BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Application of MAUI ELECTRIC COMPANY, LIMITED For Approval of Rate Increases and Revised Rate Schedules and Rules.	)	DOCKET NO. 2011-0092

DECISION AND ORDER NO. 32055

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DECISION AND ORDER

In this Decision and Order ("Order"), the commission reviews and evaluates the "System Improvement and Curtailment Reduction Plan" ("SICR") filed in this docket by the Maui Electric Company, Limited ("MECO" or "Company") on September 3, 2013, and orders MECO to file a Power Supply Improvement Plan ("PSIP") with the Commission within one hundred and twenty (120) days of the date of this Order which responds to the issues and analyses identified in Section VII of this Order.[1]

[1]The "Parties" to this proceeding are MECO and the DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS, DIVISION OF CONSUMER ADVOCACY ("Consumer Advocate"), an ex-officio party to this proceeding pursuant to Hawaii Revised Statutes ("HRS") § 269-51 and Hawaii Administrative Rules ("HAR") § 6-61-62(a).

I.

Overall Findings And Conclusions

Decision and Order No. 31288 ("Order No. 31288"), issued on May 31, 2013, in this docket, approved an increase in MECO's rates, and, among other things, addressed the curtailment of renewable energy. Specifically, as discussed in detail herein, the commission ordered MECO to produce a "System Improvement and Curtailment Reduction Plan" or "SICR" to both improve operational efficiency and reduce curtailment of renewable energy. MECO filed its SICR in response to Order No. 31288 on September 3, 2013.

At the outset, the commission is encouraged by the changes in MECO's operations that have led to a significant reduction in the curtailment of renewables since the date of Order No. 31288. In that Order, the commission noted that, for the 2012 Test Year, MECO estimated that it curtailed (or dumped) 15,625 MWh of wind energy and, "in the near future," expected this curtailment to increase to 54,429 MWh annually.[2]

[2]Order No. 31288 at 128. The commission further observed that "[a]ctual wind curtailment could be even higher since by MECO's own admission, these estimates exclude an unknown amount of embedded curtailed wind energy for KWP1 and KWP2." Id. at n. 313.

Thus, the commission found that "curtailment of renewable energy generation imposes a significant cost on MECO ratepayers."[3]

In the SICR, MECO reports significant progress in reducing the level of curtailment of currently available renewable energy:

> At this point, about 92% of the available renewable energy is now being utilized by Maui Electric. Based on production simulations with three wind farms prior to implementing any of the MOMs [Maui Operating Measures], curtailment was estimated at 28%. Implementation of the five MOMs reduced the curtailment percentage to 18%. Additional steps identified in the Company's Motion for Partial Reconsideration are expected to further reduce curtailment to 9%. With the additional action items to be implemented in the Reference Case, Maui Electric expects to further reduce curtailment to 8%. To sum up, curtailment is estimated to be reduced from 28% (if no actions had been taken) to an estimated 8% through the implementation of all of the actions assumed in the Reference case. Changes in load affect the energy delivered from facilities (both Maui Electric and as-available facilities). As a result, decreases in load (e.g., due to increased distributed PV generation) generally decreases generation, or increases curtailment, from each facility.
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> Maui Electric expects to further reduce curtailment down to about 2% to 4% with additional actions identified in the preferred plan discussed below.[4]

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[3]Order No. 31288 at 128.

[4]SICR, Exhibit A at 3. It should be noted that MECO's "Motion For Partial Reconsideration," referenced in this quote, was, in large part, denied in "Order No. 31343 Denying In Part And Granting In Part Maui Electric Company, Limited's Motion For

MECO states that as a result of a number of measures it has undertaken (and which are discussed in the SICR), there is a reduction in curtailment for the 2014-2018 period of 57.7 GWH annually, a decrease of 69% over curtailments if these actions had not been taken, which, in turn, results in a decrease in the monthly bill of an estimated $1.85 for a Maui residential customer who uses 600 kWh.[5]

These efforts not only work to the benefit of ratepayers, but assist the state in achieving the goal of reducing dependence on foreign oil. That said, the commission's review of the SICR indicates that MECO has not set forth a clearly defined path forward that addresses integration and curtailment of additional renewables, and that optimizes system operations through all of the tools that are available to MECO.

In general, what is lacking is the vision of MECO as a "utility of the future." There are many studies, pilot projects, and plans outlined in the SICR and other MECO documents. However, while the HECO Companies - including MECO - have

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Partial Reconsideration Of Decision And Order No. 31288, Evidentiary Hearing, And Partial Clarification Of Decision And Order No. 31288, And Dismissing Its Motion For Partial Stay," issued on July 2, 2013, and Exhibits A-G attached to MECO's Motion were stricken from the record of this proceeding. The commission presumes this reference is simply "shorthand" for the steps included in that Motion which are addressed in the SICR.

[5]SICR, Attachment 1 at 1-2.

recently affirmed their commitment to a corporate culture that focuses on providing superior value and choice to their customers at reasonable rates, there is no specific corporate strategy designed to ultimately achieve that vision.

The commission emphasizes that it is MECO's responsibility to develop and implement the specific strategy necessary to realize these essential objectives. Moreover as noted in Exhibit C to Order No. 31288, the commission should not be forced to employ arduous regulatory scrutiny and oversight of utility expenditures, operations, and investments to compel MECO to develop an appropriate implementation strategy. The commission was unfortunately required to take a step in this direction here when its own review of the SICR revealed deficiencies, thus requiring the retention of a consultant, Brendan Kirby, P.E., to further analyze the SICR.[6] While recognizing progress on the part of MECO as discussed above, Mr. Kirby also concluded that more could be done - and that more could have been done sooner.

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[6]This report, entitled, "MECO System Improvement and Curtailment Reduction Plan Review," is dated February 24, 2014, and was filed in this docket under cover memorandum dated February 26, 2014 ("Kirby Report").

Given the shortcomings in MECO's SICR, as supplemented by the MECO Response,[7] the commission is, through this Order, giving MECO an additional opportunity to fully address the issues discussed herein, and to present an adequate plan to address present and future system operations so as to not only reduce curtailment, but to optimize the operation of its system for its customers' benefit. The commission is specifying in detail the information that MECO is being required to produce by directing MECO to produce a Power Supply Improvement Plan or "PSIP" as further detailed below within one hundred and twenty (120) days of the date of this Order.

II.

Decision And Order No. 31288

As discussed above, MECO has taken steps to significantly reduce the curtailment of currently available renewables from the level of curtailment that existed at the time Order No. 31288 was issued. Nevertheless, Order No. 31288 will be summarized here as it establishes the background for assessing MECO's progress in reducing renewable curtailment and for the further action required by this Order.

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[7]On March 28, 2014, in this docket, MECO filed its "Maui Electric Comments on MECO System Improvement and Curtailment Reduction Plan Review ("Report") prepared by Brendan Kirby. P.E." ("MECO Response").

In Order No. 31288, the commission observed that, for the 2012 Test Year, the level of curtailment discussed therein imposed a significant cost on MECO ratepayers.[8]

> For example, MECO estimates the average energy cost of the total curtailed wind energy for the Maui Division is 11.953 cents per kWh. By refusing to take this low cost, curtailed wind energy regardless of the reason(s), MECO has to utilize additional utility fossil fuel generation. The average energy cost for MECO's fossil fuel generation for the Maui Division for the 2012 Test Year is 20.843 cents per kWh.[9]

The commission also cited a study by Sandia National Laboratories - the Maui Energy Storage Study ("MESS") - which concluded that the designation of certain units at the Kahului Power Plant ("KPP") as "must run" units "contributes to curtailment of renewable energy, which negatively impacts MECO's customers through higher electricity rates."[10] Further, "[w]hile MECO's use of its units in KPP have been examined in various studies, MECO appears to be reluctant to fully commit to the retirement, reduction in use, or re-designation of its KPP units, even in light of abundant available wind energy on Maui."[11]

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[8]Order No. 31288 at 128.

[9]Order No. 31288 at 128 (footnotes omitted). The average energy cost for MECO fossil generation is derived by dividing annual fuel expense of $198,123,000 by the test year fossil generation of 950,533 MWhs. Id. at n. 315.

[10]Order No. 31288 at 129 (footnote omitted).

[11]Order No. 31288 at 129.

The commission observed that the retirement dates of the KPP Kahalui units 1-4 had been delayed several times, most recently, through 2025. According to MECO, the reason for this deferral was because "it was cost-effective to continue to use the existing units since, among other things, the continued operation of the existing units deferred the need to install new generation and allowed for newer technologies, including renewable energy, to develop and mature."[12] In its 2007 Integrated Resource Plan ("IRP"), MECO utilized the 2025 retirement date, and discussed a "hypothetical" retirement of these units in 2015 at the earliest based on installing replacement generating capacity at a new plant.[13]

With respect to the operating costs associated with the KPP Kahului units 1-4, the commission stated:

> The commission notes that the total 2012 Test Year revenue requirements associated with KPP is estimated by MECO to be $51,819,400 annually. This translates into a busbar cost of energy of 30.062 cents per kWh which is more than 2.5 times higher than the average cost of curtailed wind. Further, KPP has average fuel conversion efficiency (heat rate) of 14,228 BTUs/kWh and therefore is substantially less fuel efficient than MECO's diesel-fired generators on Maui which have an average heat rate of 9,432 BTUs/kWh. Based upon the foregoing, MECO should be

[12]Order No. 31288 at 130 (footnote omitted).

[13]Order No. 31288 at 130.

> aggressively pursuing more cost effective alternatives.[14]

The commission observed that since its 2000 and 2007 IRPs, MECO's system had undergone various changes, including the purchase of significant quantities of renewable energy.[15] Order No. 31288 stated that by 2013, three wind farms (Kaheawa Wind Power ("KWP") I, Auwahi Wind Energy ("Auwahi"), and KWP II) would be operating on MECO's system with a total combined capacity of 72 MW.[16] The commission found:

> Appropriate integration of wind generation has been a challenge for MECO's system, requiring modifications and operational changes to the running of MECO's units, including those at KPP. With three wind-farms operational, MECO expects to curtail (or dump) 54,429 MWh of wind generated energy annually, 43,686 MWh of that energy from KWP II. This amount of wind curtailment represents almost 6.00% of the 2012 Test Year annual fossil generation for the Maui Division and an indication of the volume of fossil fuel transshipped and imported into Maui that could be avoided. According to MECO, its current system cannot integrate wind energy efficiently and that "[w]ithout significant operational upgrades, curtailment of as available generation will increase and regulating reserve requirements will continue to hurt the efficiency of the Maui Electric generation fleet."[17]

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[14]Order No. 31288 at 130-131 (footnotes omitted).

[15]Order No. 31288 at 131.

[16]Order No. 31288 at 131.

[17]Order No. 31288 at 131-132.

At the time of Order No. 31288, the commission stated that there were a number of completed studies that recommended specific remedial strategies and scenarios to reduce the level of wind curtailment.[18] In addition, other studies were underway to "assess MECO's current system, promote system efficiencies, and increase integration of wind energy on Maui."[19]

> The commission notes that some of these studies recommend options and scenarios to increase integration of renewable energy that involve portions and/or all of MECO's KPP generating units being retired and/or "mothballed" prior to 2025, MECO's purported retirement schedule for its KPP units. In particular, the MESS found that MECO could reduce or eliminate the operation of KPP units by installing a battery energy storage system and appears to indicate that there are significant potential benefits from reducing or eliminating the use of the KPP units.[20]

In response to an information request, MECO stated that accepting more wind energy instead of operating units at KPP

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[18]Order No. 31288 at 132. These included the following: (1) the "KWP II Wind Integration Study," conducted by General Electric International in 2010; (2) the "Maui Resource Planning Study," conducted by PA Consulting Group in 2011; (3) the "Operational Flexibility Study for the Integration of Renewable Energy," conducted by Stanley Consultants in 2011; and (4) the 2012 MESS. Id.

[19]Order No. 31288 at 133. These included the following, which were scheduled to be completed in 2013: (1) the "Generation Performance and Reserve Study/Analysis of Cycling Costs & Countermeasure Recommendations," by Electric Power Systems/Intertek Aptec and (2) the "Hawaii Solar Integration Study" by GE Energy Consulting.

[20]Order No. 31288 at 133-134 (footnotes omitted).

would result in savings in fuel and purchased power expense of approximately $6.9 million annually, although that figure did not include any additional costs or savings associated with modifying the "must-run" designation of certain units at KPP.[21] Nevertheless, MECO stated that it planned to continue KPP operations as they presently stand "due to certain operational constraints and other concerns."[22]

The commission stated that it was not satisfied with MECO's response, observing that, even though MECO planned to continue studying integration issues, "MECO can and should implement certain corrective operational changes that have already been recommended in various studies to reduce operational costs and achieve further integration of renewable resources on Maui."[23] Thus, the commission ordered MECO to produce a "System Improvement and Curtailment Reduction Plan" or "SICR" to both improve operational efficiency and reduce curtailment of renewable energy.[24] MECO was directed to address the following in

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[21]Order No. 31288 at 134.

