on each island (e.g., MWh of renewable energy generation per island/county), unless it negatively impacts the presentation of this breakdown.	Footnote added to reference the 2022 RPS report
At 23, Figure 1-3	It would be helpful to note that the Stage 3 additions include standalone BESS in the Hybrid Solar + Wind (as stated in the STWG meeting)	We have added a callout box for readers to better understand "hybrid solar" since it's a key term used throughout the document.
At 23, Figure 1-3	It appears that not all existing fossil fuel plants are addressed in the "retirements/deactivation" portion of this timeline. Are these units assumed to not be retired and/or deactivated prior to 2050? Are there any unit conversions (i.e., to biodiesel or another generating source) that are not depicted in this timeline?	Remaining generating units are assumed converted biofuel in 2045. We clarify this in the figure.
At 21	"To grow the market for large-scale projects that also benefit host communities, we propose routine cyclical procurements with public input and community benefit packages from developers." *Where in the IGP does it describe the proposal? How frequent will these "routine" procurements be, and what does "cyclical" mean in this context?*	This is discussed in Section 11.2, additional edits for clarity have been added as follows. "While the urgent timeline to meet climate goals may necessitate a large procurement in the near-term, we believe smaller procurements on a regular schedule instead of large procurements (i.e., Stage 2 and 3 RFPs) would lead to a smoother and efficient procurement and interconnection process because of the complexity and logistics to develop and execute projects in Hawai'i."
At 23, Figure 1-3	Since firm renewable procurements are designed to be "staggered" (300 MW in 2029 and 200 MW in 2032), it would be useful to reflect this in this figure. The current design makes it look like all 500 MW of firm renewables from the Stage 3 procurement are planned to be procured by 2030).	We did not want to add more complexity to the presentation of the current figure. Once we have clarity on Stage 3 projects, we will update the timeline graphic accordingly. The upper end of the Stage 3 target was 700 MW in total for Oahu.
Chapter 2 – Action Plan		
At 27	In the discussion under "Keep rates lower than the status quo of fossil-fuel reliance," Hawaii Electric makes the following statement: "Although utility rates will rise in the transition to clean energy..." I would update to "Although utility rate may/are likely to rise" to make that statement less definitive. It also is confusing because Hawaii Electric follows up with "Our projections show that customer bills may remain relatively flat..." This may be better explained in Sections 9 and 10.	Made the appropriate clarifications throughout that rates may rise in the near-term transition but stabilize over the long-term.
At 28	While HECO notes that widespread adoption of energy efficiency is needed to grow the marketplace, the discussion of energy efficiency is less present in the executive summary narrative, and could be emphasized alongside rooftop solar and distributed storage as a	Additional language added to Section 1.5.2

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	means to meet energy needs through customer resources.	
At 28	Clarify whether the identified goals for distributed solar and storage, energy efficiency, and large-scale renewables are in addition to current deployment or inclusive of current deployment. For example, HECO's sustainability report indicates that the existing amount of residential and commercial rooftop solar and energy storage systems as of 2022 is ~97k installations with 1,118 MW capacity, so the 2030 need would appear to be an increase of ~28k installations and 68 MW of capacity above current levels.	The EE and DER figures provided at pg 28 are cumulative 2030 totals from the IGP forecast. The EE, DER and large-scale renewable amounts shown in Figure 1-3 are provided as incremental additions from end of 2023 to end of 2030 in the forecast.
At 30	In the "Near-term actions to improve grid resilience" box, in addition to "Complete rollout of advanced metering infrastructure..." is a need to ensure the technologies, processes, and programs are in place to utilize that AMI beyond deployment.	Yes, this is the intent, added clarifications under "Actions we can take to begin increasing customer participation:"
At 31	Consider the role of new renewable energy technologies that may mature during the planning horizon, and whether there are opportunities for these emerging technologies to provide additional generation in a diverse energy portfolio.	Yes that's the intent, we expanded the description to more than just inverters and system security. Future technologies would be included as they mature. In general our procurements are intended to be technology agnostic, at times we may prefer to specify a technology if critical reliability needs must be met.
At 32	For Figures 2-1 through 2-7, consider specifying whether this reflects results from the base case or other modeling.	Clarified captions by adding (Base) to figure captions. These figures are based on the "Preferred Plans" in the IGP.
At 33, 34, 35	Clarify what projects are being referenced in "LMI and Phase 2 projects" for each island. Are these CBRE projects?	Yes, CBRE, made appropriate clarifications on these pages.
At 36	Consider the impact of federal policy action on codes & standards, which could reduce the scope and cost of utility funded efficiency programs.	The High Bookend EE sensitivity was based on the AEG Market Potential Study's Achievable – High forecast which included potential future (new) state and federal codes and standards.
Chapter 3 – Introduction		
At 40	Figure 3-2 appears to present duplicate charts for carbon emission goals by 2030 and by 2045.	This was an error, graphic has been updated.
At 42	Figure 3-3 does a great job explaining not only that community engagement is ongoing throughout every step of the process, but also highlighting how engagement is incorporated into each step.	Acknowledged.
At 44	How were these pathways developed from the approved inputs and assumptions, which outlined about 10 modeling scenarios and sensitivities per island (base, high load, low load, DER freeze, EV freeze, EE freeze, land constrained, no state ITC for PV, low renewable generation, and high fuel price)?	Language was added to tie the pathways to the modeling scenarios in Section 6.8
Chapter 4 – Community and Stakeholder Engagement		
At 51, Table 4-1	Hawaiian Electric states, "Before the COVID-19 pandemic, in early March 2020, we began our initial campaign of public outreach and engagement, connecting with 1,421 community members in person and online," with 161 in-person.	We've amended this in section 4.2.2 to be clearer: Before the COVID-19 pandemic, in early March 2020, we began our initial campaign of public outreach and engagement, hosting in-person open houses and an online open house. The online open house was built to be

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	What qualifies as connecting with community members online?	interactive and featured informational graphics, links to additional resources and an embedded survey tool. A total of 1,260 people visited the online open house, and 161 attended the in-person open houses. The engagement goal of this outreach campaign was to connect with the public, provide a general overview of Integrated Grid Planning, and gather input on what is most and least important to consider as part of the planning process.
GENERAL	Does Hawaiian Electric see current participants in public outreach and engagement as representative of all Hawaiian Electric customers? If yes, how so? If not, how do they differ? Does Hawaiian Electric feel a need to increase to increase public participation and engagement in future grid planning and resource procurement? If so, how does Hawaiian Electric plan to do so?	We acknowledge the vast diversity of the communities we serve and recognize there will always be ways for us to make our engagement and outreach more accessible for all our customers. Throughout the development of the IGP, we worked to engage as many community members as possible by tailoring our communication strategies to each island and providing multiple ways for customers to receive information and share input, both online and in-person. Energy planning is complex, and we used various tools—data dashboard, blog posts, videos, community presentations and newsletters—to distill information and allow for multiple engagement points throughout the process. Digital materials were made accessible, written in plain language and supported by visuals. We also worked to include diverse customer interests through the Stakeholder Council, which included representatives of each county, commercial and industrial customers, consumer advocates and environmental advocates, among others. Moving forward, we plan to continue a balanced approach of providing in-person and digital opportunities to share information and gather input. Fostering dialogue through physical and digital mediums is a more inclusive and equitable approach to community engagement. This approach recognizes that some community members are unable to attend in-person meetings and prefer the flexibility of sharing input online, while others may not have internet access and prefer in-person interactions with the project team and handouts they can take home to review or share with others in their community. We also plan to focus outreach efforts on communities that might be most impacted by energy projects, increasing public participation around the development of Renewable Energy Zones (REZ) and potential future projects. One strategy to accomplish this is requiring developers to provide and implement community engagement plans that outline how they will seek to involve community members, provide opportunities for input and incorporate public feedback into the projects.
61	Hawaiian Electric states, "This key takeaway [public preference for reliability and affordability] informed our Integrated Grid Plan by reaffirming our dedication to finding clean energy solutions that also stabilize customer rates and ensure reliable power that people can count on."	Public outreach and engagement also informed the following aspects of Integrated Grid Planning: • In talking to communities about affordability, lower electric bills are top of mind. Affordability is connected to energy justice, ensuring that we preserve Hawai'i's environment, equitably

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	Can Hawaiian Electric provide more specific and concrete examples of how public outreach and engagement informed Integrated Grid Planning?	distribute burdens and benefits of energy infrastructure and expand customer access to participation in energy generation, storage and efficiency. The IGP explores each of these in detail and, as discussed below and throughout the report, community partnership in the development of REZ is vital to our success. In the IGP, we develop the lowest-cost plans and assess bill impacts, evaluate tradeoffs with land constraints, provide additional analysis on the value of customer resources and examine how the energy market in Hawaii can be expanded. • Customers expect reliable service. Many communities have expressed concerns about reliance on solar and wind and have consistently brought up consideration of other technologies. We address these comments through our detailed evaluation of the impacts of weather on typical grid operations. We dedicate Section 12 to closely examining these risks such that we can position the next phase of the IGP to acquire resources to shore up generation reliability. • Refinements to our REZ map, which will shape the selection of future projects and competitive procurements. Community members' insights about their own communities were instrumental in helping us understand challenges and opportunities for potential energy projects. Their comments showed us which locations may be best for future projects that benefit their host communities, and locations that may not feasible based on cultural significance, community use and technical aspects. We are currently in the process of reviewing all public comments and planning for continued community engagement about REZ locations. • Ongoing updates to our community engagement and cultural resources preservation requirements. We've learned the value of providing opportunities for impacted communities to share their views on projects and participate in effective community dialogue. We heard from community members who wanted the company and developers we work with to improve transparency and community engagement from the start of the energy project development process. In communities where renewable projects are proposed, we are now requiring developers to provide financial community benefits to the surrounding communities as described in Section 10.4. This is a starting point, and we hope to improve benefit packages that directly address critical community needs in the future.

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
62	"Together, public input and technical studies help inform a round of competitive procurements starting to be issued 2023." Suggest deleting "starting."	We have amended this in the report, section 4.2.6.7.
At 64	The in-depth description of all the community and stakeholder engagement is super helpful and a great resource. Consider providing some reflection, either here or elsewhere in the report, regarding lessons learned from community engagement in the IGP process. Are there methods of explaining IGP and its technical aspects that were particularly effective? What are the strengths and weaknesses of the different formats for events that Hawaiian Electric explored? What improvements or changes to the community engagement process is Hawaiian Electric considering as we move forward?	We've learned the value of providing opportunities for impacted communities to share their views on projects and participate in effective dialogue with Hawaiian Electric team members. Time must be spent upfront communicating, building relationships and earning trust to develop projects that are reflective of community needs. Some of the strategies that we found most effective in explaining technical subjects and inviting input include: • Tailoring our strategies to each island, recognizing that counties have unique needs, conditions and opportunities for decarbonization and public participation. Customizing our communications to each island was facilitated by Hawaiian Electric team members who served as island community and communications leads. These team members led efforts to foster relationships with local communities, acted as a point of contact for their island and helped focus our outreach to communities that might be most impacted by local energy projects. We will carry this approach forward to continue to engage communities on each island. • As part of customizing our outreach to each island, we also found it meaningful to attend community events like fairs and festivals. This widens our outreach efforts as it reaches additional community members who may not attend a utility-specific public meeting. It also allowed us to support local initiatives for clean energy and sustainability outside of Hawaiian Electric and improve accessibility to our team by showing up and connecting with community members in places where they already were, rather than asking them to come to us. For example, attending local events was particularly effective for Hawai'i Island, where we have many rural communities and customers with limited internet access. • Providing multiple avenues to engage with the IGP process, including a variety of in-person and online formats. We found that hosting in-person meetings and attending local events is especially important in rural communities, where internet access can be more limited. For example, during some of the community meetings we attended for the projects on Hawai'i Island, we heard from community members who said they prefer face-to-face interaction and appreciate materials they could take home to review or share with others. When it came to online formats, we found that having

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
		various streams of digital content—including a blog, e-newsletter, short videos and social media posts—that all flowed to the Hawai'i Powered (website) hub for community engagement was an effective way to reach more people and provide clear, accessible and consistent information. • Providing interactive, educational web modules to help explain technical topics like inputs and assumptions planning. Developing these digital "deep dives" on technical processes helped make complex information more accessible by using plain language, meaningful visuals and a web design that walked viewers through the content step by step. We also centered the narrative on the customer experience, conveying what is involved in the processes and why it matters for individuals. We also shared messaging from these web modules in handouts and presentation materials at in-person outreach events. Improvements we are considering as we move forward include: • Enhancing our balanced approach of providing in-person and digital opportunities to share information and gather input. By offering physical and digital mediums to engage, we hope to continually improve the accessibility and inclusivity of our outreach. ○ When it comes to in-person outreach, one of our intentions is to expand our efforts to reach certain communities that may have limited access to computers, smartphones and the internet. Our goal is to continue having in-person community conversations to build relationships, foster dialogue and develop projects that are reflective of community needs. ○ When it comes to digital outreach, one of our intentions is producing more videos that explain technical subjects like REZ zones. This can help make complex topics more accessible and supplement written information online, in presentations and in print materials. • Involving communities earlier and more often throughout the procurement process for energy projects, including requiring developers to provide and implement community engagement plans. • Engaging more young people through partnerships with schools and STEM programs.

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
Chapter 5 – Today's Planning Environment		
At 66	The format of Table 5-1 is a little confusing to understand the flow. Are the state policies in the right-hand column directly related to the strategies in the middle column? If so, perhaps make it clear which policies are related to which strategies.	Reformatted the table, it wasn't meant to be that precise. It's a grouping of policies organized by sector.
Chapter 6 – Data Collection		
At 72	Note that the DER forecast assumes a Battery Bonus program targeting 50 MW, which was changed earlier this year to a 40 MW cap per Company request. This many not significantly affect the forecast, however, as additional resources attributed in this forecast to Battery Bonus may relatively reflect BYOD Program resources, but should be addressed if feasible.	This should not significantly affect the outcome of the analyses; however, the forecast will be revised in future cycles of IGP .
At 72	The cumulative distributed PV capacity in Table 6-1 indicates a consolidated capacity of about 1,025 MW by 2025, whereas Hawaiian Electric's 2022-2023 Sustainability Report indicates that as of the end of 2022, the cumulative solar capacity is 1,118 MW. Please explain the disconnect in the forecast and current capacity.	The 2022-2023 Sustainability Report cumulative solar capacity of 1,118 MW includes utility scale solar, CBRE and FIT, whereas the IGP DER forecast only includes the customer DER programs.
At 74	How were the price elasticity assumptions for TOU rates for the 3 sensitivities in Table 6-3 determined?	The elasticities were from the SMUD SmartPricing Options Final Evaluation (September 2014) and the AEG/Brattle Group State of Hawaii Market Potential study (August 2020). Elasticity of –0.70 is consistent with the SMUD elasticity of substitution for non-Energy Assistance Program Rate residential customers on the default TOU rate. Elasticity of -0.045 was the lower bound of the range sited in the AEG/Brattle Group State of Hawaii Market Potential Study. These sources were chosen following a literature review comprised of the following studies and reports: SMUD SmartPricing Options, September 2014 NV Energy Nevada Dynamic Pricing Trial, October 2015 KIUC TOU Solar Rate Pilot Program, May 2017 Hawaiian Electric Interim TOU Program, January 2020 UHERO Integrating Renewable Energy: A Commercial Sector Perspective on Price-Responsive Load-Shifting, July 2018 AEG/Brattle Group State of Hawaii Market Potential Study, August 2020. For more details, refer to Appendix B, Section 1.3.1
At 77	For Figure 6-4, is there a summary comparison of the cost (both energy and capacity) for energy efficiency bundles available?	Data on the energy efficiency bundles was provided in the IGP Key Stakeholder Documents, under the Energy Efficiency Supply Curves dropdown. See files posted on Nov. 9, 2021: Key Stakeholder Documents | Hawaiian Electric
At 78	Please define "light-duty," "medium-duty," and "heavy-duty" in the context of electric vehicles for reader comprehension.	We clarify these terms in this section.
At 82, Fig. 6-7	The process for converting sales forecasts into an hourly demand load forecast includes a Layers step for the Layer Shapes of DER, Battery Load Shift, EE, EoT, and Future	Yes, the forecasted EE hourly shapes were derived using AEG's State of Hawaii Market Potential Study

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	Layers. Please discuss whether the Layer Shape for EE are derived from the hourly load impacts provided in AEG's State of Hawaii Market Potential Study, dated July 27, 2020.	
At 86-87	For the resource costs data sources in Table 6-17, do the cost of the resources from different sources all include: electrical infrastructure and IC costs as well as O&M and land costs including land lease payments and land improvements?	As noted in the NREL ATB, all technologies include electrical infrastructure and interconnection costs for internal and control connections and on-site electrical equipment (e.g., switchyard, power electronics, and transmission substation upgrades). Similarly, all technologies also include site costs for access roads, buildings for operation and maintenance, fencing, land acquisition, and site preparation in the capital expenditures as well as land lease payments in the fixed costs for operations and maintenance. We have also added a locational adjustment for Hawaii as described in the approved Inputs and Assumptions (August 2021).
At 87, 88, Fig. 6-10, 6-11	Please clarify the units for Figures 6-10 and 6-11. Please clarify whether these graphs are duplicate, and if not, what analysis each graph provides.	The units for Figure 6-10 and Figure 6-11 are provided in the caption. Figure 6-11 was inadvertently a duplicate. It has been updated to the correct graph.
At 89	Should the Technical Potential be adjusted for the need to upgrade distribution circuits to increase hosting capacity some of which is touched on in Section 8.2.5.1?	No adjustment needed, but added clarification: Technical potential is a metric that quantifies the maximum generation available from a technology for a given area and does not consider economic, market viability, or other technical constraints (e.g., hosting capacity, system stability, etc.).
Chapter 7 – Resilience Planning		
At 93	The report states, "Achieving a target level of resilience will depend on multiple integrated aspects of resilience including emergency response, generation/power supply resilience, transmission and distribution (T&D) resilience, system/grid operation resilience, cybersecurity, physical security, and business continuity." Yet, this chapter seems to focus primarily on T&D resilience, which is just one of the seven aspects. Suggest that the current status and future plans regarding other aspects of resilience (emergency response, generation/power supply resilience, etc.) also be addressed in this Chapter. For example, regarding cybersecurity, what does this entail for Hawaiian Electric, what is currently being implemented, what is the plan and projected cost and projects for future improvements? Another example, for emergency response, how often does Hawaiian Electric perform emergency response drills, what other improvements, training, etc. are required?	Cybersecurity and emergency response is not necessarily in scope of the resilience section that focused on transmission and distribution facilities. However, the Company has a dedicated business unit to monitor and implement appropriate protections for Company operations. Additionally, as part of PBR, we report metrics related to critical load, National Incident Management System and Emergency Response Training. Additional information is available at: https://www.hawaiianelectric.com/about-us/performance-scorecards-and-metrics/resilience
At 93	HE prioritized the Hurricane /Flood/Wind combined threat as the top threat scenario to address. Again, regardless of the scenarios prioritized, all aspects of resiliency are needed to effectively handle such scenarios.	See above response.
At 95	1. Color coding of Figure 7-2 does not correspond with the language that describes the figure. 2. Figure 7-2 specifically focuses on T&D Resilience. Should there be similar metrics on the other resiliency aspects?	Language describing the figure has been updated.

