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REVIEW OF MARKET REFORM ASSESSMENT PRODUCED BY ENERGY AND ENVIRONMENTAL ECONOMICS, INC. (E3)	§ § § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

RESPONSES OF ORMAT TO COMMISSION QUESTIONS ON E3 REPORT

Ormat submits the following comments in response to the Public Utility Commission of Texas (PUCT or Commission) Staff's request for comment on the Performance Credit Mechanism (PCM) as described in the Energy and Environmental Economics, Inc. (E3) report entitled "Assessment of Market Reform Options to Enhance Reliability of the ERCOT System" dated November 2022.

I. INTRODUCTION

Ormat appreciates the opportunity to comment on E3's report. Ormat has over five decades of experience in the development of state-of-the-art, environmentally sound power solutions. It is a leading geothermal and Energy Storage Independent Power Producer with the objective of becoming a leading global provider of renewable energy. Ormat Technologies, Inc. is listed for trading on the New York Stock Exchange [NYSE: ORA], with a market cap of approximately USD3.25 billion.

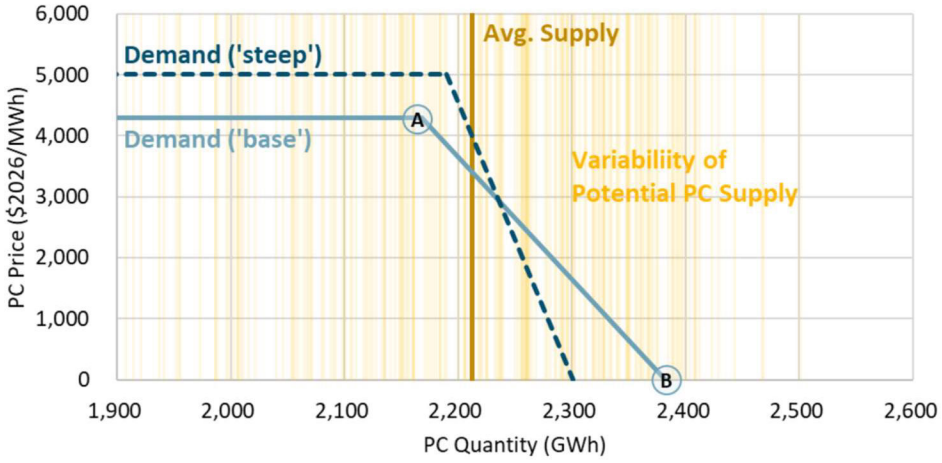
Ormat believes that the Performance Credit Mechanism (PCM) with changes described in these comments is good way forward to meeting a target reliability standard for the ERCOT market. Unlike the LSERO and FCM alternatives that rely on contentious administrative determination of resource capacity accreditation, PCM is based on actual performance. The crucial changes to make PCM an appropriate option are as follows:

1. **Use of Monthly Peak Net Load to determine the hours of highest reliability risk**. E3 proposes using 30 hours in the year with the lowest incremental available operating reserves. However, such hours could occur in a single winter event or fall/spring outage season when any particular resource may have scheduled its planned maintenance outage. This would imply that the resource would earn no Performance Credits (PCs) for the year even if it was fully available throughout the remaining 8730 hours of the year. This possible outcome also makes selling PCs forward very risky. The proposed change to say 4 hours of monthly Peak Net Load (defined as Load net of Wind and Solar (intermittent renewable resource or IRR)

generation) makes the PC resource revenue stream more predictable for investment purposes and for Loads to reduce consumption during such hours in each month.

