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January 30, 2013

Sharon M. Suzuki
President

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PUBLIC UTILITIES COMMISSION

The Honorable Chair and Members of the
Hawaii Public Utilities Commission
465 South King Street
Kekuanaoa Building, 1st Floor
Honolulu, Hawaii 96813

Dear Commissioners:

Subject: Adequacy of Supply
Maui Electric Company, Limited ("MECO")

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.

1.0 Maui Division

1.1 Peak Demand and System Capability in 2012

Maui's 2012 system peak occurred on December 31, 2012, and was 194,800 kW (net) or 199,100 kW (gross). The total system capability of Maui was 262.3 MW (net) at the time of the system peak, resulting in a reserve margin of approximately 35% over the 2012 system peak, as shown in Attachment 1.

1.2 Determination of Maui Division's Adequacy of Supply

1.2.1 Maui Division 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.*
>
> *The sum of the reserve ratings of all units minus the reserve rating of the largest available unit minus the reserve ratings of any units on maintenance must be equal to or greater than the system peak load to be supplied.*
>
> *In addition, consideration will be given to maintaining a reserve margin of approximately 20 percent based on Reserve Ratings.*

1.2.2 Other Considerations in Determining the Timing of Unit Additions

The need for new generation is not based solely on the application of the criteria previously mentioned. As capacity needs become imminent, it is essential that MECO broaden its consideration to ensure timely installation of generation capacity necessary to meet its customers' energy needs. As stated in the Capacity Planning Criteria:

> *The preceding rules apply to capacity planning in long-range generation expansion studies. The actual commercial operation date for the next unit to be added shall also be determined using these rules as guides, with due consideration given to short-term operating conditions, equipment procurement, construction, regulatory approvals, financial and other constraints, etc.*

Other near-term considerations may include:

- 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;
- the forecasted minimum demand;
- required power purchase obligations and contract terminations;
- the unpredictable output of supplemental resources;

- the uncertainties surrounding Non-Utility Generation ("NUG") resources;
- transmission system considerations;
- meeting environmental compliance standards; and
- system stability considerations for MECO's isolated system.

1.3 Peak Demand

1.3.1 Recorded Peak Demand

Maui's 2012 system peak of 199.1 MW (gross) or 194.8 MW (net) occurred on December 31, 2012. The 2012 annual gross peak was 5.0 MW higher than the 2011 gross system recorded peak of 194.1 MW (gross) (or 189.9 MW (net)) set on February 17, 2011. In addition, the 2012 recorded peak (194.8 MW (net)) was 4.5 MW higher than the forecasted peak of 190.3 MW (net) per the MECO June 2012 peak forecast; see Table 1.9-1 of this letter. The following table shows the Maui historical system peak demand.

Table 1.3.1-1: Recorded System Peak Demand

Year	Recorded System Peak, MW-Net
2005	202.1
2006	206.4
2007	204.4
2008	194.4
2009	199.9
2010	199.4
2011	189.9
2012	194.8

For most of 2012, peak load continued to decline despite moderate economic recovery which was anchored by strong performance in the visitor industry. However, Maui's higher system peak in 2012 compared to 2011 appears to have been due to warmer, more humid weather in the fourth quarter of the year coupled with slight load growth driven by a slow increase in new commercial projects, partially offset by energy conservation and efficiency efforts.

1.3.2 Projected Peak Demand

On June 7, 2012, MECO adopted a new sales forecast and a new peak forecast ("June 2012 Peak Forecast"). The following table shows the projected peak demand for Maui over the next seven years:

Table 1.3.2-1: Maui Forecast Peak Demand (2013-2019)

Year	Forecast System Peak Demand with Peak Reduction Benefits of DSM (MW-Net)
2013	192.9
2014	195.8
2015	196.9
2016	198.2
2017	199.8
2018	202.7
2019	204.9

The June 2012 Peak Forecast was developed based on the June 2012 Sales Forecast. The sales and peak forecasts incorporated University of Hawaii Economic Research Organization's ("UHERO") Maui County economic forecast published in May 2012 as well as recognized 2011 recorded sales and peak demand, which included a significant decline in peak load despite strong recovery in the visitor industry. While cautious economic recovery continues, the energy efficiency projections included in the June 2012 forecast temper the growth in peak projections. The June 2012 forecast incorporated Hawaii Energy's most recent program year[1] results as well as the "30% of electric sales" goal set in Decision and Order No. 30089, issued January 3, 2012 in the Energy Efficiency Portfolio Standards ("EEPS") Framework proceeding (Docket No. 2010-0337). Adjustments to the long-term projection will be made as forward looking projections become available from the third party administrator.

The June 2012 Sales and Peak Forecasts also recognized a few large commercial projects, such as the Courtyard by Marriott, Andaz Wailea (formerly Renaissance Wailea Beach Resort), Hyatt Timeshare, Advanced Technology Solar ("ATS") Telescope, and the Grand Wailea's room expansion project, that

[1] Hawaii Energy, Hawaii Public Benefits Fee Administrator ("PBFA"), Program Year 2010.

are forecasted to contribute to the load growth over the next six to seven years. The increased demand from future economic growth and these large projects is forecasted to be substantially offset by customers' energy conservation and efficiency efforts and installations of renewable energy generation such as photovoltaic ("PV") systems. The net result is forecasted to be slow positive growth in peak demand.

However, MECO needs to continue to evaluate and plan for the implementation of several different resource options that could serve as contingencies in the short and long term should load growth occur at a higher rate than forecasted. These contingencies are discussed in more detail in Section 1.9 of this letter.

1.4 Reductions in Peak Demand

1.4.1 MECO's Energy Efficiency DSM Programs (Maui Division)

At the time of the system peak, Maui had in place ten load management contracts totaling approximately 5,800 kW under Rider M, which reduced the evening peak by approximately 2,800 kW. In addition, Maui has had residential and commercial & industrial energy efficiency DSM programs from 1996, which reduced the system peak by an estimated 19,166 kW-net (net of free riders).[2] The estimated system peak reduction is based on MECO and Hawaii Energy, Hawaii Public Benefits Fee (PBF) Administrator, records.

