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SHARON M. SUZUKI
President

January 29, 2016

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PUBLIC UTILITIES
COMMISSION

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.*

2016 Adequacy of Supply Report Summary

- Maui Electric's generation capacity for the islands of Lana'i and Moloka'i for the next three years (2016, 2017, and 2018) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies.
- For Maui island, without the peak reduction benefits of demand response but with the equivalent firm capacity value of wind generation, Maui Electric expects to have a small reserve capacity shortfall from 2017 to 2022. Maui Electric is evaluating several measures to mitigate the anticipated reserve capacity shortfall.
- Maui Electric anticipates needing a significant amount of additional firm capacity on the Maui system in the 2022 timeframe after the planned Kahului Power Plant retirement.
- Kahului Units 1 and 2 (with a combined rating of 11.4 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 2016 Adequacy of Supply ("AOS") total system capability includes the capacity from Kahului Units 1 and 2 through 2022.

- The Hawaiian Commercial and Sugar ("HC&S") Contract Amendment was approved on September 24, 2015. The Amendment includes HC&S providing 4 MW-net of capacity instead of 16 MW-net in 2016 and 2017.
- HC&S issued a Notice of Termination of Power Purchase Agreement to Maui Electric on January 6, 2016. The termination is effective as of twelve (12) months from the date of the notice. The 2016 AOS includes HC&S providing 4 MW-net capacity in 2016, and beginning January 2017, HC&S no longer provides capacity.
- The peak load experienced on Maui in 2015 was 202.2 MW net, and was served by Maui Electric's total capability of 258.3 MW net, including firm power purchases, but not including intermittent energy sources such as wind and solar. This represents a reserve margin of approximately 28 percent over the 2015 net system peak.
- The peak load experienced on Lana'i in 2015 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 the 2015 system peak.
- The peak load experienced on Moloka'i in 2015 was 5.55 MW-gross, and was served by Moloka'i's total capability of 12.01 MW-gross. This represents a reserve margin of approximately 116 percent over the 2015 system peak.

1. Peak Demand and System Capability in 2015

Maui's 2015 system peak occurred on Tuesday, September 1, 2015, at approximately 7:22pm and was 202.2 MW (net) or 206.6 MW (gross). During the peak, wind resources provided approximately 3 MW and there was no solar output.

The total system capability of Maui was 258.3 MW-net, including 12 MW-net from HC&S and 11.4 MW-net from Kahului units 1 and 2, but not including intermittent energy sources such as wind and solar. At the time of the system peak, the reserve margin was approximately 28 percent over the 2015 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 4.7 MW under Rider M, which reduced the evening peak by approximately 0.82 MW-net. In addition, Maui has had residential and commercial & industrial energy efficiency DSM programs, which reduced the system peak by an estimated 25.5 MW-net (net of free

[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.

riders).[2] The estimated system peak reduction is based on Maui Electric and Hawai'i Energy, PBF Administrator, records. Without the Rider M contracts and DSM impacts, the 2015 system peak would have been approximately 228.5 MW-net.

2. Estimated Reserve Margins

Attachment 1 shows the expected reserve margin over the next eight years, 2016-2023, based on Maui Electric's May 2015 Peak Forecast, which includes the estimated peak reduction benefits of energy efficiency .

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 programs, and (b) customer-sited photovoltaic ("PV") with battery 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
- increases or reductions of firm generating capacity. [§4.4]

The above mentioned forecasts are similar to those used in Maui Electric's 2015 AOS Report, filed on January 30, 2015. 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.

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:

[2] Includes impacts from Maui Electric implemented energy efficiency programs and Hawai'i Energy, Public Benefits Fee ("PBF") Administrator, for Program Years 2009-2014 as reported by Leidos Engineering in the Annual Reports to the Hawai'i Public Utilities Commission.

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 guideline 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.

In Maui Electric's Power Supply Improvement Plan filed on August 26, 2014, a proposed Reserve Margin planning guideline of 30 percent was used for capacity planning analysis. In addition to the 20 percent, a 30 percent Reserve Margin guideline will be considered.

3.1 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 2016 AOS Analysis

4.1 May 2015 Peak Forecast

Maui Electric developed and adopted its peak forecast in May 2015 ("May 2015 peak forecast"), for future planning purposes. Maui Electric's May 2015 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 2015 and 2016 AOS analyses. The analyses contained in the 2015 AOS were based on the May 2014 peak forecast.