[22]Order No. 31288 at 134.

[23]Order No. 31288 at 135.

[24]Order No. 31288 at 135.

the SICR:

(1) Plans and progress to date on implementation of recommendations to reduce or eliminate curtailment of renewable energy and lower total system costs, including but not limited to those recommendations and proposed investments evaluated in the MESS, the Generation Performance & Reserve Study, and the HSIS ("Topic 1");

(2) The elimination of must run designation and/or retirement of the units at KPP ("Topic 2");

(3) Other options that MECO may have identified to accept more renewable energy or otherwise lower total system costs, such as, for example, investments at independent power producer facilities to provide increased down reserve and other ancillary services or other strategies to reduce curtailment ("Topic 3");

(4) Other load shifting incentives such as a very low dumped power rate offered to customers to shift customer demand to times when excess renewable energy would otherwise be curtailed ("Topic 4");

(5) Utilization of demand response programs and energy storage technologies to reduce the need for on-line fossil generation to provide operating reserves and other ancillary services ("Topic 5"); and

(6) A comprehensive evaluation of all fixed and variable costs, as well as all system benefits (including fuel savings, O&M expense savings, system efficiency savings, etc.) estimated to result from curtailment reduction strategies underway or proposed in

the System Improvement and Curtailment Reduction Plan ("Topic 6").[25]

For ease of reference in this Order, these topics will be referenced herein as follows:

- Topic 1 - "Reduction/Elimination Of Renewable Energy Curtailment."
- Topic 2 - "Retirement/Modification Of KPP Units."
- Topic 3 - "Other Options To Increase Use Of Renewables."
- Topic 4 - "Other Load Shifting Incentives."
- Topic 5 - "Demand Response/Energy Storage."
- Topic 6 - "Costs Of Implementing The SICR."

In addition to these findings and directives, the commission set forth a number of observations and perspectives in Exhibit C to Order No. 31288. The commission stated that it was "timely, necessary and essential to outline fundamental, emerging issues pertaining to the operation and regulation of investor-owned electric utilities in Hawaii to set a course that is mutually beneficial to utility shareholders and utility ratepayers."[26] Among other things, the commission observed that:

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[25]Order No. 31288 at 135-136. In addition, the commission ordered MECO to post certain information concerning curtailment on its website. Id.

[26]Order No. 31288, Exhibit C at 1.

- While the commission supports the concept of decoupling electricity sales from electric revenues, "existing automatic adjustment mechanisms appear to unduly insulate the HECO Companies from the need or urgency to make major adjustments to current utility management and operational practices, thus offering no motivation to implement strategies and action plans that may be more conducive to serving the public interest";

- The HECO Companies over-reliance on a link between the 2008 "Energy Agreement" and utility financial health "obfuscates utility performance and ultimately customer service and satisfaction"; and

- While the commission supports Hawaii's clean energy transformation, "clean energy in and of itself is not the singular goal but rather should be viewed as one strategy to serve the public interest along with sound business practices centered on customer value".[27]

Thus, the commission found:

From the commission's perspective, the HECO Companies appear to lack movement to a sustainable business model to address technological advancements and increasing customer expectations. The commission observes that some mainland electric utilities have begun to define, articulate and implement the vision for the "electric utility of the future." Without such a long-term, customer focused business strategy, it is difficult to ascertain whether HECO Companies' increasing capital investments are strategic investments or simply a series of unrelated capital projects

[27]Order No. 31288, Exhibit C at 2-3.

> that effectively expand utility rate base and increase profits but appearing to provide little or limited long-term customer value. While a public utility is required to have a reasonable opportunity to earn a fair financial return, attractive financial returns are not an entitlement by virtue of being a regulated utility.[28]

The commission went on to discuss the attributes of a utility engaged in the "virtuous cycle" (defined as "a well-managed, customer-focused electric utility… that is driven by a management philosophy and corporate culture to provide superior customer value through affordable electric rates and outstanding customer service, as defined by its customers"), in contrast to a utility facing a "vicious cycle" (defined as a situation where "[p]oor performance drives poor regulatory outcomes and financial penalties starting a downward cycle in the opposite direction").[29] The commission concluded:

> The extent of the HECO Companies' own volition to achieve high performance, provide excellent customer service and affordable rates will determine the appropriate amount of regulatory oversight required. Otherwise, the commission would be forced to employ arduous regulatory scrutiny and oversight of utility expenditures, operations and investments to attempt to achieve the desired performance levels and customer satisfaction. The commission prefers the former but unfortunately, at the present time, believes the lack of a strategic and sustainable

[28]Order No. 31288, Exhibit C at 3.

[29]Order No. 31288, Exhibit C at 4-5.

> business model would require more of the latter until there is evidence of an acceptable course correction.[30]

These principles form the basis for the commission's review of the SICR.

III.

MECO's SICR

On September 3, 2013, in response to Order No. 31288, MECO filed its SICR. In the SICR, MECO identifies a number of actions already taken as well as planned future actions which it believes will enhance the integration of renewables, while maintaining reliability and lowering costs to MECO's customers.[31] MECO's response to each of the six topics set forth in Order No. 31288 are discussed in turn.

a.

Topics 1 and 2 - Reduction/Elimination Of Renewable Energy Curtailment And Retirement/Modification Of KPP Units.

MECO states that the Maui Operating Measures ("MOMs") are illustrative of actions already taken. These include: (1) operating units K1 and K2 on alternating days; (2) limiting up reserve to a maximum of 50 MW and allocating up reserve to the

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[30]Order No. 31288, Exhibit C at 5-6.

[31]SICR, Exhibit A at 1.

KWP II BESS; (3) allocating 3 MW down reserve to KWP II BESS; and (4) modifying automatic generation controls ("AGC") to allow implementation of the Maui Operating Measures ("MOMs").[32]

According to MECO, these actions will result in a reduction in curtailment for the 2014-2018 period of 57.7 GWh annually, a decrease of 69% over expected curtailment if these actions were not taken.[33] As a result, MECO claims that the monthly bill for a Maui residential customer who uses 600 kWh has decreased by an estimated $1.85.[34]

MECO next states that it is committed to implementing the following actions in the future. First, in the near term, MECO plans to deactivate units K1 and K2 in 2014 and to modify operations of the dual-train combined cycle units at Maalaea Power Plant.[35] MECO states that "[t]hese actions are estimated to further reduce annual average curtailment to a range of 6.3 GWh to 12.8 GWH or 2% to 4% compared to the 54.4 GWh of annual

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[32]SICR, Exhibit A at 1, n.2.

[33]SICR, Exhibit A at 2.

[34]SICR, Exhibit A at 1; see also Exhibit B, Attachments B2 and B4.

[35]SICR, Exhibit A at 2. See also Exhibit E, which describes the program and scope of work for deactivating K1 and K2, and Exhibit F, Attachments F1, F2, and F3 pertaining to modifications of Maalaea. Note that "pre-MOMs," K1 and K2 were operated for two daily shifts and after implementation of MOMs, K1 and K2 are operated on alternating days, one shift only. SICR, Exhibit A at 6, n.8 and n.9.

curtailment identified in D&O 31288 (at 128)."[36] According to MECO, these two actions together could reduce a typical Maui residential bill by an additional $0.60 to $0.87 a month.[37]

Second, MECO states that it plans to retire the Kahului Power Plant by 2019 and upgrade the 23 kV transmission system with the Waiinu-Kanaha transmission upgrade project.[38] According to MECO, it plans to take other long term actions including the implementation of Advance Metering Infrastructure to facilitate load shifting incentive programs and to improve grid management and outage response.[39] However, while these actions are addressed in the SICR they are not included in the underlying analysis.

To achieve these reductions in curtailment, MECO considered modifying the operation of its generation assets to:

(1) reduce thermal units operating hours;

(2) reduce thermal units minimum loads;

(3) cycle thermal units offline;

(4) cycle combustion turbines ("CTs") from dual train combined cycle ("DTCC") mode

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[36]SICR, Exhibit A at 2.

[37]SICR, Exhibit A at 3.

[38]SICR, Exhibit A at 3.

[39]SICR, Exhibit A at 3.

(two CTs and one steam turbine ("ST")) to single train combined cycle ("STCC") mode (one CT and one ST);

(5) utilize the regulating reserve policy to be consistent with the Hawaii Solar Integration Study ("HSIS") recommendation, which is about half of the amount of regulating reserve for higher wind levels than is currently used today;

(6) cycle steam turbines ("STs") from STCC mode to simple cycle mode (operating one or two CTs without using the ST to utilize the waste heat from the CTs); and

(7) some combination of the above.[40]

In addition, in order to maintain grid stability and reliable service to customers, MECO evaluated several other options, including:

(1) allocating regulating reserve to more units through system upgrades;

(2) installing an energy storage system such as a battery energy storage system ("BESS") or a pumped storage hydroelectric ("PSH") system;

(3) upgrading transmission lines to enable more flexibility of operating generation; and

(4) acquiring use of quick starting engines for off-line rather than on-line reserves.[41]

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[40]SICR, Exhibit A at 4-5.

[41]SICR, Exhibit A at 5.

MECO states that, in developing the SICR, it "identified several candidate curtailment reduction measures and evaluated the effectiveness of the measures in terms of both curtailment reduction and costs," and ran a production simulation over a 25-year period (2014-2038) for 22 cases to "analyze the extent to which the candidate measures could reduce curtailment and their impacts on overall system costs."[42] The candidate measures were grouped into four categories: (1) Actions Already Implemented; (2) Actions to be Implemented; (3) Actions Likely to be Implemented; and (4) Actions to be Evaluated, with the latter two having a higher degree of uncertainty than the former two.[43] MECO states that it will conduct further research, analyses, and evaluation before proceeding with such measures.[44]

In analyzing these cases, MECO looked at a progression from the period before the MOMs were implemented, to the period beginning with the implementation of the MOMs in July 2013, to the measures to be implemented or soon to be implemented as explained in MECO's Motion for Partial Reconsideration filed June 12, 2013, in this docket.[45] MECO also performed a

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[42]SICR, Exhibit A at 5.

[43]SICR, Exhibit A at 6.

[44]SICR, Exhibit A at 6.

[45]SICR, Exhibit A at 6. As discussed in footnote 35, supra, this Motion was, in large part, denied in Order No. 31434 dated July 2, 2013.

"Reference Case," which includes those measures that HECO may implement in the immediate future, namely, deactivation of K1 and K2 in 2014 and implementation of the regulating reserve policy change identified in the Hawaii Solar Integration Study that was initiated in August 2013.[46] According to MECO:

> The Reference Case served as the baseline case against which all other cases were measured for revenue requirement, curtailment reduction, and system efficiency purposes. The cost impacts of changes in curtailment, heat rates and other effects were measured by the net present value of the revenue requirement impact of the various measures on fuel expense, purchased power expense, operations and maintenance expenses and capital costs to the extent the Company was able to quantify such impacts in dollars.[47]

Based on these analyses, MECO developed a "preferred plan" to be implemented in two phases. Phase 1 is described as follows:

> "Phase 1", (sic) of the preferred plan incorporates a mix of operating modes from Cases 13 and 19 during the years between 2014 and 2016, which are the years before the DTCC 1 can operate with lower minimum loads. Case 13 involves operating DTCC 2 in single train mode (M17 and M18 together or M18 and M19 together) primarily during periods of no/low wind conditions when more utility

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[46]SICR, Exhibit A at 7.

