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PUBLIC UTILITIES
COMMISSION

SHARON M. SUZUKI
President

January 30, 2015

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 ("Maui Electric" or "Company")

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.*

2015 Adequacy of Supply Report Summary

- Maui Electric's generation capacity for the islands of Lana'i and Moloka'i for the next three years (2015, 2016, and 2017) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies. The peak load experienced on Maui in 2014 was 190.7 MW net, and was served by Maui Electric's total capability of 262.3 MW net, including firm power purchases, but does not include intermittent energy sources such as wind and solar. This represents a reserve margin of approximately 38 percent over the 2014 net system peak.
- Kahului Units 1 and 2 (with a combined rating of 9.5 MW-net) were deactivated at the end of February 2014, and are laid up in a manner that enables their return to service in an emergency condition. The 2015 AOS total system capability includes the capacity from Kahului Units 1 and 2 through 2018.

- Maui Electric expects to have an adequate amount of firm generation capacity for Maui Island, which does not include intermittent energy sources such as wind and solar, to meet all reasonably expected demands for service and provide reasonable reserves for emergencies for the period 2014 to 2018.
- Maui Electric anticipates needing additional firm capacity on the Maui system in the 2019 timeframe.
- The peak load experienced on Lana'i in 2014 was 5.075 MW-gross, and was served by Lana'i's total capability of 10.23 MW-gross. This represents a reserve margin of approximately 102 percent over 2014 system peak.
- The peak load experienced on Moloka'i in 2014 was 5.5 MW-gross, and was served by Moloka'i's total capability of 12.01 MW-gross. This represents a reserve margin of approximately 118 percent over 2014 system peak.

1. Peak Demand and System Capability in 2014

Maui's 2014 system peak occurred on Tuesday, November 4, 2014, at approximately 6:29pm and was 190.7 MW (net) or 194.9 MW (gross).

The total system capability of Maui was 262.3 MW (net), including firm power purchases, but did not include intermittent energy sources such as wind and solar. At the time of the system peak, the reserve margin was approximately 38 percent over the 2014 system peak. [1]

1.1 Rider M and Demand Side Management (DSM)

At the time of system peak, Maui had in place nine load management contracts totaling approximately 4.9 MW under Rider M, which reduced evening peak by approximately 2.75 MW-net. In addition, Maui has had residential and commercial & industrial energy efficiency DSM programs, which reduced the system peak by an estimated 23.1 MW-net (net of free riders).[2] The estimated system peak reduction is based on Maui Electric and Hawai'i Energy, Public Benefits Fee (PBF) Administrator, records. Without the Rider M contracts and DSM impacts, the 2014 system peak would have been approximately 216.6 MW-net.

[1] The total capability value used in the calculation of this reserve margin does not account for units not available due to maintenance outages, forced outages, or derates in unit capacities.
[2] Includes impacts from Maui Electric implemented energy efficiency programs and Hawai'i Energy, Public Benefits Fee Administrator, for Program Years 2009-2013 as reported by Leidos Engineering in the Annual Reports to the Hawai'i Public Utilities Commission.

2. Estimated Reserve Margins

Attachment 1 shows the expected reserve margin over the next five years, 2015-2019, based on Maui Electric's May 2014 Peak Forecast, and includes estimated energy efficiency impacts and forecasted load management impacts.

3. 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) net energy metering, and (c) customer-sited photovoltaic ("PV") installations; [§4.1]
- peak reduction benefits of demand response programs; [§4.2]
- planned maintenance schedules for the generating units on the system; [§4.3], and
- reductions of firm generating capacity. [§4.4]

The above mentioned forecasts are similar to those used in Maui Electric's 2014 AOS Report. 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:

In addition, consideration will be given to maintaining a reserve margin of approximately 20 (twenty) percent based on Reserve Ratings.

The Rule 1 includes load reduction benefits from interruptible load customers. Because Maui Electric will not build reserve capacity to serve interruptible loads, interruptible load programs, such as demand response programs, can have the effect of deferring the need for additional firm capacity generation.

