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President

January 30, 2018

The Honorable Chairman and Members of the
Hawai'i Public Utilities Commission
465 South King Street
Kekuanaoa Building, 1st Floor
Honolulu, Hawai'i 96813

Dear Commissioners:

Subject: Adequacy of Supply
Maui Electric Company, Limited

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 Maui Electric Company, Limited ("Maui Electric" or the "Company") for the islands of Lana'i and Moloka'i for the next three years (2018, 2019, and 2020) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies.
- For the island of Maui, with the peak reduction benefits of demand response ("DR") and the equivalent firm capacity value of wind generation, Maui Electric expects to have a reserve capacity shortfall from 2018 to 2020. Maui Electric is evaluating several measures to mitigate the anticipated reserve capacity shortfall.
- Maui Electric anticipates urgently needing a significant amount of additional firm capacity on the Maui system in the 2022 timeframe with the planned Kahului Power Plant ("KPP") retirement.

- Kahului Units 1 and 2 (with a combined rating of 11.4 MW-net) were reactivated in September 2016 due to the termination of the Hawaiian Commercial & Sugar Co. ("HC&S") power purchase agreement and the increased peak load growth that occurred since these units were deactivated in February 2014. The 2018 Adequacy of Supply ("AOS") total system capability includes the capacity from Kahului Units 1 and 2 through 2022.
- The peak load experienced on Maui in 2017 was 198.5 MW-net, and was served by Maui Electric's total capability of 246.3 MW-net, including firm power purchases, but not including variable generation sources such as wind and solar. This represents a reserve margin of approximately 24% over the 2017 net system peak.
- The peak load experienced on Lana'i in 2017 was 5.40 MW-gross, and was served by Lana'i's total capability of 9.40 MW-gross. This represents a reserve margin of approximately 74% over the 2017 system peak.
- The peak load experienced on Moloka'i in 2017 was 5.90 MW-gross, and was served by Moloka'i's total capability of 12.01 MW-gross. This represents a reserve margin of approximately 104% over the 2017 system peak.

1.0 Peak Demand and System Capability in 2017

Maui's 2017 system peak occurred on Wednesday, November 1, 2017, at approximately 6:35 p.m. and was 198.5 MW (net) or 202.9 MW (gross). During the peak, wind resources provided approximately 1.9 MW and there was no solar output.

The total system capability of Maui was 246.3 MW-net, including 11.4 MW-net from Kahului units 1 and 2, but not including variable generation sources such as wind and solar. At the time of the system peak, the reserve margin was approximately 24% over the 2017 system peak.[1]

1.1 Rider M

At the time of system peak, Maui had in place nine load management contracts totaling approximately 4.2 MW under Rider M, which reduced the evening peak by approximately 1.4 MW-net.

[1] The total capability value used in the calculation of this reserve margin does not account for reduction of available capacity due to maintenance outages, forced outages, or derates in unit capacities.

2.0 Estimated Reserve Margins

Attachment 1 shows the expected reserve margin over the next eight years, 2017-2024, based on Maui Electric's March 2017 Forecast, which includes the estimated peak reduction benefits of energy efficiency.

3.0 Criteria to Evaluate Maui Electric's Adequacy of Supply

Maui Electric's capacity planning criteria are applied to determine the adequacy of supply and whether or not there is enough generating capacity on the system. Maui Electric's capacity planning criteria take into account that Maui Electric must provide for its own backup generation since, as an island utility, it cannot import emergency power from a neighboring utility. Maui Electric's capacity planning criteria are described in Section 3.1.

The results of the annual analysis of the adequacy of supply on the Maui Electric system are a function of a number of forecasts, such as:

- peak demand, including the forecasted peak reduction benefits of (a) energy efficiency demand-side management ("DSM") programs, (b) customer-sited photovoltaic ("PV") with battery installations and (c) an upward (standby adjustment to account for the potential need to serve a few large customer loads that will be served by their own internal generation); [§4.2]
- peak reduction benefits of DR programs; [§4.3]
- planned maintenance schedules for the generating units on the system; [§4.4], and
- increases or reductions of firm generating capacity. [§4.5]

Each of the current assumptions for these factors is discussed in Section 4. As with all forecasts, these elements are subject to uncertainties. Therefore, a range of scenarios was considered in the analysis.