[47]SICR, Exhibit A at 7 (footnote omitted). MECO observed that "[w]hile the production simulation covered a 25-year period, the evaluation focused on the earlier years (i.e., 2014-2018) as the earlier years contained the most differentiation between the cases examined." Id.

generation is expected to be needed to meet the system load requirements. This mode of operation is more economical than the simple cycle mode discussed for Case 19 below that will be used primarily when significant wind generation is forecasted to be available to help reduce curtailment. Case 19 involves the operation of DTCC 2 in simple-cycle mode (M17 and/or M19 operate without utilizing the steam turbine M18). Cycling M17 and M19 in 2014 and 2015 will eliminate the current minimum load requirement DTCC 2 of 16.54 MW if both M17 and M19 are turned off at minimum load periods. The reduced base load minimum is anticipated to result in reduced curtailment in these first two years. Because cycling M18 daily may be impractical because of its long startup/shutdown times, the Company plans to keep M18 off-line except when it is anticipated that it will be needed to meet the system's capacity requirements. The disadvantage of cycling DTCC 2 in simple-cycle operation is unfavorable fuel efficiency (measured by higher heat rates, see Exhibit C, Attachment C6). The Case 19 operating scenario will provide a "bridge" from current DTCC 1 operation to one that will allow low load operation of DTCC 1 and enable the more efficient base load operation of DTCC 2 in STCC mode after 2016.[48]

Phase 2 is described as follows:

The next phase, or Phase 2 describes 2016 to 2038 and beyond after low load modifications to DTCC 1 are completed. DTCC 1 will be modified to operate with lower minimum loads. The lower minimum load is anticipated to result in reduced curtailment. The new minimum load of DTCC 1 is assumed to be approximately 15 MW net lower than current operation. This number is based on the Stanley Consultants Phase 3 study and the actual new minimum load will be determined

[48]SICR, Exhibit F at 8-9.

through operation after the modification is made.[49]

MECO further notes that the DTCC 1 modifications are anticipated to reduce curtailment by creating more headroom to accept wind energy, but that operating in the lower load range will increase heat rates, and will also increase hourly operation and maintenance costs.[50]

At page 11 of Exhibit A to the SICR, MECO presents a table showing the estimated results of the preferred plan described above as compared to the Reference Case and prior operating scenarios evaluated for the 2014-2018 period in terms of average curtailment (shown in GWh and percentage), net present value of the revenue requirement, and customer bill impact. Among other things, the table shows the following decreases from pre-MOMs through Phase 2: (1) a decrease in average curtailment measured in GWh from 83.2 to between 6.3 and 12.8; (2) a decrease in the percentage of curtailment from 28.1% to between 2.1% and 4.3%; and (3) a cumulative decrease in a typical 600 kwh/month bill in the range of $2.45 to $2.72.[51]

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[49]SICR, Exhibit F at 10. A detailed discussion of the modifications to DTCC 1 that are necessary for low load operation are set forth in Exhibit F at 10-13.

[50]SICR, Exhibit A at 9.

[51]SICR, Exhibit A at 11.

MECO concludes that "the Company's production simulation model results, based on the assumptions described in Exhibit C, indicate that the measures the Company has already implemented and the additional measures the Company is committed to performing could reduce virtually all remaining curtailment in the near term, and this would benefit customers by lowering their bills."[52] MECO further notes that there may be additional benefits if actions in the "to be evaluated" category are implemented.[53]

b.

Topic 3 - Other Options To Increase Use Of Renewables.

MECO states that it plans to investigate other options that may allow it to accept more renewable energy, such as investments in IPPs to provide down reserve and other ancillary services, future development and utilization of distributed energy resources on Maui, and other storage projects, such as pumped storage hydro ("PSH") projects (although MECO observes that "[t]o date, none of the analysis done - spanning almost 20 years and performed by multiple consultants - has provided a

[52]SICR, Exhibit A at 12.

[53]SICR, Exhibit A at 12.

compelling case for the use of PSH").[54] Among other things, MECO states that it has "engaged in preliminary discussions with First Wind (the majority owners of KWP I and KWP II) and Auwahi Wind Energy to exchange ideas on further optimizing the use of the wind farm facilities, including the battery systems."[55]

> Exhibit K addresses how Maui Electric will continue its discussions with IPPs to consider other measures which IPPs can assist with in providing ancillary services and other measures to reduce wind curtailment. Additionally, Maui Electric will continue to review proposals from third party developers for generation projects with the objectives of acquiring additional renewable energy that can be safely integrated to the Maui system at a reasonable cost and lower customer's bills.[56]

c.

Topic 4 - Other Load Shifting Incentives.

MECO plans to evaluate and identify those residential and commercial customers that can meaningfully contribute to taking more energy when excess renewable energy is available.[57] Initially, MECO plans to focus on commercial customers that have energy storage capability, non-time sensitive energy

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[54]SICR, Exhibit A at 13-14.

[55]SICR, Exhibit A at 13.

[56]SICR, Exhibit A, Attachment A2 at 6, and Exhibit K.

[57]SICR, Exhibit A, Attachment A2 at 14.

requirements, or the ability to shift energy consumption to times when renewable energy curtailment is high.[58] In addition, MECO plans to run production simulations to assess changes to curtailment, generating unit efficiency, and other factors that could result from increasing or shifting load through the use of incentive rates.[59]

On December 30, 2013, in this docket, MECO filed a report titled "System Improvement & Curtailment Reduction Plan Exhibit J - Load Shifting, Response to Commitment" ("SICR, Exhibit J"), which concluded:

> Based on the evaluation of large commercial customers detailed in this filing, very few have available loads to shift. These customers would likely incur higher operating costs due to pay differentials for employee shift changes, and potentially experience operational difficulties, negative employee reactions, and labor contract issues. A new or modified rate rider or tariff to incentivize load shifting might not be effective at this time. The existing rate rider and time-of-use tariffs incentivize existing load available to shift without businesses having to deal with the potential issues above; but as noted in Exhibit J, the implementation of AMI for all customers will create an opportunity for wider participation in time-of-use rate schedules.

[58]SICR, Exhibit A, Attachment A2 at 14 and Exhibit J.

[59]SICR, Exhibit A, Attachment A2 at 14 and Exhibit J.

Nevertheless, MECO states it will likely file a request for flexibility in adjusting time-of-use periods in existing optional rate tariffs outside of general rate cases to allow for better alignment of the time-of-use periods with the changing load profile.[60]

Finally, MECO hopes to renegotiate some of its existing PPA contracts.

> In conjunction with the above proposed discussions with the IPPs, Maui Electric would like to reexamine the energy prices contained within certain PPAs. Maui Electric has made significant progress to date in reducing curtailment and, as this plan demonstrates, has plans to enact further curtailment reductions. As a result, at some point in time, Maui Electric would like to explore if certain IPPs that will benefit from the reduction in curtailments of renewable energy on Maui's system are willing to revisit the pricing terms in their PPAs as some of the assumptions under which those PPA terms were developed (e.g., amount of curtailment) have changed. This could result in a win-win situation for the IPP and Maui Electric customers - additional energy purchased from an IPP, which would increase the IPPs revenue stream even with a lower pricing structure, while the lower pricing structure could result in lower energy payments (and lower energy charges passed on to Maui Electric's customers) even with the increased amount of renewable energy purchased.[61]

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[60]SICR, Exhibit J at 7.

[61]SICR, Exhibit A, Attachment A2 at 15.

d.

Topic 5 - Demand Response/Energy Storage.

MECO states that it is committed to pursuing demand-response programs. "Although the Plan's analyses shows an increase in costs without a significant reduction in curtailment from the use of Demand Response programs in the near term, the programs are intended to result in the design of full-scale programs that have the potential to lower customer bills by deferring or reducing the need for additional generation capacity and by providing operational benefits."[62]

MECO summarizes its demand response plans as follows:

> As discussed further in Exhibit H, Maui Electric's DR Action Plan defines a key role for customer loads in meeting Maui Electric's system operational objectives for the island of Maui. The proposed investments in customer facilities and DR infrastructure will not only create value for Maui customers but also benefit Maui Electric by improving the operating flexibility and resiliency of the Maui island grid. To effectively utilize DR as a system regulating resource (i.e., demand-side equivalent of automatic generation control providing frequency management, and as a bridge resource for up-regulation and down-regulation, and as a replacement for operating reserves), Maui Electric plans to implement the necessary integrated suite of tools, information technology/operational technology systems, and telecommunications infrastructure to enable the effective,

[62]SICR, Exhibit A at 12-13.

reliable, secure and scalable dispatch of DR resources.[63]

MECO identifies three themes that govern its implementation of demand response programs: integration of more as-available renewable energy, lowering customer bills, and increasing customer value.[64] MECO's five year DR Action Plan includes the following elements:

First, with respect to commercial and industrial ("C&I") customers, MECO plans to (1) extend and expand its Fast DR Pilot Program and (2) define a realistic level of potential participation in its C&I DR program for 2014-2018 timeframe.[65] As to the latter, MECO states that it will work with C&I customers through discussions, surveys, and/or studies to identify available DR resources and will pursue participation from the County of Maui to complete water and wastewater DR potential and technical feasibility studies.[66]

Second, with respect to residential customers, MECO plans to (1) partner with non-profit entities to conduct a field trial deployment of Grid Interactive Water Heater, air conditioning, and other control devices to obtain customer

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[63]SICR, Exhibit A, Attachment A2 at 13-14.

[64]SICR, Exhibit H at 1.

[65]SICR, Exhibit H at 5.

[66]SICR, Exhibit H at 5.

feedback on residential DR program designs; (2) file an application for a residential DR pilot program; and (3) "[l]everage experience and knowledge from Maui Smart Grid demonstration projects in developing and improving the residential DR program."[67]

Third, MECO states that it plans to "operationalize" demand response to develop an integrated suite of tools and telecommunications infrastructure to enable effective, reliable, secure, and scalable dispatch and management of DR programs.

MECO goes on to describe its plans in some detail. To a large degree, these plans include additional studies and pilot programs.[68]

With respect to energy storage, MECO states that it is "currently testing potential benefits of two energy storage systems on Maui as part of the on-going Maui smart grid demonstration projects."[69] MECO plans to continue evaluating the utility-scale BESS "as part of its long-term plan to address adequacy of supply considerations using a portfolio approach although the Company's analyses did not initially show a reduction in costs or curtailment."[70] Further, MECO states that

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[67]SICR, Exhibit H at 5.

[68]SICR, Exhibit H at 5-14.

[69]SICR, Exhibit A at 13.

[70]SICR, Exhibit A at 13.

the HECO Companies "are following a broad-based application strategy to evaluate the merits of energy storage" and that "applications of the Hawaiian Electric Companies' energy storage research and demonstration projects were purposely varied to enable investigation of various operational issues."[71]

e.

Topic 6 - Costs Of Implementing The SICR.

MECO states that Exhibit B to the SICR provides the summary results of a cost-benefit analysis of the cases examined and their associated action items. MECO ran a production simulation "covering a 25-year period, from 2014 to 2038, for all twenty two cases to analyze the extent to which the candidate curtailment reduction measures could reduce curtailment and their impacts on overall system costs"; the results are presented in Exhibit B.[72]

Finally, MECO states:

> Maui Electric proposes, at a minimum, to file annual status reports with the Commission starting with an annual report by September 30, 2014. The annual status reports will include updates on (1) the status of implementing the preferred plan (including the status of any actions characterized as "to be implemented",

[71]SICR, Exhibit A, Attachment A2 at 6 and Exhibit F.

[72]SICR, Exhibit A, Attachment A2 at 3 and Exhibit B.

"likely to be implemented", and "to be further evaluated"), and (2) the metrics to be filed with the Commission by October 31, 2013.[73]

The proposed metrics were filed in this docket under cover letter dated October 18, 2013, and are described as follows: "Maui Electric proposes one wind curtailment reduction metric to track the amount of wind energy accepted in relation to the total amount of available wind energy, and four milestone metrics to track the progress of Maui Electric actions to implement operational changes to improve system operation and reduce wind curtailment."[74] The four milestone metrics are (1) implementation of the HSIS regulating reserve policy, in place of the current regulating reserve policy described in the Wind Integration Study; (2) deactivation of the K1 and K2 units at KPP; (3) modification of operations to DTCC 1; and (4) enabling DTCC 2 to operate in simple cycle mode.[75]

IV.

MECO System Improvement And Curtailment Reduction Plan Review

As discussed above, the commission retained a consultant, Brendan Kirby, P.E., to review MECO's SICR.

[73]SICR, Exhibit A at 14.

[74]SICR, Exhibit A at 14.

[75]SICR, Exhibit A at 6-9.

The Kirby Report "provides an assessment of MECO's SICR Plan and specifically assesses how well MECO addressed the six topic areas listed in the Commission's [Order] No. 31288."[76]

Prior to discussing the conclusions of the Kirby Report with respect to the six specific topics, the Report makes a number of general conclusions. To begin, the Report states:

> A significant amount of the SICR analysis documents past actions and actions MECO intends to implement soon. While MECO is to be praised for improving system operations it is not clear why it has taken so long to implement most of these measures since MECO has demonstrated they save rate-payer money as well as reduce wind curtailment. It appears reducing operations and ultimately retiring KPP could have been done years ago. Similarly, had the Hawaii Solar Integration Study (HSIS) reserves policy and/or the modifications to improve the flexibility of the combined cycle plants been implemented years ago ratepayers would have saved millions of dollars.
>
> More specifically, while it is important to be careful and deliberate in analysis and adopting new practices it is equally important to recognize that unnecessary delay is very expensive for ratepayers.[77]

The Report observes that MECO does not forecast any growth in renewables beyond distributed photovoltaics ("PV") for the next 25 years. "It appears that the power system will be unable to accommodate <u>additional</u> wind or central solar generation

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[76]Kirby Report at 1.