Rule 1 and Reserve Margin are deterministic in nature, meaning that the adequacy of supply can be determined through simple additions or subtractions of capacity without regard to the probability that the capacity will be available at any given time. For example, to determine whether or not Rule 1 would be satisfied at a given point in time, one would take the total capacity of the system in MW, add the total amount of interruptible loads that would be available for interruption at that time, subtract the capacity of the unit or units that are unavailable due to planned maintenance, subtract the capacity of the largest available unit, and determine whether the result is greater than or less than the system peak at that time. If the result is greater than the system peak, Rule 1 would be satisfied and no additional firm capacity would be needed. If the result is less than the system peak, Rule 1 would not be satisfied and additional firm capacity would be needed. The likelihood (or probability) that the largest unit will be lost from service during the peak is not a factor in the application of this rule.

The Reserve Margin criterion is also a deterministic calculation. To determine whether or not the Reserve Margin consideration would be satisfied at a given point in time, one would take the total capacity of the system in MW less the estimated system peak after reduction by interruptible loads that would be available for interruption at that time, then divide it by the system peak less the total amount of interruptible load. This calculation will determine whether the result is greater than or less than 20 percent. If the result is greater than 20 percent, the Reserve Margin consideration would be satisfied and

no additional firm capacity would be needed. If the result is less than 20 percent, additional firm capacity would be needed.

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 ("NUG") resources;

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

4. Key Inputs to the 2015 AOS Analysis

4.1 May 2014 Peak Forecast

Maui Electric developed and adopted its peak forecast in May 2014 ("May 2014 forecast"), for future planning purposes. Maui Electric's May 2014 peak forecast was used for the purposes of this analysis.

Figure 1 illustrates Maui's historical system peaks and compares them to the forecast used in the 2014 and 2015 AOS analyses. The analyses contained in the 2014 AOS were based on an August 2013 forecast.

Figure 1: Recorded Peaks and Future Year Projections

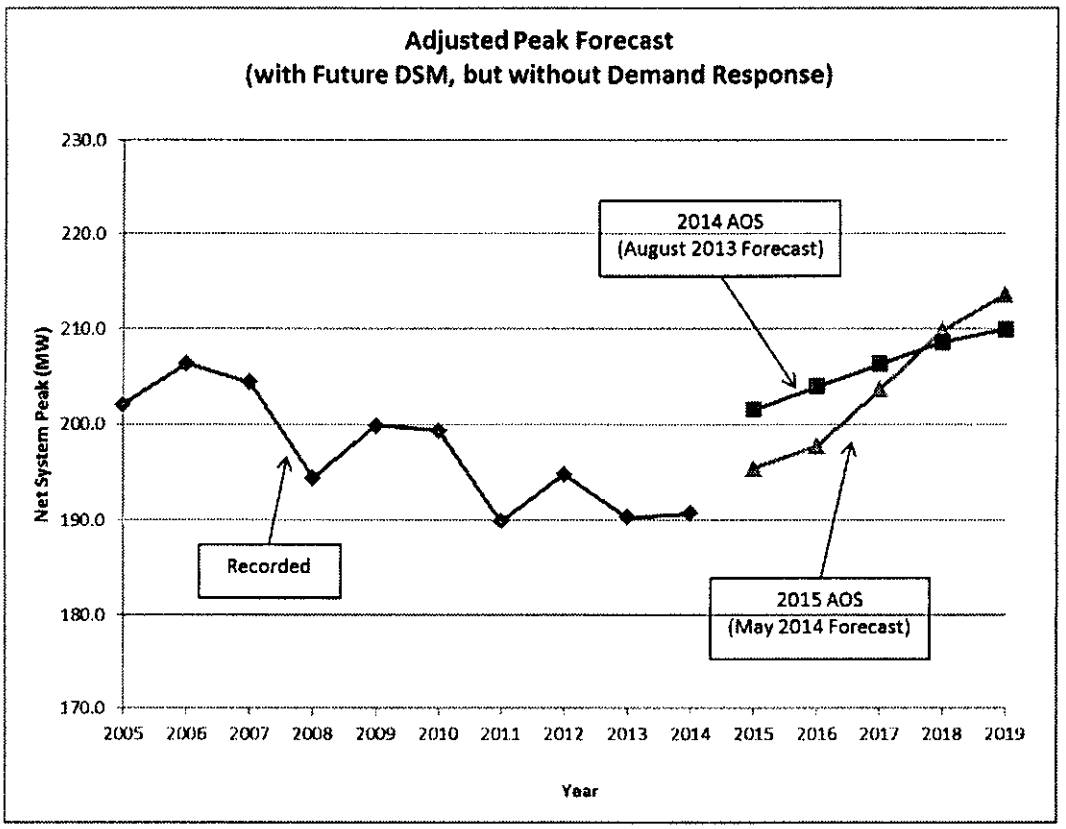

Table 1 below provides the recorded peaks from 2005 and compares the forecasts used in the 2014 AOS and this 2015 AOS. The comparison between forecasts indicate the degree to which key planning assumptions such as the peak forecast can change significantly in one year. For example, the 2014 peak forecast includes the impact of incorporating liquefied natural gas (LNG), a lower cost fuel, into the forecast. The LNG assumption results in reducing electricity price which increases energy usage and peaks.

