



January 31, 2022

The Honorable Chairman and Members of the
Hawai'i Public Utilities Commission
465 South King Street
Kekuaanoa Building, First Floor
Honolulu, Hawai'i 96813

Dear Commissioners:

Subject: Adequacy of Supply Report
Hawai'i Electric Light Company, Inc.

The following information is respectfully submitted in accordance with paragraph 5.3a of General Order No. 7, which states:

The generation capacity of the utility's plant, supplemented by electric power regularly available from other sources, must be sufficiently large to meet all reasonably expectable demands for service and provide a reasonable reserve for emergencies. A Statement shall be filed annually with the Commission within 30 days after the close of the year indicating the adequacy of such capacity and the method used to determine the required reserve capacity which forms the basis for future requirements in generation, transmission, and distribution plant expansion programs required under Rule 2.3h.1.

2022 Adequacy of Supply Report Summary

- Hawai'i Electric Light Company, Inc.'s ("Hawai'i Electric Light" or the "Company") 2022 Adequacy of Supply employs the Energy Reserve Margin criteria, developed to review adequacy of supply in all hours of the year vs. during the peak hour of the day or year, and incorporates the reliability contribution of variable and energy-limited resources, such as energy storage, and duration limited grid services, such as demand response resources.
- Hawai'i Electric Light's Energy Reserve Margin is anticipated to be slightly short of the 30% target for a period in 2022 but is otherwise satisfied for 2023-2026. The shortfall is during a three-week complete plant outage of Hamakua Energy. Prior to the outage, the Company's System Operations will assess the system state and anticipated available capacity from firm and variable resources and may implement operational measures to mitigate risk, such as onsite generation maintenance support.

- The peak load experienced on Hawai‘i Island in 2021 was 193.9 MW net, when Hawai‘i Electric Light’s total firm generating capability was 259.7 MW net, including firm power purchases. This represents a firm generating reserve margin of approximately 33.9% over the 2021 system net peak.

1.0 Peak Demand and System Capability in 2021

Hawai‘i Electric Light’s 2021 system peak occurred on November 17,¹ at approximately 6:07 pm and was 193.9 MW-net based on system demand remaining after contribution from distributed generation.

Hawai‘i Electric Light’s 2021 total firm generating capability of 259.7 MW-net includes 58 MW from Hamakua Energy LLC (“HEP”) and 24.0 MW from Puna Geothermal Venture (“PGV”).²

The Hawai‘i Electric Light system had a generating reserve margin of approximately 33.9% over the 2021 system peak net demand based on firm generation resources.³ This calculation does not include any variable generation sources (hydro, wind, solar) or demand response.

2.0 Criteria to Evaluate Hawai‘i Electric Light’s Adequacy of Supply

Hawai‘i Electric Light’s capacity planning criteria are applied to determine the adequacy of supply – whether or not there is enough generating capacity on the system. Hawai‘i Electric Light’s capacity planning criteria take into account that the Company must provide for its own backup generation since, as an island utility, it cannot import emergency power from a neighboring utility.

The function of a planning criteria is to establish guidelines to manage the risk of insufficient generation capability from a diverse mix of generating resources available to the system in long-range generation expansion studies. Resource plan development is evaluated based on an evolving guideline or criteria to provide adequate generation to meet customer demand, with reasonable reserves to account for routine maintenance or overhauls of units, unexpected outages of generating units, growth in customer demand over time, and possibilities of higher than forecasted instantaneous peak demand.

With the increasing quantities of variable renewable wind and solar resources, and future energy storage additions to the system, an Energy Reserve Margin criteria was developed

¹ Hawai‘i Electric Light’s system peak in 2021 occurred in the month of November, although December is more common. For this report, it is assumed that Hawai‘i Electric Light’s future annual system peaks will occur in December.

² PGV began returning from an outage due to prior volcanic activity on November 5, 2020, and at the end of 2021, had a rated capacity of 24.0 MW.

³ Refer to section 3.6., Table of Generating Unit Capacities.

considering the dynamic nature of variable resources and limited duration storage.⁴ For the purposes of this adequacy of supply report, Hawai‘i Electric Light used this planning criteria.

2.1 Energy Reserve Margin

The Energy Reserve Margin is the percentage by which the system capacity must exceed the system load in each hour, for planning purposes. With increasing quantities of variable renewable wind and solar resources, this capacity planning criteria is intended to account for current and future variable generation resources considering the dynamic nature of energy provided by wind, PV and the implications of limited duration storage. The hourly evaluation of available energy allows for statistical representation of the impact of variable and finite resources at all hours of the day in the assessment of energy margins. The Energy Reserve Margin target for Hawai‘i Electric Light is 30% to provide reasonable reliability reserves to address some level of contingencies, forecast errors, and uncertainties inherent in the assumptions and methodology.