3.1 Maui Electric's Capacity Planning Criteria

The following capacity planning criteria are used to determine the timing of an additional generating unit for the Maui Division:

New generation will be added to prevent the violation of the rule listed below where "units" mean all units and firm capacity suppliers physically connected to the system, and "available unit" means an operable unit not on scheduled maintenance.

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 capacity needed to serve the estimated system peak load less the total amount of interruptible load;*

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 percent based on Reserve Ratings.

In the Hawaiian Electric Companies'[2] *PSIP Update Report: December 2016*,[3] a proposed Reserve Margin planning guideline of 30% was used for capacity planning analysis starting in the year 2022 with the replacement capacity of KPP. Reserve Margin guidelines of 20% and 30% are considered in the 2018 AOS.

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 Maui Electric 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; the preferred mix of generation resources to meet varying daily and seasonal demand patterns at the lowest reasonable capital and operating costs;
2. required power purchase obligations and contract terminations;
3. the uncertainties surrounding Non-Utility Generation resources;

[2] "Hawaiian Electric Companies" or "Companies" refers collectively to Maui Electric, Hawaiian Electric Company, Inc., and Hawai'i Electric Light Company, Inc.
[3] See Power Supply Improvement Plan ("PSIP") Update Report, filed December 23, 2016, in Docket No. 2014-0183.

4. transmission system considerations;
5. meeting environmental compliance standards; and
6. system stability considerations for Maui Electric's isolated system.

In the application of Maui Electric's capacity planning criteria that are used to determine its adequacy of supply, the inputs drive the results. The key inputs in the application of the capacity planning criteria are (1) projected peak demand (including the anticipated peak reduction benefits of energy efficiency programs and DR programs) and (2) the total firm capacity on the system. These key inputs are described in the following sections.

4.0 Key Inputs to the 2018 AOS Analysis

4.1 Period Under Review

This adequacy of supply review covers the period 2018 to 2024. As indicated in the *PSIP Update Report: December 2016*, KPP will be decommissioned in the 2022 timeframe. Given that it may take five to seven years to install replacement firm capacity, generating system reliability was examined up to 2024 to determine the impact of the loss of KPP's firm capacity.

4.2 March 2017 Peak Forecast

Maui Electric developed and adopted[4] its peak forecast in March 2017. This forecast was used for the purposes of this analysis. In addition, a high weather peak scenario forecast was used in the analysis to show asymmetric risks associated with unusual events that could occur in future years. In 2015, Maui Electric experienced significantly higher peak loads than forecasted primarily due to unusually high temperature and humidity conditions. To evaluate the potential risk associated with higher peaks due to unusual conditions such as high temperature and humidity, a high weather peak scenario forecast was created.

Figure 1 and Table 1 below illustrate Maui's historical system peaks and compares them to the forecasts used in the 2017 and 2018 AOS analyses. The analyses contained in the 2017 AOS were based on the November 2016 peak forecast. A comparison between recorded and forecasted peaks shows the volatility of recorded system peaks from year to year. It should be noted that the 2016 and 2017 recorded Maui peaks from 2015-2017 were 7.8 MW higher than the recorded peak in 2014 (190.7 MW-net). The 2015 and 2016 peaks were also the highest peaks experienced on Maui since 2007. The higher peaks were primarily

[4] The March 2017 peak forecast was adopted by Maui Electric for years 2017 through 2022.

due to higher than average temperature and humidity conditions and commercial load growth.

The March 2017 forecast includes peaks that are slightly lower than the November 2016 forecast driven primarily by updated outlook for energy efficiency and commercial sales.

The AOS assumes that the annual system peaks occur in October. The actual annual peak month can vary from year to year, and occurred in November in 2017. The annual peak is assumed to occur in October because on average it has the highest peak compared to other months.

For both the recorded and forecast data, Table 1 includes the peak reduction benefits of energy efficiency programs and naturally occurring conservation.