For both the recorded and forecast data, Table 1 includes the peak reduction benefits of energy efficiency programs and naturally occurring conservation. The peak forecast also includes the impact of customer-sited PV and other renewable generation system installations through the Net Energy Metering ("NEM") program, Standard Interconnection Agreements ("SIA"), and Feed-In Tariffs ("FIT"). 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.

Table 1: Recorded Peaks and Future Year Projections

	Net System Peak (MW) (with Future DSM, but without Demand Response)			
Year	Actual	2014 AOS Aug 2013 S&P	2015 AOS May 2014 S&P	Difference 2015 - 2014 AOS
2005	202.1			
2006	206.4			
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		201.5	195.4	-6.1
2016		204.0	197.7	-6.2
2017		206.3	203.7	-2.6
2018		208.6	209.8	1.2
2019		209.9	213.6	3.6

4.2 Projected Peak Reduction Benefits of Demand Response Programs

Maui Electric is committed to pursuing Demand Response ("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.

Maui Electric will continue to implement DR in future years. Participants of the Fast DR Pilot Program will be provided an opportunity to transition to future DR programs as they become available.

The DR capacity forecast used in these analyses is depicted in Table 2.

Table 2: Projected Commercial and Residential DR Impacts (MW)

Year	Residential	Commerical
2014	0.0	0.2
2015	0.0	0.2
2016	0.9	4.1
2017	1.4	4.6
2018	2.0	5.1
2019	2.6	5.5

4.3 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 or circumstances. When major revisions to planned and/or maintenance outages occur, the Planned Maintenance Schedule is revised.

4.4 Reductions of Firm Generating Capacity

4.4.1 Kahului Units 1 and 2 Deactivation

Kahului Units 1 and 2 (with a combined rating of 9.5 MW-net) were deactivated at the end of February 2014, and are laid up in a manner that enables their return to service in an emergency condition.[3] The 2015 AOS total system capability includes the capacities of Kahului Units 1 and 2.

4.4.2 Reactivation of Kahului Units 1 and 2

Deactivated units may be reactivated in the event of an emergency and/or to mitigate reserve capacity shortfalls caused by factors such as the termination of an existing PPA for firm capacity, load growth, uncertainties in the forecasted peak reduction of DSM and the market potential for demand response programs, natural disaster, or other force majeure events involving HC&S or Maui Electric. Reactivation may also occur if it is determined that the generating capacity of K1 and/or K2 is needed

[3] Docket No. 2011-0092 (MECO 2012 Test Year Rate Case; Maui Electric System Improvement and Curtailment Reduction Plan, Exhibit E.

to maintain system reliability, avoid violation of Maui Electric's capacity planning criteria, and/or avoid the risk of load shedding.[4]

4.5 Capacity from Hawaiian Commercial & Sugar Company ("HC&S")

In a letter agreement dated March 26, 2014, and provided to the Commission on April 4, 2014 ("March 26, 2014 Letter Agreement"), Maui Electric acknowledged and agreed to HC&S's request to exercise its one-time right to decrease its firm capacity to eight (8) MW for 8,474 hours per Contract year, effective January 1, 2015, pursuant to Article II, Section F of the PPA.[5]

On July 31, 2014, HC&S and Maui Electric reached tentative agreement on language for a proposed amendment to the PPA in anticipation of its expiration. The proposed amendment language extends the term of the existing PPA so that Maui Electric can purchase, at its request, scheduled energy from HC&S ("Proposed Extension"). The parties anticipate that the Proposed Extension would extend the term of the PPA to December 31, 2017. On December 8, 2014, the Commission concluded that the Competitive Bidding Framework does not apply to an extension to the PPA (Order No. 32500, Docket No. 2014-0011). Maui Electric anticipates filing the Proposed Extension application with the Commission in February 2015.