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General	Is HECO coordinating any resiliency planning with the IPP's for the renewable generation facilities, or only for HECO-owned and operated generation facilities?	As renewable energy becomes a larger proportion of the generation mix, we are evaluating how to incorporate these IPP facilities into its overall resilience planning process. Hawaiian Electric already requires stringent performance standards, such as grid forming and black start which would allow these facilities to provide critical services in the event that the Company's more traditional generators were not capable of doing so. In addition, we require a stringent cyber security review of all new facilities.
At 98, 7.4.1	Stated, "Hawaiian Electric's initial Transmission and Distribution Resilience Program (Docket 2022-0135) represents the first phase of foundational system hardening investment of approximately $190 million across the islands we serve, with the potential for a 50% match of federal funding." This is a large ticket item, and again, this is only for physical T&D resilience improvements, with more to be identified. What are the plans and projected costs for the other aspects of resiliency? If not included in the IGP report, what is the reason? Or if included, but in other Chapters, please provide references.	Other aspects of the company and system were not in scope for IGP and the resilience working group. Other resilience measures the Company prepares for may require discussions with different stakeholders than the resiliency working group.
At 99, 7.4.3	In the application filed in Docket No. 2022-0135, the Companies noted a synergy between hardening and upgrading conductors belonging to HELCO's 6200 line and the planning goals for renewable energy. Do the Companies consider these kinds of synergies for all transmission hardening candidates? Hawaiian Electric also states that it is currently evaluating its wind speed design policies. Are Companies' current requirements for IPP interconnection facilities inline/consistent with the Companies' hardening criteria?	Yes, the Companies considered synergies between resilience planning and other planning goals (such as net zero) when developing the transmission hardening plans for each company. For example, hardening the Ma'alaea-Pu'unēnē (to become Ma'alaea-Kanaha) line on Maui is also aligned with renewable energy goals, as this line was identified for reconductoring in the REZ study. While the Companies do not intend to reconductor Ma'alaea-Pu'unēnē as part of the initial hardening plan, the Companies intend to harden structures such that they will meet or exceed resilient wind design criteria with the larger conductor size contemplated by the REZ study. The Companies' current requirements for IPP interconnection facilities are consistent with the Companies' hardening criteria. Any future updates to the Companies' design policies will be reflected in the Companies' design policies that are provided to IPP developers.
Chapter 8 – Grid Needs Assessment		
At 104	"If REZ zones cannot be developed, future renewables may be delayed until technological advancements or aggregated DERs become more cost-effective. In this scenario, system stability is a concern with current state of customer-scale inverter technology" Please specify, if known, what technological advancements are necessary, including what needs to change in inverter technology to enable DERs. What is HECO doing to address these changes?	From a system stability perspective, according to the latest findings, momentary cessation is the biggest concern with current state of customer-scale inverter technology. For our island systems, momentary cessation should be disabled or reduced to a much lower threshold than current Rule 14h SRD and IEEE 1547 standards, for both existing and future customer-scale inverter. The alternative option would be using sufficient grid-scale grid-forming resouce (e.g., GFM standalone BESS, GFM STATCOM) to mitigate customer-scale inverter momentary cessation issue. We are currently looking into this option. We have also been reaching out to customer-

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		scale inverter OEM to address this issue. Currently; however, we have received limited feedback from inverter OEMs. None of major brand inverter OEM in our State has yet reponded to ourinquiries. It is important to know that detailed information regarding customer-scale inverter control and protection are very limited at this time, and mostly are proprietary information of OEM. We are also currently performing inverter testing in order to get more information. Other system stability related challenging may be identfied in future.
At 106	"The Maui system may require Transmission network expansion earlier, starting from the Stage 3 procurement, and the Oahu and Hawaii Island systems may require network expansion in later years" – have there been discussions with developers in Stage 3 about the network upgrades needed on Maui?	No. The transmission network expansions highly depend on locations of the Stage 3 awarded bids. Without knowing these locations, it is difficult to ascertain system upgrade requirements and discuss with developers regarding details of transmisson networks expansion. These issues will be part of the Stage 3 RFP process. In future procurements, one consideration is to be proactive about project location and transmission needs. As stated in the "Large-scale" Competitive Procurements section, we state, " Through our community engagement efforts and analysis to evaluate renewable energy zones, we are also considering different options to identify communities we can collaborate with to develop renewable energy zones to site future renewable projects. Pre-selecting locations or areas for renewable projects as part of the RFP has potential benefits, including to engage with communities early, plan and build infrastructure needed to enable or expand transmission capacity, and streamline the procurement process."
At 104	"Transmission non-wires alternatives can cost-effectively manage the buildout of this new transmission, though this may mean that less than the full technical potential for new variable renewables can be developed." [Emphasis added] Please explain why transmission NWAs may result in less than the full technical potential for development.	In the "Transmission and System Security Needs" section we clarify that non-wires alternative to defer transmission expansion could come in the form of energy storage with limiting interconnection AC size and possible longer hour duration, which results in less than REZ potential AC MW limit interconnected to the system. This would mitigate the transmission overloads that are observed in the transmission needs analysis. This is further articulated as part of the Preferred Plans.
At 105	Section 8.1 would benefit from clear table(s) that summarize the grid needs on each island, including the Preferred plans developed around the adjusted RESOLVE outputs. It should also clearly describe how these Preferred Plans were translated into the Preferred Plans described in Section 2.2, which aggregate solar and wind projects and include resources not selectable by RESOLVE (such as energy efficiency).	Add language at the end of Section 8.1 to describe changes made due to the results of the transmission needs analysis, RA analysis, and TAP feedback (4hr BESS) relative to RESOLVE plans. Additional information added to each island's Preferred Plan section. We also hope the new area stacked charts are helpful to understand the components of the Preferred Plans.
At 105	"In 2030, the O'ahu and Maui Base scenarios and the O'ahu Land-Constrained scenario that include 450 MW of hybrid solar and some new firm renewable generation from the Stage 3 RFP achieve a loss of load expectation less than 0.1 day per year." Given that the 2030 systems are already reliable assuming the Stage 3 procurements come online, why is so much additional capacity proposed in the preferred resource plans for 2030? Is it because of near-term economic savings (i.e., lower energy costs)? Is it because the model has foresight into future energy and capacity needs, and	Additional PV+BESS and onshore wind capacity is selected due to its low cost of energy. In the RESOLVE model, energy reserve margin Is not a binding constraint in 2030.

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	the model sees it economic to build that capacity earlier intime? Something else? Please explain.	
At 106	It could be helpful to include a "limitations" paragraph or section that discusses some of the limitations of the probabilistic resource adequacy analysis. For example, 5 weather years considered may not capture all types of extreme weather events that the actual grid may face. How is consideration of "tail end" extreme events incorporated into the GNA?	Paragraph was added to section 8.1.2 to note some of the limitations in the resource adequacy analysis. Tail events could be incorporated and used as the basis for the grid needs that should be procured. Alternatively, we point out in Section 12 the risks of higher load which also identifies certain needs. Ultimately along with stakeholders and the commission we would need to determine whether higher load forecasts (a risk) or tail events (another risk) should be used as a basis for procurements.
At 107	"GFM capability is critical to system stability. To mitigate risks, there is a minimum requirement of GFM resource capacity or "MW headroom" to maintain system stability within the planning criteria. GFM resource MW headroom is the available capacity before the GFM resource generation reaches its contract capacity. The MW headroom requirement is directly related to the amount of DG outputting on the system at a given time" How will GFM capacity and/or MW headroom be contracted? Such as specific GSPAs for frequency response? Does HECO have the flexibility to achieve its needed MW headroom under the RDG contracts?	Yes, the benefit of the current Renewable Dispatchable Generation contracts with hybrid solar plants is our ability to dispatch the resource to meet system needs, including system security needs as identified in IGP. In our Preferred Plan sections we describe that we simulate this in PLEXOS by maintaining headroom to be able to respond to an event (rather than using the entire charge of the BESS).
At 108	"It is worth noting that to identify transmission system capacity needs to accommodate future large-scale generation projects, distributed generation is not considered in the steady-state analyses" Please explain the rationale for not considering DG. Could the Companies have utilized the multiple DER scenarios to perform the steady-state analyses? What could considering multiple levels of DERs change about the analyses?	DER was excluded from developing the transmission need to consider the effects of a scenario with days of rain and/or clouds that limit the contributions from DER to capacity on the transmission lines. This happened in the recent years during Kona Low weather. By considering DER generation in the study, DER generation could reduce loading on the transmission by supplying part of load locally. Transmission line overloading issue could be smaller or mitigated. This study results would require measures (such as policies or programs) to make sure the studied DER generation capacity is always available. The clarification has been added to the section 8.1.4.1 Important Study Assumptions and Scope Limitations.
At 109-110	How are the different load scenarios and DER scenarios/benchmarking impacting the distribution grid needs (both hosting capacity grid needs and location-based grid needs)?	Generally the high load scenario has more load-driven grid needs and the high DER scenarios have more hosting capacity grid needs.
At 111, Table 8-1	It would be helpful to provide a brief explanation, rationale, or methodology for how the thresholds across the "Favorable", "Moderate or Uncertain", and "Unfavorable" categories were determined, as well as what "Market Assessment" is referring to here. There appears to be a typo under the Favorable column (0$-10%).	Deleted Market Assessment and Forecast Certainty from Table 8-1. Needs updating, reference to Appendix F, section 1.3.2.2 The Project Economics and Operating Date (Timing) thresholds are based on stakeholder feedback and best industry practices. The Performance Requirements thresholds (MW and duration) were developed based on the Company's previous experience with sourcing grid needs. The thresholds were created to be conservative to allow greater opportunity for potential NWAs to move forward to Step 3 of the evaluation. This threshold will be reassessed as the Company gains additional experience with grid needs sourcing.

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At 112, Table 8-2	Good use of scenarios to illustrate the differences in the NWA opportunity evaluation	Acknowledged.
At 114, Figure 8-2	Please discuss why biomass and new firm renewable energy resources are selected in the high load scenario, but not the faster technology adoption scenario for Oahu.	Both the high load and faster technology adoption scenarios assume high EV growth, but the high load scenario assumes low EE and DER growth, while the high technology adoption assumes high EE and DER growth. As a result the high load scenario has a greater load than the high technology adoption scenario. The biomass and new firm resources are selected to provide energy and capacity, especially in the later years.
At 115	"We note that, because the DER aggregator resource is not selected until 2045 and 2050 when we must comply with the 100% renewable energy mandate, new advanced generation technologies could become available prior to 2045 that could accelerate the path to 100% renewable energy in a Land-Constrained scenario." What types of advanced generation technologies might these be? What is HECO doing to explore/pursue those advanced technologies?	A new section 6.9.5 regarding emerging technologies has been added in response to stakeholder comments.
At 115	Why was the Land Constrained scenario not able to meet the 70% goal? Was this not a constraint in the RESOLVE model? Will the 70% emissions reductions be used in the RESOLVE model going forward?	GHG was not a constraint in RESOLVE. As a result, in the Land Constrained scenario, the consolidated GHG reduction was around 55%. A figure was added to section 9 to show the Consolidated GHG emissions when O'ahu is Land Constrained. To test the impact of achieving a 70% GHG reduction in 2030 in a Land Constrained scenario, a separate run was performed in RESOLVE using the RPS target as a proxy for GHG emissions. By setting the 2030 RPS target to 70%, we were able to see how the results in RESOLVE may change to achieve a 70% GHG reduction. The results shown in Chapter 8 highlight that RESOLVE will burn biofuel in a Land Constrained scenario when the RPS target in 2030 is 70%.
At 116	How can RESOLVE/overall modeling steps be improved such that it can analyze a High Fuel Retirement scenario that does not result in a system that exceeds 0.1 LOLE, or build in more constraints for reliability?	The high fuel retirement scenario could be further evaluated in a resource adequacy analysis to identify additional resources that would be needed to meet reliability. However, the curve fits examined in Section 12 largely cover the same types of scenarios where additional existing thermal generation is removed and identify what replacement capacity would be needed from PV+BESS or firm resources.
At 117, Figure 8-7	Are the RPS percentage numbers on top of the Annual Generation bar graph correct? Why doesn't the High Fuel Retirement scenario increase the RPS amounts in 2030 and 2035?	Figure has been updated to correct RPS.
At 114, Figure 8-2 and 8-3	Why is DER+DBESS not shown in Figure 8-2, even though we can see DER+DBESS generation in Figure 8-3? Is all that generation coming from existing DER+BESS? *Same question for Figures 8-16 and 8-17 (Hawai'i), Figures 8-26 and 8-27 (Maui), Figures 8-36 and 8-37 (Moloka'i), and Figures 8-45 and 8-46 (Lana'i)	Clarification inserted into text. Figure 8-2, and similar figures for other islands, shows the capacity of new resources selected by RESOLVE. Figure 8-3, and similar figures for other islands, shows the annual generation from all existing, planned, and selected resources. DER+DBESS refers to the forecasted DER and therefore is not selected by RESOLVE but is utilized as shown in Figure 8-3.
At 115, Figure 8-4 and 8-5	How are DER aggregated resources depicted in Figure 8-2, considering generation from these resources is	Figure has been updated to show all new resources selected by RESOLVE.

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	depicted in Figure 8-5, and the narrative indicates that the DER aggregator resource is selected started in 2045?	
At 116, Figure 8-6	"In the High Fuel Retirement Optimization scenario, RESOLVE chooses to retire 570 MW of thermal capacity (see Figure 8-6)." Is the model retiring generation from specific plants? If so, it would be informative to indicate which ones. *Same question for endogenous retirements selected on Hawai'I at 139 and Maui at 151	To manage model complexity, thermal units with similar operating characteristics are bundled together. When RESOLVE chooses to retire thermal units, it retires capacity from the bundle and not an individual unit explicitly. For this reason, it is better to view the retirements as thermal capacity removed in aggregate than the retirement of a specific unit.
At 117, Table 8-3	It would be helpful to include the age of the units during the year the unit is proposed to be retired, so that the reader can have a clearer sense of how old these units are at the time, and to validate the retirement order.	Age of the units upon retirement was added to the Table 8-3.
At 117-119	This section (8.2.2) seems wordy and is not particularly intuitive. Instead of (or in addition to) the 8 bulleted scenarios, consider visually representing the content as a figure or table that includes the year, resource combinations, and whether those combinations meet the 0.1 LOLE standard.	Refer to table 8-4, 8-5 and Section 12 for tables that provide the probabilistic resource adequacy results.
At 119, 120, Table 8-5	Was a case evaluated in the probabilistic modeling considering the High Load RESOLVE portfolio under the High Load demand profile? If so, why wasn't it included in Table 8-5? Additionally, are the resource additions suggested for the High electricity demand scenario described on p.120 informed by the RESOLVE High Load portfolio? *Same questions for Hawai'i at 141, Table 8-18 and Maui at 153, Table 8-27	A case was not evaluated using the High Load RESOLVE portfolio. Table 8-5 focused on the Base and Land Constrained resource plans to see how the Base resource plans performed and the risk that may occur if the load trended towards the high load forecast and we cannot procure additional resources quickly enough. The results of the RESOLVE load bookends showed that the same resources are largely built as the load forecast increases. This may mean that additional resources should be selected in future RFPs, above the target identified using the Base scenario, to ensure resource adequacy if the high load bookend were to occur. In other words, if this risk is deemed prudent to mitigate than the high scenarios can inform the needs to procure in future RFPs. The resource additions suggested on page 120 was based on the variable and firm curve fits presented in Appendix C and looked at how much additional resources may be needed to meet 0.1 LOLE if the load were to increase towards our high load forecast.
At 119	"In the 2035 probabilistic resource adequacy analysis, however, the 153 MW combined cycle was assumed not to be installed to test whether this firm generator is needed for resource adequacy." Since the RESOLVE Land-Constrained scenario without the 153 MW combined cycle still meets the 0.1 LOLE standard, it would be helpful to understand why RESOLVE is building this capacity that does not seem needed. Is there an economic-driven reason (rather than a capacity-driven reason)?	Initially, RESOLVE was allowed to build fossil fuel thermal units. In the Land Constrained case, with less available potential to develop other renewable resources, a new thermal unit with improved heat rates would lower energy cost if on fossil fuel. However, new thermal unit additions were assumed to be on biodiesel for the PLEXOS analyses and after the resource adequacy cases were conducted, this combined cycle unit was removed because it was not needed for reliability.
At 120, 121, Figure 8-8 and 8-9	Please explain what analysis/learnings are available from Figures 8-8 and 8-9, including any key points that help inform preferred plans or other outcomes of IGP.	Figure 8-8 and Figure 8-9 are the energy profiles under the Status Quo scenario. The transition to 100% renewables will necessitate a change in how the firm thermal generators on our system operate. Renewable resources and storage will reduce our reliance on existing fossil generators to serve load. This is shown in the daily energy profiles and operational