[77]Kirby Report at 2.

without significant curtailment, even with the remedial actions MECO is proposing, though this is not known for certain because MECO did not model any cases with additional variable renewable generation."[78] Thus, the Kirby Report recommends that the SICR include an analysis of adding new wind and central solar generation beyond what is operational today, and that this analysis include plans for mitigating curtailment of additional generation.[79]

More generally, Mr. Kirby recommends that the commission and stakeholders address the preferred power system for MECO into the future.[80] Mr. Kirby observes that this review should not be constrained by the current configuration of the system, and should address a variety of objectives including "maximizing renewable generation to minimize the use of imported fossil fuels at minimum cost for economic, environmental, and reliability reasons."[81] With respect to this recommendation, as further discussed below, in this Order, the commission is directing MECO to file a Power Supply Improvement Plan ("PSIP") in order to begin this process.

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[78]Kirby Report at 2 (emphasis added).

[79]Kirby Report at 2.

[80]Kirby Report at 2.

[81]Kirby Report at 2.

a.

Topic 1 - Reduction/Elimination Of Renewable Energy Curtailment.

At the outset, the Kirby Report observes that MECO provided a great deal of information to show that curtailment of wind has been significantly reduced.[82]

> Improvements already implemented include the Maui Operating Measures (MOMs) which reduced KPP units 1 and 2 (K1 & K2) to single shift operations on alternate days (down from two shifts per day every day), up reserves were limited to 50 MW, up and down reserves were allocated to the KWP II BESS, and the automatic generation control (AGC) system was modified. The Motion for Partial Reconsideration (MFPR) includes lower minimum loads for K3 and K4, as well as K3, K4, M15 and M16 contributing regulation.[83]

Based on the information provided, Mr. Kirby makes two recommendations. First, MECO should be directed to analyze an additional case (or cases) which assumes the addition of new wind and/or central solar generating plants, as discussed above.[84] Second, MECO should be directed to analyze the ability of fast response from BESS, demand response, and existing (and new) wind and solar facilities to reduce the need to hold reserves on

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[82]Kirby Report at 5.

[83]Kirby Report at 5.

[84]Kirby Report at 5.

thermal generators. Mr. Kirby explains:

> The Hawaii Solar Integration Study (HSIS) discussed the need to hold down reserves on combined cycle plants (CC) to avoid unintended unit trips during loss-of-load events. The study also noted that the KWP2 BESS is effective at absorbing most of the excess power in the system due to its rapid response speed, thus reducing the impact on the CC plants. HSIS noted that "Additional BESS equipment with aggressive initial frequency response is effective to reduce mechanical power reductions on CTs. If these types of mitigations are of interest, more analysis of control strategies is recommended. It does not appear that MECO examined the reserve benefits of fast response from BESS in reducing down reserve requirements on CC and CT plants. DR can provide similarly fast response to frequency excursions. MECO did not examine DR benefits in reducing down reserve requirements. MECO did not appear to examine if additional faster response could be obtained from the wind plants to mitigate down reserve requirements.[85]

b.

Topic 2 - Retirement/Modification Of KPP Units.

The Kirby Report begins its discussion of this topic by observing that MECO has committed to retiring all four KPP units by 2019, which is a significant change from previous plans to keep KPP operating until 2025.[86] The Report states that retirement of all KPP units in 2019 results in dramatic

[85]Kirby Report at 6.

[86]Kirby Report at 7.

reductions of renewable curtailment in all cases studied.[87] Nevertheless, the Report states that "[w]hile MECO provided the amount of renewable energy curtailed in each year for each case it is not possible to tell what the percentage of curtailment is from the public version of MECO's filing as they redacted the amount of accepted renewable energy, both as an aggregate total in Table L11 and by renewable energy resource (KWP 1, KWP 2, Auwahi, and FIT Tier 3) in Tables L12 through L15."[88]

Next, the Report observes that while MECO included new flexible and efficient internal combustion engine driven generation (ICE) in its SICR Plan, MECO assumed that generation would burn very expensive biofuel (double the cost of diesel and triple the cost of medium sulfur fuel oil per MMBTU in 2018) despite the engine's ability to burn diesel, medium sulfur fuel oil, or even lower cost heavier fuels.

> Oddly, MECO only analyzed the ICEs [internal combustion engines] fueled with very expensive biodiesel rather than with one of

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[87]Kirby Report at 8.

[88]Kirby Report at 8. The Report states that it is not clear why this information was redacted, and recommends that MECO be directed to publically release "Exhibit L, Attachment L1, Table L11 "Year by Year Total Renewable Energy Accepted - KWP 1, KWP 2, Auwahi, FIT Tier 3 (GWH)"; Exhibit B, Attachment B4, pg 3 and 4: "Summary of Renewable Energy Taken (GWH)", "Summary of Incremental Renewable Energy Taken", and "Summary of Renewable Energy Taken (%)"; and Table L15 "Year by Year FIT Tier 3 Total Renewable Energy Accepted" and Table L20 "Year by Year FIT Tier 3 Renewable Energy Curtailment". Id.

> the fossil diesel fuels (diesel, S500, or ultra low sulfur diesel) or with the relatively low cost medium sulfur fuel oil (MSFO) currently used by the KPP steam units even though both Wartsilla and Caterpillar engines can burn a range of fuels including natural gas, diesel, biodiesel, medium sulfur fuel oil, crude oils, emulsified fuels, and high viscosity fuel oils up to 3000 cSt at 50°C. Heavier fuels are typically lower cost. MECO estimates the cost of MSFO at 68% of the cost of diesel.[89]

The Report further observes that the ICE generators available from Caterpillar, Wartsila, and possibly others can start and fully load in under five minutes, have no cycling cost, have minimum run times under ten minutes, and have minimum loads of 20% of full load.[90] Further, these generators are extremely flexible and have lower production costs than any of the existing oil fired generators (including the combined cycle units).[91] Moreover, the ICE generators can both increase flexibility to accommodate wind and solar and simultaneously reduce thermal generation production costs; this dramatically differs from the MECO preferred plan to operate combined cycle plants in simple cycle, significantly increasing operating cost in order to obtain moderate flexibility.[92]

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[89]Kirby Report at 9.

[90]Kirby Report at 3.

[91]Kirby Report at 3-4.

[92]Kirby Report at 4.

Comparing use of biodiesel to use of other fuels, the Report states:

> MECO's analysis assumed the ICEs will be fueled with biodiesel while KPP is fueled with MSFO. While the use of biodiesel is laudable for environmental reasons, MECO estimates that it is more than three times the cost per MMBTU of MSFO in the near term and more than double the cost of diesel. Any analysis of the benefits of a new generator should separate the analysis of the generation technology itself (new ICE vs old steam) from the analysis of an alternative fuel (biodiesel, diesel, or MSFO). Either both the new and old plants should be modeled with their least cost fuel or both the new and the old plants should be modeled burning bio fuel. It makes neither economic nor environmental sense to require new plants to burn biodiesel while old plants are allowed to burn MSFO. Combining the two changes into a single analysis may lead to the incorrect conclusion that a new ICE is more expensive to operate than an old steam unit when the correct conclusion is that biodiesel is more expensive than MSFO. This forcing the new flexible and efficient plant to use expensive biodiesel while allowing the old inflexible and inefficient steam plant to use lower cost MSFO results in an analysis that economically favors the old plant and denies ratepayers of both lower costs and lower emissions.[93]

The Kirby Report concludes that MECO has failed to clearly discuss fuel costs and generation alternatives in the SICR.[94] The Report observes that "new ICE driven generators will have lower fuel cost per MWh than any existing MECO thermal

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[93]Kirby Report at 10.

[94]Kirby Report at 11.

generator when burning MSFO" and that they "will also be lower cost than any MECO thermal generator including the combined cycle generators when burning diesel and when comparably loaded."[95]

Thus, the Report recommends that MECO be directed to analyze the optimal deployment, commitment, and dispatch of the proposed ICE generators considering MSFO, LSFO, and possibly diesel fuels.[96] In conducting this analysis, the Report suggests that MECO (1) use a 40% minimum load and (2) consider allowing the ICE engines to provide down reserves to 20% minimum load since operations at that power level would be for short durations or explain why this cannot be done.[97] The Report further states:

> This analysis involves more than simply recalculating the fuel costs in each case. It involves determining if new efficient, flexible, generation operating on lower cost fuel could cost effectively reduce or eliminate the need to operate other baseload generation and further reduce renewables curtailment.[98]

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[95]Kirby Report at 12.

[96]Kirby Report at 13.

[97]Kirby Report at 13-14.

[98]Kirby Report at 14.

c.

Topic 3 - Other Options
To Increase Use Of Renewables.

With respect to Topic 3, the Kirby Report states that MECO did not appear to examine "investments at independent power producer facilities to provide increased down reserve and other ancillary services or other strategies to reduce curtailment," apparently because MECO felt it did not have sufficient information on these alternatives at the time the analysis was performed.[99] The Report states:

> From an engineering perspective this answer does not seem reasonable. It should be easy to incorporate wind and solar reserve flexibility into the production cost modeling. Reasonable assumptions could be made about the possible capabilities of existing wind and new distributed solar generation. This is no different and no more difficult than analysis utilities perform all the time where potential capabilities of future facilities must be estimated. Wind plants are especially good at providing down reserves and similarly limiting upswings when power systems are constrained.[100]

Thus, Mr. Kirby recommends that MECO be directed to examine investments at IPP facilities to provide increased down reserve and other ancillary services, as well as other strategies

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[99]Kirby Report at 14.

[100]Kirby Report at 14.

to reduce curtailment.[101] In particular, down reserves from wind, demand response, and BESS should be examined in order to reduce the need for down reserves from thermal generators and for must run generation; as to the latter, this examination should include methods to mitigate concerns of thermal generators moving below their minimum stable operating loads during high frequency events.[102]

d.

Topic 4 - Other Load Shifting Incentives.

As discussed above, MECO stated that it would investigate the potential for customers to increase or shift loads as a means to reduce curtailment of renewables. In Exhibit J, it concluded that its larger commercial customers were unlikely to shift loads as they would incur higher costs, employee problems, and, potentially, operational difficulties.

Referencing these conclusions, the Kirby Report states that "[u]nfortunately MECO again focused exclusively shifting the hours of energy consumption rather than on short duration rapid response and the provision of ancillary services."[103] The Report

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[101]Kirby Report at 14.

[102]Kirby Report at 14-15.

[103]Kirby Report at 15.

states that MECO incorrectly focused on night and early morning hours as the periods when curtailment was high, observing that "peak curtailment is expected to exceed off-peak curtailment by 2016" and that "curtailment is expected to be greatest from 11am through 3pm."[104] Thus, "[s]hifting additional load to the night and early morning will not help reduce curtailment."[105]

The Report states that responsive loads can often provide greater ancillary service response than load shifting response, e.g., commercial and residential cooling loads can typically provide three times the MW response for contingencies than is available for peak reduction.[106] Thus, the Report finds that "MECO's response is consistent with the lack of tangible results for reducing curtailment and facilitating renewables integration with their demand response programs to date."[107] While observing that these conclusions do not mean that load shifting cannot be effective in utilizing excess renewable energy, it does mean that "the responding loads will have to be flexible and that traditional fixed schedules are not likely to be useful."[108]

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[104]Kirby Report at 15.

[105]Kirby Report at 15.

[106]Kirby Report at 15.

[107]Kirby Report at 15.

[108]Kirby Report at 16.

Mr. Kirby recommends that MECO be directed to redo the analysis "utilizing the full flexibility of the responding resources, especially for limited duration fast response and for the provision of ancillary services."[109]

e.

Topic 5 - Demand Response/Energy Storage.

With respect to MECO's current demand response programs, and in conjunction with the discussion of Topic 4, Mr. Kirby concluded:

> The demand response program described in the SICR Plan appears both slow and misdirected. With wholesale energy costs an order of magnitude higher than on the mainland one would think that Hawaii would be leading in the deployment of demand response. On the contrary, while the Electric Reliability Council of Texas (ERCOT) must limit market-supplied demand response of contingency reserves (too much demand response is offered and at prices below generation response), MECO finds demand response ineffective and expensive. **This may be because MECO's focus has been on traditional peak reduction and load shifting rather than on flexibility and fast response.** With curtailment expected during all hours (Figure 6) it is up and down reserves that are required, especially reserves that can bridge until fast-start generation can respond. In the case of new ICE generation this can be under five minutes. The island's small electrical size, compared with mainland interconnections, can be an advantage for

[109]Kirby Report at 16.