Figure 1: Recorded Peaks and Future Year Projections

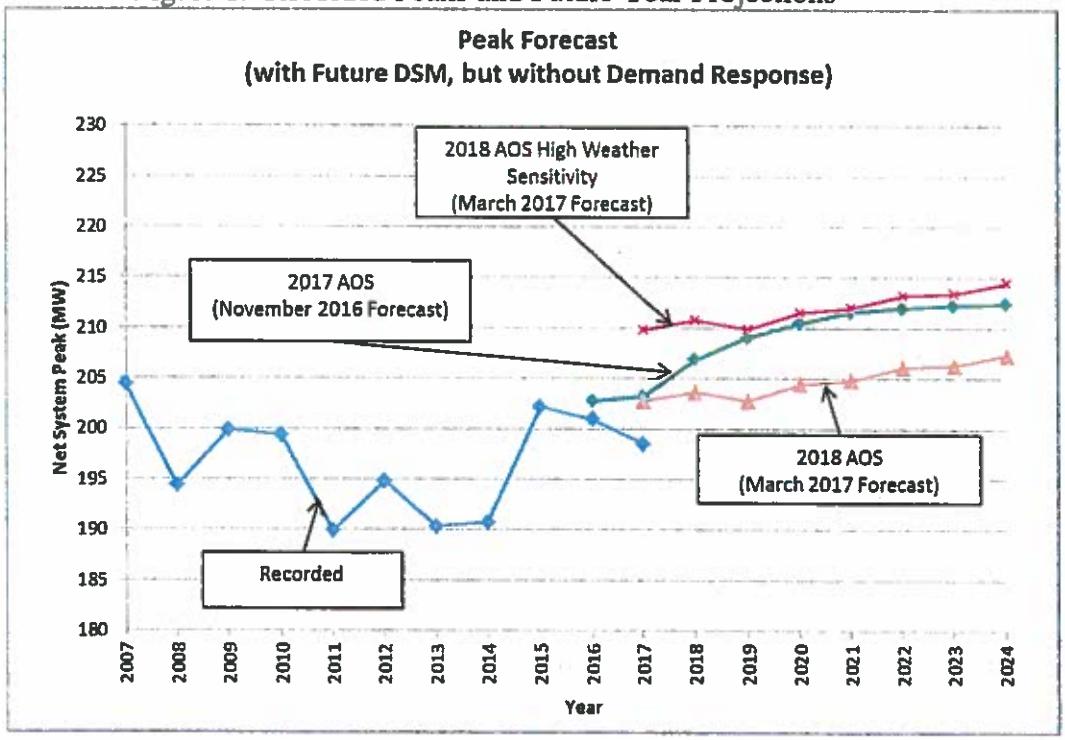

Table 1: Recorded Peaks and Future Year Projections
Net System Peak[5] (MW) with Future DSM, but without DR

Year	Actual Net-to-System	2017 AOS Nov 2016 Peak Forecast	Difference 2018 - 2017 AOS	2018 AOS March 2017 Peak Forecast	Difference 2018 AOS - 2018 AOS High Weather	2018 AOS High Weather March 2017 Peak Forecast
2007	204.4					
2008	194.4					
2009	199.9					
2010	199.4					
2011	189.9					
2012	194.8					
2013	190.3					
2014	190.7					
2015	202.2					
2016	201.0	202.8				
2017	198.5	203.2	-0.5	202.7	7.0	209.8
2018		206.9	-3.3	203.6	7.1	210.8
2019		209.0	-6.3	202.7	7.1	209.9
2020		210.5	-6.1	204.4	7.1	211.6
2021		211.6	-6.8	204.8	7.1	211.9
2022		212.0	-6.0	206.1	7.1	213.2
2023		212.3	-6.0	206.3	7.1	213.4
2024		212.4	-5.1	207.3	7.1	214.5

4.3 Projected Peak Reduction Benefits of DR Programs

Maui Electric 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 Integrated Demand Response Portfolio Plan ("IDRPP") filed with the Commission 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 requesting approval of:

[5] The March 2017 peak forecast includes ~ 2 MW of standby load.

- 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.

On September 2, 2016, Maui Electric filed an application seeking to expand its Fast DR Program to 5.0 MW in order to address an urgent reserve capacity shortfall need ("Fast DR Expansion Application").[6] The current Fast DR Program has 0.2 MW. A Revised DR Portfolio filing was filed on February 10, 2017, which provided modified approval requests and DR program design and targets (MW) following 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. Maui Electric will continue to implement DR in accordance with future targets.

For the purpose of AOS analysis, high distributed generation photovoltaic ("DG-PV") DR peak reduction impacts from the *PSIP Update Report: December 2016* were used for scenario analysis and shifted two years. For example, 2017 targets are now 2019 targets. The DR impacts can vary each month so Table 2 lists the peak reductions in the month with the highest peaks, which is October.

Table 2 – DR Peak Reduction

Year	October DR Peak Reduction Impacts (MW-Net)
2018	4.0
2019	5.6
2020	9.1
2021	10.3
2022	12.3
2023	12.4
2024	12.8

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

[6] See Application filed in Docket No. 2016-0232.

change frequently due to unforeseeable findings during outage inspections or to changes in priorities due to unforeseeable problems or circumstances. When major revisions to planned and/or maintenance outages occur, the Planned Maintenance Schedule is revised.