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		statistics in this section. Reducing dependance on fossil generators will improve reliability given that our fossil generators are currently over 60 years old, as shown in Appendix C, and experiencing higher outage rates. The analysis in Section 9 also shows that utility rates will be lower than if we continue to rely on fossil fuels.
At 123, Figure 8-14 and 8-15	Please provide a description of how units were categorized as "Baseload", "Cycling", and "Peaking" and what types of technologies those include. *Same question for Hawai'I at 144, Figure 8-24 and 8-25; Maui at 156, Figure 8-24 and 8-35; Moloka'i at 169-170, Figure 8-44 and 8-45; and Lana'i at 177 at Figure 8-54 and 8-55.	Appendix C shows which thermal generators are categorized as "Baseload", "Cycling", or "Peaking". Language was added to the document to clarify.
At 123, Figure 8-14	Confirm that "New" generators represent peaking units, and if not, what they do represent.	New generators include thermal generators procured through the Stage 3 RFP and selected by RESOLVE. On O'ahu, the new generators from Stage 3 were modeled as 6-50MW CT and 1-208MW CC, and the new generator selected by RESOLVE in the Land-Constrained case was modeled as a 1-153MW CC. On Maui, the new generators from Stage 3 were modeled as 2-8MW ICE. Language was added to the document to clarify.
At 125	Retrofitting of existing GFL IBR inverters is discussed in Section 8.2.4.2 for the Land Constrained Scenario but should retrofit be limited to that scenario? (The recommendation from 2021 System Stability Study (p. v) is that when there is opportunity, current GFL IBR plants be converted to GFM IBR plants).	No, retrofitting existing grid-following inverter-based resources should be considered in all scenarios. Clarificaiton is added in Section 8.2.4.1.
At 130-133	The maps include the geographic locations of proposed new resources. Please explain how these locations were determined and if they are indicative of preference of locations of future procurements.	Those are the locations represent locations of projects that were awarded (but withdrew) during RFP Stage 1 and 2, or locations where capacity is currently available to host projects.
At 130	If Land-Constrained Scenario requires much less transmission network expansion, is there significantly more distribution network upgrades needed to enable more DERs? How do the distribution network upgrades compare to the cost of the transmission upgrades in other scenarios? On the whole, which is more cost effective (transmission buildout vs distribution buildout)?	The distribution analysis looked out to a 5-year timeframe for hosting capacity and 10-year timeframe for load-driven grid needs. Distribution upgrade costs beyond year 2030 were not included for any of the scenarios. However, under the land-constrained scenario with significant additions of DER in 2045, we expect significant transmission and distribution upgrade costs to be needed.
At 134, Table 8-7 & 8-8	How does the DER adoption compare between the faster technology adoption and the land-constrained cases, and were the distribution grid needs costs associated with greater DERs considered in the land-constrained cases?	Distribution grid needs through year 2030 were identified in this analysis. Since the land-constrained scenario uses the Base DER Forecast (Table 6-16), the distribution grid needs for the land constrained case would be similar to the Base scenario through year 2030 which has fewer grid needs than the Faster Technology Adoption scenario. Additional distribution upgrade costs beyond 2030 to accommodate the aggregated DER added in the land-constrained scenario were not determined.
At 134, 8.2.5.1	Hawaiian Electric states that most circuits have sufficient hosting capacity or could accommodate the 5-year hosting capacity without infrastructure investments. Does Hawaiian Electric also evaluate upgrading circuits that have little or no hosting capacity as these circuits may indicate circuits/areas that are willing and able to add DER	The Company evaluates all distribution circuits for DER and load capability and those circuits that have more forecasted DER adoption than available hosting capacity were identified as a hosting capacity grid need. Throughout the IGP process the Company adopted a less

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	but for the lack of hosting capacity? (According to HECO's Oahu Locational Value Map (LVM), there are a significant number of areas with only up to 5% available Hosting Capacity.) Also, although the Draft Report states that most of the 384 circuits have sufficient DER hosting capacity, please explain why the LVM appears to show a significant number of locations in the Central and Leeward districts that have a certainty rating indicating a grid need.	conservative calculation for hosting capacity. That revised calculation is in the process to be reflected in LVM. The grid need certainty rating in LVM represents grid needs driven by load
At 135, Table 8-9	Earliest NWA opportunity is in 2025, how soon will a procurement be coming?	For the 2025 NWA opportunity (Transformer CEIP3 / Circuit CEIP 46), an EOI was released on 2/6/2023. The Company did not receive any responses therefore a procurement for this specific opportunity will not be issued. Our EOI / RFP strategy is outline in Section 10 under NWA Competitive procurement.
At 135	If an item is in Track 1 of the Base, shouldn't it also be in Track 1 of the High Load Bookend? For example, Transformer CEIP 3.	The year the overload occurs is dependent upon the forecast scenario. For this specific case, Transformer CEIP 3 / Circuit CEIP 46, the overload for Scenario 1 is forecasted to occur in 2025, while in Scenario 2 - High Load, the overload is forecasted to occur earlier in 2023. The earlier required date in Scenario 2 makes this an unfavorable NWA opportunity based on the Timing criteria in the NWA methodology.
At 136	Related to Preferred Plan, what was driving the inclusion of the 153 MW CC unit that RESOLVE selected, if the RA analysis determined it was not necessary? Did the increased BESS duration alter any other grid needs?	See response above at 119
At 136, 137	It would be useful to summarize the changes made to the RESOLVE Base and Land-Constrained plans in developing the Preferred Plans in a table. Seeing the original and modified plans side-by-side would greatly increase clarity. Were the Preferred Plans subject to a resource adequacy backcheck, given the changes from both RESOLVE and probabilistic resource adequacy analyses? Same comments apply to the Preferred Plan sections for all the other islands (Sections 8.3.6, 8.4.6, 8.5.6 and 8.6.6)	The preferred plans were not subject to a resource adequacy back check specifically but were the result of the resource adequacy back check conducted on the Base resource plans.
At 136	"Increased duration of paired and standalone BESS to 4 hours to match current market conditions." How does this change affect costs and/or reliability? Why not start by constraining RESOLVE to use only 4-hour storage? *Same question for Maui at 163, Moloka'i at 171, and Lana'i at 179.	RESOLVE was run without constraining the duration of the storage to 4-hours to allow RESOLVE the opportunity to optimize the duration, which was based on TAP feedback early on in the process. Based on the RESOLVE results where 2-3 hr durations were selected for paired and standalone BESS, the TAP suggested assuming 4-hour duration to match market conditions and improve the BESS contribution to meeting reliability in the resource adequacy analyses. Longer duration batteries will increase cost but should also improve reliability as more energy can be stored and shifted to meet demand. We don't believe constraining RESOLVE to 4-hr storage would have a significant impact on the optimization.
At 137, Table 8-14, 8-15	Please explain the comparison of production costs with and without transmission constraints. How are the transmission capital costs >$4B in the base case, but the difference with and without transmission constraints is <$1M? It would be more helpful to see the MW capacity of each resource type compared with and without transmission	The production costs shown in Table 8-14 and 8-15 include the cost for fuel, O&M, and IPP payments, but does NOT include the transmission capital cost shown in Table 8-15. The purpose of Table 8-14 and 8-15 was to determine whether the transmission constraints, which included

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	constraints to see if the transmission constraints impact what resources are selected.	modifications to the size of the REZ buildout and the additional reserve for dynamic stability, materially affected the costs for fuel, O&M, and IPP payments. The transmission constraints did not impact what resources are selected but did reduce the size of certain REZ to avoid additional new transmission or reconductoring cost to accommodate the REZ at its original size.
At 140, Figure 8-17 and at 141, Table 8-18	"In 2030, assuming a Base scenario load forecast with Hamakua Energy Partners combined cycle already retired…A loss of load less than 0.1 day per year is expected even if Hamakua Energy Partners combined cycle and some additional firm is brought offline unexpectedly." This seems to be a contradiction. If Hamakua Energy Partners combined cycle is assumed to be already retired in this scenario, what does it mean for HEP to be brought offline unexpectedly? Please clarify: is HEP modeled in the 2030 base scenario, or not?	HEP is modeled in the 2030 Base scenario. The results shown in Table 8-17 include HEP. The bullet points towards the end of section 8.3.2 summarize analysis detailed in Appendix C. As shown in Table 8-17, the 2030 Base scenario (which includes HEP) has an LOLE of 0. When evaluating how adding/removing resources affects LOLE, it's helpful to compare systems with non-zero LOLE. This is why the analysis in section 12 and Appendix C (summarized in section 8) doesn't include HEP. The comment about HEP being brought offline unexpectedly is meant to show that the 2030 Base system could withstand HEP being removed from the system.
At 141	Please discuss why the Future Wind and Future Standalone BESS resources are lower in the High Load case than in the Base case.	The Future Wind and Future Standalone BESS resources in the 2030 results are not planned resources but are resources added by RESOLVE. The intent was to include the RESOLVE-added resources in the 2030 analysis but only include planned resources for the 2035 analysis. Only including planned resources in 2035 gives a clearer reference point when discussing the additional resource capacity needed to meet reliability targets in Appendix C. Several rows have been added to Table 8-18 to show how the system reliability for Base and High Load scenarios changes with and without the RESOLVE-added resources.
At 141	"Though 140 MW of hybrid solar is not needed to meet the reliability target in 2030, acquiring even half of the 140 MW will greatly benefit the system." Please elaborate and provide specifics on what is meant by "greatly benefit the system."	Figure C-5 in Appendix C shows the 2030 Base scenario without HEP and the 140 MW hybrid solar from Stage 3 achieves an LOLE of 0.1. Adding only 60 MW of hybrid solar to the system, while not reducing LOLE as much as an additional 140 MW of hybrid solar, will still reduce LOLE by an order of magnitude.
At 146	It would be helpful to see a formula for east side minimum generation (MW) with conditions.	Overloading caused by too much east side generation is also related with location of where to interconnection future west side generation. So, that equation has not yet determined.
At 153	"In 2035, assuming a High electricity demand scenario and all of Stage 3 RFP resources and 37 MW of hybrid solar from RESOLVE model, approximately 540 MW of additional hybrid solar is needed and approximately 33 MW of additional firm is needed" Have there been any scenarios run to see if Maui can accommodate 540 MW of hybrid solar? Noting that there is no land-constrained modeling for Maui.	The 540 MW of additional solar is less than the REZ zone capacity for Maui; but roughly the amount needed by 2050. The 2050 REZ requirements would be a close approximation of the upgrades needed.
At 153 and Figure 8-26	"In 2035, assuming a High electricity demand scenario and all of Stage 3 RFP…and 37 MW of hybrid solar from the RESOLVE model: Approximately 540 MW of additional hybrid solar is needed to bring the system loss of load expectation down below 0.1 day per year.	Wind is primarily being selected by RESOLVE for its low cost of energy and high capacity factor. In 2035, energy reserve margin is not a binding constraint. However, similar to the reliability curves developed in Section 12, wind will have a contribution toward meeting the reliability standard; albeit diminishing returns similar to the hybrid solar curves.

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	Approximately 33 MW of additional firm generation is needed to bring the system loss of load expectation down below 0.1 day per year." The RESOLVE High Load scenario also includes substantial additions of onshore wind compared to the Base case. Please clarify whether wind is considered here to help the system meet the reliability standard?	
At 163	"Modified Stage 3 firm renewable proxy to two 8.14 MW units based on 2030 resource adequacy results." Please provide justification for this.	We explain in Maui's Preferred Plan in Section 8 that we reduced the Stage 3 firm renewable proxy from five 8.14 MW units to two 8.14 MW units based on 2030 resource adequacy results. The justification can be seen in Section 12.3.3.2 and Figure 12-30 and Figure C-10 in Appendix C, where the addition of two 9 MW and 8.14 MW units meet the LOLE target respectfully.
Chapter 9 – Customer Impacts		
At 181-188	How does potential continually rising fuel costs affect these analyses of customer bills? What is the assumed fuel cost? Does Hawaiian Electric assume that fuel costs will rise as fuel is purchased in smaller quantities? Does the Status Quo attempt to address this scenario?	The base fuel price forecast that was modeled assumes a continually rising trajectory through the planning horizon, using the EIA AEO. No adjustment was made to the forecast to account for high fuel prices as fuel is purchased in smaller quantities. The EIA forecasts were part of the approved Inputs and Assumptions in response to stakeholder feedback.
At 182	Please explain the "status quo" scenario in more detail, given that this was not listed as one of the modeling scenarios in Table 6-16. Is the jump in revenue requirements and bill impacts in 2045 observed across several of the islands largely due to the transition from fossil fuels to expensive biofuels?	The Status Quo scenario assumed the Base forecast; commercial operations of Stage 1, Stage 2, and CBRE Phase 2 Tranche 1 projects; successful renegotiation of existing independent power producers; and continued operation of most existing thermal units. The Status Quo plan excluded CBRE Phase 2 Tranche 2, Stage 3 RFP resources, and future resources selected by RESOLVE. The jump in bill impact in 2045 is largely due to the transition from fossil fuel to biofuel.
At 194	Please consider providing a comparison chart that incorporates biogenic CO2 emissions.	We did not provide the "with biogenic" GHG reduction analysis and calculations; however, we expect emissions to be higher than the without biogenic case because of biodiesel combustion and burning of municipal waste. To abate these emissions, we would need a zero emissions firm source (i.e. geothermal) on Oahu and other islands or additional investment for carbon capture or negative emissions technology.
Chapter 10 – Energy Equity		
At 205	What opportunities does partnership in DOE's ETIPP afford to Hawaiian Electric and its customers? Is there research assistance, funding assistance, or other support available?	The partnership with DOE's ETIPP project has provided Hawaiian Electric with technical support to develop a hybrid microgrid opportunity map. In the development of this map, the technical team (made of national labs) have used data from the Company as well as other publicly available sources to find areas that can be categorized by criticality, vulnerability, and societal impact. These visualization tools (in-progress) can help customers and the Company to identify locations that may require additional focus and attention based on the characteristics of the particular area.

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Chapter 11 – Growing the Energy Marketplace		
At 211	Table 11-1 presents avoided costs for the freeze scenarios without much context. While it's clear from the DPS Phase 3 Modeling Results (in a separate docket) that these represent RESOLVE results for the year 2030, it's difficult to contextualize what these avoided costs represent. Consider incorporating the total cost of the base case for each island as well to show the scale of impacts for each of these freeze scenarios.	The avoided costs are the difference between the Base and Freeze scenarios NPVs. The NPVs represent costs over the RESOLVE planning horizon (2029-2050), not just 2030 like what was shown in the DPS Ph 3 Modeling Results since these programs may not specifically target 2030. This difference in cost would inform the program costs that could be incurred to encourage adoption of DER, EV or EE resources and be cost effective to other supply side alternatives. The percent difference in NPV is described in the narrative. Base case NPVs were added to the table in the report.
At 212	Please elaborate on the differences observed due to the unmanaged EV scenario.	The Unmanaged EV scenario produced similar results to the Base scenario which assumed managed EV charging. In 2030, the Unmanaged EV scenario and the Base scenario selected the same resources, and the sizes of the resources selected were within a couple percent. In 2050, the Unmanaged EV scenario selected 6 MW of new firm renewable generation and an additional 45 MW of Biomass (45% more) over the Base scenario. The other resources selected in the Unmanaged EV scenario have sizes within 5% of the Base scenario. The difference in NPV was within 1% of each other between the Managed EV and Unmanaged EV scenarios.
At 212, Section 11.1.2.1	"The EE as a Resource scenario selects the EE supply bundle, standalone solar, and renewable firm in addition to the renewable resources selected in the Base scenario. As shown in Section 11.1.3, the load impact of the EE supply curves is smaller than the EE load forecast. This results in more selected resources and higher generation need for the EE as a Resource scenario than for the Base scenario." Please clarify whether this implies that the load forecast develops some energy efficiency measures that are not cost-effective and/or double-counts some energy efficiency potential.	In cases where the EE as a Resource scenario built less EE bundles than the Base forecast, the load forecast may have assumed more energy efficiency than was cost effective. However, energy efficiency may be needed in greater amounts than what was modeled if onshore renewables cannot be developed as shown in the Base cases. There are also other EE benefits that cannot be precisely quantified such as reduction in land needed if more EE can be built, especially in land-constrained scenarios.
At 220	Will there be any strategy to smooth out the size and timing of the procurements coming out of IGP? Concerns have been raised about the size of the RFPs recently and the impacts of that on HECO's resources on the interconnection/resource acquisition teams.	Yes, ideally. We clarify this in Section 11.2,
At 221	How will the details of the REZ studies be translated into future RFPs where more upfront information could be helpful to provide proposers with estimated costs of interconnecting their projects?	The REZ studies help to identify high-level transmission requirements to add generation capacity to certain zones. It is not yet certain how this information will be used to inform future procurements; however, there is consideration for planning procurements that target certain areas to combine the transmission requirements to support high amounts of renewable capacity to enable a more efficient interconnection and development process. The technical information developed in the REZ studies are one part of a complex process, which includes commercial, community, and other input to develop these zones.