> demand response utilization with power system frequency providing a very fast deployment signal.[110]

The Kirby Report observes that the modeling conducted in response to Order No. 31288 was not able to determine when to dispatch demand response resources for optimal curtailment reduction because those resources are modeled as scheduled programs, rather than as flexible tools to help mitigate curtailment of renewable generation.[111] This is problematic for a number of reasons, including: (1) it focuses on using demand response to eliminate the need for cycling generation, but does not show whether demand response could help to eliminate the need for baseload generation and (2) MECO appears to have modeled demand response on a fixed schedule, negating its flexibility and response benefits.[112]

Moreover, the Kirby Report states that "[i]t is especially troubling to base recommendations and decisions on modeling tools and analysis that fall materially short of accurately reflecting the capabilities and limitations of the power system and the resources being analyzed."[113] The Report

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[110]Kirby Report at 2 (emphasis added).

[111]Kirby Report at 17.

[112]Kirby Report at 17.

[113]Kirby Report at 17-18.

observes that "[r]atepayers cannot afford to compensate MECO for increased operating costs that result from inadequate modeling techniques and tools."[114]

Among other observations, the Kirby Report states that MECO's demand response programs are limited to research, demonstration, and pilot programs for the foreseeable future.[115] In addition, the Report states:

> MECO discusses additional efforts such as on-bill financing of DR-enabled devices, the Maui smart grid demonstration project, and the demand response management system. These all sound good in a general way. The concern is that none of the efforts have resulted in a significant amount of demand response providing ancillary services and facilitating renewables integration. MECO does not expect this to change within the next several years if ever.
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> The report does discuss use of DR for regulation in terms of their implementing "the necessary integrated suite of tools, information technology/operational technology systems, and telecommunications infra-structure to enable the effective, reliable, secure and scalable dispatch of DR resources." The discussion does not provide a clear understanding of what the responsive load is or how it will provide response. This risks forcing the load to conform to utility infrastructure requirements and potentially significantly reducing the pool of potentially responsive resources.[116]

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[114]Kirby Report at 18.

[115]Kirby Report at 21.

[116]Kirby Report at 21.

The Kirby Report thus makes the following recommendations with respect to MECO's demand response programs:

1. MECO should analyze using demand response to provide ancillary services and operating reserves to reduce the amount of required must run generation and curtailment of renewable resources. If MECO is currently unable to model the full range of demand response resources, MECO should rectify this shortcoming by improving its modeling capability before performing the analysis.[117]

2. MECO's demand response programs should be examined to determine if they are fully addressing the actual system flexibility needs necessary to facilitate integration of renewable resources.[118]

3. MECO should be directed to analyze demand response programs and energy storage technologies to reduce the need for on-line fossil generation to provide operating reserves and other ancillary services. However, given the amount of effort MECO has invested in current ineffective demand response efforts, a complete redesign of the current demand response effort may be in order.[119]

4. For water and wastewater facilities, commercial aggregators that enable these facilities to provide ancillary services already exist. Thus, MECO should be directed to invite an appropriate commercial aggregator to analyze the facilities and to recommend a solution for possible immediate implementation.[120]

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[117]Kirby Report at 18.

[118]Kirby Report at 23.

[119]Kirby Report at 22.

[120]Kirby Report at 23.

f.

Topic 6 - Costs Of Implementing The SICR.

With respect to Topic 6, Mr. Kirby addressed five subtopics: (1) fixed schedules; (2) base load and must run generation; (3) renewable energy payments versus marginal production cost optimization; (4) additional wind and/or central solar generation; and (5) a fully optimized system.

(1)

Fixed Schedules

With respect to fixed schedules, the Kirby Report states that MECO imposes fixed charging and discharging schedules on proposed BESS use, even though "BESS is capable of responding in cycles with both real and reactive power so there is no need for continuous charging or discharging before the contingency or for scheduled real-power operations."[121] The Report further states that MECO apparently did not analyze whether it would be possible to remove a base load unit from service and, instead, provide ancillary services from the BESS, wind, solar, etc.[122]

Thus, the Report recommends that MECO be directed to analyze a "full optimization where base load units are not

[121]Kirby Report at 23.

[122]Kirby Report at 24.

preferentially assumed into the generation fleet and where resources are not operated on fixed schedules."[123] In addition:

> The Commission should consider asking MECO to perform the BESS analysis again making full use of flexibility that the BESS is capable of to respond to the real-time conditions of wind, solar, and load variability. MECO should also verify the capital cost estimate in light of technology advances, incentives and market changes. Note, the assumed capital cost is so high for the energy shifting BESS that I do not expect Case 7 or 8 to result in viable projects. Case 2 may be viable, especially if an additional wind or central solar plant is added or if the base load units are not forced onto the power system. Nonetheless, MECO should eliminate fixed schedules from its operations and analysis.[124]

(2)

Base Load And Must Run Generation

With respect to baseload and must run generation, the Kirby Report notes that progress is being made "in finding ways to cycle generators that were previously thought to require continuous operations and to lower minimum loads on generators."[125] To continue this progress, he recommends that

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[123]Kirby Report at 24. The Report further states that "MECO should utilize security constrained unit commitment and economic dispatch to optimize power system operations." Id.

[124]Kirby Report at 24.

[125]Kirby Report at 24.

MECO be directed to explore increasing the flexibility of its thermal generators and to examine the economic attractiveness of replacing existing thermal generators with more flexible and efficient generation.[126] Further, as discussed in detail in the Kirby Report, MECO should be directed to investigate "if the must run restrictions imposed by the inflexibility of the DTCC 1 and DTCC 2 plants can be further alleviated, or if it is appropriate to consider replacing these plants with newer, more flexible and more efficient generation such as the new ICE generators that are better suited to the variable load and renewable generation conditions of the island power system."[127]

(3)

Renewable Energy Payments Versus
Marginal Production Cost Optimization

With respect to renewable energy payments versus marginal production cost optimization, Mr. Kirby observes that fully optimized power system operations minimize costs based on the marginal production cost of each resource (MECO generators, IPP generators, and, ideally, storage and demand response).[128]

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[126]Kirby Report at 25.

[127]Kirby Report at 27.

[128]Kirby Report at 28.

> The SICR analysis used the marginal production costs of MECO generators but used the contract prices for the wind plants, which does not reflect their marginal cost. This results in a sub-optimal solution. When wind is uncurtailed there is no increased fuel use, the uncurtailed energy is produced at essentially zero cost (increased variable O&M might be ~$1/MWh). An optimization analysis should look at economically optimizing the entire system based on the marginal production cost of each resource.[129]

Thus, Mr. Kirby recommends that MECO should be directed to redo the analysis using the marginal production cost of all resources rather than contract prices (reasonable estimates can be used when actual costs are not known precisely) to determine which projects are genuinely economic.[130]

(4)

Additional Wind And/Or Central Solar Generation

With respect to adding more wind and/or central solar generation, Mr. Kirby states that "[t]he goal should not be to simply accommodate the existing wind and solar generation but to facilitate increased renewables penetration to further reduce dependence on expensive imported fossil fuels."[131] He further

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[129]Kirby Report at 28.

[130]Kirby Report at 28.

[131]Kirby Report at 28.

observes that "the efforts to date that have reduced renewables curtailment appear to have left the system on the edge of significant curtailment if additional wind or solar generation is added."[132]

(5)

Fully Optimized System

With respect to a fully optimized system, the Kirby Report states:

> The final plan should be an optimized mix of all of the options, however. That optimization should be better than any of the individual options. Further, the power system should be operated to take advantage of all of the physical flexibility that each resource (MECO generators, IPP generators, loads, and storage) are capable of providing. The system should use security constrained unit commitment and economic dispatch to optimize the system under the conditions it is experiencing at the time and what the short term forecast predicts. Generators, demand response, and storage should respond to the real-time variability of load, wind and solar. Fixed schedules for generators, demand response, and storage are economically inefficient.[133]

The Report states that MECO's preferred plan goes "part way" in determining an optimal solution by combining two of the cases analyzed (cases 13 & 19). MECO states that

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[132]Kirby Report at 28.

[133]Kirby Report at 29.

"the customer bill impact of implementing the combination of case 13 and case 19 from the 2014 to 2018 period will range between $(0.32) to $(0.58) per month as compared to the Reference case."[134] However, the Kirby Report notes:

> It is not clear why benefits should "range between" the values for the individual cases. Case 19 by itself is estimated to provide a $(0.58) per month customer benefit. There would be no reason to deviate from the Case 19 proposal if the deviation were to lead to a reduction in benefits. Instead, it is likely that combining Case 13 and Case 19 actions will result in better performance than Case 19 alone. So customer benefits should exceed $(0.58) per month. It is also likely that the Case 13 and Case 19 benefits are not linearly additive. Still, the combined case should be better than either case alone, or there is no reason to combine the cases. More importantly, it is likely that a full optimization of the possible operating modes and improvements will result in the greatest and most cost effective benefits.[135]

Thus, the Report recommends that MECO be directed to develop a fully optimized SICR plan which does not assume fixed schedules but instead uses current utility "best practices" including security constrained unit commitment and economic dispatch (MECO generation, IPP generation, DR, and storage) to respond to real-time load, wind, and solar conditions, which takes full advantage of the physical flexibility offered by each

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[134]SICR, Exhibit A at 12.

[135]Kirby Report at 29.

resource, and which responds to the actual real-time conditions rather than to fixed operating schedules.[136] In addition, demand response and storage should be optimized, and ICE generators should be considered.[137]

g.

Final Conclusions.

The Kirby Report concludes with a summary of the above recommendations. In addition, the Report states that the 505 pages of material filed by MECO partially respond to the commission's directives in Order No. 31288 by describing actions taken and to be taken primarily to reduce curtailment of wind.[138] These actions are discussed in the Report and above, and include such things as (1) reducing the scheduled operation of units K1 and K2; (2) reducing the minimum loads on units K3 and K4; (3) deactivation of K1 and K2 in 2014; (4) retirement of K1, K2, K3, and K4 by 2019; (5) regulating with K3, K4, M15 and M18; (6) adding new flexible biofueled ICE generation; (7) adopting the Reduced HSIS regulation recommendations; (8) changing the

[136]Kirby Report at 29.

[137]Kirby Report at 29.

[138]Kirby Report at 31.

PV forecast; and (9) crediting wind with capacity value starting in 2016.[139]

Mr. Kirby concludes:

> These actions significantly reduce wind curtailment and MECO is to be commended for adopting them, though ratepayers would have saved much more had these actions been taken earlier. The analysis also highlights the fact that changing long held practices can benefit ratepayers by reducing costs and advancing environmental and fuel diversity goals while maintaining reliability if they are done wisely and expeditiously.[140]

V.

MECO Response To The Kirby Report

On March 28, 2014, in this docket, MECO filed its "Maui Electric Comments on MECO System Improvement and Curtailment Reduction Plan Review ("Report") prepared by Brendan Kirby P.E." ("MECO Response"). According to MECO's cover letter, the MECO Response includes comments and supporting documentation in response to the Kirby Report, provides a brief update to the commission on matters relevant to the Kirby Report, and sets forth areas of agreement, clarifications, or responses to the raised in the Report.

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[139]Kirby Report at 31.

[140]Kirby Report at 31.

The MECO Response will be discussed as pertinent with respect to the commission's findings and conclusions herein.

VI.

Findings And Conclusions

In this section, the commission addresses various aspects of the SICR, the Kirby Report, and the MECO Response. As a result of the findings and conclusions set forth here, the commission is directing MECO to file a Power Supply Improvement Plan as set forth in the next section within one hundred and twenty (120) days of this Order. In addition, the commission is issuing a demand response policy statement simultaneously with this Order that calls for certain actions on the part of each of the HECO Companies, including MECO. Many of the issues raised by MECO's SICR with respect to demand response are addressed in the policy statement.

a.

Topic 1 - Reduction/Elimination Of Renewable Energy Curtailment.

As discussed herein, the reduction in curtailment of renewable energy from the date of Order No. 31288 is encouraging. As noted in the MECO Response, "[w]ith implementation of the five Maui Operational Measures ("MOMs"), curtailment was reduced to an

estimated 18%" and "[w]ith the further actions already accomplished and committed to by Maui Electric, curtailment was further reduced to an estimated 8% in the Reference Case."[141] However, as noted by Mr. Kirby, while these results are impressive, they assume "no additional wind or central solar generation for the next 25 years."[142] The Kirby Report made two recommendations to address this assumption.

First, Mr. Kirby recommended that MECO supplement its SICR by analyzing additional cases that provide for additional wind and/or central solar generating plants. MECO responds by stating that it is generally willing to analyze such cases.[143] However, the commission observes that MECO's proposal appears to continue to focus on curtailing existing renewable energy: "[t]he analyses performed in the SICRP indicated that the operational changes that Maui Electric is in the process of implementing, and is planning on implementing in the future are forecasted to further reduce curtailment of the existing as available resources...."[144]

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[141]MECO Response, Attachment 1 at 1.

[142]Kirby Report at 5 (emphasis added).

