Comments of Powerex Corp. on Price Performance in CAISO's Energy Markets First Report

Submitted by	Company	Date Submitted
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Powerex appreciates the opportunity to submit comments on CAISO's June 18, 2019 report entitled "Price Performance in the CAISO's Energy Markets," and the associated stakeholder discussion on June 21, 2019 ("Report").

Powerex appreciates the significant time and effort by CAISO staff in preparing the detailed analysis contained in the Report, which addresses a comprehensive range of price formation issues. The use of specific case studies also provided important context for understanding the particular circumstances present in each scenario, the actions taken by operators in light of those circumstances, and how those actions and circumstances are reflected in market prices. Powerex believes the Report provides an unparalleled degree of transparency and insight into price formation in CAISO's energy markets, and is highly responsive to stakeholders' requests to better understand several of these issues. Powerex appreciates CAISO's commitment of resources to this analysis and to the openness of its engagement with stakeholders.

I. The Report Indicates The Need For Additional Market-Based Tools To Maintain Reliability And Achieve Efficient Market Outcomes

Powerex believes that one of the key insights from the Report is the extent of the challenges faced by CAISO operators in real-time to maintain reliability in the face of a rapidly transforming grid. The extensive growth of variable energy resources ("VERs") has significantly increased the uncertainty as well as intra-hour variability of imbalance energy needs. At the same time, retirements of conventional fossil fueled generation resources has reduced the flexible, dispatchable generation resources available to meet those increased needs. Yet, while the composition of the grid has changed significantly, the core design of the CAISO energy markets has not. Under the current design, for instance, the day-ahead optimization still balances supply against bid-in demand for energy, with no accounting for the capacity needed to address uncertainty in the day-ahead peak net load forecast or the need for flexible stand-by capacity to meet intra-hour variability and uncertainty. Even the design of the real-time market is largely unchanged since the introduction of flexible ramping requirements in 2012 and the shift to 15-minute intertie awards in 2014. The need for a modernized market design is reflected in CAISO's active pursuit, through other stakeholder initiatives, of market design enhancements that are better suited to the changed grid conditions.

It is against this background that the results of the price performance analysis must be assessed. In particular, while the CAISO's analysis indicates that operators are increasingly taking out-of-market action to maintain reliability, it may be incorrect to view this as the cause of market inefficiencies or price distortions. Instead, Powerex believes that the frequency of operator interventions and the impact of these interventions on price formation may most appropriately be viewed as quantifiable evidence of the limitations of the current market design, which fails to result in the procurement of all of the products necessary to fully address the needs of the modern grid.

II. Recommendations for Further Analysis

Although the information that has been provided thus far is not yet sufficient to draw firm conclusions regarding the factors driving operator interventions and out-of-market procurement, Powerex believes that the use of these mechanisms may reflect operators' expectations regarding the quantity of capacity and flexibility necessary to compensate for a market design that frequently leads to the commitment of capacity and flexibility that falls well short of the levels that CAISO operators believe are necessary to reliably operate the grid under a range of possible real-time grid conditions. In particular, it appears likely that the current day-ahead market solution falls short of operators' judgments regarding the levels of capacity and upward flexibility necessary to reliably serve load during peak periods and to maintain balance during periods of high expected upward net load ramps. In such cases, CAISO operators—as the entities ultimately responsible for reliable operation of the grid—may routinely feel they have little choice but to procure additional capacity and flexibility using the limited tools at their disposal, including: (1) RUC adjustments; (2) exceptional dispatch; and (3) load biasing in the HASP run. Under this theory, such operator actions may often be pursued in order to force the market software to schedule additional quantities of imports in order to reduce the schedules of internal resources, thereby preserving "headroom" in order to provide CAISO operators additional capacity and flexibility options to respond to evolving grid conditions in real-time. In effect, these activities may be routinely undertaken by operators to create needed "balancing reserves" to:

1. cover variations and uncertainty in net load between the hourly day-ahead market solution and the *potential* real-time net load at 5-minute granularity (with regulating reserve used to cover variations and uncertainty within each RTD interval); and
2. offset day-ahead market awarded supply that may not deliver physical energy in real-time, including speculative and non-firm import supply awards and virtual supply awards.

If this is true, the CAISO's analysis may provide valuable evidence on the need for, and potential benefits of, enhancements to the CAISO's day-ahead market to (1) integrate the RUC process into the day-ahead market and establish a new day-ahead market upward capacity constraint and (2) implement a day-ahead market flexible ramping product

Powerex outlines further analytical questions, below, that it believes will help test this hypothesis. To the extent it is confirmed, Powerex believes the analytical results should be viewed as identifying the need for—and the value of—market design enhancements that more fully reflect the range of products and services needed for reliable operations, and incorporate those needs *within* the market optimization. Such enhancements will not only reduce the need for manual

operator actions, but will also improve the efficiency of dispatch and accuracy of prices in CAISO's markets.

1. *Use of load bias in HASP run*

Summary: The Report shows that CAISO operators often use upward load bias in the HASP run, but this level of manual load adjustment is reduced in the subsequent FMM and RTD runs. Powerex understands that an increase in load forecast used in the HASP run will tend to cause additional supply offers to clear, including, but not limited to, block hourly offers on the interties. In the specific case of block hourly offers on the interties, the schedules in the HASP run are binding from a quantity perspective (other HASP awards are advisory, as the binding award is determined in the intra-hour FMM and RTD processes). Thus, load bias in the HASP run has the effect of increasing the quantity of hourly block intertie import awards, which are treated as self-schedules in the intra-hour market runs. If the quantity of upward load bias is reduced after the HASP run, the result is to schedule internal (or 15-minute intertie) awards at lower quantities, with greater upward "headroom" than if there had been no upward load bias in the HASP. This has the effect of providing operators with additional upward flexible capacity within the hour to meet uncertainty and variations in net load. Unfortunately, these actions are highly inefficient at selecting resources to carry upward flexible capacity. Moreover, prices in the FMM and/or RTD runs may also tend to be systemically lower than the advisory HASP prices against which the block hourly intertie offers were cleared, potentially causing significant losses for entities awarded HASP import schedules and discouraging continued participation in CAISO's real-time market.