For capacity planning purposes, Maui Electric assumes that HC&S will contribute 8MW toward total system firm capacity on the Maui system for calendar year 2015. For calendar years 2016 and 2017, Maui Electric assumes that HC&S will contribute 4MW toward total system firm capacity. The need for future increments of firm capacity will be re-evaluated once it is determined how much capacity HC&S will provide to Maui Electric under an extended or new PPA.

5. Scenario Analysis

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 providing variable generation resources (e.g. wind) with capacity value. Also examined is the effect of a 30 percent reserve margin criteria on future capacity addition, which is 10 percent higher than the reserve margin criteria explained in Section 3.1 of this letter.

[4] K1 and K2 were reactivated on January 13, 14, and 15, 2015 during the afternoon/evening load periods. These units were reactivated based on forecasts of insufficient total system capacity due to generator maintenance and minimal variable generation forecasted to meet the forecasted system load in accordance with the Company's Rule 1 capacity planning criteria.

[5] See *Notification of Replacement of December 18, 2013 Letter Agreement* filed in Docket No. 2014-0011 on April 4, 2014 ("HC&S March 26, 2014 letter").

5.1 Description of Scenarios

In Maui Electric's Power Supply Improvement Plan filed on August 26, 2014,[6] a proposed reserve margin planning standard of 30 percent was used for capacity planning analysis.[7]

Forecasts of the inputs to the analysis are subject to uncertainties. Currently, the Maui system includes 72 MW of variable wind generation, which is a significant amount with respect to the system load. The wind facilities have increased the amount of renewable energy accepted on the Maui system as a result of Maui Electric's commitment to increasing renewable generation resources. Further 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. Therefore, another planning assumption was analyzed, which provided 2MW toward total system firm capacity for existing wind facilities (Kaheawa Wind Power, Auwahi Wind Energy, Kaheawa Wind Power 2). The existing wind resources were assigned a total capacity value of 2MW based on a statistical correlation of variable generation output during the peak hour of each day. A 90 percent probability level was used to determine the capacity value.

5.2 Results of Analysis

Table 3 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 2019 under a set of assumptions including, but not limited to: (1) residential and commercial demand response program impacts at the levels described in Table 2; (2) continued acquisition of third-party energy efficiency; (3) retirement of the Kahului Power Plant; and (4) firm IPP contract expiration. Also included in the Table 3, is the result for Rule 1 of the scenario that includes 2 MW toward total system firm capacity for existing wind facilities.

[6] Order No. 32289 issued on September 12, 2014, transferred Maui Electric's PSIP Report from Docket No. 2011-0092 into Docket No. 2014-0183.
[7] Refer to Appendix M of Maui Electric's PSIP report for reference.

Table 3: Maui Division Rule 1 Analysis

Year	Reference Case (MW)	Scenario (MW)
2015	0.0	0.0
2016	0.0	0.0
2017	0.0	0.0
2018	0.0	0.0
2019	-35.7	-33.7

Table 4 shows the reserve margin of both the reference case and the scenario analysis.

Table 4: Maui Division Reserve Margin Analysis

Year	Reference Case (MW)	Scenario (MW)
2015	30%	31%
2016	30%	31%
2017	27%	28%
2018	22%	22%
2019	2%	3%

Under the 20 percent reserve margin consideration described in Section 3.1, the Maui system would fall below the reserve margin threshold in 2019. If the reserve margin criteria were assessed at a 30 percent level, then the Maui system would fall below the reserve margin in 2017.

6. Lana'i Division

6.1 Peak Demand and System Capability in 2014 - 2017

Lana'i's 2014 system peak of 5,075 kW (gross) occurred on December 29, 2014 (6:28p.m.). The total system capability of Lana'i was 10,230 kW-gross at the time of the system peak resulting in a reserve margin of approximately 102 percent over the 2014 system peak.

At times during 2014, Lana'i received energy from Lanai Sustainability Research, LLC ("LSR"), a photovoltaic independent energy producer. Since this contract is not for firm capacity, it is not reflected in Lana'i's total firm generating capability.

Maui Electric developed and adopted its peak forecast in May 2014 that was used in this analysis for Lana'i.

Table 5 shows the expected reserve margins over the next three years, based on the May 2014 Forecast.