Maui Electric schedules three days of maintenance for combustion turbine engine replacements; however, in previous AOS reports, combustion turbine engine replacements were not included in the analysis. These three-day engine replacements were not included because Maui Electric intends to undertake these three-day outages at times that present a low degree of risk, such as during the weekend, when loads are expected to be relatively low. As a result, these shortfalls, in isolation, did not warrant any longer-term mitigation measures to be implemented. In order to identify the additional risk to the system this short-term maintenance can present, the 2018 AOS shows the analysis results with and without the three-day combustion turbine maintenance.

4.5 Reductions of Firm Generating Capacity

4.5.1 Kahului Units 1 and 2 Deactivation

Kahului Units 1 and 2 (with a combined rating of 11.4 MW-net) were deactivated at the end of February 2014, and were laid up in a manner that enabled their return to service in emergency conditions and/or generation shortfalls (based on reserve planning criteria). However, with the termination of the HC&S power purchase agreement and increased peak load growth, the generating capacity of K1 and K2 is needed in order to maintain system reliability and to avoid violating Maui Electric's contingency reserve planning criteria and the possible risk of load shed. As a result, in September 2016, K1 and K2 were removed from deactivated status and designated as reactivated.[7]

4.5.2 Kahului Power Plant Retirement

Maui Electric will retire KPP by 2024 to comply with mandatory National Pollution Discharge Elimination System requirements. In the AOS analysis, KPP is assumed to retire at the end of 2022. There is an urgent need for replacement generation on Maui in order to meet the KPP retirement deadline.

[7] See the Third Annual Status Update of the Milestone Metrics for the System Improvement and Curtailment Reduction Plan filed on September 30, 2016 in Docket 2011-0092.

4.6 Other Inputs

For the purposes of the analysis, DG-PV additions and DR impacts were included. Estimated peak reductions from customer batteries in the customer self-supply and smart export program forecasts were included. No future firm or variable resource additions were included so that capacity needs could be examined without the addition of future resources.

5.0 Scenario Analysis

5.1 Description of Scenarios

Scenario analyses are performed to examine the effects of different input assumptions. Evaluation of results under different planning criteria could also provide insight into future capacity addition requirements. This section explains the effects of assigning variable generation resources (e.g., wind) with an equivalent capacity value. Next, the effects of DR and customer-sited battery systems were added. Reserve capacity shortfalls under Rule 1 and reserve margin were calculated under these different scenarios. A sensitivity for unusually high temperature and humidity conditions, as seen in 2015, was also investigated.

The reference case used below only includes the capabilities of the Maui generating units when calculating the reserve capacity shortfalls and reserve margin.

Examination of variable wind generation contribution to total firm capacity was performed in a scenario as a consideration due to the large amount of total wind capacity on the Maui system. Currently, the Maui system includes 72 MW of variable wind generation, which is a significant amount with respect to the system load. A 90% probability level was used to determine a capacity value of 2.6 MW for the existing wind generation. This probability level means the wind output is expected to be 2.6 MW or higher during 90% of the daily peaks. Conversely, the risk is that wind power output is expected to be less than 2.6 MW during 10% of the daily peaks as occurred in 2017 when only 1.9 MW of wind power output was available during the annual peak.

The contributions of DR programs and exclusion of three day-maintenance in additional scenarios were evaluated in sensitivity analysis discussed below.

Additionally, a high weather peak forecast sensitivity was investigated using Rule 1 and reserve margin criteria for the scenarios listed above. In 2015 Maui experienced a peak that was more than 11 MW higher than the previous year and higher than the previous seven years. This peak was due to abnormal weather. Because Maui's generating capability is on the brink of a reserve

capacity shortfall an unexpectedly high peak poses an asymmetrical risk of not meeting the load.

5.2 Results of Analysis

Table 4 shows the reserve capacity shortfall, in MW, in the amount needed to satisfy Rule 1 of the capacity planning criteria. The analysis shows that Rule 1 is violated in the reference case beginning in 2018 under a set of assumptions including, but not limited to: (1) continued implementation of third-party energy efficiency; and (2) planned retirement of KPP in December 2022. DR program impacts have not been included in the reference analysis. Also included in Table 4 is the result for Rule 1 of the scenario that includes 2.6 MW toward total system firm capacity from the existing wind facilities and a scenario that includes the impacts of combined wind capacity, DR, and customer-sited batteries with and without three-day combustion turbine engine replacement maintenance.