[143]MECO Response, Attachment 1 at 2.

[144]MECO Response, Attachment 1 at 2.

With respect to additional wind and solar, MECO states:

> With consideration to demand response ("DR") and energy storage providing ancillary services to the Maui system, there is potential for the Maui system to accept more as-available generation, but this would be dependent on DR program and energy storage design, availability, capability, and response time. Maui Electric is also responsible for the stability of the electrical delivery system (voltage and frequency support), which will have to be addressed with the retirement of the KPP and operating fewer firm generating units. The response to issue 3 explains the on-going work that Maui Electric is performing with respect to this.[145]

The commission does not view this is as an adequate response. Prompt development of available DR and energy storage resources for the benefit of MECO's customers - including a thoughtful and analytically sound assessment of how demand response and energy storage design, availability, capability, and response time can assist in reducing curtailment and adding more renewable energy in the near term future - should be undertaken immediately. Hence, the commission is directing MECO to address these - and other issues - in the PSIP as well as in the demand response policy statement being issued simultaneously with this Order.

Second, the Kirby Report recommended that MECO be directed to analyze the ability of fast response from BESS,

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[145]MECO Response, Attachment 1 at 2.

demand response, and existing (and new) wind and solar facilities to reduce the need to hold reserves on thermal generators.[146] While MECO states that it generally agrees with this recommendation, MECO goes on to say that its analysis did not assess the cost to charge the BESS "because the production simulation model does not have the capability to simulate the intra-hour system characteristics."[147] Thus, MECO states that it is limited in its ability to implement this recommendation:

> However, as pointed out in Mr. Kirby's review of the SICRP, a model that would be able to determine the dispatch of resources for optimal curtailment reduction (DR or BESS) would be needed, because the required real-time response is typically in much shorter lime periods (minutes rather than hours). The Company agrees that a production simulation with intra-hour analysis capability could provide results to respond to these inquiries. However, given the current limitation with the Company's production simulation model, in which the lowest time increment is on an hourly basis, Maui Electric currently does not have the capabilities to run sub-hourly time intervals in its production simulations. Hawaiian Electric's Generation Planning Division is investigating the feasibility of acquiring a production simulation model which would have intra-hour analysis capability.[148]

The Commission finds this response simply unacceptable. It is the utility's job to use planning tools that adequately

[146]Kirby Report at 6.

[147]MECO Response, Attachment 1 at 2.

[148]MECO Response, Attachment 1 at 3.

simulate the operation of the power system. As the operational needs of the system change, the utility needs to reassess and potentially acquire new tools rather than use the limitations of existing tools as an excuse to neglect future planning.

The MECO Response also notes that there is a connection between Topic 1 and Topic 3 addressing demand response and energy storage. According to MECO, its response to Topic 3 discusses ongoing work to be performed to address demand response and storage issues.[149] In discussing Topic 3, the Kirby Report observes that "[i]t is especially troubling to base recommendations and decisions on modeling tools and analysis that fall materially short of accurately reflecting the capabilities and limitations of the power system and the resources being analyzed" and, further, that "ratepayers cannot afford to compensate MECO for increased operating costs that result from inadequate modeling techniques and tools."[150]

A similar conclusion is called for with respect to the Kirby Report's second recommendation concerning Topic 1. As noted above, the commission does not accept MECO's response that the limitations of their existing production simulation

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[149]MECO Response, Attachment 1 at 2.

[150]Kirby Report at 18.

model precludes analysis of demand response and energy storage technologies.

b.

Topic 2 - Retirement/Modification Of KPP Units.

As discussed above, MECO states that it plans to deactivate units K1 and K2 in 2014 and to modify operations of the dual-train combined cycle units at Maalaea Power Plant.[151] In addition, MECO states that it plans to retire the Kahului Power Plant by 2019 and upgrade the 23 kV transmission system with the Waiinu-Kanaha transmission upgrade project.[152]

The Kirby Report made three recommendations with respect to this portion of the SICR. The first recommendation is identical to the first issue addressed under Topic 1 above, and, thus, will not be further addressed here.

Mr. Kirby's second recommendation is that MECO be directed to analyze the optimal deployment, commitment, and dispatch of the proposed ICE generators, considering MSFO, LSFO, and possibly diesel fuels.[153] He further recommends that in conducting this analysis, MECO (1) use a 40% minimum load and (2) consider allowing the ICE engines to provide down reserves to

[151]SICR, Exhibit A at 2.

[152]SICR, Exhibit A at 3.

[153]Kirby Report at 33.

20% minimum load since operations at that power level would be for short durations or explain why this cannot be done.[154] Mr. Kirby states that this analysis involves more than simply recalculating the fuel costs in each case; rather, the analysis involves determining if new efficient, flexible, generation operating on lower cost fuel could reduce or eliminate the need to operate other baseload generation, and further reduce renewables curtailment, on a cost effective basis.[155]

MECO states that it is in "partial" agreement with this recommendation, but is "uncertain of the intent with respect to other parts."[156] As to the former, MECO states that the ICE units were assumed to use biofuel in furtherance of the Hawaii Renewable Energy Agreement and, more generally, in furtherance of moving towards use of more renewable energy.[157] While recognizing that biofuel is currently more expensive than other fossil fuel alternatives such as those identified in the Kirby Report, MECO nevertheless states:

> [T]the Company is willing to perform additional analyses based on other fuels (diesel, medium sulfur fuel oil ("MSFO"), liquefied natural gas ("LNG"), etc.) in the

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[154]Kirby Report at 33.

[155]Kirby Report at 14.

[156]MECO Response at 4.

[157]MECO Response at 4.

> ICE generating units. Along with other fuel options, consideration to other issues, such as environmental regulations, will need to be addressed with regards to operating assumptions, run hours, starts per day or others as necessary. Taking into account these considerations, the optimal deployment, commitment and dispatch of the proposed ICE generating units may be analyzed.[158]

The commission assumes that the "other issues" identified by MECO - with the exception of environmental issues - have already been included in the SICR analyses based on utilization of biofuels. Stated differently, the commission understands that the only change to the analyses at this point is to analyze the optimal deployment, commitment, and dispatch of the proposed ICE generators by considering alternatives to biofuel such as MSFO, LSFO, and possibly diesel fuels, giving due consideration to any environmental factors.

MECO next addresses the recommendation that MECO explain why new ICE generators cannot provide short-duration down reserves to 20% load. MECO asserts that the operating characteristics of the ICE unit were based on the 17MW ICE unit submitted in the 2013 IRP report, and that Mr. Kirby's request would require this unit to operate outside the parameters for this unit and so, in MECO's view, that request is hypothetical.[159]

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[158]MECO Response at 4.

[159]MECO Response, Attachment 1 at 4.

MECO goes on to state that "[t]his is not to say that it is impossible to operate at the levels being requested," but that "it may be more appropriate to analyze this once the generating unit is established through a solicitation or procurement process."[160]

MECO then states the obvious: that for a unit to provide short term down reserves, it must be running at the time the operation takes place.[161] To MECO, this means that one or more of the ICE units must be operated at all times.[162] MECO concludes:

> It would appear that the System Impact Study (which will be completed at the end of April and the study scope is provided in Attachment 2 in the response to issue 3 below) would provide the information necessary to determine the system needs with respect to unit mode of operation (i.e., baseload, cycling, peaking). In addition, fuel resource assumptions for the ICE units will impact the commitment and dispatch of the unit(s), and whether down reserve provision by the ICE unit(s) is the most cost effective, relative to the other unit(s) that can provide down reserves.[163]

The commission finds this response deficient. To begin, Attachment 2 to the MECO Response is a three page

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[160]MECO Response, Attachment 1 at 4.

[161]MECO Response, Attachment 1 at 4.

[162]MECO Response, Attachment 1 at 5.

[163]MECO Response, Attachment 1 at 5.

document entitled "Maui Curtailment Reduction Plan System Impact Study Scope of Work," apparently to be conducted by Electric Power Systems ("EPS Study"). There is very little detail provided concerning the breadth or scope of the EPS Study, what modeling techniques are to be used, what assumptions are being made, or even when the EPS Study was requested; in short, there is no way to determine exactly what the EPS Study is intended to analyze or achieve.

To be sure, MECO describes the EPS Study as having been commissioned "as a result of the ongoing and future changes in operations described in Exhibit F of the SICRP".[164] At another point, MECO says the Study will include "the determination of any system needs resulting in operational changes, as well as to provide recommendations on how to use existing resources, such as the energy storage systems, to address those needs."[165] Finally, MECO describes the deliverables from the study as (1) a final report that "will include an overall assessment of the proposed operating modes outlined in the Maui Curtailment Reduction Plan's preferred plan and an [blank in copy]"

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[164]MECO Response, Attachment 1 at 5.

[165]MECO Response, Attachment 1 at 5.

and (2) "a Powerpoint report presenting the method of study, results of the study, and recommendations."[166]

As noted above, the EPS Study is apparently designed to provide an assessment of MECO's preferred plan. Taken at face value, there is no indication that the above recommendations from the Kirby Study will be directly addressed by the EPS Study, despite MECO's statement that "it would appear" that these issues will be addressed, because Mr. Kirby's recommendations are not part of the preferred plan.

As discussed in this Order, an overall strategy concerning how MECO's system can be operated efficiently and cost effectively is lacking, as is any discussion of how to integrate additional renewable sources. The scant information provided by MECO with respect to the EPS Study does nothing to address this issue.[167]

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[166]MECO Response, Attachment 1 at 5, and Attachment 2 at 3.

[167]Mr. Kirby's third recommendation concerns whether or not certain documents should be considered confidential. While the commission does not address this issue in this order, the commission observes that such issues can be raised by parties to the docket or by the commission on its own motion in the ongoing proceedings.

c.

Topic 3 - Other Options
To Increase Use Of Renewables.

As discussed above, in the SICR, MECO states that it plans to investigate other options that may allow it to accept more renewable energy, such as investments in IPPs to provide down reserve and other ancillary services, future development and utilization of distributed energy resources on Maui, and other storage projects, such as pumped storage hydro ("PSH") projects. Thus, the Kirby Report observes that, in the SICR, MECO did not appear to examine using IPP facilities to provide increased down reserve, other ancillary services, and other strategies to reduce curtailment.[168] More specifically, Mr. Kirby recommends that MECO examine down reserves from wind, demand response, and BESS to reduce the need for down reserves from thermal generators and for must run generation; such examination would include a review of methods to mitigate concerns associated with operating thermal generators below their minimum stable operating loads during high frequency events.[169]

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[168]Kirby Report at 14.

[169]Kirby Report at 14-15.

In its Response, MECO states that it agrees with the "intent" of Mr. Kirby's recommendations.[170] MECO states that it will address these recommendations as part of the EPS Study discussed above.[171]

The shortcomings of MECO's presentation concerning the EPS Study are set forth above and will not be repeated here. Suffice it to say that there is no indication that the EPS Study will address the specific issues identified by Mr. Kirby here.

d.

Topic 4 - Other Load Shifting Incentives.

In the SICR, MECO stated that it would investigate the potential for customers to increase or shift loads as a means to reduce curtailment of renewables. In Exhibit J, MECO concluded that its larger commercial customers were unlikely to shift loads as they would incur higher costs, employee problems, and, potentially, operational difficulties.

In response, the Kirby Report states that MECO incorrectly focuses on shifting energy consumption between time periods, rather than using renewables for short duration rapid

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[170]MECO Response, Attachment 1 at 5.

[171]MECO Response, Attachment 1 at 5.

response and the provision of ancillary services.[172] Thus, the Kirby Report states that:

> [O]n-peak curtailment is expected to exceed off-peak curtailment by 2016. This does not mean that load response cannot be effective at using excess renewable energy. It does mean that the responding loads will have to be flexible and that traditional fixed schedules are not likely to be useful. Similarly, fixed schedules for BESS operations and other DR programs are also not likely to be effective. Fixed schedules for thermal generation are not likely to be effective either.[173]

The MECO Response states that MECO generally agrees with Mr. Kirby that "flexibility and fast response may be more pertinent than a focus on traditional peak reduction and off-peak load shifting tariff, because curtailment may occur at all hours (Report at 2) and customer participation in voluntary time-of-use rates is not able to provide the response described."[174] Having conceded the point, however, MECO then states:

> Maui Electric agrees that a production simulation with intra-hour analysis capability could provide results to respond to these inquiries. However, given the current limitation with the Company's production simulation model, in which the lowest time increment is on an hourly basis, Maui Electric currently does not have the capabilities to run sub-hourly time intervals in its production simulations.

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[172]Kirby Report at 15.

[173]Kirby Report at 16.

[174]MECO Response, Attachment 1 at 6.

