



JAY IGNACIO, P. E.
President

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The Honorable Chairman and Members of the
Hawai'i Public Utilities Commission
465 South King Street
Kekuanaoa Building, Room 103
Honolulu, Hawai'i 96813

PUBLIC UTILITIES
COMMISSION

Dear Commissioners:

Subject: Adequacy of Supply
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.

2018 Adequacy of Supply Report Summary

- The generation capacity of Hawai'i Electric Light Company, Inc. ("Hawai'i Electric Light" or the "Company") for the next three years (2018-2020) will be sufficient to meet reasonably expected demands for service and provide reasonable reserves for emergencies.
- The peak load experienced on the Big Island in 2017 was 190.5 MW net, and was served by Hawai'i Electric Light's total firm generating capability of 276.8 MW net, including firm power purchases. This represents a firm generating reserve margin of approximately 45% over the 2017 system net peak.

1. Peak Demand and System Capability in 2017

Hawai'i Electric Light's 2017 system peak occurred on October 23,¹ at approximately 6:27 pm and was 190.5 MW-net based on net generation exclusive of contribution from unmeasured distributed generation.

Hawai'i Electric Light's 2017 total firm generating capability of 276.8 MW-net includes 34.6 MW from Puna Geothermal Venture ("PGV")² and 60 MW from Hamakua Energy Partners, L.P. ("HEP").

The Hawai'i Electric Light system had a firm generating reserve margin of approximately 45% over the 2017 system peak net demand based on firm generation resource³. This calculation does not include variable generation sources (hydro, wind, solar).

2. Estimated Reserve Margins

Table 1 in Appendix 1 shows the expected reserve margins over the next three years, 2018-2020, based on Hawai'i Electric Light's May 2017 Sales and Peak Forecast ("May 2017 Forecast"), which includes estimated self-generation, customer battery and energy efficiency impacts on net demand. Reserve margin values are calculated with and without both the peak reduction benefits of Demand Response ("DR") and an estimated capacity credit for variable generation.

3. 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.

¹ Hawai'i Electric Light's system peak in 2017 occurred in the month of October. Typically, Hawai'i Electric Light's system peaks have occurred in the month of December. For the purposes of this report, it is assumed that Hawai'i Electric Light's future annual system peak will occur in December.

² The PGV additional 8 MW facility was placed in-service on March 19, 2012. PGV's total capacity subsequently increased from 30 MW to 34.6 MW based on completed acceptance testing. This value is expected to reach 38 MW by 2019. Testing performed in November and December of 2017 demonstrated average power output above 38 MW; however, PGV did not pass other technical and operational performance tests so additional work and testing will be conducted in 2018. For the purposes of this report, a capacity of 34.6 MW was assumed for PGV in the reserve margin calculations for 2017 and 2018, and 38 MW for 2019 and 2020.

³ Refer to section 4.8., Table of Generating Unit Capacities, and Appendix 1, Table 1 for additional details.

3.1. Hawai'i Electric Light's Capacity Planning Criteria

The following capacity planning criteria are used to determine the need for additional generation:

Rule 1:

The total capability of the system must at all times be equal to or greater than the summation of the following:

- a. the estimated system peak load, less the total amount of interruptible loads;*
- b. the capacity of the unit scheduled for maintenance; and*
- c. the capacity that would be lost by the forced outage of the largest unit in service.*

Reserve Margin:

Consideration will be given to maintaining a reserve margin of approximately 20% based on Net Top Load ratings.

Reserve Margin Sensitivity:

In the Hawaiian Electric Companies' PSIP Update Report: December 2016,⁴ a possible reserve margin planning standard of 30% was used for capacity planning analysis.⁵

3.2. 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 become imminent, it is essential that Hawai'i Electric Light broaden its consideration 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;

⁴ The "Hawaiian Electric Companies" or "Companies" are Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawai'i Electric Light.

⁵ Refer to Appendix J of the PSIP Update Report: December 2016, filed December 23, 2016 in Docket No. 2014-0183.

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.