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At 221	"Pre-selecting locations or areas for renewable projects as part of the RFP has potential benefits…" Is there potential to pre-study locations in order to reduce the time required for interconnection studies after the bidding selection process?	Yes, see response above. If there are targeted procurements, high-level transmission requirements can be identified to support the addition of targeted generation resource capacities in a region or area.
At 221	"In some instances, it may be prudent to specify technologies consistent with the IGP to send market signals that certain types of attributes are needed to fulfill certain grid needs." Would it be more competitive and fairer to tailor procurements to the desired types of attributes and let the market respond with technologies that will meet those attributes at least cost?	In general, that has been our practice in Stages 1-3 RFPs, where we do not specify technologies. However, when it comes to urgent reliability needs, we have identified the need first through analysis, and made a determination that for critical needs such as reliability, strong market signals should be sent as to what we are seeking based on our assessment of the need and the current state of technologies. Otherwise, we may not attract the bids necessary to meet these critical needs. For example, we also specify grid-forming requirements which is a specific type of inverter; rather than describing the general problem or need that was identified in the analysis to ensure the market is clear what we need to meet critical reliability needs.
At 222	"Other examples of modifications that will likely be necessary include the requirements for certain actions at the time of bid submission, such as site control, and model submission. In addition, the overall RFP schedule will likely require modification, and contract terms will also need to be developed to contemplate the longer period between contract execution and commercial operations" There may be additional benefits to such changes to the RFP process, such as planning for a smoother allocation of resources to study interconnections over a longer time horizon, rather than several projects simultaneously.	Yes, please see response above on this topic.
At 223	"Based on the EE supply curve analysis we believe that including energy efficiency as part of the grid services would help to complement existing EE programs, accelerate adoption of energy efficiency, allow for competitive market pricing, and target location-specific benefits" How would introducing EE into GSPAs and introducing more competition into the EE offerings interplay with Hawaii Energy, the EE administrator role, and the PBF framework?	EE contracted through a GSPA would target the same load reduce grid service that is already being procured on this contract. An EE program and EE procurement can coexist. This is similar to aggregators contracted on the GSPA contract in parallel with ongoing DER programs. If there is a gap in the program reach, the procurement may be an avenue to fill that gap.
At 224	"A procurement would also allow the market to determine the value and compensation for resilience services, provide flexibility to determine the performance and capabilities needed for each unique microgrid opportunity, the best way to integrate and use DER for resilience, determine the supply and demand for microgrids in Hawai'i, and identify prospective developers of microgrids" What other efforts are ongoing to put a value and determine compensation for resilience services?	Please see discussion in Section 7.3.2.
Chapter 12 – Securing Generation Reliability and Assessing Risks		
At 226	Please define the terms "removal from service," "retirement," "deactivation," and "standby," as they all represent steps toward replacing existing resources on	

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	the system, but have different requirements. It could be helpful to reference the Fossil Fuel Retirement Report. For planning purposes, what does HE plan to do with the property when a unit is fully retired? Will all structures and buildings on the property be demolished/cleared? Does HE have plans for the cleared properties? – Could they be used for future renewable generation sites?	Definitions for removal from service, retirement, deactivation, and standby were added to the Glossary. In Section 11.2.3, the Company notes, "Pursuant to the Public Utilities Commission's guidance, we are also exploring if other company-owned sites could be made available for interconnection of a variety of technologies in our RFPs, and further seeking ways to streamline the interconnection process."
Section 12.3	This section references various demand scenarios and generation resource mixes. Are the graphs in this section based on any of the Tables provided in Appendix C? If so, please add references to the applicable tables in App. C.	The graphs in Section 12.3 are not based on a specific resource plan, but rather, they are based on sensitivities done to the resource plan to determine how the LOLE changes with varying firm/variable additions.
At 232	Section 12.3 would greatly benefit from a detailed summary section. This might include a summary of key findings, a comparison or results between islands (for example in a single table), an explanation of how results from this analysis were incorporated in selection of the Preferred portfolios, and additional explanation of where and how results were used to inform other parts of the GNA.	A table was added to each island's subsection to summarize the resource adequacy scenarios that were performed. This table describes the resource combinations that were evaluated, as well as, the LOLE results.
At 232-264	For each island evaluated in Section 12.3, it would be helpful to include a table that summarizes of the probabilistic modeling results included in the GNA (Chapter 8), and includes the probabilistic adequacy results for the Preferred scenarios in 2030 under Base and in 2035 under Base and High load growth assumptions.	A table was added to each island's subsection to summarize the resource adequacy scenarios that were performed. This table describes the resource combinations that were evaluated, as well as, the LOLE results.
At 225	"Generation reliability is an area of concern in Performance-Based Regulation and is intertwined with State policy to retire fossil fuel-based generation as soon as practicable…" It would be helpful here (and elsewhere) to provide citations as footnotes, endnotes, or in-text citations to specific documents, webpages, etc. when referring to other dockets, policies, studies, etc.	Provided clarification and cite.
At 232 and Figure 12-6	"Importantly, this chart demonstrates the sensitivity of reliability that O'ahu has to small changes in capacity. For example, 200 MW of hybrid solar results in a significant swing (approximately 8.7 days per year) in reliability. We consider this point a significant consideration in how we plan and procure resources to meet our customers' reliability expectations." Can you please elaborate on how this finding will be incorporated as a "significant consideration" in procurements for reliability? How will this affect how you are planning for near-term and long-term resource procurements?	We believe this means that given the age of our units, the challenges in developing a project through commercial operations among other factors, we must ensure that we are not caught short of capacity resources. That means our procurements should take into account awarding projects (i.e., hybrid solar and firm generation) such that we procure sufficient resources to retire units as outlined in the Plan as well as acquiring additional resources to ensure we can assure reliability while withstanding projects dropping out of the process. This may mean the we acquire projects in excess of the state targets.
At 236 and Figure 12-13	It appears there is unserved energy in more hours of the year in the case with the additional 150 MW of firm capacity. Can you please explain this behavior?	Figure 12-12 and Figure 12-13 was updated with corrected EUE charts.
At 236	Based on the caption for Figure 12-13 it appears the difference between the left and right is 150 MW and not the additional 650 MW identified in the paragraph about Figure 12-13.	Paragraph was corrected. Difference between left and right is 150MW of firm generation.
At 238-239 and Figure 12-14	It's not clear what scenario are being modeled here. Why is 1,600 MW of future hybrid solar being evaluated if only 1,145 is intended to be procured in the Base case? What	The 1,600 MW of future hybrid solar is a combination of the 450 MW from Stage 3 RFP and the 1,145 MW selected by RESOLVE. Made a clarification in the narrative.

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	amount of other new and existing resources are being modeled?	
At 240-241 and Figure 12-16, Figure 12-17	It's confusing to keep track of which resource combinations are being evaluated given the provided descriptions. A clear table showing the amount of each resource evaluated in each scenario, relative to the base case, would be helpful, for Hawai'i and all other islands where relevant.	A table was added to each island's subsection to summarize the resource adequacy scenarios that were performed. This table describes the resource combinations that were evaluated, as well as, the LOLE results.
At 243	"We also observe that even small amounts of added resources can dramatically reduce the system's reliability." Is this a typo? Wouldn't additional resources increase the system's reliability?	This was a typo. Paragraph was corrected to say small amounts of added resources can dramatically change the system's reliability.
At 250-251 and Figure 12-31	"Figure 12-31 shows when we expect unserved energy to occur and at what quantities when no future firm renewable from Stage 3 is assumed, from the scenario shown in Figure 12-30 with a loss of load expectation around 0.75 day per year." Please explain why an LOLE of 0.75 is used here, when all of the other heatmaps show EUE when LOLE is around 0.1?	The LOLE of 0.75 was a result of the RA analysis for the no new firm scenario which does not meet the 0.1 LOLE target. The result of the analysis supports the finding that there is a firm need on Maui.
Appendix B – Forecasts, Assumptions and Modeling Methods		
At 7	Re NEM Customers add to Residential Addressable Market. How are NEM Plus participants who increase their PV size to attain the minimum bill but are prevented from increasing their export accounted for?	NEM+ customers were included in all case scenarios for all islands, but only from 2024-forward for Oahu and Maui Base case because Schedule-R NEM customers were re-introduced in the customer pool for uptake modeling in 2021-2023 due to scheduled dispatch/battery bonus on those islands.
At 15	"It is important to note that many of the measures in group A could have absolute costs ($/MWh) that are higher than measures in group B or C. In those cases, the greater benefit of peak-focused resources offsets the costs in the MPS methodology. Depending on how the shape of bundles meets the RESOLVE model's needs, it might choose lower absolute costs first, which could produce differences between the RESOLVE model selections and the MPS." This statement demonstrates the value of treating EE as a selectable resource in capacity expansion modeling.	Yes, however, the underlying conclusion whether a forecast layer or supply side resource is that EE is beneficial and can be cost-effective. The challenges are in implementation and the ability to acquire customers to implement these measures at the scale identified in the MPS report. We have proposed potential other mechanisms to help fill those gaps (i.e.,EE through procurements).
At 15	Bundles were assigned based on the range of Benefit-Cost Ratios. Can a table be provided that shows what exactly is in each bundle along with its BCR? (Based on Table B-14, it looks like each bundle just has a different amount of the same EE measures)	Figure B-5 provides the energy savings in each supply curve bundle using the same A, B, C, D grouping for its benefit-cost ratio on a consolidated basis. The mapping of BCR to bundle is noted in Section 11.1.3 and in Appendix B, table B-13. Similar charts as Figure B-5 are provided for each island in the Bundle Summary and Costs files in the Key Stakeholder Documents under the Energy Efficiency category, see https://www.hawaiianelectric.com/clean-energy-hawaii/integrated-grid-planning/stakeholder-and-community-engagement/key-stakeholder-documents
At 16, 1.4.1.1	In order to compete against other supply side resources, the model was provided a levelized cost of conserved energy (LCOE). Can the LCOE for each model be summarized along with a few generation resources'	The Bundle Summary and Costs files in the Key Stakeholder Documents under the Energy Efficiency category provide additional data on levelized cost, see https://www.hawaiianelectric.com/clean-energy-

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	levelized cost to give a reader a sense of the similarities/differences between the costs?	hawaii/integrated-grid-planning/stakeholder-and-community-engagement/key-stakeholder-documents. Using O'ahu as an example, the nominal savings weighted LCOE in $/MWh for 2023 ranged from Other_A at $21/MWh to Other_D at $1,723/MWh. Peak focused supply bundles were more expensive than the flatter Other bundle with Other_A and Other_B at $21/MWh and $49/MWh and Peak_A and Peak_B at $70/MWh and $72/MWh, respectively.
At 17, Table B-14	Adding a table showing the weighted average levelized cost of each bundle as well as the weighted average cost/kilowatt would greatly enhance the ability of readers to interpret the differences in EE development between those assumed in Base Case Forecast and the RESOLVE modeling results.	A reference was added in Appendix B to the Bundle Summary and Costs files that provide this information.
19, Figs. B-6 & 7	Please provide axes and units for these figures.	Figures have been updated.
Appendix C – Data Tables		
General	Some of the generation resources and their dates available, may need to be updated prior to finalization of the IGP report, based on the latest status of the projects.	The dates in Appendix C match the modeled assumption that was made for Stage 1 and Stage 2 RFP resources.
Appendix D – System Security Study		
General	Note that this study identifies system transmission level grid needs to accommodate various future plans in accordance with transmission system planning criteria. Also, "these study findings are sensitive to the future grid-scale resource interconnection locations and size, as well as system load growth and system DER growth. Therefore, it is necessary to update study when grid scale resource procurement plans are identified and finalized." It is therefore understood that the future transmission system plans may change often in the coming years. Has HECO determined what frequency (at minimum) this plan should be updated (eg annually, every 2 years, etc.)?	A specific determination on frequency has not been made, but it may be appropriate to update the study every two years and/or when the system undergoes a significant resources or assumptions change.
General	Which of the portfolios in Appendix C is this study based on? For example, does the study include the transmission system needs to support the Planned and New Resource Additions in the Preferred Plans for each of the islands? If not, which plans do the forecasted transmission system needs and projects identified in this study support?	The system security analyses was based on the Base and Land Constrained RESOLVE resource plans, prior to implementing any additional constraints or adjustments. The Base and Land Constrained resource plans were then iterated to account for the outcomes of the system security study and develop the Preferred plans. Resource Tables for the Preferred Plans (post-adjustments from RESOLVE plans) are included in Appendix C.
Appendix E – Location-Based Distribution Grid Needs		
At 9, 2.a	The draft report states that initially, substation transformers and circuits are screened to determine if there are violations based on the forecasted annual peak demand. Are there additional analyses that need to be conducted related to the backflow of energy from	As circuits are forecasted to see reverse power flow, the transformer load tap changer is reviewed and upgraded as needed to accommodate the reverse power flow.

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
	residential PV such as the adequacy of the transformer load-tap-changer?	
At 12	HECO used a 75% of equipment rating to test for planning violations as a contingency condition based on engineering judgement. What types of scenarios would cause a derate of the equipment of this type? Do other jurisdictions use similar "derate" scenarios for distribution planning? If so, what percentage derate do they assume?	75% of normal rating was used to quickly screen for equipment that may not have capacity to provide backup capability under an N-1 contingency scenario. The contingency scenario is when load is transferred to an equipment because an adjacent circuit is out-of-service. If the equipment is already at or near normal rating capacity (75%), and additional load is transferred to it, there is a greater possibility that the equipment will become overloaded under contingency rating capacity. The 75% screen is to identify the circuits that will move on to more detailed hourly analysis to identify any grid needs under contingency scenarios. The Company is not "derating" any equipment for this screening analysis.
At 31	Was there any minimization of wires solutions between the Location-Based Grid needs and DER/Distribution Hosting Capacity grid needs?	The grid needs identified by the load-driven analysis for the Base scenario were on different tsfs/ckts compared to the grid needs identified by the hosting-capacity-driven grid needs. Therefore there were no overlap in wires solutions that would solve both a Location-Based grid need and a Distribution Hosting Capacity grid need.
Appendix F – NWA Opportunity Evaluation Methodology		
At 10	How does the North Kohala BESS project track with the timeline outlined in the NWA methodology?	The North Kohala BESS project was initiated outside of the NWA methodology.
At 36	"In the years 2022 and 2023, EOIs were issued for three T&D NWA opportunities which were identified as Track 1 opportunities based on the NWA methodology." *Where were these EOIs published?*	The EOIs were posted on the website: https://www.hawaiianelectric.com/clean-energy-hawaii/selling-power-to-the-utility/competitive-bidding-for-system-resources The EOIs were also sent via email to the Company's potential developer list made up of approximately 500 recipients.
At 38	For Kewalo/Kakaako load growth, where is the 50x jump in energy/8x jump in capacity coming from in one year?	The load growth is primarily due to planned development by Kamehameha Schools and Howard Hughes in the Kakaako area.
Appendix G – Revised Framework for Competitive Bidding		
GENERAL	Has HECO identified any changes to the CBF necessary to carry out a long-term RFP?	In the January 27, 2021 filing, we said, "The topic of a long-term RFP was discussed in detail in the context of the CBF with the CPWG. Presently, the group believes that the CBF is broad and flexible enough to incorporate long-term RFPs and therefore has not proposed specific updates at this time, and will work together to address specific issues in these future procurements." Also see Section 11.2.3.
At 14, Section III.A.2.f	Why did HECO drop the following clause section from the Approved Revised CBF from June 30, 2022: "f. Where the utility is using a utility-owned (in fee simple) site in a self-build option, the utility shall offer that utility-owned site to bidders, unless it is demonstrated to the Independent Observer and the Commission that doing so would be unreasonable."	This was an oversight; the incorrect version of the CBF was provided with the draft report. The final approved CBF reflecting edits made after comments were received is attached with this draft.

Reference	PUC Staff Question/Comment	Hawaiian Electric Response
At 20	Please explain the addition of the clause: "Subject to Commission approval, the utility may also recover such costs through the major project interim recovery ("MPIR") adjustment mechanism, Exceptional Project Recovery Mechanism ("EPRM"), renewable energy infrastructure program ("REIP") surcharge or other recovery mechanism until such costs are recovered through effective rates approved in a rate case or other Commission approved regulatory process or mechanism."	This language is not in the final approved version of the CBF and will not be included in the appendix filed with the next draft.
At 15, Section VI.B	Has HECO considered adding a deadline for the request to not propose a self-build project?	In practice, it would be best for such request to be submitted and approved before the final RFP is approved such that streamlining modifications can be made to the RFP to account for the absence of a self-build proposal.
GENERAL	Has HECO considered moving the Framework to the Administrative Rules instead of including it in the IGP Report?	No. The Framework is a standalone document that was approved by the PUC in 2008. A revised version of the Framework was approved by the PUC in 2022 involving stakeholders. The Framework was revised to generalize the planning methodology used by the utility in the event that IGP were to change. In which case, the Framework could go on without being tied to the specific process as the 2008 one was with specific references to IRP.

1.2 Technical Advisory Panel (TAP) Comments

This feedback and summary were delivered by the IGP Technical Advisory Panel (TAP) to Hawaiian Electric (HECO) based on HECO's draft Integrated Grid Planning (IGP) report. As always, TAP's comments are suggestions.