2.2 Other Considerations in Determining the Timing of Unit Additions

The need for new generation is not based solely on the application of the criteria previously mentioned. As capacity needs emerge, it is essential that Hawai‘i Electric Light consider additional factors to ensure timely installation of generation capacity necessary to meet its customers’ energy needs.

Other near-term considerations may include:

1. The current condition and rated capacity of existing units;
2. Required power purchase obligations and contract terminations;
3. The uncertainties surrounding non-utility generation resources;
4. The uncertainties surrounding new energy and generation resources;
5. Transmission system considerations;
6. Meeting environmental compliance standards; and
7. System reliability considerations for Hawai‘i Electric Light’s isolated electrical system.

⁴ Refer to Appendix C (page 102) of Hawaiian Electric’s Integrated Grid Planning Grid Needs Assessment & Solution Evaluation Methodology filed November 5, 2021:
https://www.hawaiielectric.com/documents/clean_energy_hawaii/integrated_grid_planning/20211105_grid_needs_assessment_methodology_review_point_book_1.pdf

While meeting the planning criteria implies a reasonable adequacy of supply, it is not equivalent to a guaranteed supply. As firm capacity resources are displaced to accommodate variable renewable energy, resource planning may need to include resource characteristics to mitigate adequacy of supply risks by having large amounts of offline reserves. This may include consideration of minimum fast-start capability and/or means to curtail demand on short notice.

3.0 Key Inputs to the 2022 Adequacy of Supply Analysis

In the application of Hawai‘i Electric Light’s capacity planning criteria, the inputs drive the results. Key inputs are described in the following sections.

3.1 Period Under Review

This adequacy of supply review covers the period 2022 to 2026.

3.2 June 2021 Sales and Peak Forecast

In June 2021, a sales and peak forecast (“June 2021 S&P forecast”) was developed which was subsequently approved by the Company for future planning purposes and used for this analysis.

The June 2021 S&P forecast began with the development of the energy forecast (i.e., sales forecast) by rate class (residential, small, medium and large commercial and street lighting) and by layer (underlying load forecast and adjusting layers – energy efficiency, distributed energy resources, and electrification of transportation). The underlying load forecast is driven primarily by the economy, weather, electricity price, and known adjustments to large customer loads and is informed by historical data, structural changes, and historical and future disruptions. The impacts of energy efficiency (“EE”), distributed energy resources (“DER”), primarily photovoltaic systems with and without storage (i.e., batteries), and electrification of transportation (light duty electric vehicles (“EV”) and electric buses (“eBus”), collectively “EoT”) were layered onto the underlying sales outlook to develop the sales forecast at the customer level.

The sales and peak forecasts used for the analysis herein is the result of the methodology described above and the continued impacts of the COVID-19 pandemic. In 2021, the COVID-19 pandemic continued to disrupt global travel, local resident behavior, economic activity and as a result, electricity consumption, with improvements resulting from the widespread distribution of vaccines. Electricity usage continued to be impacted, although in different ways depending on the sector. The economic outlook from the University of Hawai‘i Economic Research Organization (“UHERO”), shows continued recovery in key economic

drivers (i.e., visitor arrivals and jobs) but a return to pre-pandemic levels does not occur in the forecast period.

The June 2021 forecast used in the 2022 Adequacy of Supply is based on the latest information at the time the forecast was developed. Hawai‘i Island’s peak demand forecast for 2022-2026 has increasing impacts from Energy Efficiency and DER which reduce the forecasted peaks compared to historical. The forecast reflects the Company’s most current outlook for customer energy demand for the next five years.

Figure 1 below illustrates Hawai‘i Electric Light’s historical system peaks and compares them to the forecasts used in the 2021 and 2022 Adequacy of Supply analyses.