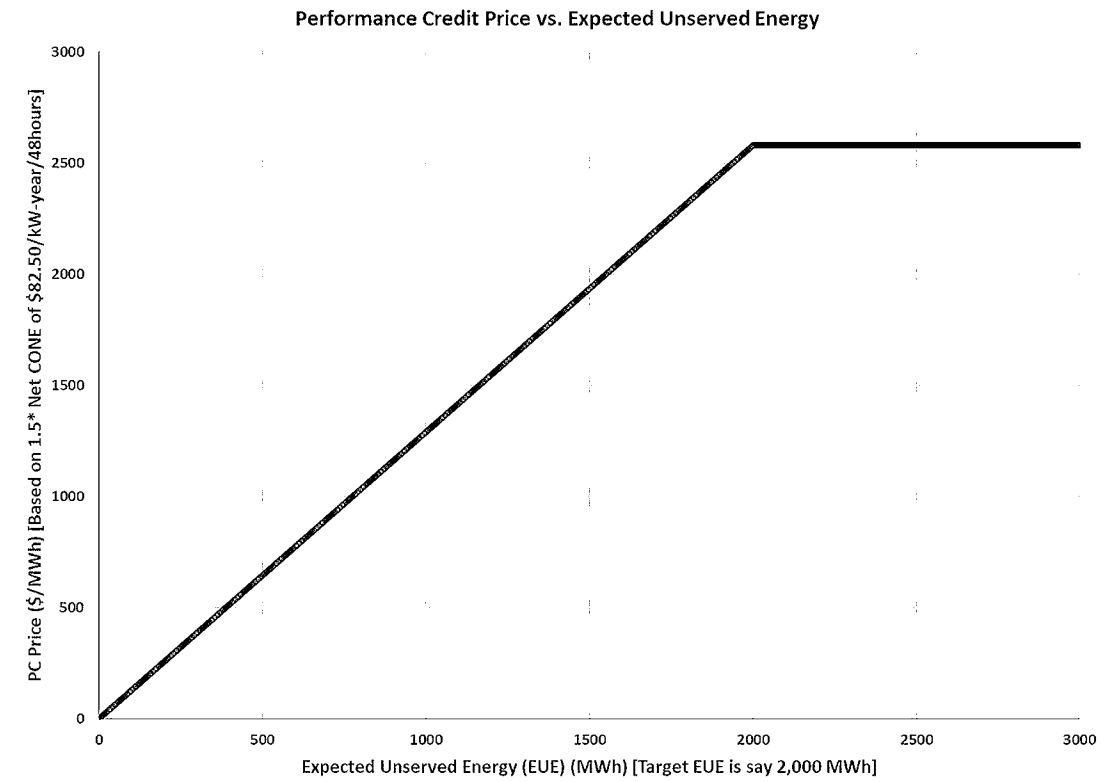
2. **Use target reliability standard and actual realized net Cost of New Entry (CONE) to set PC prices**. The PCM design in the E3 report will result in highly uncertain PC values from year to year which is likely to not incent the desired investment in new generation. For example, ERCOT's forecast of total PC generation for the next year could be based on ERCOT's forecasted 30 hours during tight supply situations in the Fall/Spring outage seasons and thus a lower estimate of total PCs. However, in that year, a hot summer results in the 30 hours falling in the summer months with much higher PC generation than forecasted a year ago. This could result in a PC value of $0/MWh for the year. The opposite is also true where the PC value is at the cap if ERCOT over-forecasts PCs for the following year. None of these random PC value outcomes are based on the ERCOT market's ability to meet the reliability standard set by the Commission. The graph in page 106 of the E3 report shows illustrates this uncertainty in PC prices based on variability of PC supply:

Figure 43. Potential PCM Supply and Demand ('Base' and 'Steep') Curves



To provide a more predictable PC revenue stream, the price for PCs should be set based on the ERCOT system's ability to meet the reliability standard instead on forecasted PC generation. Thus, if the system is short resources to meet the reliability standard, then PC prices should be set at the cap of 1.5 times Net CONE for a Combustion Turbine (CT) to incent new build. If the system far exceeds the reliability standard, the PC prices should be close to $0/MWh. Assuming Expected Unserved Energy (EUE) based reliability standard of say 2,000 MWh/year is adopted

(any other reliability standard, such as LOLE, can also be used), then the PC price is determined using ERCOT-calculated EUE for the year using the following curve:



For example, if the ERCOT-calculated EUE were 15,000 MWh for the following year (with EUE standard set at 2,000 MWh), then the PC price would be set at 1.5*Net CONE/48hours regardless of the actual quantities of PCs generated in the following year. However, if the ERCOT-calculated EUE were 1,000 MWh for the following year (with EUE standard set at 2,000 MWh), then the PC price would be set at 0.5*1.5*Net CONE/48hours regardless of the actual quantities of PCs generated in the following year. Loads would allocated the total cost of PCs, which is determined by PC price times PC quantities actually generated, based on their Load Ratio Share during the 4 Peak Net Load hours each month. This PC price setting mechanism sends a clear and certain price signal to the market for new investments if the reliability standard is not met.