The Rule 1 analysis is based on annual peaks occurring in October of each year. Because the reserve margin analysis looks at the annual peak and is indifferent to which month the peak occurs, the results of the reserve margin analysis can account for the annual peaks occurring in different months.

Table 4 Maui Division Rule 1 Analysis

Year	Reference Case (MW)	Wind Capacity Scenario (MW)	Wind Capacity and DR Scenario (MW)	Wind Capacity and DR Scenario Excluding Three Day Maintenance (MW)
2018	-6.2	-3.6	-1.1	-1.1
2019	-19.7	-17.1	-11.6	-6.3
2020	-11.9	-9.3	-1.3	-1.3
2021	-3.9	-1.3	8.2	8.2
2022	-4.1	-1.5	10.9	10.9
2023	-40.6	-38.0	-25.6	-25.6
2024	-41.1	-38.5	-25.6	-25.6

Table 5 shows the reserve margin of the reference case and the two scenario analyses.

Table 5: Maui Division Reserve Margin Analysis

Year	Reference Case (%)	Wind Capacity Scenario (%)	Wind Capacity and DR Scenario (%)
2018	21.2	22.5	24.0
2019	22.1	23.4	26.9
2020	21.5	22.8	28.6
2021	21.6	22.8	29.4
2022	20.9	22.2	30.1
2023	3.2	4.5	11.3
2024	2.7	4.0	10.9

Maui Electric's Rule 1 criteria analysis resulted in shortfalls in every year of the reference case. Wind capacity value can partially reduce shortfalls each year. With DR and wind capacity value included, and excluding three-day maintenance in the Rule 1 analysis, small shortfalls remain in years 2018, 2019 and 2020, and large shortfalls occur after KPP retires at the end of 2022. Excluding the three-day maintenance from the analysis results in a lower shortfall of 6.3 MW in 2019, compared to 11.6 MW in the scenario when wind capacity value and DR are included.

Under the 20% reserve margin consideration described in Section 3.1, the Maui system meets the 20% reserve margin threshold for the reference case until 2022. The reserve margin is 3.2% in 2023 and 2.7% 2024, which means that there is little minimal reserve capacity in these years.

If the reserve margin guideline were assessed at a 30% level following the retirement of KPP then the Maui system falls below the reserve margin in 2023 by 18.7% or 35.9 MW in the scenario when wind capacity value and DR are included.

Table 6 shows the Rule 1 analysis and Table 7 shows the Reserve Margin for the high weather peaks sensitivities.

Table 6: Maui Division Rule 1 Analysis – High Weather Peaks Sensitivity Forecast

Year	Reference Case (MW)	Wind Capacity Scenario (MW)	Wind Capacity and DR Scenario (MW)	Wind Capacity and DR Scenario Excluding Three Day Maintenance (MW)
2018	-13.0	-10.4	-7.9	-7.9
2019	-26.7	-24.1	-18.6	-13.5
2020	-18.8	-16.2	-8.2	-8.2
2021	-10.8	-8.2	1.3	1.3
2022	-10.9	-8.3	4.0	4.0
2023	-47.4	-44.8	-32.4	-32.4
2024	-47.9	-45.3	-32.5	-32.5

Table 7: Maui Division Reserve Margin Analysis – High Weather Peaks Sensitivity Forecast

Year	Reference Case (%)	Wind Capacity Scenario (%)	Wind Capacity and DR Scenario (%)
2018	17.1	18.3	19.8
2019	17.9	19.2	22.5
2020	17.4	18.6	24.0
2021	17.4	18.7	24.8
2022	16.8	18.1	25.4
2023	-0.3	1.0	7.3
2024	-0.7	0.5	7.0

The high weather peaks sensitivity resulted in shortfalls in all years under the Rule 1 criteria analysis of the reference case and the wind capacity scenario. With DR and wind capacity value included in the Rule 1 analysis, shortfalls still occurs in all years except 2021 and 2022. DR is anticipated to expand enough to cover the shortfalls in 2021 and 2022 for this scenario.

For the high weather peaks sensitivity under the 20% reserve margin consideration, the Maui system is below the 20% reserve margin threshold in all years under the reference case and in the scenario with wind capacity. Counting the capacity value of wind, implementing DR programs, and customer batteries could eliminate the shortfalls in the years 2019 to 2022 and reduce the shortfalls in the other years.