On January 3, 2012, the Commission attached the Framework for Energy Efficiency Portfolio Standards ("EEPS Framework") as an exhibit to Decision and Order No. 30089 ("D&O 30089"), Docket No. 2010-0037. Energy Efficiency Portfolio Standards ("EEPS") is designed to achieve 4,300 GWh of electricity use reductions statewide by 2030 or to achieve some other level of reduction as may be determined by the Commission. The EEPS Framework contained "Performance Period Goals" in Tables 2 and 3 therein in which specific targets of electricity use reductions were set from 2009 to 2030, in which the 4,300 GWh of electricity use reduction would be achieved by 2030. Goals may also be revised through evaluations, scheduled every five years based on the recommendations of the Technical Working Group ("TWG"). The energy reduction targets incorporated in MECO's June 2012 sales and peak forecast were lower than the

[2] In addition to MECO implemented energy efficiency programs, Hawaii Energy, Public Benefits Fee Administrator, reported system level kW impacts, net of free-riders, of 1,488 kW for Program Year (PY) 2009, July 1, 2009 – June 30, 2010, 1,819 kW for PY2010, July 1, 2010 – June 30, 2011, and 1,684 kW for PY 2011, July 1, 2011 – June 30, 2012 as reported in the RW Beck Annual Report to the Hawaii Public Utilities Commission, dated September 10, 2010, November 22, 2011, and December 3, 2012, respectively.

EEPS targets in the near term, however they reflect achievement of the "30% of electric sales" EEPS goal in 2030.

Table 1.4.1-1: Maui Estimated Reductions from DSM

Year	Forecasted Sales Reduction (MWH)	Forecast Peak Reduction (MW)
2013	108,792	17.4
2014	120,046	18.8
2015	131,300	20.3
2016	142,554	21.6
2017	153,808	23.0
2018	165,062	24.4
2019	176,316	25.7

1.4.2 Maui Load Management DSM Program

Based on the MECO March 2011 sales and peak forecast, MECO had intended to pursue load management DSM programs for the island of Maui. However, due to forecasted lower peaks in the June 2012 Peak Forecast, the need for additional firm capacity has been deferred and is expected to occur in 2019. Therefore, MECO has decided to delay the submission of the load management applications and will re-evaluate the program design and implementation timeline to determine the appropriate load management or demand response resource to implement.

MECO will continue to study and evaluate demand response resource options and technologies in support of future programs to provide associated benefits to the electrical system and customers.

1.4.3 Distributed Generation ("DG")

Firm DG resources can provide generating capacity if they can be reliably dispatched by the utility, or can provide reliable load reductions if operated by customers. MECO is also evaluating the potential for firm DG resources to provide additional quick start generating capacity to address increased wind capacities from the 21 MW Kaheawa Wind Power II project and the 21 MW Auwahi Wind Energy wind project. See Section 1.10 for a discussion of the quick starting generating capacity to accept greater amounts of as-available energy.

MECO, with Hawaiian Electric's assistance, will continue to evaluate its options with DG, including potential utility-sited DG projects and dispatchable standby generation ("DSG") projects similar to Hawaiian Electric's Honolulu Airport DSG Project.

1.5 Total Firm Capacity

1.5.1 Total Maui Division Firm Capacity

The Maui Division has a total of 246.3 MW-net of firm capacity. A summary of MECO's firm capacity, as of December 31, 2012, is shown in Attachment 2.

1.5.2 HC&S Power Purchase Agreement ("PPA")

On July 25, 2007, MECO filed a letter with the Commission in Docket No. 6616 (Hawaiian Commercial & Sugar Company ["HC&S"]), which informed the Commission that MECO and HC&S agreed on July 2, 2007 not to issue a notice of termination of the PPA resulting in termination of the PPA prior to the end of the day on December 31, 2014.[3] This agreement was reached so that HC&S would have more certainty as to the future revenue sources supporting its sugar business, MECO would be able to rely on the continued availability of power from HC&S (a firm, non-fossil fuel power producer) beyond the end of 2011 in planning MECO's generating system and in meeting its Renewable Portfolio Standards, and both parties would have additional time in which to consider HC&S' future plans before negotiating a new, long-term PPA.

On September 30, 2011, MECO sent a letter to HC&S that proposed to amend the agreement in the July 2, 2007 letter and replace it with an agreement that neither party would give written notice of termination resulting in the termination of the PPA prior to the end of the day on December 31, 2017. This letter also outlines the possibility that HC&S may give, not less than thirty (30) days, notice to MECO to terminate the PPA, if HC&S is unable to meet the U.S. Environmental Protection Agency ("EPA") rule for Major Source Boiler MACT.[4]

[3] A previous agreement between MECO and HC&S (June 28, 2005) not to issue a notice of termination of the PPA resulting in the termination of the PPA prior to the end of the day on December 31, 2011. MECO filed the June 28, 2005 letter with the Commission on July 27, 2005 in Docket No. 6616. At the time, the resulting need date for new firm capacity was deferred from 2009 to 2011.

[4] On March 21, 2011, the EPA issued a final rule to regulate emissions of hazardous air pollutants (HAP) from industrial, commercial, and institutional boilers and process heaters located at major sources of HAP emissions (the "Major Source Boiler MACT"). On May 18, 2011, the EPA published notice in the Federal Register postponing the effective date of the Major Source Boiler MACT rule, as well as a rule concerning commercial and industrial solid waste incineration units. The notice provided, in pertinent part, "This delay of effectiveness will remain in place until the proceedings for judicial review are completed or the EPA completes its reconsideration of the rules,

HC&S would have to reasonably determine that the Major Source Boiler MACT applies to HC&S and after taking commercially reasonable efforts to determine the effort and expense that would be required to comply with the Major Source Boiler MACT rule, HC&S reasonably determines that its compliance plan regarding the Major Source Boiler MACT rule is to cease operating its boilers prior to December 31, 2017.