Further analysis:

- Can CAISO provide greater insight regarding the particular grid conditions associated with increased levels of upward load bias in the HASP?
- Can CAISO confirm or reject whether operators enter an upward manual load adjustment for the purpose of increasing the available headroom on internal units to provide upward flexible capacity or "balancing reserves" to cover uncertainty and/or intra-hour variability with a high degree of confidence?
- Can CAISO provide greater insight into reductions in upward load bias that occur between the HASP and the FMM as opposed to between the FMM and the RTD?
- Can CAISO provide a more detailed analysis of price impacts during the hours of largest upward load bias (*e.g.,* in the 100 hours with largest upward bias)?
    - What was the estimated difference between the actual HASP advisory price and the estimated HASP advisory price with load adjustment equal to the adjustment used in the FMM or the RTD?
    - What fraction of economically bid block hourly intertie awards that actually cleared the HASP were settled at an FMM price below their offer price? Is it possible to determine what fraction of this amount is due to the upward load adjustment in the HASP?
- There is also a significant gap between the load bias in the FMM and the RTD. Does this pattern similarly reflect operators pursuing efforts to preserve available headroom for upward flexible capacity or "balancing reserves" within each FMM interval?

2. *RUC adjustments*

Summary: Upward RUC adjustments increase the CAISO's forecast of CAISO load used to commit additional units after the day-ahead IFM. The Report identified that upward RUC adjustments increased significantly in the summer of 2018, and were used primarily during HE 10-22 (*See* Report at Figs. 23-24). To the extent RUC adjustments are made to protect against insufficient capacity to meet real-time needs, these actions may indicate the need for a day-ahead capacity requirement to be enforced in the day-ahead market optimization.

Further analysis:

- Is it possible to more precisely associate the use of upward RUC adjustments with operator expectations or concerns regarding: (1) day-ahead load forecast uncertainty and/or ramping; and (2) the quantity of remaining online internal supply available?
- Can CAISO analyze the relationship, if any, between upward RUC adjustments and:
    - The level of the day-ahead peak load forecast?
    - Anticipated or potential net load ramp?
    - A combination of both? (*i.e.,* high net load ramp during a moderate peak load day may be less concerning than a high net load ramp during a very high peak load day)
    - Remaining online internal supply available after the day-ahead market?
    - Concerns regarding delivery of physical supply awards?

3. *Exceptional dispatch*

Summary: Exceptional dispatch is the most direct way for CAISO operators to increase supply delivered to the CAISO grid. The Report indicates that the volume of energy from exceptional dispatch is relatively small, *on average* (See Report at Fig. 54). However, the Report also shows that the volume of exceptional dispatch increased dramatically during July and August 2018 (Fig. 52) and appears greatest during the evening hours (Fig. 53). It may therefore be informative to better understand the conditions or concerns that CAISO operators seek to address through exceptional dispatch.

Further analysis:

- Can CAISO provide information on the use of exceptional dispatch during the highest load hours (*e.g.,* top 20 load hours of 2018)?
    - What hours of the day did this occur?
    - What was the volume of exceptional dispatch, separately for internal and intertie resources, during these hours?
    - Can CAISO approximate what the SMEC would have been in the FMM and in the RTD if this supply had been procured through the market?
- How does the quantity of exceptional dispatch procured during the highest load hours compare to exceptional dispatch during all hours of the year?
- Can CAISO provide further insight into the specific conditions or concerns that cause operators to exceptionally dispatch resources?

- Can CAISO provide further insight into how often, if ever, exceptional dispatch had the effect of preventing the application of scarcity pricing in the HASP, FMM or RTD?

4. Quantifying Headroom Sought By Operator Actions

Summary: If an important objective of manual operator actions such as RUC adjustments, load bias, and exceptional dispatch is to increase the upward headroom available from internal resources, it may be useful to understand how much headroom operators feel is necessary to be confident that the grid can be operated reliably under a range of potential grid conditions.

Further analysis:

- Can CAISO provide more insight from operators regarding the types of conditions or circumstances that can lead to manual actions to increase available supply?
- Can CAISO quantify the amount of additional supply that operators have sought to procure through manual actions? Can this amount be associated with metrics of grid conditions, including:
    - Forecast of expected (p50) peak load
    - Potential maximum (*e.g.,* p97.5) peak load
    - Forecast of expected (p50) peak net load ramp
    - Potential maximum (*e.g.,* p97.5) peak net load ramp
    - Potential delivery failures on intertie awards
    - Other circumstances or concerns?
- Do each of the above considerations differ for day-ahead actions as opposed to those taken in real-time?
- Given the above, is it possible to estimate the confidence level that may be implicit in the manual actions of CAISO operators to procure additional supply?
    - For example, how does the quantity of supply procured through manual operator actions compare to the 95% confidence interval of net load forecast changes between day-ahead and the HASP? Between the HASP and the RTD?

Powerex believes that the results of the proposed further analyses may be very useful in informing the formulation of balancing reserve capacity and/or flexibility procured in the day-ahead market. Such day-ahead procurement would ideally seek to not only maintain reliability, but also to give CAISO operators confidence that reliability will be protected, thus minimizing or eliminating the use of manual operator actions to procure supply outside of the market clearing process.