Figure 1: Recorded Peaks and Future Year Projections

(with Future Energy Efficiency and Customer PV Battery, but without DR & Rider M)

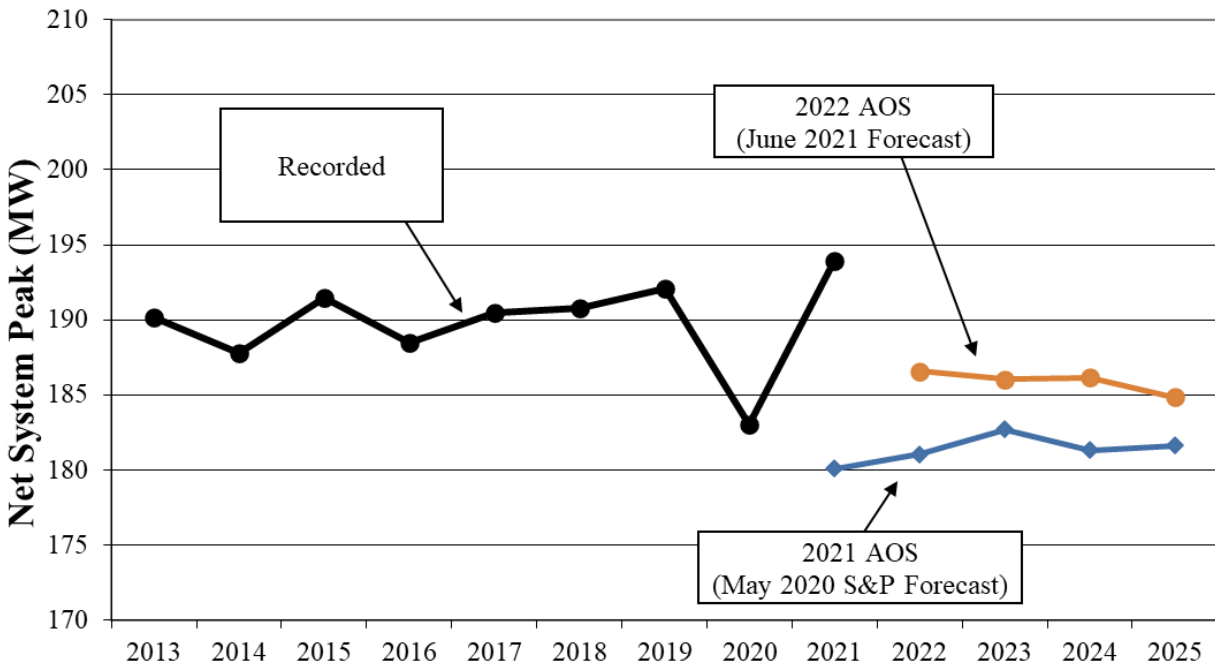


Table 1 below provides the recorded peaks since 2013 and the forecasts used in Hawai‘i Electric Light’s 2021 and 2022 Adequacy of Supply analyses.

Table 1: Recorded Peaks and Future Year Projections

Net System Peak (MW) (with Future Energy Efficiency and Customer PV Battery, but without DR)			
Year	Actual	May 2020 S&P	June 2021 S&P
2013	190.2		
2014	187.8		
2015	191.5		
2016	188.5		
2017	190.5		
2018	190.8		
2019	192.1		
2020	183.0		
2021	193.9	180.1	
2022		181.1	186.6
2023		182.7	186.0
2024		181.3	186.2
2025		182	184.9
2026			185.6

Figure 1 also includes estimated peak reduction benefits of energy efficiency programs and naturally occurring conservation. With the advent of storage technology (i.e., battery energy storage systems (“BESS”)) for the consumer market, impacts of customer-sited PV paired with batteries were included in the peak forecast. As solar capacity continues to grow year over year, daytime loads are projected to be reduced and, all else being equal, the average daily load profile is expected to have a more pronounced difference between daytime and evening peak. With an operating assumption of BESS charging during the daytime hours, coincident with PV generation, and discharging the stored energy during the system priority peak period, the system peak has been reduced for this type of energy storage operation.

3.3 Projected Peak Reduction Benefits of Demand Response Programs

Hawai‘i Electric Light is committed to pursuing demand response (“DR”)

programs and grid services procurements designed to provide cost-effective resource options.

In 2015, the Hawaiian Electric Companies submitted to the Commission an application for approval of a DR Portfolio in Docket No. 2015-0412. A Revised DR Portfolio was filed on February 10, 2017, which provided modified approval requests and DR program design and targets consistent with the DR Portfolio used in the *PSIP Update Report: December 2016*. On January 25, 2018, the Commission issued Decision and Order No. 35238, approving the Companies’ Revised DR Portfolio tariff structure framework.

The Commission supported the approach of working with aggregators to implement the DR portfolio. In 2020, the utilities signed a multi-year Grid Services Purchase Agreement (“GSPA”) with a third party aggregator. Currently, the Companies are implementing three GSPA contracts that were approved by the Commission on December 31, 2020. Customer enrollment under these GSPA contracts have been delayed by the COVID-19 pandemic, but the Companies are diligently working with the aggregators to catch up in 2022. For the purposes of this analysis, Hawai‘i Electric Light’s adequacy of supply was calculated using the estimated DR impacts from the GSPA for Hawai‘i Island, as shown below. The DR impacts in Table 2 lists the peak reductions from 5:00 PM to 9:00 PM forecasted for 2022. Peak reductions for 2023 to 2026 are assumed to be the same for 2022 as a conservative estimate.