On September 10, 2012, MECO sent a letter to HC&S notifying them that MECO is proceeding with plans to solicit a Request for Proposals (RFP) for new firm renewable energy generating capacity to acquire new generation capacity in 2019. Because HC&S would need to be operational through at least 2020 to provide generating capacity deferral value to MECO, a two or three-year extension to the existing HC&S PPA is no longer feasible. HC&S has the option to participate in this RFP; however, given HC&S' important role in the economy of Maui and the State of Hawaii, MECO stated that it is willing to explore with HC&S the possibility of negotiating a new PPA through the 2020 timeframe, subject to receiving a waiver from competitive bidding from the Public Utilities Commission in accordance with the Commission's Framework for Competitive Bidding. Alternatively, if HC&S is unable to consider entering into a PPA of this length, MECO would consider a new PPA that reflects the lack of longer term capacity value, such as energy only payments.

On December 10, 2012, MECO signed a Letter Agreement with HC&S to allow the parties to continue discussions relating to the new PPA and agree that either party may provide written notice of termination on or before June 30, 2013 (rather than December 31, 2012, as described in the Letter Agreement dated July 2, 2007 between MECO and HC&S) to terminate the PPA as of the end of the day on December 31, 2014.

As of January 30, 2013, MECO and HC&S continue to be in communication about this matter.

For planning purposes, MECO assumes the HC&S PPA will terminate at the end of 2014. If the PPA is assumed to continue in effect beyond 2014, the timing for the need for future increments of firm capacity could be affected.

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whichever is earlier, and the Agency publishes a notice in the Federal Register announcing that the rules are in effect." 76 Fed Reg 28662 (May 18, 2011). On December 23, 2011 EPA published proposed revisions to the Major Source Boiler MACT rule. On January 9, 2012, the U.S. District Court for the District of Columbia vacated the EPA rule that delayed implementation of the EPA's final Major Source Boiler MACT rule. The vacatur may be interpreted as reinstating the effective and compliance dates. On December 21, 2012, EPA finalized amendments to the Major Source Boiler MACT rule. The effective date of the rule will be 60 days from the date of publication in the Federal Register. The compliance date is three years from the date of publication in the Federal Register.

1.5.3 Total Firm Capacity on Maui

The total firm generating capacity on Maui is 262.3 MW-net, including both MECO and HC&S generation. The Maui Division's total system capacity would be reduced by 16 MW if HC&S does not continue its operations beyond the December 31, 2014 termination date of the existing power purchase contract.

1.6 Load Service Capability

Based on the forecast provided in Section 1.3.2 above (including the peak reduction benefits of energy efficiency DSM), the projected peak reduction benefits of load management programs, the assumption that the HC&S PPA will terminate at the end of 2014, the total existing firm capacity on the MECO system, Maui Division's planned maintenance schedule as of July 2012, and the application of MECO's capacity planning criteria, there are projected reserve capacity shortfalls starting in 2019, as shown in the following tables below, with the assumption that no new firm capacity is added to the system.

Table 1.6-1: Projected Reserve Margins

Year	Forecast Peak Demand (MW-Net)	Total Firm Capacity on MECO System (MW-Net)	Reserve Margin (%)
	[A]	[B]	(B-A)/(A)
2013	192.9	262.3	36%
2014	195.8	262.3	34%
2015	196.9	246.3	25%
2016	198.2	246.3	24%
2017	199.8	246.3	23%
2018	202.7	246.3	22%
2019	204.9	246.3	20%

Table 1.6-2: Load Service Capability Margin Shortfall

and Reserve Capacity Deficit Based on 20% Reserve Margin

Year	Forecast Peak Demand (MW-Net)	Total Firm Capacity on MECO System (MW-Net)	Largest Load Service Capability Margin Shortfall (Rule 1) (MW-Net)	Largest Reserve Capacity Deficit by 20% Minimum Reserve Margin (MW-Net)
2013	192.9	262.3	0.0	0.0
2014	195.8	262.3	0.0	0.0
2015	196.9	246.3	0.0	0.0
2016	198.2	246.3	0.0	0.0
2017	199.8	246.3	0.0	0.0
2018	202.7	246.3	0.0	0.0
2019	204.9	246.3	-1.4	0.0

1.7 Impact of New Forecast on Need for Additional Firm Generating Capacity

Notwithstanding HC&S's willingness to continue beyond December 31, 2014, HC&S's actual ability to continue will depend on when the final Major Source Boiler MACT rules become effective. As such, MECO's base planning scenario at this time continues to assume that HC&S will cease its sale of firm power to MECO after December 31, 2014.

1.7.1 Other Considerations in Determining the Timing of Unit Additions

The determination of the timing of the need for additional firm capacity is not based solely on MECO's capacity planning criteria. For example, Section 1.2.2 identified other factors that are considered. In addition, consideration is given to the uncertainty of the inputs used in the application of MECO's capacity planning criteria. For example, there may be an increasing need for firm capacity in the future if:

- The system peak is higher than forecasted. This could be due to hotter weather, lower rainfall resulting in higher irrigation and drinking water pumping loads or more rapid than forecasted economic growth that

result in greater than forecasted peak demand. Consideration may be given to a higher peak forecast scenario as a representation of non-normal weather or more rapid economic growth.

- DSM programs (energy efficiency and load management) provide peak reduction benefits that are less than currently projected.

- Recently promulgated environmental standards for air emissions cause a change in normal operation of existing units, such as lower normal top load capacity operation. In 2010 and 2011, the Environmental Protection Agency established emission regulations for MECO and the other Hawaiian Electric Companies. The applicable regulations with the associated estimated compliance dates are as follows:

    - Reciprocating Internal Combustion Engines National Emissions Standards for Hazardous Air Pollutants ("RICE NESHAP") – May 3, 2013

    - 1-Hour SO_2 National ambient Air Quality Standards ("NAAQS") – no later than August 2017, subject to regulatory determinations regarding statewide compliance requirements and schedules.