Figure 1: Recorded Peaks and Future Year Projections

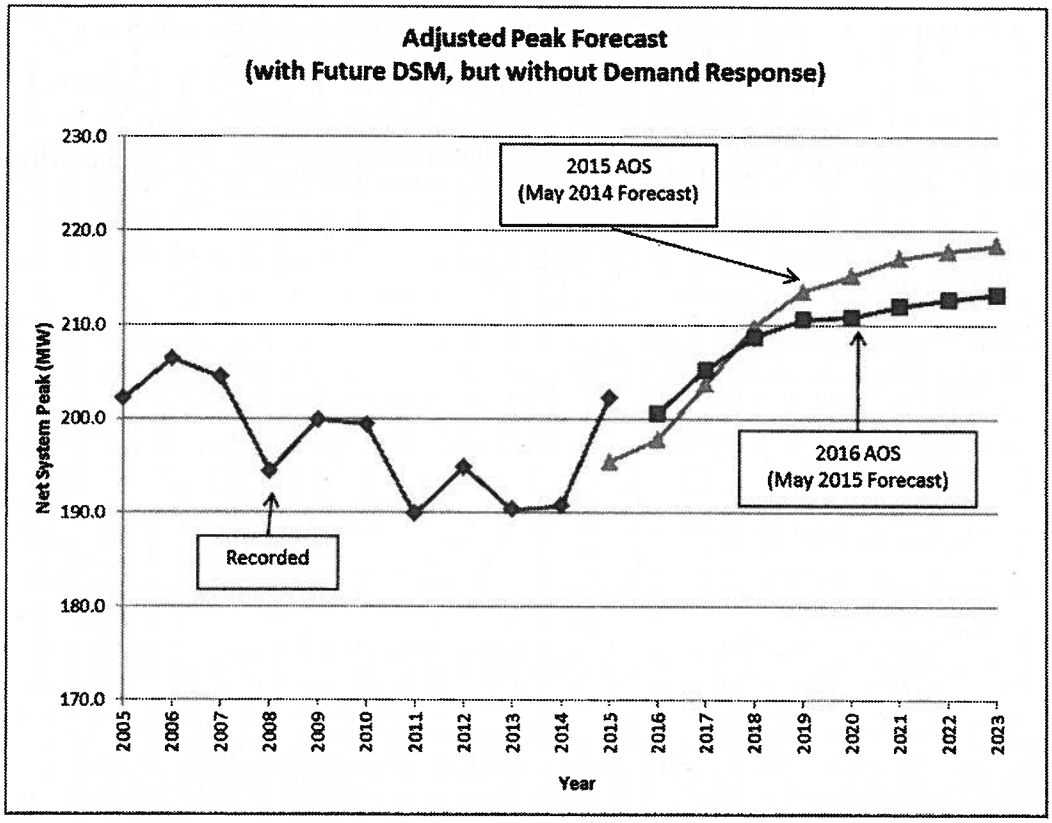

Table 1 below provides the recorded peaks from 2005 and compares the forecasts used in the 2015 AOS and in this 2016 AOS. The comparison between forecasts indicate the degree to which key planning assumptions such as the peak forecast can change in one year. It should be noted that the 2015 recorded Maui peak was 11.5 MW higher than the recorded peak in 2014 (190.7 MW (net)). The 2015 peak was also the highest peak experienced on Maui since 2007. (See Table 1 below.) The forecasted peak in the 2015 Maui Electric AOS letter, based on the May 2014 Maui peak forecast, was 195.4 MW (net). Therefore, the recorded peak in 2015 was 6.8 MW greater than what was forecasted in the May 2014 peak forecast. It should also be noted that the 2015 AOS assumed that the annual system peaks occur in December. The actual annual peak month can vary from year to year. The annual peak is assumed to occur in December because it the most common month for annual peaks to occur.

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 with battery and other renewable generation system

installations through the Net Energy Metering program, Standard Interconnection Agreements, and Feed-In Tariffs. 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 the advent of storage technology (i.e., battery energy storage system ("BESS")) for the consumer market, impacts of customer-sited PV paired with batteries were included in the peak forecast. With an operating assumption of BESS charging during the day time 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.

Table 1: Recorded Peaks and Future Year Projections

	Net System Peak (MW) (with Future DSM, but without Demand Response)			
Year	Actual	2015 AOS May 2014 Peak Forecast	2016 AOS May 2015 Peak Forecast	Difference 2016 - 2015 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	202.2	195.4		
2016		197.7	200.6	2.9
2017		203.7	205.3	1.6
2018		209.8	208.7	-1.1
2019		213.6	210.6	-3.0
2020		215.2	210.8	-4.4
2021		217.1	212.0	-5.1
2022		217.8	212.7	-5.1
2023		218.5	213.3	-5.2

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, 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 an interim DR Portfolio Application requesting:

- Approval of proposed tariff structure for DR programs;
- Approval of cost recovery mechanism;
- Approval of a 2-year program and budget approval cycle; and,
- Approval of the Companies' proposed reporting structure.