TAP members:

- Jordan Bakke (MISO)
- Dana Cabbell (SCE)
- Matthias Fripp (UH/EDF)
- Elaine Hale (NREL)
- Andy Hoke (NREL, Chair)
- Debbie Lew (ESIG)
- Durgesh Manjure (MISO)
- Vishal Patel (SCE)
- Deepak Ramasubramanian (EPRI)
- JoAnn Rañola (EPRI)
- Matt Richwine (Telos/HNEI)
- Rick Rocheleau (HNEI)
- Kevin Schneider (PNNL)
- Derek Stenclik (Telos/HNEI)
- Gord Stephens (NREL)
- Terry Surles (HNEI)
- Aiden Tuohy (EPRI, Co-chair)

TAP feedback and comments are divided into four categories:

1. Informational, no action needed
2. Near-term action strongly suggested
3. Concern or suggestion, for future discussion or consideration
4. Clarification needed in draft report

Hawaiian Electric responses are provided in purple italicized font.

1.2.1 General comments

Overall, the IGP report presents an enormous effort by HECO and its stakeholders to plan out how to reach very ambitious and timely renewable energy goals. Many aspects of the report reflect past TAP feedback that has been used to improve the analysis; some of those improvements are noted in this feedback document. The report describes a long-term plan to achieve 100% renewable energy as well as concrete near-term actions to meet interim renewable goals. The long-term plan and near-term actions appear reasonable. In the places where the TAP would suggest improvements or clarifications, those are noted here in colored text.

As is to be expected from an integrated grid plan, the analysis described in the report makes various assumptions; those assumptions in general appear reasonable. Similarly, the analysis uses modeling methods designed to find an optimal solution; those methods are generally reasonable, well vetted, and are aligned with best practices. Where the TAP has concerns, sees risks, or would suggest improvements or clarifications, that is noted in this document in colored text with the most urgent items shown in red.

We agree on the need for urgent action and generally encourage HECO to continue the various efforts underway and to begin implementing the plan described in this report, notwithstanding any specific TAP comments to the contrary. At the same time, it will certainly be possible to improve the plan going forward as new information is gained, modeling methods improve, and technology evolves. Therefore, the plan should remain flexible to allow for future adjustments, as the report notes. For example, a near-term opportunity to evaluate assumptions will come with the Stage 3 RFP bids, which will provide valuable information on resource availability, pricing, and other details.

Some TAP comments may be best addressed by simply including a reference to the relevant section of the report. In other words, we may have missed some details (and other readers could also use help finding those details).

Inflation Reduction Act – we suggest more discussion on how large of a change this is and what it means for the different resource portfolios.

- We understand that the legislation was passed recently and after all of the capital cost assumptions were finalized, but this dramatically changes costs of clean technologies. Further discussion on the potential implications for resources selected by RESOLVE and timing of new additions is warranted. In the next IGP, we suggest HECO provide a detailed representation of the IRA in the capital cost of resources.
- Oahu is an energy community (10% IRA bonus) and neighbor islands likely have low income community or indigenous community multipliers. HECO should flag what HECO, SEO, and other government entities can do to maximize the IRA opportunities for the state.

- *Hawaiian Electric Response – Clarification made to Section 5.2.1. The Company does not expect that tax credits from the inflation reduction act would materially affect the outcome of the modeling provided in the IGP Draft Report. The cost projections for hybrid solar and wind already assumed these were the*

least cost resources. While there are "adders" in the inflation reduction act that may increase the eligible tax credits for projects in Hawaii, the Company also notes that projects costs have risen since the cost projections for IGP were approved by the Commission. There is likely to be some cancelling effect between the additional tax credits and increase in underlying equipment costs. The Company will gain further insight into the IRA impacts as it evaluates developer proposals through the Stage 3 RFP. Standalone storage could be appreciably lower cost than we have seen in the past; which could lower cost for the ancillary services that a standalone storage system provides; however, this likely would not impact the optimization because it is not in of itself a generator of renewable energy which is needed in large amounts to meet 2030 decarbonization goals. Notwithstanding, the Company does recognize the importance of the IRA towards affordability. The Company is pursuing tax credits for any of its own projects. We also expect that developers of prospective projects will look to maximize the tax credits available to them when developing their project proposals for an RFP.

Firm capacity needs: There is a lot of discussion throughout the IGP on firm resource needs. It is clear that with HECO's aging fleet and limitations of (4-8 hour) battery storage that the need for new firm resources is reasonable. However, the needs may not be to the level that the report indicates. For example, the Stage 3 RFP firm RE target was not analyzed through the IGP process. While it makes sense to move forward with the Stage 3 RFP process given the need to identify what projects the market can provide (and at what costs), before building the Stage 3 firm RE projects we recommend further analysis to clearly define the firm resource needs, including those already part of Stage 3, at increasing levels of VRE and storage integration and with different retirement assumptions. We are not suggesting this analysis needs to be done before this report is finalized.

Hawaiian Electric Response – First, the Company clarifies that the Stage 3 firm RFP targets were informed by a grid needs assessment using IGP assumptions in July 2022, where firm resource additions were first optimized by RESOLVE then verified through a combination of ERM and probabilistic resource adequacy analyses. In IGP, the Stage 3 targets are then assumed to be planned resources. Notwithstanding, as part of the Stage 3 RFP evaluation, based on direction by the Commission, the Company intends to consider firm generation needs in the context of the entire portfolio (i.e., variable renewable resources) that may be advanced from the Stage 3 process.

- Firm resources are not selected by the RESOLVE model. It is unclear if this is because existing unit retirements are not being selected by the model or not being included as an option?

  Hawaiian Electric Response – Firm resources are a resource option in RESOLVE. It is not chosen because there are other lower cost options in RESOLVE. When these other options are removed, as in the case of the Land-Constrained scenario on O'ahu, then a firm resource was chosen.

- Table 8-4 and 8-5 show resource adequacy results of the RESOLVE portfolios of 0.00 days/year LOLE. We suggest analysis that shows for each of those future years/portfolios, how much existing firm resources can be retired or new firm can be deferred to show how much firm the future years need. I.e., back-

solve for the total firm capacity needed at each future year (2030, 2035, 2040). We recommend this be done before reaching the building Stage 3 firm RE projects. We are not suggesting this analysis needs to be done before this report is finalized.

Hawaiian Electric Response – The Stage 3 RFP will include a reliability analysis to assess system reliability given the actual proposals/resources bid into the RFP.

- The firm resources actually don't appear to need to be flexible. And the existing firm will not need to cycle as much as it has had to in the past due to the amount of storage coming on. This is illustrated on the Base Case of page 123 and is an important finding for the firm needs. 1) New firm resources may not need to be flexible, but will need to operate for extended periods and be offline for potentially large parts of the year. 2) HECO may be able to keep older units online longer if they don't cycle as much.

It would be helpful to give context to the stage 3 RFP. It could be helpful to have a table showing the system as it is today, then stage 1 and 2 projects, and then stage 3. The Status Quo scenario could be included in this table.

Hawaiian Electric Response – The Stage 3 firm RFP resources were modeled as 6 x 50MW CT and 1 x 200 MW combined cycle on O'ahu and 5 x 8 MW internal combustion engines on Maui. While they may not need to constantly start/stop as flexible units, they will be relied upon to provide reserves on both an intra-hour basis to shore up the intermittency of PV and wind and potentially multi-hour reserves for extended periods of poor weather when the paired BESS is more likely to be exhausted.

Offshore wind

- No portfolios were evaluated without offshore wind being selected. Offshore wind on a small scale of a couple hundred MWs (relative to North American plants that are between 1-2 GW) in the deep ocean is highly uncertain.
- Given the high degree of technological, cost, and regulatory/siting uncertainty for future offshore wind development, HECO should conduct a sensitivity for Oahu - similar to the land constrained case - where offshore wind resources are not available to show the resulting portfolio.

  Hawaiian Electric Response– Given the uncertainty of developing a new offshore wind project and numerous public comments received in regards to offshore wind, the Company ran RESOLVE without offshore wind as an option to determine if the resource plans meaningfully change. The results are discussed in Section 8.2.1.3. In summary, when offshore wind is not an option, more hybrid solar is developed in the Base scenario and more DER Aggregate is developed in the Land Constrained scenario. This underscores that our lowest cost renewable options: onshore wind, hybrid solar and offshore wind are critical to meeting our decarbonization goals. We must continue to diligently work with communities to keep as many of these resource options on the table as possible.
- If the LCOE of OSW is much higher than grid-scale PV and residential PV (per page 88), why is it getting built in the future scenarios? Is RESOLVE hitting land or other constraints? Or is the model highlighting a benefit for resource diversity?

Hawaiian Electric Response– The LCOE presented in the Draft IGP was mistakenly the capital cost and not the LCOE. The figure has been corrected. The LCOE for offshore wind with the tax credit is close to the LCOE for hybrid solar. Based on the LCOE, onshore wind, low slope PV+BESS, offshore wind, high slope PV+BESS are the least cost resources in ascending cost order. The resource selections in RESOLVE follow this same order. By 2050, the resource potential is being reached for the hybrid solar and onshore wind. In both the Base and Land Constrained scenarios, the offshore wind is primarily being used for energy.

- There is discussion of this risk of offshore wind development on page 105, but it should be made more explicit. Oahu has a significant problem if OSW is not technically feasible or cost effective.

  Hawaiian Electric Response– See discussion above on "no offshore wind" scenarios.

- The Big Island RESOLVE model selects no grid-scale solar until after 2035 – presumably because land-based wind is cheaper than solar+storage. However, this does not align with recent RFPs, community acceptance, and likelihood of being built.
- We suggest at least one case for Hawaii Island where onshore wind is not available as a candidate resource to see if the model selects more grid-scale solar or another resource (like geothermal). This type of info is needed in case community preference is to avoid building new wind resources. This analysis should be completed when the Stage 3 RFP results are available to inform the analysis. We suggest the IGP report just include a brief note stating acknowledging the concern.

  Hawaiian Electric Response– On Hawaii Island, the situation is different than Oahu in the Land Constrained scenario and the uncertainty surrounding offshore wind. While RESOLVE is selecting wind for its low cost and high capacity factor relative to other technologies, the Company believes there is potential for development of other low cost resource such as hybrid solar. The RFPs will help to determine the technology choices on Hawaii Island. Additionally, we believe if we limited the amount of wind on Hawaii Island then the model would select hybrid solar in its place and both resources have sufficient technical potential to serve Hawaii Island loads. This is similar to Oahu where the wind potential is limited and so the RESOLVE model favors hybrid solar in its place once the wind potential is maxed out. Indeed, wind and solar have different characteristics, but we will continue to test reliability of portfolios that may be selected through the RFP process. Should we see evidence that neither future solar nor wind is viable on Hawaii Island, that may warrant an update to Hawaii Island's pathways at that time.

- In general, the selection of land-based wind on Big Island (along with the OSW finding on Oahu) shows the importance of showing multiple portfolio options. The RESOLVE portfolios show only the least cost portfolio, but the costs of alternative portfolios are likely close (and the cost assumptions are highly uncertain anyway). Other constraints like land, community acceptance, and regulatory/siting (DOD restrictions) are likely the more important factors. Reporting out on other portfolios that aren't necessarily least cost but may have more realistic pathways to deployment, may be helpful.

Hawaiian Electric Response – Stakeholders identified land-constraints on the island of Oahu; therefore, we modeled a specific scenario to evaluate how we could reach 100% renewable energy in that scenario. We currently do not have any reason to believe that Maui and Hawaii Island cannot achieve the Preferred Plans. If procurements dictate that other factors like land or community acceptance may hinder the "optimal" plan adjustments to pathways/scenarios could be made in future iterations.

Given that several projects have dropped out of recent RFPs, what is HECO's backup plan if a similar result happens with Stage 3? Will existing firm plant lives be extended, or is another plan needed to fill resource gaps? Can you run resource planning scenarios in which one or more Stage 3 plants drop out? Would it make sense to give preference to smaller firm projects from multiple developers rather than one big firm renewable resource?

Hawaiian Electric Response – These are important questions that we will need to evaluate as the portfolio from the Stage 3 process becomes clearer. We are also developing contingency plans where necessary to ensure we are able to maintain reliability if projects selected through the Stage 3 process are unsuccessful in timely reaching commercial operations.

The grid needs assessment implemented the suggested "Bookend" analysis in the forecasts, as suggested by the TAP, but didn't really show that in the resulting portfolios. The point was to show how even with a very wide range of assumptions, it doesn't change the least cost portfolio much. Can you add some discussion with a figure or table showing that?

Hawaiian Electric Response – Each island has a Capacity Expansion Scenario that shows the results from the Low Load, Base, Faster Tech, and High Load scenario. The first bullet in Section 8.1 of the draft report (now Section 8.1.1) also highlighted that across different load scenarios, the models consistently selected high levels of solar, wind, and energy storage.

Colors of resource types are not aligned throughout the report, making it hard to flip between figures/sections. This is not a must-fix, but it's a "nice-to-have".

Where does IGP go from here (in addition to the various items in the Action Plan)? Does another iteration of IGP start once the plan from this iteration is approved? Or is there a pause?

Hawaiian Electric Response – The plan is to execute the action plan, including competitive procurement(s) over the next several years. Updates to the plan can be made following each procurement/acquisition of resources. The next major update may occur in the next 3-5 years depending how the market, environment, or other material events may affect the pathways.

It might be useful to quantify more clearly to consumers the costs and benefits of different options, particularly around aspects such as electrification of transport, smart thermostats/water heaters, etc.

TAP has not reviewed some of the aspects in quite a while, or in some cases, not at all yet; for example the resilience section does not seem to have been shared. It might be worth discussing whether these aspects are worth review, or if they are still too early to receive technical review from TAP.

1.2.2 Executive summary

In general the executive summary provides a good summary of the report.

One TAP member felt the executive summary itself could benefit from a shorter summary.

Guiding Principles box:

- The guiding principles appear reasonable. It's great to see that renewable energy is the first option.
- We were surprised to see a mention of "dynamic pricing". What are the details? Or do you really mean "advanced pricing", rather than truly dynamic pricing (which implies that prices paid by customers change frequently based on communicated signals)? (Dynamic pricing does not appear to be mentioned anywhere else.)

Molokai: You note the majority landowner will form a microgrid. Will this be a utility-connected microgrid or will they operate disconnected from HECO's system most/all of the time?

Will the community benefits packages from IPP plant developers become an RFP requirement? Is this for Stage 3, or afterwards?

Hawaiian Electric Response – The community benefits packages for IPPs have been implemented for Stage 3 RFP. We will continue to improve on iterate on these requirements as we gain more experience on how this is implemented between developers and communities.

It will be very interesting to see what firm renewables are actually proposed in the Stage 3 RFP and future procurements. This appears to be one of the biggest unknowns and challenges in the energy transition (not just in Hawaii, but worldwide). Should the executive summary acknowledge this uncertainty? Also, we notice bio-energy is not mentioned here, whereas geothermal, waste-to-energy, and green hydrogen are - is that intentional? (In the report body, bioenergy/biofuels seem to be considered the most likely option, so it's surprising that they are not mentioned at all in the executive summary.)

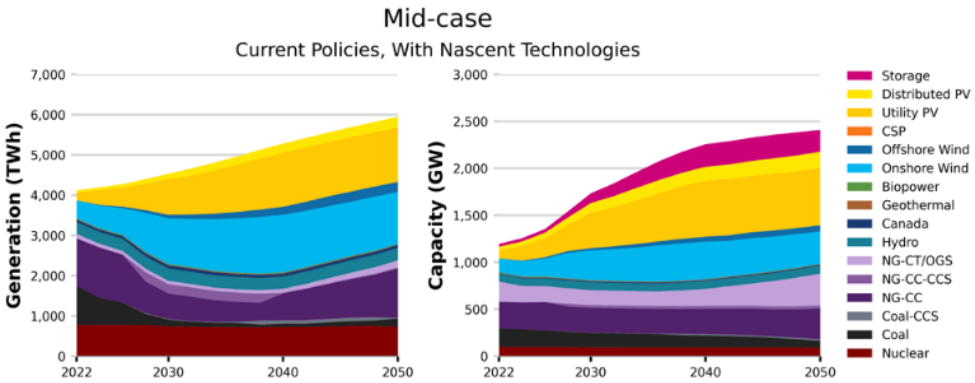
Figure 1-3: What are the remaining CO2 emissions in 2050 from? Is this electric sector emissions or total Hawaii emissions across all sectors?

Hawaiian Electric Response: The emissions shown in Figure 1-3 is for Hawaiian Electric. In 2050, some emissions are still produced by H-Power as a byproduct of its waste-to-energy process.

Figure 1-4:

- The change in generation profile from 2022 to 2030 is enormous (from 32% renewable to 81%). How likely is it to be successful? How far do just Stage 1 and Stage 2 resources get you?
- Stacked area plots or stacked bar charts are easier to read than side-by-side pie/donut charts to show the preferred portfolio resource mix over time. (Figure 2-3, etc.) Here is an example of stacked area plots from NREL's Standard Scenarios report:

Hawaiian Electric Response – Stacked area versions of the pie charts have been inserted into the Preferred Plan subsections in Section 8.



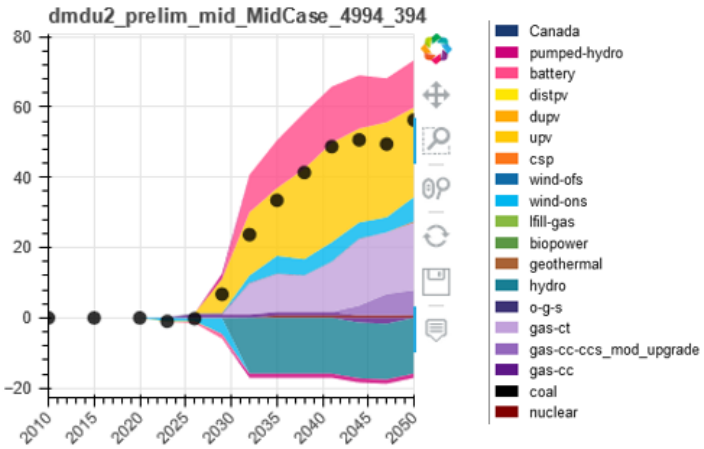
- Please clarify that Figure 1-4 (and similar) are on an energy basis (not installed capacity)

  Hawaiian Electric Response – This is on an energy basis and not a capacity basis.