MECO has already committed to using lower sulfur fuel, in applicable existing units, to comply with RICE NESHAP by May 3, 2013. MECO is currently evaluating various means, such as using lower sulfur fuels and the installation of post-combustion emission abatement equipment as potential compliance measures for NAAQS. MECO is also considering whether or not the retirement of certain existing units would be viable compliance measures. The retirement of existing generating units would result in the need to add replacement firm capacity. This was a consideration in establishing the size of the firm capacity Request For Proposals, which is discussed in Section 1.8.4.1 below.

Conversely, if, individually or cumulatively, DSM programs, third party CHP projects, and load management programs provide greater impacts than currently forecasted, if system peak demand is lower than currently forecast, if HC&S and MECO are successful in contract extension negotiations, and/or if planned or unplanned firm projects on Maui enter the system prior to 2019 then the timing of the need for additional firm capacity could be deferred beyond 2019. In summary, MECO considers a number of potential scenarios with different

inputs, or different levels of inputs, to determine when new firm generating capacity should be installed.[5]

1.8 Acquisition of Additional Firm Generating Capacity

1.8.1 Competitive Bidding is the Required Acquisition Mechanism

On December 8, 2006, the Framework for Competitive Bidding ("CB Framework") was adopted by the Commission in Decision and Order No. 23121 ("D&O 23121") in Docket No. 03-0372, pursuant to HRS §§ 269-7 and 269-15, and Hawaii Administrative Rules § 6-61-71. The Commission's CB Framework states that "[c]ompetitive bidding, unless the Commission finds it to be unsuitable, is established as the required mechanism for acquiring a future generation resource or a block of generation resources, whether or not such resource has been identified in a utility's IRP."[6]

As stated above, MECO will need additional firm capacity in the 2019 timeframe. MECO will seek to acquire the additional firm capacity through a competitive bidding process.

1.8.2 Exemptions to the CB Framework

In D&O 23121, the Commission adopted "exemptions based on size" as proposed by the HECO Utilities. One exemption given in Section II.A.3.f. on page 5 of the CB Framework states in relevant part:

> This Framework also does not apply to: (i) generating units with a net output available to the utility of 1% or less of a utility's total firm capacity, including that of independent power producers, or with a net output of 5 MW or less, whichever is lower. For systems that cover more than one island (i.e., MECO's system, which has generation on Maui, Molokai and Lanai), the system firm capacity will be determined on a consolidated basis.

MECO's total firm capacity (gross reserve MW) as of December 31, 2012 is 290.11 MW, which is based on the following:

Maui:	267.7 MW
Lanai:	10.4 MW
Molokai:	12.01 MW

[5] On June 30, 2010, MECO submitted an update to the January 28, 2010 AOS letter to the Commission. Sensitivity analyses (high peak, low peak, HC&S extension scenario) were provided in the AOS update letter.
[6] CB Framework, Section II.A.3. on page 3.

One percent of MECO's total firm capacity is 2.90 MW. As a result, for MECO, the CB Framework would not apply to proposed generating units with a net output available to the utility of 2.90 MW (i.e., the lower of 2.90 MW and 5 MW) or less.

1.8.3 Foundation for the Request For Proposals ("RFP")

The foundation for the RFP was provided in MECO's 2011 AOS. The CB Framework states "Any electric utility's IRP shall specify the proposed scope of the RFP for any specific generation resource or block of generation resources that the IRP states will be subject to competitive bidding."[7] However, the Commission suspended the IRP process as of December 9, 2008 when it issued an Order Closing Docket No. 04-0077 (Maui Electric Company, Limited, Integrated Resource Planning).

The Commission attached as an exhibit to the Order filed March 14, 2011 in Docket No. 2009-0108 (Instituting a Proceeding to Investigate Proposed Amendments to the Framework for Integrated Resource Planning), a revised IRP framework that governs energy resource planning by electric and gas utilities in the State of Hawaii ("Revised Framework"). On March 1, 2012, the Commission issued Order No. 30233 in Docket No. 2012-0036 initiating the IRP process for the Hawaiian Electric Companies. On June 29, 2012, the Commission issued Order No. 30513 that established the Advisory Group for the Hawaiian Electric Companies' IRP process. The Hawaiian Electric Companies have until June 29, 2013 to file their IRP Report and Action Plan. The procedural milestones for Docket No. 2012-0036 call for the Commission to render a decision on the Hawaiian Electric Companies' IRP Action Plan, to the extent possible, 180 days from the filing of the IRP Report and Action Plan.

With the IRP process on-going, MECO continues to assess the adequacy of its generating resources to provide reliable service and files Adequacy of Supply reports annually, as part of its normal planning work. As a result, MECO is providing the scope of the RFP herein.

1.8.4 Scope of the RFP

1.8.4.1 Size (in MW) of RFP

MECO currently plans to seek up to 30 MW of firm capacity to accommodate anticipated load growth and to maintain generating system reliability in the event the HC&S PPA does not extend past the end of 2014, and to allow MECO to possibly replace existing oil-fired generating capacity. In addition, MECO is currently working on environmental

[7] Id., Section II.B.1., on page 7

compliance plans for its generating units, and this may have an effect on the total system capability. The RFP will be prepared in such a manner as to allow bidders to participate in bidding options aligned with the firm capacity needs for MECO.

1.8.4.2 Timing of Firm Capacity Needs

Based on the load service capability described in Section 1.6, above, capacity will need to be in service by 2019 to accommodate the potential loss of HC&S capacity and anticipated load growth.

However, provisions in the RFP will be included to indicate that the capacity need dates may change due to unforeseen conditions and that bidders should provide adjustment mechanisms in their proposals should MECO's need for capacity change.

Should HC&S be able to continue with certainty beyond 2014(extent of time frame pending discussions and agreements between MECO and HC&S, and Commission approval), MECO may still have a need for capacity in 2019 depending on the measures implemented to meet the environmental compliance standards and forecasted system load.