If the reserve margin guideline were assessed at a 30% level following the retirement of KPP, then the Maui system falls below the reserve margin in 2023 by 22.7% or 45.1 MW in the scenario when wind capacity value and DR are included.

6.0 Mitigation Measures

To avoid near-term reserve capacity shortfalls, Maui Electric has taken a portfolio approach because individually, none of the following measures will be able to fully mitigate the near-term reserve capacity shortfalls.

6.1 Fast DR Expansion

In 2017, the expanded fast DR program ("Fast DR") remained at 0.2 MW. However, there continues to be interest in the program from Maui Electric's commercial customers. Approximately 5.9 MW of potential program participation has been identified. Audits for approximately 1.408 MW have been completed and awaiting customer contracting (240 kW contracted as of January 19, 2018). Audits for an additional 3.25 MW are pending, with another 1.25MW worth of audits waiting being scheduled. Maui Electric continues to treat these efforts with great urgency as the first and best option to boost Maui's reserve capacity.

6.2 Temporary Distributed Generation

Maui Electric's application to purchase and install approximately 4.95 MW of temporary distributed generation ("Temp DG") remains suspended.[8] However, the Company believes Temp DG is the lowest risk alternative to supplement DR capacity in the near-term. Temp DG units can be operational in six months or less, and provide a high level of dependable capacity, relative to the other options available to Maui Electric.

Should the Company decide to pursue Temp DG units as a solution, leasing the units may be the preferred option (versus buying and later selling the

[8] See Order No. 34437 Suspending the Docket, filed on March 9, 2017 in Docket No. 2016-0234.

units as originally proposed in the Temp DG application). The AOS analysis shows that the need is greatest in the 2018-2020 timeframe. As noted below, Maui Electric is also considering a battery project that could provide additional generation options in the 2019 timeframe. Combined, these factors may shorten the period that the Temp DG units are needed, which negatively impacts the viability of the buy/sell option. Leasing may also alleviate stakeholder concerns regarding the permanency of the units.

6.3 Battery Energy Storage System

A battery energy storage system ("BESS") has the potential to both address system security and provide an alternative means of addressing peak demand by storing energy during non-peak periods and discharging stored energy during peak demand periods. Although the project is still in the evaluation stage, a BESS could be installed as soon as the fourth quarter of 2019. Assuming no change in the sizing identified for contingency needs in the *PSIP Update Report: December 2016*, this BESS would provide up to 9 MW of energy to the Maui system. Due to the timing of this project, it would not be able to offset the reserve capacity shortfalls expected during the 2018-2019 period. Maui Electric must continue to pursue Fast DR and suitable alternatives such as Temp DG.

6.4 Collaboration with Hawai'i Energy

Maui Electric and Hawai'i Energy are working together to maximize the impact of Hawai'i Energy's efforts on Maui relative to reducing loads during Maui's system peaks. For example, the parties have discussed focusing efforts on technologies that reduce load during the evening peak and that can be implemented quickly, during the years with the lowest amount of reserve capacity. This type of coordination will help both parties achieve their goals of providing for Maui's energy needs.

6.5 Refinement of Maintenance Schedule

Maui Electric's normal maintenance scheduling practices are performed by the Maui Electric Power Supply Department. Scheduling involves many different operational factors. Maintenance scheduling can be expected to be adjusted numerous times over the year due to changing operational factors. In the event of reserve capacity shortfalls, rearranging maintenance schedules, to the extent possible, may provide some level of mitigation.

6.6 Call for Conservation

Maui Electric may request voluntary customer curtailment of demand during capacity reserve shortfall conditions.

7.0 Acquisition of Replacement Firm Generating Capacity

Any new capacity needed for Maui will be acquired in accordance with the Commission's Framework for Competitive Bidding, adopted by the Commission on December 8, 2006, in Decision and Order No. 23121 in Docket No. 03-0372, and pursuant to Hawai'i Revised Statutes §§ 269-7 and 269-15, and Hawai'i Administrative Rules § 6-61-71.

In response to requests filed by the Companies, on October 6, 2017, the Commission opened Docket No. 2017-0352 related to competitive procurement of dispatchable firm generation and new renewable energy. On October 23, 2017, the Companies filed a draft request for proposals ("RFP"), including one for 40 MW of firm renewable generation on Maui to be in service by the end of 2022. On January 12, 2018, in Order No. 35224, the Commission provided guidance on the RFP process, prioritizing finalizing the Maui variable request for proposals, and signaling further guidance from the Commission on the Maui Firm RFP would be forthcoming in the first quarter of 2018.