The Company's 2015 adequacy of supply report identified risks due to transmission line outages from trees that required lengthy repairs and potential for impacts from the Kilauea lava flow. The lessons learned from these events drove plans for:

- a) evaluating designs to allow operation of the Hawai'i Electric Light grid in two or more "islands";
 - b) increasing expenditures on line hardening and tree trimming projects;
 - c) projects to synchronize breakers to connect two live "islands" during restoration;
- and
- d) retaining sufficient capacity to recover from multiple transmission line outages and consequential isolation of large resources such as PGV and/or HEP.

Hawai'i Electric Light has taken extensive measures for vegetation management that resulted in fewer transmission line outages, thereby mitigating transmission line risks. Based on current conditions, increased capacity margin for the potential capacity loss for transmission outages could be considered in the future. Currently, there is no lava flow that is threatening populated areas or generation.

While meeting the planning criteria indicates a reasonable adequacy of supply, it is not equivalent to a guaranteed supply, as there is a minimum advance notice to start offline generation. As firm capacity resources are displaced, with increased offline cycling to accommodate variable renewable energy, resource planning may need to include resource characteristics to mitigate adequacy of supply risks by having large amounts of the reserve offline. This may include consideration of minimum fast-start capability and/or means to curtail demand on short notice. For example, despite adequate supply based on the present criteria, Hawai'i Electric Light experienced a generation shortfall on February 20, 2016. Both Keahole CTs experienced forced outages while HEP was out of service for maintenance. There was insufficient time to bring online Puna Steam (which at the time required 24-hour notice) to meet the evening peak, resulting in outages to certain customers for a two-hour period.

In the application of Hawai'i Electric Light's capacity planning criteria the key inputs are (1) projected peak demand (including the anticipated peak reduction benefits of energy efficiency

programs) and (2) the total firm capacity on the system. These key inputs are described in the following sections.

4. Key Inputs to the 2018 Adequacy of Supply Analysis

4.1. Period Under Review

This adequacy of supply review covers the period 2018 to 2020. As indicated in Hawai'i Electric Light's January 31, 2017 Adequacy of Supply letter, the Company's reserve margin was sufficiently high such that its generating capacity for the period 2017 to 2019 would be adequate to meet reasonably expected demands for service and provide reasonable reserves for emergencies. The *PSIP Update Report: December 2016* indicates that Hawai'i Electric Light may remove the Puna Steam and Hill 5 and 6 units from daily dispatch service as soon as 2020. This is dependent upon additional considerations beyond adequacy of supply, including fuel costs and relative economic benefit of the steam units at the time of the decision, and requires that they are not needed for system reliability.⁶ Adequacy of supply considerations will also be considered in the operation of the units, considering the minimum time to bring online reserve capacity units. The present operational planning criteria will provide sufficient capacity, including offline capacity available within two hours, to meet expected demand after loss of the largest operating unit. Offline capacity that cannot be brought online within two hours is not considered towards these criteria. Should the steam units be removed from service, it would be equivalent to approximately 49 MW of capacity or about 18% of the total system firm capacity; thus the present adequacy of supply would not be met if these units are decommissioned.

4.2. May 2017 Forecast

Hawai'i Electric Light developed its sales and peak forecast in May 2017, which was subsequently approved by the Company for future planning purposes and used for this analysis.

Hawai'i Electric Light May 2017 Forecast	
Year	Peak, Net MW
2018	190.4
2019	192.8
2020	192.4

The May 2017 peak forecast update is lower than the November 2016 forecast (used in the *PSIP Update Report: December 2016*) because it took into consideration a slightly less optimistic economic outlook including higher forecasted electricity prices and higher energy efficiency and customer-sited storage projections

⁶ Refer to Appendix M of the *PSIP Update Report: December 2016*.

4.3. Projected Peak Reduction Benefits of DR Programs

Hawai'i Electric Light is committed to pursuing DR programs designed to provide cost-effective resource options to meet the capacity needs and support the reliable operation of the system, as identified in the Hawaiian Electric Companies Integrated Demand Response Portfolio Plan ("IDRPP") filed on July 28, 2014, Update filed March 31, 2015, and Supplement filed November 20, 2015, in Docket No. 2007-0341. On December 30, 2015, the Hawaiian Electric Companies submitted to the Commission for approval a DR Portfolio Application (Docket 2015-0412) requesting approval of:

- a proposed tariff structure for DR programs;
- a cost recovery mechanism;
- a two-year program and budget approval cycle; and,
- the Companies' proposed reporting structure.