1.8.4.3 Attributes of New Generation

The RFP will not specify the type of generating technology bidders should propose. Rather, the RFP will specify the attributes that proposed resources should possess. The attributes of desired future firm generating capacity are described below. Definitions of the terminology are described in Attachment 3. The description of the attributes and the definitions of the terminology will be refined as needed in the draft and final RFPs.

- Firm Capacity – Each generator must provide firm capacity at rated power factor;[8]
- Dispatchable – Each generator must be fully dispatchable between its minimum and maximum range by Maui Electric;
- Each generator must be able to cycle on and off multiple times per day;

[8] Firm Capacity means the amount of energy producing capacity which can be guaranteed to be available at a given time.

- The size of any one generator shall not exceed 15 MW at unity power factor;
- Each generator must be able to help regulate (via AGC) and stabilize (via droop) the system frequency. The unit should be capable of setting and operating with a 4% droop characteristic;
- Each generator must be able to help regulate voltage;
- Each generator must be able to deliver reactive power at output levels within, and up to the limit of the reactive capability curves of each generator while delivering rated (MW) output. The generator capability (MVA rating) should range from 0.85 lagging to 0.90 leading power factor;
- Each generator will be evaluated on the range of output of the unit as a fraction of its rated full output (larger is better).
- Each generator must be able to increase or decrease its power output at a rate equal to or greater than 5 MW per minute;
- The input energy (such as the fuel supply) to the generator must be "renewable" under the RPS;
- Each generator must be able to operate on multiple fuel types to switch when the lowest priced fuel type changes.
- Each generator must use commercially available and proven technology;[9]
- Each generator will be evaluated for its black-start capability (i.e. capability of starting up on a completely de-energized utility grid);
- Generators with black start capability must have the capability to operate in either isochronous or governor droop modes with the ability to transition from one mode to the other on the fly;

[9] Commercially available and proven technology means technology that has been in commercial operations at the size consistent with the Bidder's offering (at full output) for at least one (1) year when the draft RFP is released for technical input in the United States and where the owner is receiving revenues for the output (i.e., not a technology supplier demonstrating its own technology).

- For the 30 MW required by 2019, all 30 MW of new capacity shall be able to start up and run up to full load within 30 minutes or less from the time a start-up signal is received. In addition, 10 MW of the 30 MW block will be reserved for 5-minute quick-starting capacity. This 10 MW of new capacity is the output that can be provided within 5 minutes (i.e., the time between the start signal and synchronizing the generator to the system, closing the breaker and reaching 10 MW load shall be 5 minutes or less). Quick-start units, after having attained minimum load, must be immediately available to be ramped up to full load operation and meet all environmental requirements for operation. For any generation resource(s) less than 10 MW (at unity power factor), the new capacity will be required to provide full output within 5 minutes. For resources greater than 10 MW (at unity power factor), the new capacity will be required to provide 10 MW within 5 minutes from the time the start-up signal is received, with the remaining capacity beyond 10 MW to be provided within 30 minutes or less from the time a start-up signal is received.

- The capacity to be provided may come from multiple Generators.

- Facility scheduled maintenance outage to result in no more than 15 MW of unavailable capacity.

1.8.4.4 Other Considerations

The design of the RFP will also take into consideration other matters, such as reducing curtailment of as-available generation from both existing and future resources, meeting environmental compliance requirements, supporting the recommendations of Reliability Standards Working Group[10], and Maui County's RFP for a waste-to-energy facility. In light of the importance of the potential project to the County's long range solid waste management plans, Maui Electric is willing to work with the County of Maui to pursue a waiver from the Framework for Competitive Bidding, subject to Commission review of whether the plans are in the best interests of Maui customers.

[10] In Docket No. 2011-0206.

1.8.5 Competitive Bidding Process

1.8.5.1 Request Commission Open a Docket and Approval of Independent Observer

On January 31, 2011, MECO submitted to the Commission a Request to Open New Docket and Approval of Independent Observer Contract. On February 24, 2011 the Commission opened Docket No. 2011-0038 (Instituting a Proceeding Related to a Competitive Bidding Process for Firm Generating Capacity on Maui) to receive filings, review approval requests, and resolve disputes, if necessary, in connection with MECO's plan to proceed with a competitive bidding process to acquire up to approximately 50 megawatts of new, renewable firm dispatchable capacity generation resources on the island of Maui, with the initial increment coming on line in the 2015 time frame. On November 16, 2011, the Commission selected Boston Pacific Company, Inc. as the Independent Observer to monitor the competitive bidding process and report on the progress and results to the commission.

Subsequent to the MECO June 2012 sales and peak forecast, MECO plans to seek up to 30 MW of firm capacity with an anticipated in-service date of 2019.

1.8.5.2 Timeline

The proposed timeline for the competitive bidding process is anticipated to take between 18 and 27 months from the issuance of the Draft Request for Proposals to selection of the Final Award Group. The actual timeline will be influenced by the number of bids received and the complexity of any issues that may be raised by participants.

1.9 Contingency Planning for Capacity Needed in 2019

Based on the currently forecasted 2019 need date for the next increment of firm capacity on Maui, MECO plans to solicit proposals in the 2013 timeframe, pursuant to the CB Framework, for new generating capacity via a competitive bidding process. MECO may have a limited ability to accelerate the installation schedule given the lead-time required in connection with a competitive bidding process and for the successful bidder to acquire the necessary permits, procure major equipment and construct the facility by 2019. However, with MECO targeting installation of new capacity by 2019, MECO will continue to perform contingency planning for the implementation of mitigating measures, given the uncertainties described above and to allow more time for the proper procedures involved with adding firm capacity to the Maui system.

As Table 1.9-1 illustrates, forecasted peaks can change dramatically from one forecast to the next for various reasons. While forecasted peaks showed a marked decrease from the March 2011 peak forecast to the June 2012 peak forecast, a continued decrease or dramatic increase in forecasted peaks can also occur from one forecast to the next, as MECO has experienced in the past.