> Hawaiian Electric's Generation Planning Division is investigating the feasibility of acquiring a production simulation model which would have intra-hour analysis capability.[175]

The commission has previously discussed the problems with MECO's production model, and will not repeat its conclusions here. Suffice it to say that, given the rapid development of renewables, and MECO's recognition that flexibility and fast response "are pertinent," it is difficult to understand why the necessary modeling tools are not already in use.

e.

Topic 5 - Demand Response/Energy Storage.

MECO's discussion of demand response in its SICR follows the path of its past pronouncements on the subject. MECO makes general statements concerning the usefulness of demand response with respect to system operational flexibility and resiliency, and then states that it "plans to implement the necessary integrated suite of tools, information technology/operational technology systems, and telecommunications infrastructure to enable the effective, reliable, secure and scalable dispatch of DR resources."[176] As discussed above,

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[175]MECO Response, Attachment 1 at 6.

[176]SICR, Exhibit A, Attachment A2 at 13-14.

MECO's five year plan for demand response consists largely of plans to conduct additional studies and pilot programs.

With respect to battery storage, MECO states that (1) MECO will "continue evaluating" utility-scale BESS and (2) the HECO Companies "are following a broad-based application strategy to evaluate the merits of energy storage" and that "applications of the Hawaiian Electric Companies' energy storage research and demonstration projects were purposely varied to enable investigation of various operational issues."[177] The lack of specificity in these statements is obvious.

Mr. Kirby describes MECO's demand response programs as "slow and misdirected" and further states that this may be because MECO's focus is (and has been) on traditional peak reduction and load shifting, rather than on flexibility and fast response. Among other things, the Kirby Report again points to serious deficiencies in MECO's modeling capabilities and analyses, observing that these tools "fall materially short of accurately reflecting the capabilities and limitations of the power system and the resources being analyzed."[178]

Mr. Kirby makes four recommendations with respect to demand response and energy storage, each of which are discussed,

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[177]SICR, Exhibit A, Attachment A2 at 6 and Exhibit F.

[178]Kirby Report at 17-18.

in turn, below. However, prior to discussing these recommendations, the commission reiterates that it strongly supports the use of cost-effective and efficiently run demand response programs, and is issuing a demand response policy statement simultaneously with this Order that calls for certain actions on the part of the HECO Companies, including MECO. Many of the issues raised by MECO's SICR are addressed in the policy statement as well. However, the commission here addresses four issues that have been raised with respect to this topic.

First, Mr. Kirby recommends that MECO analyze the use of demand response to provide ancillary services and operating reserves so as to reduce the amount of required must run generation and curtailment of renewable resources.[179] Apparently anticipating MECO's response, Mr. Kirby further states that if MECO is unable to model the full range of demand response resources, MECO should rectify this shortcoming by improving its modeling capability before performing the analysis.[180]

MECO's response again appears to agree with this recommendation in theory, but then states the recommendation cannot be carried out in practice because of MECO's inability to run sub-hourly intervals in production modeling:

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[179]Kirby Report at 17-18.

[180]Kirby Report at 18.

> Maui Electric agrees that a production simulation that supports sub-hourly analysis should be used to depict the utilization of the full flexibility of the responding DR resources for limited duration fast response and for provision of ancillary services. Program design and aggregators for DR programs will also need to be defined. As noted above, Maui Electric does not currently have a production simulation model with intra-hour analysis capability.[181]

Again, the commission has addressed in the shortcomings in MECO's production model, and further addresses this issue with respect to the PSIP.

Second, the Kirby Report recommends that MECO's demand response programs be examined to determine if they fully address the actual system flexibility needs necessary to facilitate integration of renewable resources.[182] MECO offers a number of comments to this recommendation in its response.

To begin, MECO states: "[t]his recommendation appears to assume that DR programs to provide operating reserves and other ancillary services are well-established and readily applicable for Maui."[183] Apparently in an attempt to prove the opposite, MECO cites a report issued by the Federal Energy Regulatory Commission ("FERC") for the proposition that

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[181]MECO Response, Attachment 1 at 6.

[182]Kirby Report at 23.

[183]MECO Response, Attachment 1 at 7.

"DR applications to provide operating reserve and ancillary services are still at an early stage" ("FERC DR Report").[184] MECO then concludes:

> Given Maui's isolated and smaller DR market potential, success of the application of DR programs on the U.S. Mainland's interconnected wholesale electric grids might not necessarily transfer to Maui's grid, in whole or in part. The costs of using DR programs to achieve the proposed recommendation would also need to be weighed against other alternatives.[185]

The commission strongly disagrees with these statements. At the outset, MECO appears content to "wait and see" what other utilities are doing, rather than taking a proactive approach to how demand response can best be utilized on the MECO system, so as to assist in system operations, provide integration of renewables, and deliver tangible benefits to MECO's ratepayers. Precisely because MECO operates in a smaller, more isolated market - albeit with higher percentages of renewables than many of its mainland counterparts - MECO should be investigating what are the best uses of demand response for its system now and for the future, not relying on what mainland utilities have done in the past.

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[184]MECO Response, Attachment 1 at 7, citing "Assessment of Demand Response & Advanced Metering," FERC Staff Report, October 2013.

[185]MECO Response, Attachment 1 at 7.

Moreover, the FERC DR Report is essentially an annual survey, by region, that assesses electricity demand response resources for mainland utilities. Notably absent from the report is any discussion of Hawaii utilities, or the future of demand response. Because Hawaii is ahead of the mainland in developing and integrating renewables, the commission believes it is appropriate for Hawaii to be utilizing advanced demand response resources to provide a variety of services as discussed above, including the accommodation of renewable energy integration.

Use of demand response for ancillary services is neither experimental nor theoretical. Despite MECO's conclusion above, the HECO Companies are not unfamiliar with use of demand response to provide these services. For example, in 2010, the HECO Companies filed an application to implement "Fast DR" programs, stating that the term "Fast DR" refers to customer loads that can be shed within ten minutes or less from the time the customer receives notification by the utility, and that Fast DR may provide many, but not all, of the attributes of the "quick start" class of firm generation resources.[186]

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[186] "In the Matter of the Application of HAWAIIAN ELECTRIC COMPANY, INC., HAWAII ELECTRIC LIGHT COMPANY. INC., MAUI ELECTRIC COMPANY, LIMITED, For Approval of a Fast Demand Response Pilot Program and Recovery of Program Costs," Docket No. 2010-0165, HECO Companies' Application at 1, filed on August 31, 2010 ("2010 Fast DR Application").

> The EnergyScout for Business CIDLC Program is primarily designed to be a resource option for generation capacity deferral and emergency system protection. In contrast, the Fast DR Pilot Program is designed to be a "quick start" (i.e., less than 10 minutes) bridge resource primarily intended to facilitate grid operations when there are increasing levels of variable intermittent renewable energy. Under specific system event conditions resulting from a sustained ramp-down of intermittent wind resource, Fast DR could be an effective option to supplement the need for additional spinning reserve requirements.[187]
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> Actual operating experience will provide a means for Hawaiian Electric and MECO system operations personnel to evaluate the reliability of the fast response customer loads to function as a grid management tool capable of providing a variety of ancillary services for managing increasing levels of renewable energy penetration from wind and solar.[188]

Likewise, Exhibit G to the Fast DR Application provided a general discussion of how demand response resources could be used to provide a variety of ancillary services:

> The DR Roadmap envisions a portfolio of DR that consists of existing (CIDLC and RDLC) and future (Fast DR and Dynamic Pricing) programs that provides resources covering the spectrum of response times that the utility uses to maintain system reliability. Those DR resources, juxtaposed with supply-side resources, provide the utility with

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[187] 2010 Fast DR Application at 8.

[188] 2010 Fast DR Application at 15-16.

> tools to improve generation efficiency, improve service reliability, accept increased renewable energy into the system, potentially defer investments in new generation resources, or otherwise lower costs.[189]

Contrary to MECO's statements, demand response programs designed to provide operating reserves and ancillary services have been under development for many years, and forward-thinking utilities have moved beyond demand response as a tool for simply shifting load. For example, the Electricity Reliability Council of Texas ("ERCOT") has obtained spinning reserves from demand response since 2002. ERCOT found that DR is faster than governor response and reduces the need for inertia.[190] The ability of demand response to serve a variety of system needs is expanding rapidly, both through utility actions and use of third party providers.

MECO makes similar comments with respect to energy storage: "Maui Electric also believes that the use of energy storage technologies to reduce the need for on-line fossil generation to provide operating reserves and other ancillary services on Maui requires further evaluation."[191] MECO provides a copy of a January 2013 report prepared by the staff of the

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[189]201 Fast DR Application at Exhibit G, p. 1 of 1.

[190]See D. Hurley, et al., "Demand Response as a Power System Resource," Regulatory Assistance Project, May 2013.

[191]MECO Response, Attachment 1 at 7.

California Public Utilities Commission entitled "Energy Storage Phase 2 Interim Staff Report." MECO concludes - as it did with respect to demand response programs to provide operating reserve and ancillary services - that "energy storage technologies are at a similar developmental stage as the use of DR to provide storage and ancillary services."[192]

In line with the above discussion, the commission finds MECO's response disconcerting. Two wind plants on the MECO system have installed battery energy storage systems per conditions of their power purchase agreements with MECO to provide ancillary services to the MECO grid and allow for greater utilization of renewable energy. Other storage projects are being installed as a part of demonstration projects in Kihei and Wailea. The issue has been studied at length in several renewables integration studies, including studies partially funded by MECO with costs recovered from ratepayers and included as exhibits in prior filings by MECO in this docket. Simply stated, the Commission believes MECO needs to move beyond further evaluation of these technologies and develop proactive plans to implement these resources cost-effectively.

Third, and related to the previous recommendation, the Kirby Report states that MECO should be directed to analyze

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[192]MECO Response, Attachment 1 at 7.

demand response programs and energy storage technologies to reduce the need for on-line fossil generation to provide operating reserves and other ancillary services. However, Mr. Kirby further observes that, given the amount of effort MECO has invested in current ineffective demand response efforts, a complete redesign of the current demand response effort may be in order.[193]

MECO's Response states:

> With respect to this recommendation, Maui Electric notes that the Hawaiian Electric Companies have retained the consulting services of PA Consulting Group ("PACG") to assist in the design of a DR strategy focused on the development and implementation of a company-wide strategy that will take full advantage of the economic DR opportunities available on Oahu, Maui and the island of Hawaii. This company-wide DR strategy will be aligned with the companywide smart grid plans, and will differentiate DR initiative potential, scope, timing and pricing in order to maximize the use of cost effective DR resources on each island (DR action plans may be different for each island due to differing operational needs and timing).[194]

As with the EPS Study, no details are provided with respect to this study such as the date on which the study was commissioned, the issues to be analyzed, the assumptions being made, the modeling techniques to be used, the qualifications of

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[193]Kirby Report at 22.

[194]MECO Response, Attachment 1 at 8.

PA Consulting Group, etc. This lack of details is troubling, and certainly provides no assurance that Mr. Kirby's recommendation will be addressed.

MECO next states that "a proceeding to review the DR programs is not necessary for Maui Electric."[195] The commission strongly disagrees, and, in fact, has come to the opposite conclusion for all of the HECO Companies, including MECO. Thus, the commission again notes that it is issuing a demand response policy statement simultaneously with this Order. Given the lack of specific policy goals by the HECO Companies for demand response in general, and the ineffectiveness of MECO's demand response programs noted by Mr. Kirby in particular, the commission is ordering a complete and thorough re-evaluation of the HECO Companies' current demand response programs and future plans.[196]

Fourth, Mr. Kirby observes that, for water and wastewater facilities, commercial aggregators that enable these facilities to provide ancillary services already exist. Thus, MECO should be directed to invite an appropriate commercial

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[195]MECO Response, Attachment 1 at 9.

[196]Given the lack of details here, the commission cautions that the PA Consulting Group study may or may not be pertinent to the issues to be addressed pursuant to the policy statement.

aggregator to analyze the facilities and to recommend a solution for possible immediate implementation.[197]

MECO states that it agrees with this recommendation and has engaged Brown & Caldwell to perform an initial assessment of demand response potential and technical feasibility of asset classes within the County of Maui's Division of Water Supply ("DWS") and Wastewater Reclamation Division ("WWRD").[198] This study is to be completed by the end of April 2014.

The purpose of this study is described as follows:

> MECO has prepared a demand response (DR) program action plan that includes pursuing participation from DWS and WWRD including completion of water and wastewater DR potential and technical feasibility studies. The action plan states that DWS and WWRD "facilities are potentially positioned to provide real-time DR resources to the MECO grid by supplying generation and non-generation ancillary services and to potentially shift water pumping loads in order to accept renewable energy generation that might otherwise be curtailed". MECO is interested in investigating the feasibility of reducing electrical demand at DWS and/or WWRD facilities during peak demand periods and shifting the demand to non-peak periods to reduce customer bills and to increase the use of renewable energy.[199]

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[197]Kirby Report at 23.