- It would be good to provide an installed capacity version of the same information early on (e.g. Section 2) – especially if the plots later in Section 8 don't reflect the final preferred plans

  Hawaiian Electric Response – Installed Capacity Stacked area charts have been inserted into the Preferred Plan subsections in Section 8.

- It might be helpful to show a difference plot (whether early on or in Chapter 8) that focuses specifically on net capacity additions and removals relative to today, capturing both prescribed and optimized (where applicable) retirements. This might help people internalize when and how much fossil is going away, and what's replacing it – effectively a graphical equivalent to Figure 1-3/2-1 (which is very helpful). Here is an example of a capacity difference chart:



Hawaiian Electric Response –Capacity Difference Stacked area charts have been inserted into the Preferred Plan subsections in Section 8.

"Why is rooftop solar not enough?" - It does seem clear that getting to 100% renewables with only rooftop PV would be extremely technically difficult. It would also likely be much more expensive than a plan that includes large-scale solar and other resources; should this aspect be mentioned in this box?

Hawaiian Electric Response – In response to comments above on the offshore wind resource, the land-constrained case was run without offshore wind. In this case, reliability and renewable goals are met through additional biofuel generation and expansion of the DER aggregator. Because this case removed additional low-cost large-scale resource options, it is expected to be much higher cost.

1.2.3 Section 2 - Action plan

The TAP agrees it is a good idea to implement IEEE 2800 for large-scale IBRs. You may also want to mention that in many areas you go beyond IEEE 2800's requirements due to the unique needs of your very high-IBR island system.

2.1.4: You state "It is not possible to ensure a consistent, reliable flow of electricity if the entire grid is powered by weather-dependent, energy-limited resources." We'd suggest changing "not possible" to "not economically desirable…". It is certainly possible to run a grid with only weather-dependent generation if enough storage is present - but it would likely be extremely costly (i.e. very large amounts of energy storage).

Hawaiian Electric Response – We do not believe, especially on Oahu, that there would be sufficient land to develop enough solar and wind to be able to charge the energy storage to supply the load on all days. On some days, we would require some other generation source like firm generation to sufficiently charge the energy storage or serve the load directly. While economics plays a part, other competing uses for limited land on Oʻahu (housing and food/farmland) will limit what land can be used for energy.

2.1.4 Box titled "Near-term actions to adopt emerging technologies:"

- Adoption of grid-forming technology for large-scale plants should probably also be on this list. (It is mentioned in the text above, but not here.)
- You mention a need for a standard for V2G. This probably should apply to all EVs, not just V2G, because losing a very large block of load could be just as problematic as losing a very large block of V2G energy.

Hawaiian Electric Response – Changes have been made in the report main body section 2.1.4 to address both bullets points, above.

2.2 :

- The resource mixes presented in this section are the result of optimization in a capacity planning tool and a resource adequacy tool followed by a system security study, and potentially iteration of the capacity planning/RA, right? If so, perhaps state this (in terms understandable to typical stakeholders) - otherwise readers might think these are numbers HECO has picked based on some other criteria. In

other words, if you have run detailed techno-economic models to find the least cost plan to meet renewable and reliability goals, state that here. Maybe show the flow chart, or at least point to the relevant section.

- There's an obvious typo in the first paragraph.
  Hawaiian Electric Response – Text updated

2.2.1: What is a "LMI project"? (LMI means low and middle income, but what kind of projects are these? Rooftop PV? Community solar? Something else?) And what is "Phase 2"?

Hawaiian Electric Response – These are community based renewable energy projects. Section 2.2 has been updated to clarify that these are community based renewable energy projects.

2.3: External Actions and Policies for Successful Implementation

- Why is "Investments in grid modernization and advanced technologies" listed as an "external condition/action"? Seems like it's largely under HECO control. Or did you mean R&D investments by vendors to improve technology?
- Under Resource and Technological Conditions, we'd suggest adding " "Rapid maturation of technologies for firm renewables and/or multi-day energy storage."

Hawaiian Electric Response – Removed "investments in grid modernization…" from external actions.

2.4 : Potential Risks and Challenges

- Good to see this section included. We'd suggest also referring readers to section 12 for a more detailed risk analysis and mitigation strategies.
  Hawaiian Electric Response – Added a reference to this section.

- You state "The primary threat to progress is the status quo and policy inaction to the above-listed recommendations." Agreed this is a major risk. However, this puts the focus on policymakers only. It would be good to acknowledge the (obvious) fact that success will also depend on HECO's implementation of these extensive and ambitious plants.
- *Hawaiian Electric Response – Yes, we agree, added some clarity.*

Figure 2-8: This is a helpful high-level timeline. What about transmission needs? If transmission is needed for Stage 3 (e.g. on Maui), shouldn't transmission expansion also start asap?

Hawaiian Electric Response – Agree, added text to section 2.2.

1.2.4 Section 8 - Grid needs assessment

General comments:

- After reading section 8, some TAP members still wanted to know what are you actually building and what does it cost, and what adjustments are made. We'd suggest summarizing all the pieces at the end of section 8. A bar chart or similar would be helpful showing additions and retirements from the current system. Stage 3 and new DER assumed should be included as well, but could be categorized differently. Changes in load should also be referenced there.

  Hawaiian Electric Response – Each island now has a summary of the generation and change in capacity for their preferred plan in Section 8.

- Most readers are going to be primarily interested in what the preferred plan actually is and what the corresponding resource adequacy metrics look like, so having an independent discussion of the final preferred portfolio/timeline for each island, separate from the methods details of how it was determined, would be much easier to digest. Or some of those differences and motivations could be mentioned up front, but the details saved for later.
    - E.g. "The preferred portfolio includes X MW of resource A – RESOLVE had chosen Y MW, but based on RA assessment we determined less/more was needed – for more information see Section 12.x.y.z".

  Hawaiian Electric Response – Appendix C has the preferred resource plans. A cross reference to Appendix C was added to the Preferred Plan sections. New figures were also added to show the components of the Preferred Plan. The description in each section discuss adjustments made from RESOLVE due to resource adequacy or transmission system security analyses.
- The detailed RA is saved for Chapter 12, but might be better for that information to be conveyed prior to Chapter 9, which summarizes costs and emissions reduction. Maybe these RA subsections in Chapter 8 could be expanded to include the results for the preferred adjustments that are explained in more detail in Chapter 12, and the end of the Chapter 8 subsections on each island could clarify exactly what the preferred plan is and how that was arrived at.
- It would be helpful to have a section describing *how* the grid needs were determined. A non-technical summary will be useful to show that this was a very detailed analysis. A flow chart would be helpful. A reference to any relevant appendices would also be helpful.
    - Concepts like ERM and HDC played a large role here, but they are not mentioned in this section. A reference to further information in Appendix B would be helpful.
    - The TAP understands that a study is underway to compare the ERM/HDC approach used here to other leading approaches. Is that study mentioned somewhere in the main report? It is important to point out that HECO is looking at ways to improve capacity expansion modeling before final procurement decisions are made. It is fair to say this is a novel and new approach, but that it still needs more work to fine tune. In particular, the TAP has noted in the past that the HDC/ERM approach may be biased in favor of adding thermal generation to meet reliability needs, since even with the new 80% availability threshold, it likely understates the availability of renewables during critical grid conditions. The other methods are designed to avoid this bias, so

the comparison should be completed and the costs of the resulting plans should be compared to the plan developed using ERM/HDC before reaching the "point of no return" on Stage 3 firm RE procurement. The other methods include ERM/HEC, PRM/ELCC-light and a simple approach of trying several quantities of solar and backfilling each one with enough firm capacity to reach satisfactory reliability.

Hawaiian Electric Response – Yes, the company is taking a more detailed look at this in our resource adequacy study as directed by the Commission. Notwithstanding, whether HDC/ERM is biased toward firm generation in RESOLVE, the plans were evaluated using a probabilistic resource adequacy analysis (that also evaluated lesser amounts of firm generation on the system), we also note that in general, there was far more hybrid solar selected, and very little firm generation selected in the RESOLVE modeling.

Add back in the flowchart showing the linkages between different modeling tools - it may be in appendix but would be good to see and then refer to in the text when talking about changes that needed to be made to portfolios

Hawaiian Electric Response – This was added to Section 8 to provide context of the modeling framework.

- Is there a summary table of the Stage 3 RFP resources by island somewhere in the report?
- HECO states that load-driven grid needs and DER hosting-capacity-driven grid needs do not have much overlap. Historically this is probably true: load-driven needs occur at peak load hours while hosting capacity needs occur at midday hours. But distributed storage crosses these hours – how much distributed storage is contemplated and how could this resource help address both challenges simultaneously?

Hawaiian Electric Response – The grid needs identified by the load-driven analysis for the Base scenario were on different tsfs/ckts compared to the grid needs identified by the hosting-capacity-driven grid needs. This is because the load-driven grid needs are driven primarily by new service requests. Whereas the hosting capacity grid needs are driven by DER growth forecast which may not be on the same tsfs/ckts. The mutual-exclusiveness is not so much because the load-driven grid needs occur at peak load hours while hosting capacity needs occur at midday hours. Clarification added to section 8.1.4.4 Distribution Grid Needs Summary.

The reference in the report to load-driven needs occurring during non-solar hours and hosting capacity needs occurring during solar hours was removed after the above clarification was added to the report.

Distributed storage is included as a layer in the scenario forecasts used to determine load-driven grid needs. Distributed storage is also an option for NWA solutions.

- Generally all islands are showing sufficient margin on distribution equipment in the coming 5 years.
- It is not clear how PLEXOS results fit with the other parts of the study - are they used mainly for the economic assessment, or do PLEXOS results also inform the capacity expansion or RA/transmission modeling? Are violations of load/reserves assessed in PLEXOS and fed back to higher level models? If not, it might be good to do this for future IGP iterations.

  Hawaiian Electric Response – PLEXOS was used to capture the system cost over the planning horizon and provide a view of how existing and new generators are expected to operate to meet electricity demand. Results from PLEXOS were incorporated into the transmission analysis which resulted in adjustments to the resource plans as described in each island's Transmission and System Security Needs section. PLEXOS was also used to perform the resource adequacy analysis, which may result in changes to the resource plan. At the start of Section 8, we have added back the diagram that shows how all the models interact with each other.

- Have PLEXOS results been used to benchmark the RESOLVE modeling in any way, other than LOLE studies? For example, RESOLVE will have assumptions about production costs - it would be good to verify those assumptions with the more detailed model.

8.1 - Thank you for addressing TAP feedback by describing the backup plan if large-scale renewables are not able to be developed.

8.1.1 - You mention a North American standard of 0.1 LOLE - this is not actually a standard but rather a commonly used criteria. Changing the metrics and criteria uses is also something being revisited in both research (EPRI, ESIG, NREL efforts) and starting to be proposed in practice (recent PJM proposal, SPP and ERCOT discussions). This is likely worth calling out to prepare for future changes and not to lock in 0.1 LOLE for future work when it may not be appropriate in an energy-constrained system.

Hawaiian Electric Response – This is added into the latest version of report main body, Section 8.1.2 (of the Final Report), "It is important to note that the TAP has indicated that changes to this criterion is being researched and studied, and as a result, it may change in the future."

8.1.3 - When mentioning transmission expansion, it would be good to also mention that you plan to explore non-wire alternatives to transmission, or refer to other portions of the report where you already mention that.

Hawaiian Electric Response – This is added into the latest version of report main body Section 8.1.4 Overview of Grid Needs, subsection Transmission and System Security Needs.

8.1.3.1: You state: "It is worth noting that to identify transmission system capacity needs to accommodate future large-scale generation projects, distributed generation is not considered in the steady-state analyses." Can you add a sentence or two justifying this assumption? Otherwise stakeholders may strongly question it.

Hawaiian Electric Response – This is added into the latest version of report main body Section titled Important Study Assumptions and Scope Limitations.

8.1.4: In future iterations, have you considered combining the two distribution grid needs analyses into one unified analysis? (It's not clear why the two analyses should be done separately - it would seem better to combine them, but perhaps we're missing something.)

Hawaiian Electric Response – This was due to the timing where the Company wanted to submit the hosting capacity grid needs in the 11/2021 submittal directed by the Commission. In future iterations, it could be performed together at the same time.

8.1.4.2 - Please explain up front the base, low and high DER forecasts – how many MW? Maybe have a table, or refer to another section where they are explained.

Hawaiian Electric Response – The explanation for the DER forecasts can be found in Section 2: https://www.hawaiianelectric.com/documents/clean_energy_hawaii/integrated_grid_planning/20211108_distribution_der_hosting_capacity_grid_needs_report.pdf

The links to the tables with the information can be found in Appendix A: https://www.hawaiianelectric.com/documents/clean_energy_hawaii/integrated_grid_planning/20211108_location_based_distribution_forecasts.pdf

8.1.6 - A protection roadmap has been presented to the TAP. It was very useful to see how HECO is thinking about and planning to address issues. It may be useful to separate transmission system protection from distribution system protection because the protection schemes and complexity of each tend to differ. Our understanding is that the protection challenges in the transmission system may be more difficult than those in the distribution system.

Hawaiian Electric Response — The protection challenges on transmission and distribution can be different, but it's uncertain which one would be more difficult. For instance, one significant impact of IBR generation is that it generally decreases the critical clearing times for faults at all voltage levels. That is, faults must be cleared faster everywhere. Speeding up protection system operation on transmission may, or may not, be more difficult than speeding it up on distribution. However, we agree that separating the two can help illustrate the differences and similarities between the two.

Figure 8-2 - Is "High Adoption" in Fig 6-9 is the same as Faster Tech in Fig 8-2. If so, please use a consistent name for the scenario.

Hawaiian Electric Response — Legends for Figures 6-8 and 6-9 updated to Faster Tech

Figure 8-3: We understand that DER+DBESS is from the forecast and not selected by RESOLVE, whereas. DER aggregate is selected by RESOLVE. Please clarify this for readers.

Hawaiian Electric Response — This is added into the latest version of report main body, Section 8.2.1.

8.1.4.3 - Was this done before the state announced its new decarbonization/electrification goals? If so, will it be repeated? With the state's new electrification goals, it is possible Hawaii will see very fast uptake of EVs on some circuits, which might outpace the ability to upgrade circuits. (We understand that California has recently become concerned about the high levels of time, resources, and materials like transformers that may be needed to prepare distribution circuits for EV-related load growth from now to 2030.)

Hawaiian Electric Response – The High Electricity Demand ("High Load") and Faster Technology Adoption scenarios used the High EV forecast which is based on 100% EVs by 2045.

8.1.6 - How will you learn how customer-scale inverters perform on timescales relevant to protection? Are you planning to collect point-on-wave current data on distribution circuits?

Hawaiian Electric Response - We will rely on industry experience with customer technologies to validate their specific system impacts, including on protection performance. This industry experience can possibly include research projects done in the field on actual customer equipment connected to utility systems.

8.2.1 (and other capacity expansion subsections) - Please explain for readers why different forms of firm RE are presented and modeled separately (e.g. biomass, "new firm RE", geothermal, etc). Similarly, clarify what is meant by the "new firm RE" category that apparently does not include biomass or other resources that one would assume are firm RE. If the definition of "firm RE" is different from in the RFP, please clarify; if not, please refer readers to the RFP.

Hawaiian Electric Response –Biomass, CT, CC, and Geothermal were modeled separately because they had different capital and operational costs based on the NREL ATB Data, as shown in Section 6.9 of the Draft IGP report. CT and CC are firm resources on biodiesel.

8.2.1.1 - Thank you for including this additional scenario at the TAP's request.

Figure 8-4: Should the LC_70pctRPS case be showing new firm RE in 2030?

Hawaiian Electric Response — Clarification was made to report. Cumulative New Capacity charts only show the new capacity that was selected by RESOLVE and does not include Stage 3 Firm resources.

Figure 8-5: In the LC_70pctRPS case, why is there "existing firm RE" in 2030 but it disappears in later years?

Hawaiian Electric Response– There is some biofuel generation to meet the 70% RPS target in 2030. In later years, with the addition of other renewable resources such as the offshore wind and DER Aggregate PV+BESS, this biofuel generation from existing resources is not needed.

8.2.1.2 - First word on page 117 should be "practical".

Hawaiian Electric Response – This is corrected in the latest version of report main body.

Figure 8-7: Why is 2030 HighFuel RetOpt only at 81% in 2030? Does it have to do with how Biomass is counted?

Hawaiian Electric Response– This is corrected in the latest version of report in Figure 8-7.

Table 8-4:

- Showing lots of zeros seems to indicate overbuilding. Maybe also the units and number of decimal points should be adjusted?
- EUE (%) is usually shown in PPM instead.

8.2.2 - Regarding the statement "Approximately 200 MW of new firm generation is needed, in addition to the 500 MW of firm generation from Stage 3, to bring the system loss of load expectation below 0.1 day per year." It's not clear that the numbers show this need since the LOLE goes all the way to 0.00.

In general, the system appears very reliable in most cases, with LOLE <<0.1; this should be noted somewhere. We realize this may be due to the lumpiness of the units (e.g. it's either well above 0.1 or well below when you add realistic resource increments), but might be worth clarifying why the system may seem overbuilt from a reliability perspective.