8.0 Lana'i Division

8.1 Peak Demand and System Capability in 2017-2020

Lana'i's 2017 system peak of 5,400 kW (gross) occurred on January 24, 2017 (7:30 p.m.) and March 16, 2017 (7:10 p.m.). The total system capability of Lana'i was 9,400 kW-gross at the time of the system peak resulting in a reserve margin of approximately 74% over the 2017 system peak.

At times during 2016, Lana'i received energy from Lanai Sustainability Research, LLC (LSR), a PV independent power producer. Since this contract is not for firm capacity, it is not reflected in Lana'i's total firm generating capability.

On March 6, 2015, Maui Electric's combined heat and power system, located at the Manele Bay Four Seasons Resort, incurred extensive and irreparable damage due to a fire. Therefore, the total system capability for Lana'i was reduced to 9,400 kW for years 2016 and the first half of 2017. Maui Electric replaced the unit and operated the combined heat and power system in the second half of 2017.

Maui Electric developed and adopted its peak forecast in March 2017 that was used in this analysis for Lana'i.

Table 8 shows the expected reserve margins over the next three years, based on the March 2017 Forecast.

Table 8: Lana'i Division Reserve Margin Analysis

Year	System Capability at Annual Peak Load (Gross kW) [A]	System Peak (Gross kW) [B]	Reserve Margin (%) [A - B] / [B]
2017	9,400	5,400	74%
2018	10,230	5,500	86%
2019	10,230	5,900	73%
2020	10,230	5,900	73%

8.2 Lana'i Division Capacity Planning Criteria

The following criterion is used to determine the timing of an additional generating unit for the Lana'i Division and the Moloka'i Division:

New generation will be added to prevent the violation of any one of the rules listed below where "units" mean all units and firm capacity suppliers physically connected to the system, and "available unit" means an operable unit not on scheduled maintenance.

1. *The sum of the normal top load ratings of all units must be equal to or greater than the system peak load to be supplied.*

2. *With no unit on maintenance, the sum of the reserve ratings of all units minus the reserve rating of the largest available unit must be equal to or greater than the system peak to be supplied.*

3. *With a unit on maintenance:*

   a) *The sum of the reserve ratings of all units minus the reserve rating of the largest available unit must be equal to or greater than the daytime peak load to be supplied.*

   b) *The sum of the reserve ratings of all units must be equal to or greater than the evening peak load to be supplied.*

9.0 Moloka'i Division

9.1 Peak Demand and System Capability in 2017 - 2020

Moloka'i's 2017 system peak of 5,900 kW (gross) occurred on November 1, 2017 (6:26 p.m.). The total system capability on Moloka'i was 12,010 kW-gross at the time of the system peak, resulting in a reserve margin of approximately 112% over the 2017 system peak.

Maui Electric developed and adopted its peak forecast in March 2017 that was used in this analysis for Moloka'i.

Table 9 shows the expected reserve margins over the next three years, based on the March 2017 Peak Forecast.

Table 9: Moloka'i Division Reserve Margin Analysis

Year	System Capability at Annual Peak Load (Gross kW) [A]	System Peak (Gross kW) [B]	Reserve Margin (%) [A - B] / [B]
2017	12,010	5,900	104%
2018	12,010	5,800	107%
2019	12,010	5,700	111%
2020	12,010	5,700	111%

9.2 Reductions in Peak Demand: Moloka'i's Rider

At the time of system peak, Moloka'i had in place one load management contract totaling approximately 365 kW under Rider M, which reduced evening peak by approximately 357 kW.

9.3 Moloka'i Division Capacity Planning Criteria

Moloka'i Division's capacity planning criteria are identical to those of the Lana'i Division. See Section 6.3 above, Lana'i Division Capacity Planning Criteria.

10.0 Conclusion

Maui Electric's generation capacity for the islands of Lana'i and Moloka'i for the next three years (2018, 2019, and 2020) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies.

Maui Electric forecasts small reserve capacity shortfalls for the island of Maui to occur starting 2018, under its March 2017 forecast. Maui Electric is implementing the expansion of Fast DR to mitigate these shortfalls. In the event that additional mitigation measures are needed Maui Electric is prepared to implement the Temp DG and is evaluating BESS technology to provide peak shaving capability.