[198]MECO Response, Attachment 1 at 8, and Attachment 5.

[199]MECO Response, Attachment 5 at 1 (November 13, 2013 "Revised Proposal for Demand Response Program Phase 1 Feasibility Study," prepared by Brown & Caldwell).

While MECO has not yet adequately explained the scope of this study or demonstrated a compelling strategy in response to Mr. Kirby's recommendation, the commission again notes the apparent focus on peak reduction, which clearly does not begin to approach the range of applications and services demand response resources can provide.

f.

Topic 6 - Costs Of Implementing The SICR.

As discussed above, the Kirby Report made a number of recommendations with respect to this topic. Each will be addressed in turn.

First, Mr. Kirby recommends that MECO be directed to analyze a "full optimization" where base load units are not preferentially assumed into the generation fleet and where resources are not operated on fixed schedules. In response, MECO states that "[p]roduction simulations can be performed to model a Maui system without base load generating units or fixed operating schedules."[200] However, MECO then states "it is of questionable value to perform a production simulation on a system

[200]MECO Response, Attachment 1 at 10.

that cannot be operated in the manner that ensures reliability to its customer or ignores system safety and security."[201]

MECO's response simply states the obvious, and the commission is certain that all parties would readily agree that reliability, system safety, and security concerns are of the utmost importance. That recognition, however, does not address the recommendation made by Mr. Kirby.

Second, the Kirby Report recommends that MECO perform the BESS analysis again, making full use of flexibility that the BESS is capable of to respond to the real-time conditions of wind, solar, and load variability. In response, MECO again notes that sub-hourly analysis would be beneficial in responding to this recommendation. The commission's comments with respect to this type of analysis have been discussed previously and will not be repeated here.

MECO further notes that, "[i]n addition to modeling, Hawaiian Electric is in the process of developing an energy storage strategy to define the vision, operational objectives, and action plans for energy storage."[202] Apparently, this

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[201]MECO Response, Attachment 1 at 10.

[202]MECO Response, Attachment 1 at 11.

analysis - like the demand response analysis - is to be applied to each of the HECO Companies, although the action plans for each will be different.[203] Again, the commission notes that these issues are to be addressed in response to the demand response policy statement being issued simultaneously with this Order.

Third, Mr. Kirby suggests that the commission encourage MECO to continue its efforts to increase the flexibility of their thermal generators and to examine the economic attractiveness of replacing existing thermal generators with more flexible and efficient generation. Likewise, Mr. Kirby recommends that MECO be directed to investigate whether the must run restrictions imposed by the inflexibility of the DTCC 1 and DTCC 2 plants can be further alleviated, or if MECO should consider replacing these plants with newer, more flexible and efficient generation such as the new ICE generators that are better suited to the variable load and renewable generation conditions of the island power system.

MECO responds that an RFP for new firm generation on Maui's Waena site would be a means to address this issue. The issues raised by this recommendation are addressed in the PSIP.

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[203]MECO Response, Attachment 1 at 11.

Fourth, the Kirby Report recommends that MECO be directed to run case(s) with one or more additional wind and/or central solar plant(s). MECO agrees with this recommendation.[204]

Fifth, the Kirby Report recommends that MECO be directed to develop a fully optimized SICR plan which does not assume fixed schedules but instead uses current utility "best practices" including security constrained unit commitment and economic dispatch (MECO generation, IPP generation, DR, and storage) to respond to real-time load, wind, and solar conditions, which takes full advantage of the physical flexibility offered by each resource, which responds to the actual real-time conditions rather than to fixed operating schedules, which optimizes demand response and storage, and which considers the use of ICE generators.

MECO again disagrees:

> Other than HC&S (Hawaiian Commercial and Sugar), Maui Electric is already doing this. Wind and distributed (i.e., rooftop) PV energy are considered must take energy. AGC logic prioritizes and accommodates as-available wind generation on the system first and controls thermal units to operate at required baseload minimums unless as-available generation is not available. Currently, there is no technology available to the Company to curtail PV energy; hence it must be treated as must take energy.[205]

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[204]MECO Response, Attachment 1 at 12.

[205]MECO Response, Attachment 1 at 13.

The commission observes that this reply is not responsive to the recommendation as it only states what MECO is doing now, rather than addressing what could be done. These issues are further addressed in the PSIP.

VII.

Power Supply Improvement Plan

The commission acknowledges the extensive analyses provided by MECO in the SICR Plan, however, as discussed in this Order, these analyses do not adequately respond to the commission's directives in Order No. 31288. Fundamentally, the SICR Plan lacks an overall philosophy concerning how MECO's system can be operated efficiently and cost effectively in the future, as well as any discussion of how to integrate additional renewable energy sources and to lower costs to MECO's ratepayers. The scant information provided by MECO with respect to the EPS Study does nothing to address this issue. Collectively, the SICR and MECO's response to the Kirby Report do not convey a positive impression that MECO is aggressively pursuing initiatives to reduce the current high cost of energy, or that MECO is pursuing them with a clear sense of urgency.

The commission is, therefore, ordering MECO to prepare and file with the commission a Power Supply Improvement Plan

("PSIP") within one hundred and twenty (120) days of the date of this Order, which shall include remedial analyses to supplement the SICR Plan, as well as a comprehensive evaluation of MECO's power supply system and a detailed strategy and set of resulting action plans to implement changes to MECO's portfolio of generating units and current operating practices.

The PSIP shall be designed to ensure MECO is capable of reliably integrating substantial additional amounts of renewable energy, resulting in significant improvements to the operation of the MECO power system and significant reductions in the cost of providing electric power service to MECO's customers. The PSIP shall include, at a minimum, the following components:

a. A ***Generation Fleet Adequacy Analysis,*** which shall inform the commission as to potential roles each generating unit on the MECO system can perform in the future, if any. The analysis shall include an evaluation of whether or not MECO's existing generation mix has sufficient quick-start, flexible, fuel efficient, dispatchable capacity to accommodate integration of existing and substantial additional variable renewable energy resources without significant curtailment. The generation fleet adequacy analysis shall also include reviews of "must run" unit designations, units operated on

fixed schedules, and current retirement plans for existing units.[206]

b. Building on the analysis in the System Improvement and Curtailment Reduction Plan, MECO shall develop an ***Optimal Renewable Energy Portfolio Plan*** to identify and describe, based on the analyses performed in the PSIP, how MECO will develop an optimal, least-cost, diverse portfolio of renewable energy resources to meet and exceed a 40 percent level of renewable energy. In developing this plan, MECO shall constructively take into account the critiques of the commission's consultant and shall develop a fully optimized plan which (1) does not assume fixed schedules, but instead uses current utility "best practices," including security constrained unit commitment and economic dispatch (MECO generation, IPP generation, DR, and storage) to respond to real-time load, wind, and solar conditions; (2) takes full advantage of the technical flexibility offered by each

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[206]Functional or economic obsolescence, not physical plant age or condition, should be the determinant of whether an existing generating unit would continue to be operated. Therefore, it is possible that even the newest MECO base load generating units could be candidates for retirement and replacement with new, quick-start, flexible, fuel efficient, dispatchable capacity.

resource; (3) responds to the actual real-time conditions; (4) optimizes the utilization of demand response and storage resources; and (5) considers the most economic use of new, flexible generation.

The Optimal Portfolio Plan shall, at a minimum, include the following:

i. A detailed plan to increase renewable energy utilization beyond current approximately 30 percent in 2013;

ii. An analysis of the appropriate mix of variable and firm renewable energy resources;

iii. An analysis of the appropriate mix of solar PV resources versus other higher capacity factor renewable energy resources;

iv. Costs and technical challenges, including reserve margins, ancillary services and generation unit upgrades or replacements required, to integrate different levels, mixes and locations of renewable energy technologies;

v. An analysis of how an interisland transmission cable connecting the Maui island power system to Oahu would affect the economics and operation of the Maui power system as described in the PSIP;

vi. A comprehensive evaluation of all fixed and variable costs, as well as all system benefits (including fuel savings, O&M expense savings, system efficiency savings, etc.), including revenue requirements, estimated to result from implementation of the strategies and action plans included in the PSIP, as well as costs and ratepayer impacts that result from full attainment of renewable energy portfolio standards (RPS), including a comparison of full attainment of the RPS with various levels of exceeding the RPS.

c. A ***Generation Commitment and Economic Dispatch Review*** to ensure that existing generation resource allocation policies and practices yield the most fuel-efficient and cost-effective outcome given MECO's potential evolving portfolio of power supply resources. The Generation Commitment and Economic Dispatch Review shall, at a minimum shall:

i. Demonstrate that MECO's current unit commitment and economic dispatch policies and operational practices ensure that total fuel expense and purchased energy costs are and will continue to be minimized in the future;

ii. Demonstrate that MECO's current policies and operational practices by which supply resources are selected to provide ancillary services and operating reserves ensure that the combined total cost of generating electricity and providing ancillary services are and will continue to be minimized collectively in the future (i.e., co-optimization of energy and ancillary service dispatch); and

iii. Identify ways in which MECO could provide visibility and transparency regarding its generation commitment and economic dispatch process for the purpose of providing greater public confidence that the process minimizes energy costs, maximizes renewable energy generation, and dispatches both utility and IPP generation in a non-preferential and non-discriminatory manner.[207]

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[207] The commission acknowledges MECO's recent rollout of the "Renewable Watch" website. MECO is encouraged to examine mainland RTO/ISO websites to benchmark the type of system operational information that is publicly available, and the frequency of information updating, for potential inclusion in its Renewable Watch website.

d. ***Additional Considerations*** to potentially reduce MECO's future cost of service. MECO shall, at a minimum, include the following:

i. An analysis of how non-transmission alternatives ("NTAs") such as energy storage systems, customer demand response, aggregated PV capacity with advanced inverter functionality, and new quick-starting, flexible conventional distributed generation sets could be utilized to avoid construction of new transmission lines such as the proposed South Maui (Maalaea-Kamalii) transmission line and the planned Waiinu-Kanaha transmission upgrade project associated with the Kahului Power Plant retirement. The new quick-starting, flexible, fuel efficient, dispatchable capacity required at the system level, if strategically-located on the MECO transmission system, could also result in the avoidance of future transmission capital investments;

ii. An analysis of how MECO will utilize the substantial electrical pumping loads on Maui installed by water and wastewater utilities and by agriculture for irrigation wells and pumps to

provide fast-response, dynamic demand response resources to the MECO power system; and

iii. An analysis of how MECO could utilize pumped storage hydro resources to optimize the economics and operation of the MECO power system, including providing off-line reserves and other ancillary services, as well as provide bulk energy storage for high penetration of variable renewable energy resources.

The commission concludes that MECO has the responsibility to plan for and make major changes to both its existing generation portfolio and its current power supply operational practices in order to accommodate large amounts of lower-cost, variable renewable energy, reduce power supply costs, and to provide significant customer rate relief. The commission expects MECO to utilize the PSIP process as an opportunity to re-examine its existing generation portfolio and current power supply operational practices in order to develop forward-looking strategies and actionable implementation plans to expeditiously retire older, less-efficient generation ill-suited to meeting customer needs now and in the future, eliminate must-run generation designation policies, increase generation flexibility, adopt new technologies such as energy storage and demand

response, and institute operational practice changes, as appropriate, to enable integration of a diverse portfolio of additional low cost renewable energy resources and optimize the production of electricity for MECO's customers.

The commission further directs MECO to include as part of the PSIP appropriate reliability analyses and studies to demonstrate that the Maui grid will be operated reliably with substantially greater quantities of renewable energy resources. In preparing the PSIP, MECO should focus on articulating a clear vision for the future of the power system, focused on meeting customer needs, and formulating well-reasoned strategies and resulting action plans that can be implemented expeditiously, supported by high-quality evaluations of the current and expected future conditions that reflect utility best-practices in resource planning and analysis, as appropriate. The commission emphasizes that voluminous backward-looking discussions and analyses with outdated and inappropriate methodologies and techniques are not acceptable, nor are deflections and excuses that conclude additional studies are required.

VIII.

Order

THE COMMISSION ORDERS:

1. MECO shall submit a PSIP per the directives set forth in Section VII within one hundred and twenty (120) days of the date of this Order.

DONE at Honolulu, Hawaii APR 2 8 2014.

PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

By _____
Hermina Morita, Chair

By _____
Michael E. Champley, Commissioner

By _____
Lorraine H. Akiba, Commissioner

APPROVED AS TO FORM:

_____
Thomas C. Gorak
Commission Counsel

2011.0092.sr

CERTIFICATE OF SERVICE

The foregoing order was served on the date of filing by mail, postage prepaid, and properly addressed to the following parties:

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