A Revised DR Portfolio filing was filed on February 10, 2017, which provided modified approval requests and DR program design and targets (MW) consistent with the DR Portfolio used in PSIP Update Report filing on December 23, 2016. On January 25, 2018 the Commission issued Decision and Order No. 35238, approving the Companies Revised DR Portfolio tariff structure framework. For the purposes of the analysis in this report, reserve margin was calculated without an estimate of the peak reduction benefits from DR. Hawai'i Electric Light will continue to implement DR in accordance with future targets.

4.4. Planned Maintenance Schedules for the Generating Units on the System

Planned outages 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.

4.5. Other Inputs

The resource plan evaluated herein was based on Hawai'i Electric Light's five-year resource plan shown in the *PSIP Update Report: December 2016*.⁷ For the purposes of the reserve margin sensitivity analysis, distributed generation ("DG")-photovoltaic ("PV") additions and DR impacts were included. No future firm or variable resource additions were included, so that capacity needs could be examined without the addition of future resources.

⁷ Refer to Table 6-5, on page 6-20, of the *PSIP Update Report: December 2016*.

4.6. Additions of Capacity

4.6.1. Firm Capacity Additions

On May 9, 2017, an Amended and Restated PPA ("A&R PPA") for the Hu Honua 21.5 MW biomass project was submitted for Commission review and approval, and on May 17, 2017 the Commission issued Decision and Order No. 34554, opening Docket No. 2017-0122. On July 28, 2017 in Decision and Order No. 34726, the Commission approved the A&R PPA, with Hu Honua expected to be in-service in January 2019. The capacity from Hu Honua was not included in the analysis herein; upon commercial operation of the facility, Hu Honua will be included in future AOS calculations.

4.6.2. Non-Firm Capacity Additions

On January 1, 2017, Hawai'i Electric Light filed a letter with the Commission requesting to open a docket and appointment of an Independent Observer to seek proposals for new renewable energy generation with a target installation date of 2020, consistent with the *PSIP Update Report: December 2016*. In response, on October 6, 2017, the Commission opened Docket 2017-0352 to receive filings, review approval requests, and resolve disputes, if necessary, related to the Utilities' plan to proceed with a competitive bidding process of variable renewable generation on Hawai'i Island. The Commission also indicated that it will appoint an independent observer to monitor the competitive bidding process. On October 23, 2017, the Hawaiian Electric Companies filed draft requests for proposals for Oahu's variable renewable dispatchable generation and stated that the Hawai'i Island draft will be similar and provided at a later date. On January 12, 2018, in Order No. 35224, the Commission provided guidance on the request for proposals process. However, none of this variable renewable capacity was assumed in the calculation of reserve margin.

In the *PSIP Update Report: December 2016*, the resource plans show Community Based Renewable Energy (CBRE) additions of 1 MW of PV and 2 MW of Wind by the end of 2018. On December 22, 2017 the Commission issued Decision and Order No. 35137, in Docket No. 2015-0389 indicating a 1 MW PV CBRE program for Hawai'i Island. However, this capacity was not assumed in the calculation of reserve margin.

4.7. Changes to Existing Generating Capacity

Two 1.25 MW dispersed diesel units (D24 and D27) previously at Kapoho Substation and permitted only for emergency use (such as due to lava flow) were relocated back to their original locations (Panaewa on March 20 and Kapua on March 30 of 2017, respectively) and their capacities are counted toward reserve margin.

4.8. Table of Generating Unit Capacities

NTL (Normal Top Load) ratings are used for reserve margin calculation and NDC (Net Dependable Capacity) ratings are shown for reference.