An update to the interim DR Portfolio Application, to be filed in mid-2016, will publish finalized DR program design and targets (in MW) following the Power Supply Improvement Plan ("PSIP") update filing in April 2016. Pending Commission approval of the DR Portfolio Application, the next AOS filing will be updated with the revised DR program targets (in MW). Maui Electric will continue to implement DR in accordance with these targets 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.

Given the pending DR Portfolio Application now before the Commission, for the purposes of the analysis in this report, the peak reduction benefits of DR were assumed to be zero.

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 11.4 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 2016 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 power purchase agreement ("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 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 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 February 26, 2015, HC&S and Maui Electric executed an amended and restated PPA in anticipation of its expiration ("Amended PPA"), and subsequently filed an application for approval of the Amended PPA on March 31, 2015. On September 24, 2015, the Commission issued Decision and Order No. 33160 approving Maui Electric's Amended PPA with HC&S.[6] The Amended PPA extended the term of the existing PPA to December 31, 2017, and provided that Maui Electric can purchase, at its request, scheduled energy from HC&S. On January 6, 2016, HC&S issued a Notice of Termination of Power Purchase Agreement to Maui Electric[7]. The termination is effective as of twelve (12) months from the date of the notice. Therefore, HC&S's contribution to the total system firm capacity will end on approximately January 6, 2017.

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

[4] K1 and K2 were reactivated at various times throughout 2015. These units were reactivated based on forecasts of insufficient total system capacity due to generator outages and minimal variable generation forecasted to meet the forecasted system load in accordance with the Company's Rule 1 capacity planning criteria, as well as for system security needs.

[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").

[6] Docket No. 2015-0094; Decision and Order No. 33160

[7] See Notice of Termination received from HC&S file on January 19, 2016 in Docket No. 2015-0094 ("HC&S January 6, 2016 letter").

For capacity planning purposes, Maui Electric assumes that HC&S will contribute 4MW toward total system firm capacity on the Maui system for calendar year 2016 and zero (0) MW for calendar year 2017 and thereafter. At this time, it is uncertain if there will be significant changes to the load that Maui Electric must serve due to the end of the sugar cane processing operations at HC&S. The 2016 AOS assumes that the cessation of delivery of electrical capacity and energy from HC&S in January 2017 will neither increase nor decrease the load that Maui Electric must serve. Maui Electric will continue to evaluate this situation.

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 assigning variable generation resources (e.g., wind) with an equivalent capacity value. Also examined is the effect of a 30 percent reserve margin guideline on future firm capacity needs in lieu of a 20 percent reserve margin guideline.

5.1 Description of Scenarios

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 percent probability level was used to determine a capacity value of 2.8 MW for the existing wind generation. This probability level means the wind output is expected to be 2.8 MW or higher during 90 percent of the daily peaks. Conversely, the risk is that wind power output is expected to be less than 2.8 MW during 10 percent of the daily peaks.

The Rule 1 criteria and two levels of reserve margin guideline are discussed for consideration in future capacity addition planning. As in previous filings, a 20 percent reserve margin guideline is discussed. In addition, a 30 percent reserve margin guideline is considered based on the PSIP. In Maui Electric's PSIP filed on August 26, 2014,[8] a proposed reserve margin planning guideline of 30 percent was used for capacity planning analysis.[9]

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 2017 under a set of assumptions including, but not limited to: (1)

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

continued implementation of third-party energy efficiency; (2) HC&S contract expiration in January 2017; and (3) planned retirement of the Kahului Power Plant in December 2022. Demand response program impacts have not been included in the analysis. Also included in Table 3 is the result for Rule 1 of the scenario that includes 2.8 MW toward total system firm capacity from the existing wind facilities.

If actual peaks are greater than forecasted, then capacity shortfalls will be greater. As shown in Table 1, the 2015 annual system peak (202.2 MW (net) on September 1, 2015) was the highest recorded peak from 2008 to 2014 and exceeded the May 2014 Peak Forecast by 6.8 MW-net.

The following Rule 1 analysis is based on annual peaks occurring in December 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 3: Maui Division Rule 1 Analysis

Year	Reference Case (MW)	Wind Capacity Scenario (MW)
2016	0.0	0.0
2017	-5.8	-3.0
2018	-3.4	-0.6
2019	-5.1	-2.3
2020	-5.0	-2.2
2021	-6.0	-3.2
2022	-6.5	-3.7
2023	-42.7	-39.9

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)	Wind Capacity Scenario (MW)
2016	25%	26%
2017	20%	21%
2018	18%	19%
2019	17%	18%
2020	17%	18%
2021	16%	18%
2022	16%	17%
2023	-1%	0%

Under the 20 percent reserve margin consideration described in Section 3.1, the Maui system would fall below the 20 percent reserve margin threshold in 2018. If the reserve margin guideline were assessed at a 30 percent level, then the Maui system would fall below the reserve margin in 2016.