Table 2: DR Impacts for Capacity Planning Purposes (MW)

Year	DR Total at Year End
2022	1.6
2023	1.6
2024	1.6
2025	1.6
2026	1.6

3.4 Planned Maintenance Schedules for the Generating Units on the System

Planned overhauls and maintenance outages reduce generating unit availabilities. The schedules for planned overhaul and maintenance outages change frequently due to unforeseeable findings during outage inspections, or to changes in priorities due to unforeseeable problems. When major revisions to planned and/or maintenance outages occur, or unplanned outages impact the available margins, the Planned Maintenance Schedule is revised with outages deferred (or reduced) to the extent possible, to meet the operational planning criteria of having

sufficient available capacity, including offline capacity available within two hours or less, to serve anticipated demand, after loss of the largest operating unit. For this analysis, the five-year planned maintenance schedule was developed in 2021 for company planning purposes, with more recent updates made in January 2022.

3.5 Resource Additions

3.5.1 Firm Capacity Additions

On July 9, September 9, and October 1, 2020 in Decision and Order Nos. 37205, 37306, and 37335 respectively, the Commission denied Hawai‘i Electric Light’s request for a waiver from the Competitive Bidding Framework in Docket No. 2017-0122 for Approval of an Amended and Restated Power Purchase Agreement with Hu Honua, denied the Company’s motion for reconsideration, and closed the docket. Hu Honua appealed both Order Nos. 37205 and 37306 to the Hawai‘i Supreme Court, which on May 24, 2021, found that its prior 2019 decision “did not disturb, modify or vacate the 2017 waiver.” The Court remanded the matter back to the Commission. An evidentiary hearing was scheduled for the week of January 31, 2022, but was temporarily suspended pursuant to Order No. 38198 issued on January 26, 2022. The capacity from Hu Honua was not included in the analysis.

On December 31, 2019, Hawai‘i Electric Light filed an application for approval of an Amended and Restated Power Purchase Agreement for Firm Capacity Renewable Dispatchable Generation with Puna Geothermal Venture, in Docket No. 2019-0333. As of January 31, 2022, the Commission has not made a decision on this application. Among other things, this application included an increase in the capacity of PGV by 8 MW. This additional capacity was not included in the analysis. During 2021, PGV returned gradually to service from the lava flow outage that started in 2018. For the purposes of this analysis, the PGV facility rating was assumed to be fixed at 24 MW, based on its actual capability as of December 2021. PGV is currently working toward a restoration of its contractual and pre-lava flow capacity of 38 MW, but has not provided a schedule of when that capacity might be reached. Any capacity made available above 24 MW will increase available energy margin above that represented in this filing.

3.5.2 Non-Firm Resource Additions

In January 2017, Hawai‘i Electric Light filed a letter with the Commission requesting to open a docket to solicit proposals for new renewable dispatchable generation. The Commission subsequently issued Order No. 34856 and opened Docket No. 2017-0352 to receive filings, review approval requests, and resolve disputes, if necessary, related to the plan to proceed with competitive procurement

of this generation. Request for Proposals (“RFP”) for the above docket were separated into two stages, Stage 1 and Stage 2.

In Stage 1, on December 28, 2018, the Company submitted to the Commission applications for approval of power purchase agreements (“PPAs”) for two solar projects with storage on Hawai‘i Island. On March 25, 2019, in Decision and Order Nos. 36233 and 36234 in Docket No. 2018-0430 and Docket No. 2018-0432 respectively, the Commission approved two PPAs between the Company, AES Waikoloa Solar, and Hale Kuawehi Solar, LLC, for two 30 MW/120 MWh PV/BESS projects. These projects are currently under construction.

In 2020, the Company submitted to the Commission an application for approval of a PPA for a solar plus storage project selected in the Company’s Stage 2 RFP. In November 2021, the Company informed the Commission it was withdrawing its application for approval of this PPA. Accordingly, no Stage 2 project was included in this analysis.

The Company’s analysis includes 2.47 MW of Community Based Renewable Energy (“CBRE”) from two approved projects.