ERCOT can perform an initial monthly settlement based on estimated Net CONE and then perform a true up settlement at the end of the year based on actual realized Net CONE for the year. This mechanism will ensure that Net CONE is adjusted down in a higher energy and ancillary service price year than forecasted so that Loads are

not overpaying for capacity as well as assuring a more stable revenue stream for resources when energy and ancillary service prices are much lower than forecasted.

II. COMMISSION QUESTIONS

1. The E3's report observes that the PCM has no prior precedent for implementation. Does this fact present a significant obstacle to its operation for the ERCOT market?

Ormat believes that the PCM, with changes described in these comments, overcomes some of the shortcomings of LSERO and FCM. The innovative and unprecedented improvements proposed by the PCM to overcome the shortcomings of other alternatives should not be an obstacle to its operation for the ERCOT market. Implementing other alternatives with known problems and questionable history of incentivizing resource investment should not be given preference over the PCM simply due to PCM's lack of precedent in other markets.

2. Would the PCM design incentivize generation performance, retention, and market entry consistent with the Legislature's and the commission's goal to meet demand during times of net peak load and extreme power consumption conditions? Why or why not?

The PCM design as described in the E3 report needs some modifications, as described in the introduction and further elaborated below, in order to properly incentivize generation performance, retention, and market entry. For example, E3's proposal uses 30 hours in the year with the lowest incremental available operating reserves to allocate PCs - this makes PC revenue streams uncertain and makes selling PCs forward very risky. Changing this allocation to 4 hours of monthly Peak Net Load makes the PC resource revenue stream more predictable for investment purposes and for Loads to avoid such hours in each month. Also, the PCM design in the E3 report will result in highly uncertain PC values from year to year which is likely to not incent the desired investment in new generation. In order to provide a more predictable PC revenue stream, the price for PCs should be set based on the ERCOT system's ability to meet or not the reliability standard instead on forecasted PC generation. With these changes, the PCM design will incentivize generation performance, retention, and market entry to meet demand during times of net peak load and extreme power consumption conditions.

3. What is the appropriate reliability standard to achieve the goals stated in Question 2? Is 1-in-10 loss of load expectation (LOLE) a reasonable standard to set, or should another standard be used, such as expected unserved energy (EUE). If recommending a different standard, at what level should the standard be set (e.g., how many MWh of EUE per year)?

LOLE as a measure of system reliability has a long history in the electricity industry. However, LOLE may not be a good measure of system reliability. For example, relatively minor amount of unserved energy (say 150 MWh) over 3 days would result in LOLE of 3 days/year whereas a more significant amount of unserved energy (say 1,500 MWh) in 1 day would result in LOLE of 1 day/year. Thus, LOLE by itself does not provide a good measure of a system's reliability. The Expected Unserved Energy (EUE) standard instead measures the expected unserved MWh for the year. Using the Value of Lost Load (VOLL), Net CONE, and information on the reduction of EUE with incremental addition of capacity, the economically optimal value of capacity addition and EUE can be determined. Even though the reliability standard can be set using EUE, EUE does not fully convey the severity of the reliability exposure. Thus, along with EUE, ERCOT should post the LOLE, Loss of Load Hours (LOLH), and maximum expected lost load.

4. The E3 report examines 30 hours of highest reliability risk over a year. Is 30 the appropriate number of hours for this purpose? Should the reliability risk focus on a different measure?

E3 proposes using 30 hours in the year with the lowest incremental available operating reserves. However, such hours could occur in a single winter event or fall/spring outage season when any particular resource may have scheduled its planned maintenance outage with recently-approved ERCOT-imposed restrictions on scheduling such outages. This would imply that the resource would earn no Performance Credits (PCs) for the year even if it was fully available throughout the remaining 8730 hours of the year. This possible outcome also makes selling PCs forward very risky.

5. Over what period should the hours of highest reliability risk be determined? A year, a season, a month, or some other interval? At what point in time should that determination be made?

The hours of PCM allocation should be based on 4 hours of monthly Peak Net Load (defined as Load net of IRR generation) determined at the end of each month. This change makes the PC resource revenue stream more predictable for investment purposes and for Loads to reduce consumption during such hours in each month.