Table 1.9-1: Comparison of Forecast Peaks

Year	Peak (MW-Net) Reduced by Energy Efficiency DSM			
	Recorded	March 2011 Forecast	June 2012 Forecast	Difference (June 2012 minus March 2011)
2005	202.1			
2006	206.4			
2007	204.4			
2008	194.4			
2009	199.9			
2010	199.4			
2011	189.9	202.1		
2012	194.8	203.5	190.3	-13.2
2013		206.0	192.9	-13.1
2014		207.5	195.8	-11.7
2015		209.9	196.9	-13.1
2016		212.3	198.2	-14.1
2017		214.4	199.8	-14.6
2018		216.4	202.7	-13.7
2019		218.8	204.9	-13.9

Higher demand could advance the need for additional firm capacity by one year or more. Should MECO need additional firm capacity before 2019, MECO could implement one or more of the following mitigation measures (but would not be limited to these): pursuing utility-owned or customer-owned and utility dispatched firm distributed generation, re-scheduling unit overhaul schedules, increase utilization of existing units (i.e. run the units longer and/or up to their maximum capacities), coordinating with HC&S for the delivery of supplemental power (pending possible contract extension), pursuing load management programs, or requesting voluntary customer curtailment of demand during load service capability shortfall periods.

With the unit addition need date for firm capacity forecasted for 2019, MECO will continue to explore and evaluate appropriate supply-side and demand-side resources for the Maui Division system.

1.10 Additional Capacity May be Installed to Reduce Regulating Reserve

In 2011, Stanley Consultants, Inc completed a study called "Operational Flexibility Study for the Integration of Renewable Generation" for MECO. The study provided analyses that determined "what operational procedures or strategies and what equipment modifications are necessary to improve the MECO systems' operating flexibility, mitigate system heat rate impacts, and maintain reliable unit and system operation." One of the resources identified that would improve operating flexibility to permit more as-available generation on the system was the addition of fast-start diesel generators. Fast-start diesel generator would provide the following advantages:

- Reduce the need to supply regulating reserve from units that are actually operating or "spinning"
- Increase renewable as-available energy
- Lower system heat rate
- Reduce fossil fuel consumption
- Add firm generation to the system to reduce or eliminate the possible load service capability margin shortfall during the period between HC&S ceasing operation at the end of 2014 or sometime thereafter, and when the large firm capacity resource is added to the system via the competitive bidding process.

As a result of the Stanley Consultant, Inc. study, MECO plans to further investigate the possibility of installing a 2.9 MW distributed generating engine at the Waena site ("Waena DG"). It is anticipated that the Waena DG would burn biofuel. The Waena DG could provide the foundation for installing additional quick-starting units that may improve system heat rate efficiency and increase renewable energy. Also, with the infrastructure in place at the Waena site, this would provide MECO with the means to install the mitigation measures, as explained in Section 1.9, should capacity shortfall conditions occur prior to the installation of the firm generating resource in 2019, through the Competitive Bidding Process.

2.0 Lanai Division

2.1 Peak Demand and System Capability in 2012 - 2015

Lanai's 2012 system peak of 4,700 kW (gross) occurred on October 25, 2012. Lanai had a 2012 reserve margin of approximately 118%. Attachment 1, Table 2, also shows the

expected reserve margins over the next three years, based on the MECO 2012-2045 Peak Forecast dated June 2012.

2.2 Reductions in Peak Demand: Lanai's Energy Efficiency DSM Programs

Lanai has had residential and commercial & industrial demand side management programs in place since 1996, which reduced the system peak by an estimated 161.6 kW-net (net of free riders).[11] Similar to Maui, energy efficiency impact projections reflected in the AOS analyses are based on the expectation that DSM impacts would continue at the same rate as Hawaii Energy's performance in PY2009. Adjustments to the long-term projection will be made as further information becomes available from the third party administrator.

2.3 Lanai Division Capacity Planning Criteria

The following criterion is used to determine the timing of an additional generating unit for the Lanai Division and the Molokai 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.*

[11] In addition to MECO implemented energy efficiency programs, Hawaii Energy, PBF Administrator, reported system level kW impacts, net of free-riders, of 10 kW for the PY 2009, July 1, 2009 – June 30, 2010 and 2.0 kW for the PY2010, July 1, 2010 – June 30, 2011, and 1.0 kW for the PY2011, July 1, 2011 – June 30, 2012 as reported in the RW Beck Annual Report to the Hawaii Public Utilities Commission, dated September 10, 2010, November 22, 2011 R2, and December 3, 2012, respectively.

2.4 Lanai Combined Heat and Power Project

The Commission approved the CHP agreement between MECO and Castle & Cooke in Decision & Order No. 24058, filed February 28, 2008, in Docket No. 2006-0186. The project was completed and placed in-service on September 30, 2009.

2.5 Lanai Sustainability Research ("LSR") Project

The Lanai Sustainability Research project on the island of Lanai is a 1.2 MW photovoltaic ("PV") facility. The PV facility was first placed into service on December 19, 2008. Under the current PPA between MECO and LSR, the output of the facility will be integrated into the Lanai system in phases. In April 2011, LSR began the integration of the battery energy storage system ("BESS") into its facility, with operations of the BESS commencing upon completion of the installation in August 2011. The facility has been operating on a conditional basis at its rated output of 1.2 MW since June 27, 2012. The PV facility does not affect the Lanai system capability because it is an as-available resource.

Although, the addition of the Manele Bay CHP unit and the 1.2 MW as-available photovoltaic facility on Lanai presents operational challenges on existing units at Miki Basin, these installations also present a unique opportunity to integrate an as-available resource and a heat recovery resource into the Lanai grid. These projects allow MECO the opportunity to learn from these installations and to look at this as a stepping stone toward a greater amount of renewable energy resources into the utility grids. Interconnection and protection studies have been performed to identify the design and operational considerations for the integration of these projects into the Lanai system. In addition, the changes to the system are continually monitored.