3.6 Table of Generating Unit Capacities

Table 3: Hawai‘i Electric Light Adequacy of Supply 2022 Unit Ratings

Unit	Net Rating (MW)
Hill 5	14.20
Hill 6	20.20
Puna	15.70
Kanoelehua D11	2.00
Waimea D12	2.50
Waimea D13	2.50
Waimea D14	2.50
Kanoelehua D15	2.50
Kanoelehua D16	2.50
Kanoelehua D17	2.50
Keahole D21	2.50
Keahole D22	2.50
Keahole D23	2.50
Kanoelehua CT1	10.25
Keahole CT2	13.80

Puna CT3	20.00
Keahole CT4/CT-5/ST-7	54.00
Panaewa D24	1.25
Ouli D25	1.25
Punaluu D26	1.25
Kapua D27	1.25
Hawai'i Electric Light total	177.65
PGV	24.00
HEP	58.00
IPP Total	82.00
System total	259.65

4.0 Results of Analysis

4.1 Description of Scenarios

For the Energy Reserve Margin analysis, two scenarios were analyzed. Both scenarios include the planned Stage 1 and Stage 2 variable renewable resources described in Section 3.5.

The Moderate scenario takes the expected commercial operations dates of the Stage 1 projects, and for some of the projects, slightly delayed them 1 to 6 months. While the projects are expected to meet their commercial operations dates, for planning purposes, some dates were adjusted in light of the ongoing pandemic and global supply chain issues.

For the Conservative scenario, some of the expected commercial operations dates of the Stage 1 projects were delayed by 6 months or more. This was intended to be a more conservative scenario to consider potentially more significant or prolonged impacts from the ongoing pandemic and global supply chain issues.

4.2 Energy Reserve Margin

With PGV fixed at its current 24 MW rating and with Hourly Dependable Capacities applied to variable renewable resources, Hawai'i Electric Light's target

Energy Reserve Margin of 30% is not met in 2022. The estimated minimum Energy Reserve Margin in 2022 is 18%, occurring during the three-week Hamakua Energy complete plant outage/overhaul in July. From 2023-2026 Hamakua Energy outages of similar magnitude last only three days, and together with the addition of Stage 1 resources, the 30% Energy Reserve Margin criteria is exceeded.

A 2022 Energy Reserve Margin of 18% indicates the system is at higher risk of unserved energy if there are additional outages during the lower margin period. This risk will depend in some measure on the actual amount of variable energy at the time of the outages and actual net customer demand, in addition to the nature of other contingencies. For example, should the largest remaining unit (Keahole combined cycle (“CC”)) experience a forced outage during the Hamakua Energy planned outage, during peak net demand, there is a risk of unserved energy. The number of shortfall hours shown in Table 4 only refers to hours during which the 30% of Energy Reserve Margin target is not met, and does not indicate periods of forecast unserved energy.

Risk mitigation measures in 2022 include prioritization of maintenance to ensure the full availability of other large units (Keahole CC, Puna Combustion Turbine 3, Hill 5/6, and Puna Steam) during the Hamakua Energy plant outage, and operational measures such as standby personnel. Any available output from PGV above 24 MW will also increase margin. If the Company forecasts a shortfall in meeting forecast net demand without additional contingencies prior to the start of the outage, the outage will be deferred until sufficient resources are restored to service to meet forecast demand.

Table 4: Estimated Energy Reserve Margin Shortfall Hours

Number of Hours Below Energy Reserve Margin Target (Pass/Fail Criteria 30%)		
Year	Moderate Scenario	Conservative Scenario
2022	91 (FAIL)	91 (FAIL)
2023	0 (PASS)	0 (PASS)
2024	0 (PASS)	0 (PASS)
2025	0 (PASS)	0 (PASS)
2026	0 (PASS)	0 (PASS)

Table 5: Estimated Energy Reserve Margin Percentage

Lowest Estimated Hourly Energy Reserve Margin Percentage		
Year	Moderate Scenario	Conservative Scenario
2022	18%	18%
2023	42%	42%
2024	44%	44%
2025	44%	44%
2026	46%	46%

5.0 Conclusion

Hawai'i Electric Light's generation capacity, using the Energy Reserve Margin, will be short of its 30% target during a three-week outage of Hamakua Energy in July 2022. During this outage, the system will be at higher risk of insufficient resources to meet peak demands if generation contingencies occur and variable resource production is low. Additional output from PGV, maintenance support, and high variable output would reduce risk. The outage will be deferred if unplanned outages or other system conditions exist prior to the start of the outage that would forecast generation shortfall. Other than the three-week period in 2022, margins will exceed the established planning criteria through 2026.

Sincerely,

/s/ Kevin M. Katsura

Kevin M. Katsura
Director
Regulatory Non-Rate Proceedings

c: Division of Consumer Advocacy

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