Hawaiian Electric Response – Results in Section 12.3.1.2 Firm Generation Reliability Impacts shows the relationship between LOLE and new firm generation added after Stage 3. As shown, small changes in firm capacity can result in large changes in LOLE. In the Probabilistic Resource Adequacy Summary, it is noted that in 2030 and 2035, both the Base and Land-Constrained plans developed by RESOLVE should meet our reliability targets.

Figure 8-10 - The color for Standalone BESS Generation in this plot is better than the color used in previous and subsequent plots, which are hard to read.

Hawaiian Electric Response– Standalone BESS data in graphs has been changed to a dark green.

Figure 8-13: In section 8.2.1.1, there was no "New firm fossil" plant built. But here we see a "new firm fossil" plant operating during most hours. Where did it come from? If a new fossil fuel plant is to be built, that merits more explanation. (Is this a mistake?)

Hawaiian Electric Response– Figure 8-13 has been corrected. It should have been New Firm RE, now labeled as New Biofuels.

Figure 8-14: This shows total starts per year, but it would be more intuitive to show the average number of starts per unit for groupings with more than one unit

Hawaiian Electric Response- Figures were updated to show average starts by unit grouping.

- We don't see a "high electricity demand" scenario in the capacity planning section. Where are the details on this scenario, and where did the dispatches come from?

Hawaiian Electric Response– The high load forecasts were modeled in RESOLVE to determine if the bookends of the load forecast built the same resources or if a dramatically different resource mix was required. Based on the results of the load bookend modeling, the same resources were largely being built that scaled with the load i.e. more of the same resources were built in the high load bookend compared to the base and low load bookend.

- We don't actually see a system security study for the high load scenario described anywhere in this section. How was the high load scenario from Appendix D used?

Hawaiian Electric Response– The high load scenario was used as a sensitivity and added to Appendix D. The main body of the report focused on the base scenario.

- HECO noted that transmission expansion is not anticipated on Oahu until 2040 with the REZ. The description of planned transmission build-out appears to utilize several double-circuit lines. Are the double circuit lines considered a single N-1 event for planning (shared structure) or are these being contemplated as a separate outages? This comment also applies to Maui in the 2035 scenario and later scenarios.

According to current O'ahu transmission planning criteria, transmission element thermal loading continuous rating is used as loading limit for an outage of double circuit lines on the same steel pole; according to current Maui and Hawai'i Island transmission planning criteria, transmission element thermal loading emergency rating is used as loading limit for an outage of double circuit lines on the same steel pole.

8.2.4.1 - Hard to understand what "REZ Enablement cost estimate" is exactly in these tables. We assume "cost per MW" is the transmission project cost per MW of renewable generation. Is the REZ enablement ($MM) the millions of dollars of renewable generators or the cost of the transmission?

Hawaiian Electric Response - The REZ enablement cost is explained in section 6.9.4.

Table 8-8: Clarify why the grid needs are so high in the "Low Load" scenario (higher than in the base scenario), especially since previous discussion said that the timing of the increased demand driven needs didn't overlap with the timing of the DER/PV driven needs.

Hawaiian Electric Response – The Low Load scenario has high DER forecasts which results in more hosting capacity grid needs compared to the Base or High Load scenarios. Also the load-driven grid needs are primarily driven by customer service requests which are the same for all forecast scenarios.

Table 8-10 is titled "High Load Customer Technology Adoption Bookend Scenario" which we think is the same as table 6-16's "High Electricity Demand" and Table 8-8's "Scenario 2 (High Load)". Can you make it all one consistent name?

Hawaiian Electric Response – Confirming High Load Customer Technology Adoption Bookend Scenario (High Load) is the same scenario as the High Electricity Demand scenario (Table 6-16). Similarly, Low Load Customer Technology Adoption Bookend Scenario (Low Load) is the same scenario as the Low Electricity Demand scenario (Table 6-16).

Figure 8-27:

- Y-axis label is wrong.

- How can there be GWh produced by New Firm RE in all scenarios when New Firm RE is only built in the High Load scenario (per figure directly above)?

Hawaiian Electric Response – Y-axis was corrected. Clarification was made to report. New Firm RE in the annual generation charts include firm resources from the Stage 3 RFP.

Figure 8-29:

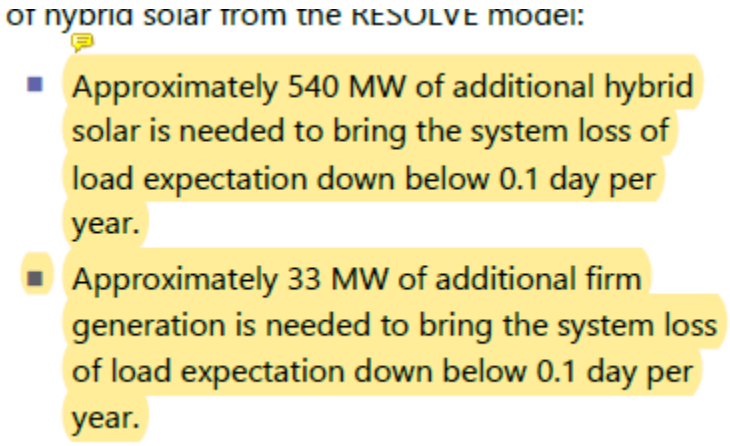
- Y-axis label is wrong.
- How can there be GWh produced by New Firm RE in the Base scenario when New Firm RE is not built in the Base scenario (per figure directly above)?

Hawaiian Electric Response – Y-axis was corrected. Clarification was made to report. New Firm RE in the annual generation charts include firm resources from the Stage 3 RFP.

8.2.6 - Storage was increased to 4 hours to reflect market conditions. While this is reasonable, indicating how that impacts results would be helpful. Presumably has an impact on both LOLE studies and the cost of storage for the overall portfolio? Would that change the resources selected in RESOLVE?

Hawaiian Electric Response – Longer duration batteries will increase cost but should also improve reliability as more energy can be stored and shifted to meet demand. We don't believe constraining RESOLVE to 4-hr storage would have a significant impact on the optimization.

Page 153: In this screenshot, are both bullets needed, or does one suffice?


of hybrid solar from the RESOLVE model:

- Approximately 540 MW of additional hybrid solar is needed to bring the system loss of load expectation down below 0.1 day per year.
- Approximately 33 MW of additional firm generation is needed to bring the system loss of load expectation down below 0.1 day per year.

Hawaiian Electric Response – Both bullets are needed because they outline two paths to bring the system below the reliability threshold. One path using only variable resources and one path using only firm resources.

Figure 8-33: Looks like the New Firm RE is turning on every morning for one hour and producing very little energy. Just a few more MWh of BESS could avoid this (at least for these three typical days).

Hawaiian Electric Response – As we move through the planning horizon, the morning peak becomes more pronounced and difficult to serve (see RA heatmaps in Section 12) as additional DER is added to the system. Assuming sufficient energy generation is available, longer duration storage may be able to solve for these morning peak periods. We must also continue to monitor the performance of these new resources (i.e., hybrid solar plants) to ensure that reliability will not be compromised in the long-term.

8.4.3.3 - "Newer internal combustion units" are mentioned here. What is the expected fuel for these units? (It appears there may be an expectation that biofuel may be the primary near-term source of new firm RE, but that is never really stated clearly. Can you clarify the expectation? And is the expected biofuel biodiesel? What were the costs of the new firm RE based on in RESOLVE?)Figure 8-35: The high capacity factor of the new units is surprising, especially compared to the PLEXOS results.

Hawaiian Electric Response – New internal combustion units are expected to burn biodiesel. Their capacity factors in the mid 20%, higher than what might be expected for standby capacity, are due to the deactivation of a significant amount of thermal capacity at Maalaea (~90 MW).

8.4.6 -

- You state that you "modified Stage 3 firm renewable proxy". Was this an increase or decrease? If it's an increase, please include more details on the justification for the increase (which may be somewhere in the report, in which case you could refer to that section and perhaps summarize here).
- Please add a reference or explanation for the grid-forming headroom constraint.
- Shouldn't the "60% grid-forming headroom capacity for dynamic stability" be listed in the tables in 8.3.4, as was done for Oahu and Hawaii?

Hawaiian Electric Response – The Stage 3 firm renewable proxy was reduced from five 8.14 MW units to two 8.14 MW units. This clarification was added to the report. The grid-forming headroom requirements are listed for 2032 scenario but not 2050 scenario, since dynamic stability study is not performed for the 2050 scenario due to high uncertainty in the later years of the planning horizon.

1.2.5 Section 9 - Customer impacts

General comments

- It would be helpful to add the ECRC and PPA information to the capital expenditure tables to provide total revenue requirements. This information is shown in the segmented bar charts but not provided in tabular format.
- NPV and revenue requirements do not show enough uncertainty or sensitivity analysis. Showing the revenue requirements across a range of oil prices and different resource costs would be helpful (but would not require rerunning of models).
- There is no discussion on the assumed oil price and its effect on NPV. A section that shows sensitivity analysis of low/high oil prices would be helpful to show the benefit of reduced oil price volatility on rates relative to the Status Quo.

- When reporting nominal dollars it is tough to understand whether revenue requirements and customer bills are increasing, decreasing, or staying flat over time. Can you share these figures in real $ to make those changes clear? Is the increase over time due to normal inflation assumptions, oil price increases, or costs of new resources and transmission?

Hawaiian Electric Response – As shown in Section 9, the ECRC component of rates, which ties to fuel cost, is expected to decline as new renewables are brought onto the system. This decreases the Company's exposure to fuel price volatility and helps to stabilize bills as the new renewable resources are contracted at fixed annual costs. This is shown in the figures showing divergence in electric rates between the Preferred Plan and Status Quo.

9.1.3 - The RBA category is hard to understand, and is a significant component, especially in the Base case. Can you explain more?

Hawaiian Electric Response – RBA is the revenue balancing account that continues the decoupling mechanism under the Performance Based Regulation Framework. This mechanism allows the Company to recover target test year revenues from customers, independent of the level of sales.

Figure 9-1: Does Status Quo assume simple swap-out of fuel--biomass instead of fuel oil? Are those cost assumptions clearly laid out somewhere?

Hawaiian Electric Response – The Status Quo assumes conversion to biodiesel in 2045, which is shown in the Status Quo resource plan in Appendix C.

9.2.3 - Could use more explanation/clarification. Won't bills go up because of increased kWh demand with electrification? You may want to prepare the public and therefore say clearly that people will be paying more to HECO but paying less to the gas station so it will even out (or maybe be less in the long run).

Hawaiian Electric Response – While utility revenue requirements are estimated to increase steadily over time, its effect on rates and bills is mitigated by a combination of higher sales with peaks reduced by managed charging and TOU rates as well as the availability of low-cost variable renewables and storage that provide most of the capacity and energy (comparing figures 9-1 to 9-2). EV adoption is also expected to avoid significant amounts of fuel (figure 9-28) which may help customer's save on their total energy bill (i.e., higher electric bill due to EV charging is expected to be greater than a customer's electric + gas bill on a combustion engine vehicle).

9.5.2 - Emissions reductions from transportation (Section 9.5.2) should be added to the emissions reductions from the power sector to show the total emissions reductions for the state. This is important information. Somehow add this to Figure 9-27 or alternative.

Hawaiian Electric Response – We have supplemented Section 9.5.2 in response to this comment to show emissions reductions from the IGP Preferred Plans relative to total emissions for the State.

1.2.6 Section 11 - Growing the energy marketplace

How will energy efficiency be incentivized (both by the utility and at the state and local level)?

Hawaiian Electric Response – A third party administrator, Hawaii Energy, administers the energy efficiency programs. We do provide our system cost information based on the modeling outputs to assist in their program design. As noted in our action plan we also intend to seek additional energy efficiency through our grid service procurements.

Figure 11-3 appears to be missing new capacity for the DER freeze scenario. That case should have more hybrid solar resources.

Hawaiian Electric Response – Figure 11-3 has been corrected.

Figure 11-4 should show the delta NPV relative to the base case so readers can compute how much DER saves the system, or how much electric vehicles add. Also, the DER freeze scenario does not consider the avoided distribution system upgrades, correct?

Hawaiian Electric Response – The difference in NPV is provided in Table 11-1. The difference in NPV is based on the results from RESOLVE and do not include distribution system costs.

11.1.3: EE Various terms are used without a definition/explanation (or maybe we missed it). For example "the A grouping", "Other" measures. Can you clarify?

Hawaiian Electric Response – Appendix B provides additional background on the EE bundles. Two key characteristics were used to categorize the energy efficiency measures into separate bundles: load shape and cost effectiveness. For load shape, measures were grouped between evening "peak" focused measures vs. flatter, "other" measures. For cost effectiveness, measures were grouped by their B/C ratio determined in the Market Potential Study where A is >1.2, B is 1.0-1.2, C is 0.8-1.0, and D is < 0.8.

Some past DER programs have not achieved goals. For example, the Smart Export tariff made export uneconomical compared to serving local loads and resulted in very little export. How will near-future tariffs be designed to achieve their goals more effectively?

Hawaiian Electric Response – We are currently working with the DER industry and the Commission in the DER docket to develop new DER programs based on the modeling completed in the IGP report.

1.2.7 Section 12 - Securing Generation Reliability and Assessing Risk

General comments:

- Overall the probabilistic analysis provided in Section 12 is a big improvement to the IGP and a place where TAP feedback was directly integrated into the IGP process.

- The section on retirement planning, schedules, and risks is a helpful discussion. Given the aging generator fleet on HECO's system, the retirement plan is equally important – if not more important – than the analysis on new resources.
    - The discussion on unit age is important. It may be useful to HECO to show the average age of the North American natural gas fleet for comparison to show that HECO's resources are significantly older than typical utilities across the country.
- Many of the results provided in this section appear for the first time and are based on previous TAP feedback. This is the first opportunity the TAP has had to review those results. Similar results were presented to the TAP in the past, so the overall methods make sense and are consistent with previous discussions. However, some of the specific results would likely have benefited from discussion if time had allowed, as discussed in more detail below.
- The first two sections of this chapter present really good information/context. Maybe those subsections and the preferred plan adjustments for each island (based on the RA analysis) could be incorporated into Chapter 8, and the details could be retained in an appendix?

Comments on Methodology / Assumptions:

- 250 samples is likely not enough for resource adequacy (RA) results to converge. In future RA analyses, we recommend at least 500, potentially more if evaluating relatively small changes in the resource mix or load.

  Hawaiian Electric Response: On April 28, 2022, we presented some results from our resource adequacy analysis that was done for the Oahu Stage 3 RFP. In that presentation, we showed that 250 samples showed a good balance between computation time and convergence of the resource adequacy results. That presentation is available on our website located here at https://www.hawaiianelectric.com/documents/clean_energy_hawaii/integrated_grid_planning/stakeholder_engagement/technical_advisory_panel/20220428_tap_presentation_materials.pdf

- The probabilistic resource adequacy analysis requires more weather data. In the HNEI analysis, we developed a 22-year solar dataset (while using fewer wind years). This was done at the expense of breaking correlation with solar, but given that the portfolios are so solar-centric, it is important to have many years of solar data.
- Can HECO provide more information on how storage is optimized? What model look-ahead was used? Was grid charging allowed for paired resources? How were end effects modeled for battery resources? *Hawaiian Electric Response: In PLEXOS, the optimization is done over a day with a day look-ahead. The Stage 2 paired storage was allowed to charge from the grid after 5-years. Stage 1 was not allowed to charge from the grid due to the RFP terms. Future paired storage was not allowed to charge from the grid.*

- Sensitivities on outage rates would be useful to show how important that assumption is and why thermal generator replacements may be useful/necessary.

Response: In the Oahu Near-Term Grid Needs Assessment - July 2022 (hawaiianelectric.com), a resource adequacy analysis was performed looking at the sensitivity of outage rates on LOLE. In that analysis, we showed how our outage rates have trended higher over the past ten years, and that the recent outage rates have led to higher LOLE.

Comments on Results:

- The LOLE vs. Capacity charts provide useful information and a good way to summarize results, but there are a few recommendations to improve:
    - Try using a log-axis. The important region of the curve is between 0 and 0.5 days/year, so making sure that range is readable is necessary.
      Hawaiian Electric Response – A version of these graphs with a log-axis is located in Appendix C. We felt it was important to emphasize how adding resources can have different reliability impacts depending on the resource capacity currently in the system.
    - You can add curves from firm capacity and paired solar additions on the same chart, so readers can directly compare the LOLE vs. capacity relationship between the two resource types.
    - Using this information, you can calculate Marginal Reliability Improvement (MRI) as the change in LOLE relative to the change in capacity, which can be used as a proxy for capacity value.
    - Overall these curves and the report discussion overemphasize the diminishing returns of resource additions to reduce LOLE. As the system gets more reliable, there are fewer loss of load events, so new resources are inherently less effective at reducing risk. It is true that there is saturation of the resources though.
      Hawaiian Electric Response – While there may be fewer loss of load events as resources are added, it's not inherent that new resources should be less effective at reducing risk. Resource availability during a loss of load event also plays a part as does resource saturation of a particular resource type. If a resource could be perfectly available during loss of load events, its effectiveness shouldn't be diminished even though there may be fewer events as the portfolio changes.
- The starting point of the probabilistic resource adequacy analysis is important. In each section, it would be useful to have a footnote annotating which resources are included and which ones are assumed retired for each curve.
    - At one point in the report it said that without any new firm resource, 1600 MW of paired solar would be required to meet the LOLE target, but it was unclear what that assumed for generator retirements (without retirements, there would be no need for new resources after Stage 1 and 2 are complete)
      Hawaiian Electric Response: A table has been added to the beginning of each island's section in Chapter 12 to summarize the various resource adequacy scenarios that were run, along with the capacity of existing and future firm and variable resources in each scenario and the resulting LOLE.