Maui Electric forecasts large reserve capacity shortfalls for the island of Maui to occur in year 2023 with the planned retirement of the units at KPP in 2022. The 2018 AOS confirms the urgent need of replacement capacity of KPP in 2022 with a projected reserve margin shortfall of 35.9 MW in 2023 based on a 30% reserve margin with wind capacity value and DR.

Very truly yours,

Sharon M. Suzuki
President

Attachments

c: Division of Consumer Advocacy (with Attachments)

Table A1:
Maui Division Projected Reserve Margins

Year	System Capability at Annual Peak Load (Net MW) [A] (I)	System Peak (Net MW) [B] (II)	Interruptible Load (net MW) [C] (III)	Reserve Margin (%) [A - (B-C)] / (B-C)
2018	246	203	0	21%
2019	246	202	0	22%
2020	246	203	0	22%
2021	246	203	0	22%
2022	246	204	0	21%
2023	210	204	0	3%
2024	210	205	0	3%

Notes:

I. System Capability includes:
- Maui Electric central station units at total normal capability in 2017 was 246.3 MW-net.
- Planned retirement of the units at the Kahului Power Plant (35.9 MW-net) in 2022.

II. System Peaks:
- The 2018-2024 annual forecasted system peaks are based on Maui Electric's March 2017 Forecast reduced by estimated peak reduction from customer batteries.
- The forecasted System Peaks for 2018-2024 include the estimated peak reduction benefits of third-party energy efficiency programs.
- The Maui Electric annual forecasted system peak is expected to occur in the month of October.

III. Interruptible Load:
- As discussed in section 4.2, interruptible load impacts which will be part of the DR programs are assumed to be zero in this analysis.

Table A2:

Maui Unit Ratings Installed

As of December 31, 2017

Units	Gross (MW)		Net (MW)	
	Reserve	NTL[I]	Reserve	NTL[I]
M1	2.50	2.50	2.50	2.50
M2	2.50	2.50	2.50	2.50
M3	2.50	2.50	2.50	2.50
X1	2.50	2.50	2.50	2.50
X2	2.50	2.50	2.50	2.50
M4	5.60	5.60	5.51	5.51
M5	5.60	5.60	5.51	5.51
M6	5.60	5.60	5.51	5.51
M7	5.60	5.60	5.51	5.51
M8	5.60	5.60	5.48	5.48
M9	5.60	5.60	5.48	5.48
M10	12.50	12.50	12.34	12.34
M11	12.50	12.50	12.34	12.34
M12	12.50	12.50	12.34	12.34
M13	12.50	12.50	12.34	12.34
M14/15/16[II]	58.00	58.00	56.78	56.78
M17/18/19[II]	58.00	58.00	56.78	56.78
Maalaea GS	212.10	212.10	208.42	208.42
K1	5.90	5.00	5.62	4.71
K2	6.00	5.00	5.77	4.76
K3	12.70	11.50	12.15	10.98
K4	13.00	12.50	12.38	11.88
Kahului GS	37.60	34.00	35.92	32.33
HC&S[III]	-	-	-	-
Hana 1[IV]	1.00	1.00	0.97	0.97
Hana 2[IV]	1.00	1.00	0.97	0.97
Maui System	251.70	248.10	246.28	242.69

Notes:

(I) NTL = Normal Top Load

(II) The NTL rating for long-term capacity planning purposes for each of the two Maalaea Dual Train Combined Cycle units, Maalaea Unit 14/15/16 and Maalaea Unit 17/18/19, is 56.78 MW (net). In the first and second quarters of 2008, Maui Electric performed capability tests on Maalaea Unit 14/15/16 and Maalaea Unit 17/18/19, respectively. Maalaea Unit 14/15/16 resulted in a net NTL rating of 56.27 MW (0.51 MW lower than

the rated NTL) and M17/18/19 resulted in a net NTL of 56.20 MW (0.58 MW lower than the rated NTL). With consideration that the capabilities of these units can vary depending on ambient weather conditions, it was determined that the rated NTL of 56.78 MW (net) is acceptable.

(III) Units located at Hana Substation No. 41. In December 2008, a communication and controls project was completed. This project provides Maui Electric with the means to operate the Hana generators in parallel to the system and as emergency units. These units also have the capability to be indirectly, remotely controlled and automatically brought on line. With the completion of the project, the Hana units have been designated as firm capacity and are included in the total reserve rating of the Maui system capability.