6. Would a voluntary forward market for generation offers and a mandatory residual settlement process for LSE procurement provide additional generation revenue sufficient to incentivize resource availability in a way that improves reliability?

A voluntary forward market for PCs provides an opportunity for resources and Loads to hedge some of their PC exposure. However, if resources are required to offer into this forward market, resource offers from smaller resource fleets should be allowed to be at the cap given the risks associated with forward selling PCs. As a forward market may provide additional price discovery of forward PC prices for the market.

7. Does a centrally cleared market through ERCOT sufficiently mitigate the risk of market power abuse? Should additional tools be considered?

With the proposed changes to the PCM design offered in these comments, the PC prices would be set based on methods used to actually determine the reliability standard for the market. As such, the market would have a good estimate of the PC prices for the following year subject to Net CONE true-up. To mitigate any residual market power concerns, a centrally cleared market through ERCOT, along with IMM oversight, should sufficiently mitigate the risk of market power abuse.

8. If the commission adopts a market design with a multi-year implementation timeline, is there a need for a short-term "bridge" product or service, like the Backstop Reliability Service (BRS), to maintain system reliability equivalent to a 1-in-10 LOLE or another reliability standard? If so, what product or service should be considered?

Given the likely multi-year implementation timeline for PCM, there is definitely a need for short-term "bridge" measures to improve ERCOT system reliability. These bridge measures should use existing products with no major implementation cost or time. The bridge measures are as follows:

1. Immediately clarify that ERCOT can offer Reliability Must Run (RMR) contracts to dispatchable resources wanting to retire if such resource capacity is needed to meet Commission-set reliability standard. This is the least cost and direct implementation of what could be considered a Backstop Reserve Service (BRS).
2. Increase Value of Lost Load (VOLL) used in Operating Reserve Demand Curve (ORDC) determination to reflect a better estimate of actual VOLL. This change will immediately send price signals to incentivize new resource investments.
3. Increase ancillary service procurement amounts to increase the reliability buffer to address increased uncertainty risk with the addition of significant amounts of IRRs. This will not only improve operational reliability but also send a stronger price signal for new resource investments. ERCOT can determine the appropriate mix of

Responsive Reserve, ERCOT Contingency Reserve, and Non-Spinning Reserve quantities to adjust to meet this goal.

9. If implementing a short-term design as a "bridge" delays the ultimate solution, should it be considered? Is there an alternative to a bridge solution that could be implemented immediately, using existing products, such as a long-term commitment to buy the additional 5,630 MW of Ancillary services necessary to achieve the l-in-10 LOLE reliability standard?

Bridge measure should not delay implementation of PCM. The bridge solutions proposed above could be implemented immediately, including:

1. Immediately clarifying ERCOT's ability to offer RMR contracts to dispatchable resources wanting to retire if such resource capacity is needed to meet Commission-set reliability standard.
2. Increasing Value of Lost Load VOLL used in ORDC determination to reflect a better estimate of actual VOLL.
3. Increasing ancillary service procurement amounts by 5,640 MW to increase the reliability buffer to address increased uncertainty risk with the addition of significant amounts of IRRs.

All these bridge measure use existing products and tools and can be implemented immediately with no system implementation cost.

10. What is the impact of the PCM on consumer costs?

Ormat has not performed separate market analysis to determine PCM's impact on consumer costs and thus has no alternate cost estimate to the one presented in the E3 report.

11. What is the fastest and most efficient manner to build a "bridge" product or service, such as the BRS, in order to start sending market signals for investment in new and dispatchable generation, while a multi-year market design is implemented by ERCOT? Please provide specific steps.

The fastest and most efficient manner to build a "bridge" product or service is:

1. Immediately clarifying ERCOT's ability to offer RMR contracts to dispatchable resources wanting to retire if such resource capacity is needed to meet Commission-set reliability standard – this is the least cost method of implementing BRS.

2. Increasing Value of Lost Load VOLL used in ORDC determination to reflect a better estimate of actual VOLL.
3. Increasing ancillary service procurement amounts by 5,640 MW to increase the reliability buffer to address increased uncertainty risk with the addition of significant amounts of IRRs.

12. In what ways could the Dispatchable Energy Credit (DEC) design be modified through quantity and resource eligibility requirements, e.g. new technology such as small modular nuclear reactors, in such a way that it incentivizes new and dispatchable generation?