- Overall the analysis that shows what retirements can be accommodated with a given renewable and storage build is very useful. We recommend doing this analysis with and without new firm resource replacements before additional firm resources are built (though not necessarily before this report is finalized). This analysis can be shared with the TAP and stakeholders when available (e.g., after Stage 3 RFP results are available), and can be included in applications for approval for firm resources.
  Hawaiian Electric Response: Agree that the procurement process for Stage 3 must be completed and some of the current uncertainties can be resolved as plans are updated from the results of the Stage 3 RFP. We look forward to further discussions with the TAP on this topic.

- One section of the report stated that uncertainty in demand is the largest risk. While the load level is important, the forced outage rate assumptions for generators is also one of the largest, if not the largest, drivers of system risk.
- In the Hawaii Island probabilistic RA analysis, it is unclear how Puna Geothermal is being modeled. Is it assumed to be a baseload resource? Historical operations show that it is not always available and the results show that during periods where the unit is unavailable (due to maintenance) the LOLE is much higher. Modeling Puna's availability is therefore critical.
  Hawaiian Electric Response – In the probabilistic resource adequacy analysis, PGV is modeled similar to other thermal generators with a forced outage rate. However, this outage rate does not take into account its extended outage and derate due to the lava flow event in 2018. The Company is looking to revise its assumptions for PGV to account for this in the probabilistic resource adequacy analysis going forward.
- Molokai results seem problematic. On the days with LOLE there are no existing firm resources. In reality the plant has several diesel units, so how/why were all units on outage simultaneously?

  Hawaiian Electric Response – For the resource adequacy analysis, if we assumed the current generating fleet, then the LOLE would be zero and we wouldn't be able to develop a relationship between LOLE and hybrid solar. As a result, the assumption was that there are only two 2.2 MW existing firm generators on the system. This is shown in the summary table presented at the beginning of the Moloka'i resource adequacy section. For the days shown, the two units are on outage resulting in the unserved energy.

1.2.8 Appendix B

Figure B-1: What year is this showing?

Hawaiian Electric Response – 2030. Updated figure notation with footnote

Table B-2: Generally, do recent policy changes (e.g. IRA) impact which load and DER forecasts you see as most realistic?

Hawaiian Electric Response – Incentives established by the Inflation Reduction Act could result in changes to the assumptions used in the IGP Base case and less so in the Bookend scenarios. As industry, government, and

consumers begin to familiarize with the Inflation Reduction Act, the magnitude of impacts on clean technology adoption are early to speculate. In the event of revisiting the Base case, additional factors, such as continued high inflation costs and ongoing supply chain issues, would need to be re-evaluated. For example, the combination of high costs and the extension of tax incentives may incentivize customers to delay near term adoption of certain clean energy technologies for more favorable economic conditions. Uncertainties remain to what extent industry and government agencies can qualify and maximize the incentives put forth in the Inflation Reduction Act. Additionally, the current IGP Bookend scenarios encapsulate a wide range of possible outcomes, including those that may come to fruition after the enactment of the Inflation Reduction Act. For example, the current Low Bookend scenario included a ten-year extension of federal tax credits, lower assumed costs of distributed PV and battery systems, and inclusion of upfront battery storage incentives, while the High Bookend scenario included 100% EV adoption.

1.2 - Why were buildings over 6 stories excluded from DER forecasts?
Hawaiian Electric Response – With stakeholder input, buildings over 6 stories were excluded due to consideration of likely available roof space compared to the building's load. From a practical perspective, customers with low energy offset compared to overall consumption are less likely to make an investment in rooftop PV.

1.5 - This section is missing a summary of the projected number of EVs and projected annual EV load (by projection year).

Hawaiian Electric Response – Added summary table in Section 1.5

Figure B-8 - What year and island are these EV charging profiles for?

Hawaiian Electric Response – Updated figure notation with footnote

1.2.9 Appendix D - System Security

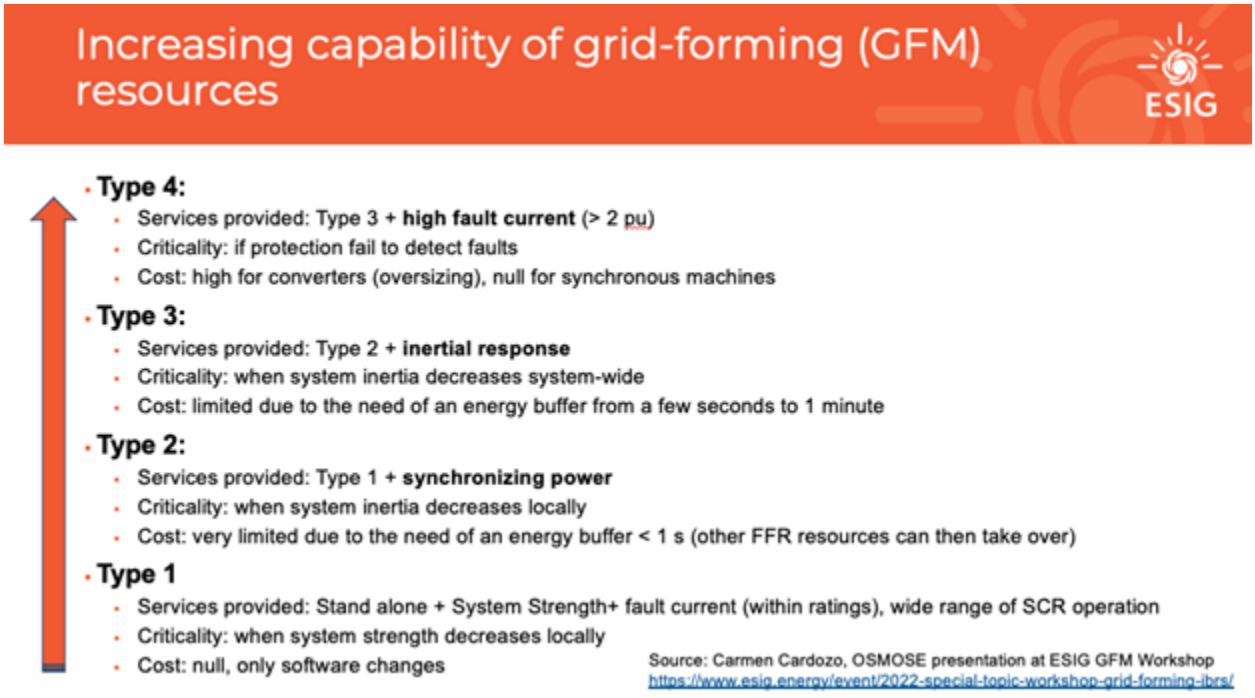
2-1

- The main report body seemed to say that in the land-constrained scenario, grid-scale PV/wind is replaced by firm renewables. Here you seem to have made a different assumption that it's replaced by DERs. Why?
- No information on the high load scenario portion of the security study seems to appear in the main report. Did we miss it? (Same question applies to all islands.)

  Hawaiian Electric Response – Language in the report has been revised. In the land-constrained scenario, the grid-scale PV/wind resources are replaced by the combinations of firm renewables and DERs from distribution side.

As mentioned previously, the TAP is pleased to see quantitative planning metrics for grid forming headroom developed. This is a leading practice. EIRGRID DS3 also has a similar service. However, it is likely that general readers who are knowledgeable about GFM but not aware of Hawaii's specific issues will not understand why the metric is a function of DER power, so some explanation would be helpful. See next comment.

Some discussion on what aspects of grid-forming capability HECO needs would be helpful. This could be placed in Appendix D, with a brief mention/reference in section 8. This could refer to other documents (RFPs for example) if useful. The TAP understands after some discussion that the most critical aspect that is driving the GFM headroom planning metric is the need to fast active power injection after a fault, but that is not clear to those outside the TAP. In addition, probably other aspects of grid-forming will also be needed - for example stabilization of the grid by providing a voltage source for grid-following IBRs to synchronize to (i.e. system strength), as well as fault current. A TAP member provided the following slide that might be useful:



Hawaiian Electric Response – more discussion regarding our GFM needs are added into the latest version of report main body section 8.1.3.

Page 25: First bullet deserves more explanation because it's so important – what triggers the momentary cessation? Do both the legacy DERs and the new DERs suffer from this? Give stakeholders a rough idea what the issue is here.

Hawaiian Electric Response – Added the following text to Appendix D, Section 3.1.3: DER momentary cessation poses high risk to system stability. Daytime peak load high DER generation with low wind generation dispatch currently poses the highest risk on system stability. During the daytime, generation from customer-scale inverter-based DER may makeup the highest proportion of generation, and in the future, this could be also true during the

evening. When there is a three-phase to ground fault that happens at the transmission system, before the fault get cleared, the voltage across the entire system can be very low (e.g., everywhere less than 0.2 pu) during the fault. This magnitude of voltage sag can cause DER to enter into momentary cessation mode (or trip offline). After the fault being cleared, which normally takes no more than 5 cycles after fault inception, system voltage would recover within continous operation range, which means most of system demand would also recover. However, depending on the inverter model, DER generation may not recover to pre-event level as fast as the system demand once it enters into momentary cessation mode. This slow DER generation recovery would take dozens of cycles, which would cause huge system wide generation load imbalance. Since system physical inertia is already low, the huge generation load imbalance can potentially cause very fast frequency decline, generation and load tripping, and even system blackout if frequency is not regulated back to acceptable range within a time limit. From a recent system event, DER momentary cessation is observed from distribution substation power quality meter fast recording data. The voltage sag caused by a fault is one of common causes for DER entering into momentary cessation mode. The momentary cessation exists in both legacy DER inverters and the latest inverters. More importantly, according to the IEEE 1547-2018 and Hawaii Rule14h Source Requirement Document, DER momentary cessation is allowed when system voltage below a certain threshold. Currently, according to the Rule 14h, this low voltage threshold for all the new inverters is no higher than 0.5 pu. For grid-scale inverters, we have been not allowing DER momentary cessation from RFP Stage 1 procurement. Currently, we are working with NREL, doing more inverter testings to better understanding inverter momentary cessation, and preliminary results indicate certain inverters do indeed enter momentary cessation or trip at low voltage levels (e.g., under 0.5 p.u.).

General comment: Can you identify what services existing IBRs provide to the network and how they are modeled in this study? This is important to understand the context within which GFM conclusions are obtained. For example: do existing IBRs provide voltage control as per FERC Order 828 (or similar)? Does existing IBR provide frequency control as per FERC Order 842 (or similar)? If these are provided, are they at plant level or inverter level? What is the closed loop response time for these services?

Hawaiian Electric Response - Existing IBRs provide reactive power and voltage control grid services per our PPAs. Existing paired IBR provides primary frequency response as well. For exisitng standalone PVs, they only provide primary frequency response when overfrequency occurs. They are plant level control. All those existing grid-scale GFL IBRs have simliar issue as DER Momentary cessation, or not being able to provide stable response during system event – we have seen actual events with some of our existing plants to this effect, which we are working to remedy. That is one reason why we are requiring GFM for all paired resources.

The TAP agrees that grid-forming inverter capability is a key piece of maintaining system stability. The most severe contingencies in the near/medium term involve a loss of GFM inverter / separation from the grid. Is HECO exploring the ability to acquire GFM-like capability from some new DERs in order to diversify the resources providing the stabilizing response?

Hawaiian Electric Response – This has come up as a research topic. This is something that may be required in the future; however, there currently are no industry-wide accepted capability or function requirements of DER GFM, or commercially available products that can provide this capability.

The report notes that GFM inverters have not been deployed in HECO territory yet (though they have been deployed in Kauai) and that validation will be a part of the tasks to ensure the performance predicted in the models is exhibited in the field. The TAP agrees validation of models is important. Can HECO speak to the validation plan to ensure close alignment between the inverter models and the hardware?

Hawaiian Electric Response – We will closly monitoring generation plants operational performance, especially during system events. By replicating system event in planning simulation software, and comparing simulation results, both in PSSE and PSCAD, with plant digital fault recorder recordings, Hawaiian Electric will validate IBR models, and ensure alignment between the models and the plant. This is listed as one of the tasks in our action plan.

Can HECO describe the procedure for updating IBR firmware (i.e., what modeling, stability scenario reruns, and validation steps may need to be re-performed)?

Hawaiian Electric Response – depending on the contents of update, Company may require IRS restudy regarding updating IBR inverter firmware.

Section 3:

- Can you add a note on how you verified the accuracy/sufficiency of simulation models across both simulation domains (PSSE and PSCAD)?

  Hawaiian Electric Response - So far, Company only requires overlapped simulation plots from PSSE simulations and PSCAD simulations during generation facility technical model review. When using historical system events to validate models, both PSSE and PSCAD simulations are performed. The PSSE simulation results are compared with DFR slow speed data, and the PSCAD simulation results are compared with fault recorder high speed data.

- Can you comment on whether the PSCAD studies faced any challenges?
  Hawaiian Electric Response - Main PSCAD study challenges are: 1) EMT study, including usage of EMT software (such as PSCAD/EMTDC), preparing EMT models, and processing simulation results, for an entire system at this scale is novel for the industry and the Company's planners. It takes lots of training and preparation to setup an EMT planning study process and be familiar with EMT study; 2)simulation is very time consuming. To run one contingency for 30 seconds takes 6-20 hours depends on system complexity, simulation and plot time steps, and workstation computation capability; 3) Interpretation of EMT study results is also much more time consuming than traditional postive sequence simulations. Need familiar with OEM EMT models which are normally black-box style, with limited information and support.

- Can you describe what challenges were identified in PSS/E to model GFM?

Hawaiian Electric Response – Hawaiian Electric relies on plant developer or OEM to provide models, but not create models for IBR in-house. So far, Hawaiian Electric received very few PSSE GFM models that pass model review process.

- Please add a note regarding how dynamics of load have been represented and what are the limitations associated with that representation, if any?
  Hawaiian Electric Response – a short discussion regarding load modeling is added into the end of section 3.3 of Appendix D.

- Can you add a note regarding how model accuracy/sufficiency of existing IBR and DER resources was verified?

  Hawaiian Electric Response – currently, this is performed by replicating a historical system event in planning model-based simulations and comparing results from the simulations with fault recorder data from the simulated events. We have observed a gap between existing IBR models performance and performance of IBR in field during system disturbance recorded by fault recorders.

Page 66: Regarding the statement "According to the past studies, maintaining available contingency reserve in the form of MW headroom (i.e. contract MW capacity minus dispatched MW generation) on GFM resources is critical for maintaining system stability and avoiding excessive UFLS." - A TAP member asks: What would happen if this MW headroom is offered by existing GFL resources?

Hawaiian Electric Response - Existing GFL resouces have struggled to maintain their generation during system disturbances, according to fault recording from historical system events. So, it is not reliable to expect GFL IBR to provide system surport during system event such as a three-phase to ground fault. This is the most important reason to ensure sufficient GFM IBR is part of the system. In certain renegotiation of PPAs we have asked for GFL inverters be retrofitted to GFM control.

Figure 27: Plot of frequency (yellow curve in first figure) seems to continue to have a decreasing trend even at t = 25.0s. However, all other plots seem to have achieved steady state. This may need more explanation. Why do none of the resources appear to be responding to the falling frequency?

Hawaiian Electric Response - The GFM resouces "virtual inertia response" faded. And they reached their MW limits. Though system is stable, addtional MW generation dispatch would be required or more load shedding will happen. This discussion is added these to section 4.1 dynamic stability study part in the Appendix D.

Figure 28: A TAP member questioned whether additional reactive support could help with the voltage problem.

Hawaiian Electric Response - It is possible. But with better voltage recovery, more MW injection to cover DER generation momentary cessation will still be required to maintain certain stability margin.

Figure 30: A TAP member asks

- What device causes the delayed voltage recovery?

- What role do load dynamics play in the voltage recovery?

Hawaiian Electric Response - In this study, the primary reason of delayed voltage recovery come from the insufficient GFM resource and retirement of synchrnous generation. Since only ZIP load is used, the load dynamics in this study is limited.

Figure 63: There is a lot of disturbance in voltage and frequency during the fault. Is there any concern regarding this?

Hawaiian Electric Response – The disturbance during the fault is not a concern, since frequency measurement could be very inaccurate when voltage is very low during the fault. Voltage and frequency oscillations post-fault clearing is more significant.

This appendix has various typos. You may want to run it through spelling and grammar checks.

1.2.10 Appendix F

Section 1.3.2.4 contingency plan: This seems to be the biggest risk with NWAs, but we were surprised it wasn't mentioned. How do you manage non-performance? What if the customer response is not as great as the NWA provider estimated?

Hawaiian Electric Response – The Company is equally concerned about the risk of NWA solutions not performing as the NWA provider estimated. Section 1.3.2.4 includes some contingency plans at different stages of the NWA procurement process. For example, continuing the wires solution design in parallel with the NWA procurement steps in case the NWA contract is not approved. However, the absolute latest a decision can be made for a distribution project intended for deferral is directly after final design is complete and before the scheduling, permitting, and construction of the project begins.

Also if it is determined that the NWA does not meet its performance requirements, the Company suggests contingency plans such as developing short lead time mitigation alternatives, smaller wires options, or operating solutions (such as temporary switching). However, if these alternatives are not available, then the Company may be left without sufficient distribution capacity to serve the load growth.

The Company currently does not have a solution to deal with non-performing NWAs for all scenarios. Additional emphasis can be added to the report on the need to specify strict NWA performance requirements as well as financial penalties for non-compliance in the NWA contract.