**Hawai'i Electric Light Adequacy of Supply
 2017 Unit Ratings (Firm Capacity at ACTUAL System Peak in December 2017)
 (Net MW)**

<u>Unit</u>	NTL Rating (MW)	NDC Rating (MW)
Hill 5	14.20	14.20
Hill 6	20.20	20.20
Puna	15.70	15.70
Kanoelehua D11	2.00	2.00
Waimea D12	2.50	2.50
Waimea D13	2.50	2.50
Waimea D14	2.50	2.50
Kanoelehua D15	2.50	2.50
Kanoelehua D16	2.50	2.50
Kanoelehua D17	2.50	2.50
Keahole D21	2.50	2.50
Keahole D22	2.50	2.50
Keahole D23	2.50	2.50
Kanoelehua CT1	11.50	10.25
Keahole CT2	13.80	13.80
Puna CT3	21.00	20.00
Keahole CT4/CT-5/ST-7	56.25	54.00
Panaewa D24	1.25	1.25
Ouli D25	1.25	1.25
Punaluu D26	1.25	1.25
Kapua D27	1.25	1.25
HELCO total	182.15	177.65
PGV	34.60	34.60
HEP	60.00	60.00
IPP Total	94.60	94.60
System total	276.75	272.25

5. Reserve Margin Sensitivity

Reserve margins (see Table 1 in Appendix 1) for Hawai'i Electric Light are still well above the *PSIP Update Report: December 2016*'s proposed 30% guideline considering firm capacity generation. The methods for assigning a contribution of variable generation to capacity margin are continuing to evolve and may change in future capacity margin assessments.

6. Conclusion

Hawai'i Electric Light's generation capacity for the next three years (2018-2020) will be sufficient to meet reasonably expected demands for service and provide reasonable reserves for unplanned generation outages.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Jay Ignacio', with a long horizontal line extending to the right.

Jay Ignacio
President

Attachment – Appendix 1

cc: Division of Consumer Advocacy (with Attachment)

Table 1
Adequacy of Supply

Year	System Capability at Annual Peak Load (net MW) [A] ^{iii, iv, v, vi}	System Peak (net MW) [B] ^{i, ii}	Reserve Margin w/o DR or Var. Gen. (%) [A-B] [B]	Demand Response (DR) (net MW) [C] ¹	Variable Generation (net MW) [D] ²	Reserve Margin w/DR & Var. Gen. (%) [A+D-(B-C)] (B-C)
2017	276.8	190.5	45.3%	0.0	4.11	47.4%
2018	276.8	190.4	45.4%	2.6	4.11	49.6%
2019	280.2	192.8	45.3%	4.4	4.11	50.9%
2020	280.2	192.4	45.6%	7.9	4.11	54.1%

Notes:

(I) System Peaks - The 2018-2020 annual forecasted system peaks are based on:

- Hawai'i Electric Light's May 2017 Forecast. The annual forecasted system peak is expected to occur in the month of December.
- The forecasted system peak values for the years 2018-2020 include estimated peak reduction benefits acquired through 2020 implemented by Hawai'i Energy, as well as the benefits of future energy efficiency programs, Rider M, and Schedule U contracts.

(II) System Peaks (Recorded):

- The recorded system peak for 2017 includes the actual peak reduction benefit of the acquired energy efficiency programs and the Rider M and Schedule U contracts.

¹ Refer to Docket No. 2015-0412.

² A 90% probability level was used to determine a capacity value of 4.11 MW for the existing hydro and wind generation. This probability level means the hydro and wind output is expected to be 4.11 MW or higher during 90% of the daily peaks.

(III) System Capability for 2017 included:

- Hawai'i Electric Light units at a total of 182.15 MW net.
- Firm independent power purchase contracts with a combined net total of 94.6 MW, from PGV (34.6 MW) and HEP (60.0 MW).

(IV) System Capability for 2018 includes:

- Hawai'i Electric Light units at a total of 182.15 MW net.
- Firm independent power purchase contracts with a combined net total of 94.6 MW, from PGV (34.6 MW) and HEP (60.0 MW).

(V) System Capability for 2019 includes:

- Hawai'i Electric Light units at a total of 182.15 MW net.
- Firm independent power purchase contracts with a combined net total of 98.0 MW from PGV (38.0 MW) and HEP (60.0 MW).

(VI) System Capability for 2020 includes:

- Hawai'i Electric Light units at a total of 182.15 MW net.
- Firm independent power purchase contracts with a combined net total of 98.0 MW from PGV (38.0 MW) and HEP (60.0 MW).