5.3 Mitigation Measures

To avoid reserve capacity shortfalls, Maui Electric would implement one or more of the following mitigation measures (but would not be limited to these):

1. Implement demand response programs as a means to reduce the system load. Currently DR programs are in pilot and technical demonstration phases on Maui island.
2. Rely on the as-available wind resources to provide generation when the system needs it as shown in the wind capacity scenario analysis.
3. Request voluntary customer curtailment of demand during load service capability shortfall periods. This mitigation measure is subject to customer voluntary participation. If the level of participation is lower than anticipated, then reliability risks exist.
4. Pursue utility-owned or customer-owned and utility dispatched firm distributed generation ("DG"). Substation sites currently under consideration include transmission and distribution substation sites that have sufficient space, access, land use and zoning classifications, and compatibility with adjacent properties. Maui Electric is also examining the viability of installing DG on a temporary or permanent basis at Maui Electric's Waena property. This mitigation measure would provide a firm resource that would have potentially unlimited use to ensure system reliability.

5. Accelerate the installation of the next firm generating unit or energy storage systems.

6. Lana'i Division

6.1 Peak Demand and System Capability in 2015 - 2018

Lana'i's 2015 system peak of 5,075 kW (gross) occurred on October 21, 2015 (6:38p.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 2015 system peak.

At times during 2015, 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.

On March 6, 2015, the Company'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 has been reduced to 9,400 kW for years 2016 and 2017. The Company plans to replace the unit with similar equipment as soon as reasonably possible. The Company estimates a return to service in 2017.

Maui Electric developed and adopted its peak forecast in May 2015 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 2015 Forecast.

Table 5: 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]
2015	10,230	5,075	102%
2016	9,400	5,300	77%
2017	9,400	5,300	77%
2018	10,230	5,700	79%

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 233.6 kW-net (net of free riders).[10]

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.*

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 2015 - 2018

Moloka'i's 2015 system peak of 5,550 kW (gross) occurred on two different dates, with the most recent occurring on December 10, 2015 (6:31p.m.). The system peak also occurred on November 4, 2015 (6:22p.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 116 percent over the 2015 system peak.

[10] Includes impacts from Maui Electric implemented energy efficiency programs and Hawai'i Energy Public Benefits Fee Administrator, for Program Years 2009-2014 as reported by Leidos Engineering in the Annual Reports to the Hawai'i Public Utilities Commission.

Maui Electric developed and adopted its peak forecast in May 2015 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 2015 Peak Forecast.

Table 5: 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]
2015	12,010	5,550	116%
2016	12,010	5,500	118%
2017	12,010	5,500	118%
2018	12,010	5,500	118%

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 528 kW under Rider M, which reduced evening peak by approximately 359 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 612.8 kW-net (net of free riders).[11]

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 6.3 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 (2016, 2017, and 2018) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies.

[11] 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.

Maui Electric forecasts small reserve capacity shortfalls to occur on Maui starting in 2017, under its May 2015 forecast. Maui Electric is evaluating mitigations measures.

Maui Electric forecasts larger reserve capacity shortfalls to occur on Maui in year 2023 with the planned retirement of the units at the Kahului Power Plant in 2022. Maui Electric anticipates needing additional firm capacity on Maui in the 2022 timeframe.

Very truly yours,

Sharon M. Suzuki

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)
2015	258	202	0	28%
2016	250	201	0	25%
2017	246	205	0	20%
2018	246	209	0	18%
2019	246	211	0	17%
2020	246	211	0	17%
2021	246	212	0	16%
2022	246	213	0	16%
2023	210	213	0	-1%

Notes:

I. System Capability includes:
- Maui Electric central station units at total normal capability in 2015 were 246.3 MW-net.
- Firm power purchase contract of 8.0 MW from HC&S through October 26, 2015.
- Reduction of firm power from HC&S to 4.0 MW in starting October 27, 2015.
- Expected reduction of firm power from HC&S to zero MW following December 31, 2016.
- Planned retirement of the units at the Kahului Power Plant (35.9 MW-net) in 2022.

II. System Peaks:
- The 2016-2023 annual forecasted system peaks are based on Maui Electric's May 2015 Forecast.
- The forecasted System Peaks for 2016-2023 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:
- 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

As of December 31, 2015

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)	4.00	4.00	4.00	4.00
Hana 1(IV)	1.00	1.00	0.97	0.97
Hana 2(IV)	1.00	1.00	0.97	0.97
Maui System	255.70	252.10	250.28	246.69

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) All values for HC&S are net to the system. HC&S provides 4 MW of firm capacity starting October 27, 2015 based on the HC&S Contract Amendment which was approved by the PUC on September 24, 2015. Prior to October 27, 2015 HC&S was counted towards providing 12 MW total (8 MW purchase power plus 4 MW optional additional capacity).

(IV) 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.