3.0 Molokai Division

3.1 Peak Demand and System Capability in 2012 - 2015

Molokai's 2012 system peak of 5,600 kW (gross) occurred on December 5, 2012. Molokai had a 2012 reserve margin of approximately 114%. Attachment 1, Table 2, also shows the expected reserve margins over the next three years, based on the MECO 2012-2045 Peak Forecast dated June 2012.

3.2 Reductions in Peak Demand: Molokai's Energy Efficiency DSM Programs

At the time of the system peak, Molokai had in place one load management contract totaling 390 kW under Rider M, which reduced the evening peak by

approximately 137 kW. In addition, Molokai has had residential and commercial & industrial DSM programs in place since 1996, which reduced the system peak by an estimated 540.8 kW-net (net of free riders).[12] Similar to Maui and Lanai, energy efficiency impact projections reflected in the AOS analyses are based on the expectation that DSM impacts would continue at the same rate as Hawaii Energy's performance in PY2009. Adjustments to the long-term projection will be made as further information becomes available from the third party administrator.

3.3 Molokai Division Capacity Planning Criteria

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

4.0 Conclusion

MECO's generation capacity for the islands of Lanai and Molokai for the next three years (2013, 2014, and 2015) is sufficiently large to meet all reasonably expected demands for service and provide reasonable reserves for emergencies. MECO 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 2012 to 2018 under the June 2012 Peak Forecast. MECO anticipates needing additional firm capacity in the 2019 timeframe. MECO's activities, such as those related to an RFP and any parallel or contingency plans, will be based on that need date. MECO will give consideration to mitigation measures should future forecasts project higher than currently forecasted peak demand.

Very truly yours,

Sharon M. Suzuki

Sharon M. Suzuki
President

Attachments

c: Division of Consumer Advocacy (with Attachments)

[12] In addition to MECO implemented energy efficiency programs, Hawaii Energy, PBF Administrator, reported system level kW impacts, net of free-riders, of 13 kW for PY 2009, July 1, 2009 – June 30, 2010, 28.0 kW for PY2010, July 1, 2010 – June 30, 2011, and 11.0 kW for PY2011, July 1, 2011 – June 30, 2012, as reported in the RW Beck Annual Report to the Hawaii Public Utilities Commission, dated September 10, 2010, November 22, 2011 R2, and December 3, 2012, respectively.

Table 1
Maui Adequacy of Supply

Year	System Capability at Annual Peak Load[II] (kW) [A]	With Future DSM (Includes Acquired DSM)[I] System Peak[III] (kW) [B]	Reserve Margin (%) [[A-B] / B]
Maui Division (Net Generation)			
Recorded			
2012	262,300 [IV]	194,800 [V]	35%
Future			
2013	262,300	192,900	36%
2014	262,300 [VI]	195,800	34%
2015	246,300	196,900	25%
2016	246,300	198,200	24%
2017	246,300	199,800	23%
2018	246,300	202,700	22%
2019	246,300	204,900	20%
Maui Division (Gross Generation) [VII]			
Recorded			
2012	267,700 [IV]	199,100 [V]	34%
Future			
2013	267,700	197,100	36%
2014	267,700 [VI]	200,100	34%
2015	251,700	201,200	25%
2016	251,700	202,600	24%
2017	251,700	204,200	23%
2018	251,700	207,200	21%
2019	251,700	209,400	20%

Notes – Table 1:

(I) System Peaks (With Future Peak Reduction Benefits of DSM Programs):
Implementation of full-scale energy efficiency DSM programs began in the second half of 1996 following Commission approval of the programs. The forecasted system peak values for the years 2013-2019 include the actual peak reduction benefits acquired in 1996-2009 and also include the estimated peak reduction benefits acquired in 2010 and 2011, as well as peak reduction benefits of Rider M and T customer contracts. Forecasted energy efficiency DSM programs for 2013-2019 (future DSM) are based on the expectation that impacts would continue at the same rate as Hawaii Energy's performance in PY 2009.

(II) The net reserve ratings of the units are used in the determination of the Maui system capability. In addition, the Maui Division system capability includes 16,000 kW (which includes 4,000 kW of system protection capacity) from HC&S. When the system capability at the time of the system peak differs from the year-end system capability, an applicable note will indicate the year-end system capability.

(III) The 2013-2019 annual forecasted system peaks are based on MECO's June 2012 Peak Forecast and includes reductions for existing 3rd Party CHP impacts. The Maui annual forecasted system peak is expected to occur in the month of August.

(IV) Includes the Hana generating units as firm capacity. Hana communications and control project was completed in 2008, enabling the Hana units to be dispatchable distributed generation.

The following independent power producer ("IPP") wind facilities were added to Maui system:

- 30 MW Kaheawa Wind Power, LLC (June 9, 2006)
- 21 MW Kaheawa Wind Power II, LLC (July 2, 2012)
- 21 MW Auwahi Wind Energy, LLC (December 28, 2012)

The installation of these wind resources will not affect the system capability because the wind resources are as-available resources, which is not dispatchable and cannot provide given amounts of power at scheduled times.

On September 22, 2006, Makila Hydro, LCC, an IPP, completed construction of a 500 kW hydro-electric facility and commenced providing energy to the Maui system. The installation of this hydro resource does not affect the system capability because the hydro resource is an as-available resource, which is not dispatchable and cannot provide given amounts of power at scheduled times.

(V) The actual 2012 recorded system peak was 199,100 kW (gross) which is equivalent to 194,800 kW (net).

(VI) Capacity planning assumption that the HC&S non-termination agreement will end on December 31, 2014.

(VII) The Maui Division Gross Generation data is provided here for comparative purposes.