Table 5: Lana'i Division Reserve Margin Analysis

	System Capability at Annual Peak Load (Gross kW)	System Peak (Gross kW)	Reserve Margin (%)
Year	[A]	[B]	[A - B] / [B]
2014	10,230	5,075	102%
2015	10,230	5,200	97%
2016	10,230	5,300	93%
2017	10,230	5,300	93%

6.2 Reductions in Peak Demand: Lana'i's Energy Efficiency DSM Programs

Lana'i has had residential and commercial & industrial demand side management programs in place since 1996, which reduced the system peak by an estimated 221.6 kW-net (net of free riders).[8]

6.3 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.*

[8] Includes impacts from Maui Electric implemented energy efficiency programs and Hawai'i Energy Public Benefits Fee Administrator, for Program Years 2009-2013 as reported by Leidos Engineering in the Annual Reports to the Hawai'i Public Utilities Commission.

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.*

7. Moloka'i Division

7.1 Peak Demand and System Capability in 2014 - 2017

Moloka'i's 2014 system peak of 5,500 kW (gross) occurred on three different dates, with the most recent occurring on December 19, 2014 (6:21p.m.). The system peak also occurred on January 14, 2014 (6:27 p.m.) and February 17, 2014 (6:30 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 118 percent over the 2014 system peak.

Maui Electric developed and adopted its peak forecast in May 2014 that was used in this analysis for Moloka'i.

Table 6 shows the expected reserve margins over the next three years, based on the May 2014 forecast Peak Forecast.

Table 5: Moloka'i Division Reserve Margin Analysis

	System Capability at Annual Peak Load (Gross kW)	System Peak (Gross kW)	Reserve Margin (%)
Year	[A]	[B]	[A - B] / [B]
2014	12,010	5,500	118%
2015	12,010	5,600	114%
2016	12,010	5,600	114%
2017	12,010	5,700	111%

7.2 Reductions in Peak Demand: Moloka'i's Rider M and Energy Efficiency DSM Programs

At the time of system peak, Moloka'i had in place one load management contract totaling approximately 377 kW under Rider M, which reduced evening peak by approximately 292 kW. In addition, Moloka'i has had residential and commercial and

industrial energy efficiency DSM program from 1996, which reduced the system peak by and estimated 600.8 kW-net (net of free riders).[9]

7.3 Moloka'i Division Capacity Planning Criteria

Moloka'i Division's capacity planning criteria are identical to those of the Lana'i Division. See Section 2.3 above, Lana'i Division Capacity Planning Criteria.

8. Conclusion

Maui Electric's generation capacity for the islands of Lana'i and Moloka'i for the next three years (2015, 2016, and 2017) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies. Maui Electric expects to have an adequate amount of firm capacity for Maui Island to meet all reasonably expected demands for service and provide reasonable reserves for emergencies for the period 2014 to 2018 under its May 2014 forecast. Maui Electric anticipates needing additional firm capacity in the 2019 timeframe. Maui Electric's activities, such as those related to a Competitive Bidding Process and any parallel or contingency plans, will be based on the 2019 capacity need date.

Very truly yours,

Sharon M. Suzuki
President

Attachment – Appendix 1

c: Division of Consumer Advocacy (with Attachment)

[9] Includes impacts from Maui Electric implemented energy efficiency programs and Hawai'i Energy Public Benefits Fee Administrator, for Program Years 2009-2013 as reported by Leidos Engineering in the Annual Reports to the Hawai'i Public Utilities Commission.

Table A1:
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)
2014	262	191	0	38%
2015	254	195	0	30%
2016	250	198	5	30%
2017	250	204	6	27%
2018	246	210	7	22%
2019	210	214	8	2%

Notes:

I. System Capability includes:
- Maui Electric central station units at total normal capability in 2014 was 246.3 MW-net.
- Firm power purchase contract of 16.0 MW in 2014 from HC&S
- Firm power purchase contract of 8.0 MW in 2015 from HC&S.
- Expected reduction of firm power from HC&S to 4.0 MW in 2016 and 2017.
- Expected reduction of firm power from HC&S to 0.0 MW following December 31, 2017.
- Expected retirement of the units at the Kahului Power Plant (35.9 MW-net) in 2019.

II. System Peaks:
- The 2015-2019 annual forecasted system peaks are based on Maui Electric's May 2014 Forecast.
- The forecasted System Peaks for 2015-2019 include the estimated peak reduction benefits of third-party energy efficiency DSM programs.
- The Maui Electric annual forecasted system peak is expected to occur in the month of December.

III. Interruptible Load:
- Interruptible Load impacts are at the net-to system level, and are approximate impacts at the system peak.