DEC should only be considered if the Commission wants to explicitly address extreme weather resiliency. DEC resource eligibility can be improved as suggested in the question; however, the main concerns with DEC are the price suppressing energy offer incentives and market price suppression caused by DEC resource dispatch. To address both these issues, DEC needs to be modified as follows:

i. DEC are awarded for being available and offering into energy and/or AS during the same monthly high risk hours as PCM.
ii. For DEC resource energy dispatch to not suppress market prices, any potential price suppression from DEC resource energy deployment by SCED should be reversed by applying the Reliability Deployment Price Adder and such resource capacity would not be considered as contributing to "operating reserves" in the ORDC. This will make the energy market prices indifferent to the addition of new subsidized DEC resources.

Respectfully submitted,

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EXECUTIVE SUMMARY OF ORMAT RESPONSE TO COMMISSION QUESTIONS ON E3 REPORT

An Executive Summary of Ormat's responses to Commission Staff's request for comment on the Performance Credit Mechanism (PCM) as described in the Energy and Environmental Economics, Inc. (E3) report entitled "Assessment of Market Reform Options to Enhance Reliability of the ERCOT System" dated November 2022 is given below.

Ormat believes that the Performance Credit Mechanism (PCM) with changes described in these comments is good way forward to meeting a target reliability standard for the ERCOT market. Ormat likewise believes the LSERO and the FCM are viable alternatives to the PCM which each address revenue uncertainty for generators. The crucial changes to make PCM an appropriate option are as follows:

3. **Use of Monthly Peak Net Load to determine the hours of highest reliability risk**. E3 proposes using 30 hours in the year with the lowest incremental available operating reserves. However, such hours could occur in a single winter event or fall/spring outage season when any particular resource may have scheduled its planned maintenance outage. This would imply that the resource would earn no Performance Credits (PCs) for the year even if it was fully available throughout the remaining 8730 hours of the year. This possible outcome also makes selling PCs forward very risky. The proposed change to say 4 hours of monthly Peak Net Load (defined as Load net of Wind and Solar (intermittent renewable resource or IRR) generation) makes the PC resource revenue stream more predictable for investment purposes and for Loads to reduce consumption during such hours in each month.
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situations in the Fall/Spring outage seasons and thus a lower estimate of total PCs. However, in that year, a hot summer results in the 30 hours falling in the summer months with much higher PC generation that that forecasted a year ago. This could result in a PC value of $0/MWh for the year. The opposite is also true where the PC value is at the cap if ERCOT over-forecasts PCs for the following year. None of these random PC value outcomes are based on the ERCOT market's ability to meet the reliability standard set by the Commission. The graph in page 106 of the E3 report shows illustrates this uncertainty in PC prices based on variability of PC supply:

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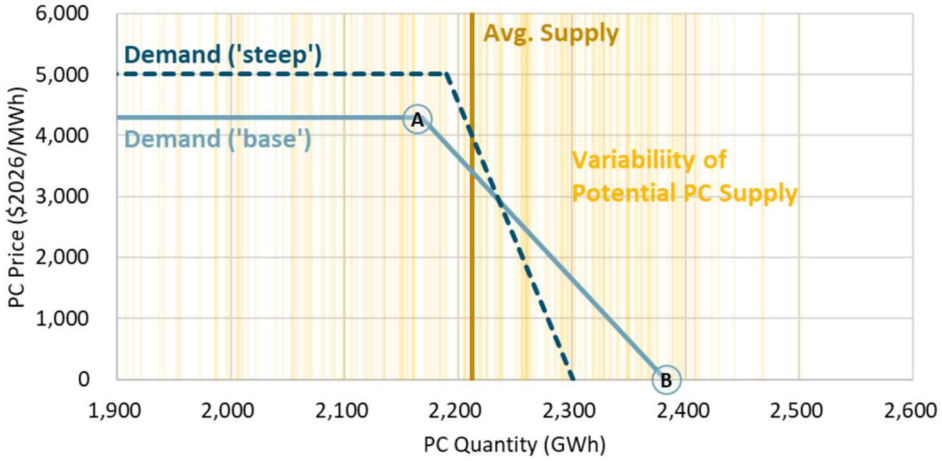

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