Table 2
Lanai and Molokai Adequacy of Supply

		With Acquired DSM [I]	
Year	System Capability at Annual Peak Load [II] (kW) [A]	System Peak [III] (kW) [B]	Reserve Margin (%) [[A-B] / B]
Lanai Division (Gross Generation)			
Recorded			
2012	10,230 [IV]	4,700	118%
Future			
2013	10,230	4,600	122%
2014	10,230	4,600	122%
2015	10,230	4,600	122%
Molokai Division (Gross Generation)			
Recorded			
2012	12,010 [V]	5,600	114%
Future			
2013	12,010	5,800	107%
2014	12,010	5,800	107%
2015	12,010	5,800	107%

Notes – Table 2:

(I) System Peaks (Includes Acquired DSM):
Implementation of full-scale DSM programs began in the second half of 1996 following Commission approval of the programs. The forecasted system peak values for the years 2013-2015 include the actual peak reduction benefits acquired in 1996-2009 and also include the estimated peak reduction benefits acquired in 2010 and 2011. Currently no future DSM impacts are forecasted for Lanai or Molokai.

(II) The gross reserve ratings of the units are used in the determination of the Lanai and Molokai system capabilities. When the system capability at the time of the system peak differs from the year-end system capability, an applicable note will indicate the year-end system capability.

(III) The 2013 - 2015 annual forecasted system peaks are based on MECO's June 2012 Peak Forecast. The Lanai and Molokai annual forecasted system peaks are expected to occur in the month of January.

(IV) Miki Basin Units LL-1 to LL-6 (six 1,000 kW diesel engine-generator units totaling 6,000 kW) were converted to peaking status at the end of 2006, and as such, can be relied on for 5,000 kW of capacity to the Lanai system.

MECO signed an agreement with Castle & Cooke Resorts for the installation of an 884 kW (net including electric chiller offset and auxiliary loads) CHP system at the Manele Bay Hotel. The CHP system was installed and placed in-service as of September 30, 2009.

MECO signed an agreement with Lanai Sustainability Research, LLC for the installation of a 1.2 MW photovoltaic system on the island of Lanai. In December 2008, partial facility completion and operation of this as-available resource was added to the Lanai system. The entire facility was completed in August 2011. Refer to Section 2.5 for further details. The installation of this PV resource does not affect the system capability because the PV resource is an as-available resource, which is not dispatchable and cannot provide given amounts of power at scheduled times.

(V) Palaau Units 1 and 2 (two 1,250 kW Caterpillar units), and Palaau Units 3, 4, 5 and 6 (four 970 kW Cummins units) operate in peaking service. Because of the age and operating history of these units, MECO includes one Caterpillar unit and two Cummins units (1,250 + 970 + 970 = 3,190 kW) towards firm capacity for the Molokai system.

Maui Unit Ratings

As of December 31, 2012

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]	16.00	12.00	16.00	12.00
Hana 1[IV]	1.00	1.00	0.97	0.97
Hana 2[IV]	1.00	1.00	0.97	0.97
Maui System	267.70	260.10	262.28	254.69

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, MECO 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. The reserve ratings include an additional 4.0 MWs of system protection capacity.

(IV) Units located at Hana Substation No. 41. In December 2008, a communication and controls project was completed. This project provides MECO 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.

Lanai Unit Ratings

As of December 31, 2012

Units	Gross (kW)	
	Reserve	NTL(I)
LL-1 (V)	1,000	1,000
LL-2 (V)	1,000	1,000
LL-3 (V)	1,000	1,000
LL-4 (V)	1,000	1,000
LL-5 (V)	1,000	1,000
LL-6 (V)	1,000	1,000
LL-7	2,200	2,200
LL-8	2,200	2,200
Miki Basin GS	9,400	9,400
Manele Bay CHP (VI)	1,000	830
Lanai System	10,400	10,230

(V) Miki Basin Units LL-1 to LL-6 (six,1,000 kW diesel engine-generator units totaling 6,000 kW) were converted to peaking status at the end of 2006, and as such, can be relied on for 5,000 kW of capacity to the Lanai system.

(VI) Manele Bay CHP in-service date of September 30, 2009.

Molokai Unit Ratings

As of December 31, 2012

Units	Gross (kW)	
	Reserve	NTL[1]
P-1[VII]	1,250	1,250
P-2[VII]	1,250	1,250
P-3[VII]	970	970
P-4[VII]	970	970
P-5[VII]	970	970
P-6[VII]	970	970
Solar CT	2,220	2,220
P-7	2,200	2,200
P-8	2,200	2,200
P-9	2,200	2,200
Palaau GS	12,010	12,010

(VII) Palaau Units 1 and 2 (two 1,250 kW Caterpillar units), and Palaau Units 3, 4, 5 and 6 (four 970 kW Cummins units) operate in peaking service. Because of the age and operating history of these units, MECO includes one Caterpillar unit and two Cummins units (1,250 + 970 + 970 = 3,190 kW) towards firm capacity for the Molokai system.

Terminology for New Generating Unit Attributes

Firm Capacity – The amount of energy producing capacity which can be guaranteed to be available at a given time.

Dispatchable – The ability to turn on or turn off a generating resource at the request of the utility's system operators, or the ability to increase or decrease the output of a generating resource from moment to moment in response to signals from a utility's Automatic Generation Control System, Energy Management System or similar control system, or at the request of the utility's system operators.

Renewable Energy – Energy generated or produced using the following sources:

1. Wind
2. The sun
3. Falling water
4. Biogas, including landfill and sewage-based digester gas
5. Geothermal
6. Ocean water, currents, and waves, including ocean thermal energy conversion
7. Biomass, including biomass crops, agricultural and animal residues and wastes, and municipal solid waste and other solid waste
8. Biofuels
9. Hydrogen produced from renewable sources

Sustainable Fuel Supply – Lasting and stable fuel supply, including transportation and fuel related services if applicable.

Commercially Available and Proven Technology – Technology that has been commercially operating for at least five years, with capacity factors within design and dispatch parameters, and at a scale of 100 KW or larger and be scalable to produce energy on a commercial level submitted.