



Comments of Pacific Gas and Electric Company
Contingency Modeling Enhancements
Second Revised Straw Proposal

Submitted by	Company	Date Submitted
John Anderson (415) 973-6955 Paul Gribik (415) 973-6274	PG&E	March 27, 2014

Pacific Gas and Electric Company (PG&E) respectfully submits the following comments in the stakeholder process for the California Independent System Operator's (CAISO) Contingency Modeling Enhancements (CME) initiative March 13, 2014 Second Revised Straw Proposal (Proposal).

In summary, PG&E's comments are:

- The CAISO should prioritize completion of its market simulations and afford stakeholders an opportunity to evaluate and comment on the simulation results. Transparent market simulations are necessary to convince stakeholders that the proposed market changes will achieve the WECC SOL reliability standard at a reasonable cost to customers;
- The CAISO should include in its next CME proposal the precise formulations of the optimization problems its software will attempt to solve upon enforcement of the preventive-corrective constraints in the Day-Ahead and Real-Time markets;
- The CAISO should consider the implications of its proposed market changes for Congestion Revenue Rights (CRR) revenue adequacy and include potential solutions in its next CME proposal;
- To afford the Southern California Edison (SCE) alternative proposal a fair assessment, PG&E raises several questions about the design for the CAISO and stakeholders to reflect upon;
- PG&E supports the CAISO's efforts to identify enhancements to the Local Market Power Mitigation (LMPM) procedures as part of the CME stakeholder process;
- The CAISO should specify what new market data it plans to make available to stakeholders after each market run; and

- The CME stakeholder process is an appropriate venue for the CAISO to consider allowing economic buy-back of Day-Ahead Ancillary Services (AS) awards in Real-Time, a change likely to improve both grid reliability and market efficiency.

PG&E appreciates the CAISO's interest in identifying more efficient means of meeting the WECC SOL reliability standard, and we believe that robust market simulations are key to evaluating the CAISO's CME design (as well as any alternative designs). Taking time to fully assess the design is warranted given the scope of the proposed changes – namely, the introduction to the market of many new constraints and locational prices – and the fact that the CAISO has FERC-approved tools for maintaining reliability under its current tariff.

1. The CAISO should prioritize completion of its market simulations and afford stakeholders an opportunity to evaluate and comment on the results

The CAISO previously informed stakeholders that it would develop a prototype of the preventive-corrective constraints to provide a proof-of-concept by testing it on actual production save cases.¹ To date, the progress and results of this market simulation exercise remain non-public.² The completion of these market simulations should be among the CAISO's highest-priority CME activities. The initiative's schedule must also accommodate the needs of stakeholders to evaluate and comment on the simulation results. PG&E emphasizes these points for two reasons:

- i. We seek assurance that the CAISO's proposed preventive-corrective market optimization model produces reasonable market outcomes with respect to Locational Marginal Prices (LMPs) for Energy, Ancillary Services Marginal Prices (ASMPS) for 10-minute Operating Reserves, and Locational Marginal Capacity Prices (LMCPs) for 30-minute Corrective Capacity. This is important for assessing whether the proposed market changes are likely to meet the WECC SOL reliability standard at a reasonable cost when compared with the CAISO's current practices – namely, Exceptional Dispatch and Minimum Online Commitment (MOC) constraints.
- ii. We seek assurance that the CAISO's proposed preventive-corrective market optimization model can in fact be solved for the co-optimized Energy dispatch, Operating Reserve schedules, and Corrective Capacity schedules in the limited time available – especially in the case of Real-Time Dispatch (RTD). PG&E notes, for

¹ In the June 18, 2013 CME Revised Straw Proposal, CAISO states: "We are taking steps to develop a prototype to share with market participants based on a realistic example using a production level case. We will rerun a saved case with the [preventive-corrective] constraint to demonstrate how the constraint will function and impact the results of the saved case. We believe this effort will take about two months to accomplish."

² According to the March 13, 2014 Second Revised Straw Proposal, the CAISO's market simulation results were supposed to be the focus of the March 20, 2014 CME stakeholder call.

instance, that if a generator has a “dynamic” ramp rate (i.e. a ramp rate that may change depending on the level of Energy dispatch, as is the case in Example 3 of the Proposal), then the maximum Corrective Capacity available from this generator is likely to be a non-convex function of the generator’s dispatch level. Identifying a global optimum in a non-convex optimization problem can be a very computationally-intensive task: in particular, the formulation could involve a large increase in the number of integer variables. The CAISO should demonstrate to stakeholders that it is capable of solving such complex problems in a timely manner or it should specify the simplifications it may make in order to reduce solution time. Furthermore, the CAISO should report to stakeholders the time required by its software to identify an optimal solution.

2. The CAISO should include in its next CME proposal the precise formulations of the optimization problems its software will attempt to solve upon enforcement of the preventive-corrective constraints in the Day-Ahead and Real-Time markets

PG&E requests that in the next CME proposal the CAISO specify precisely the optimization problems its software will attempt to solve – for both the Day-Ahead (IFM and RUC) and Real-Time (FMM and RTD) markets.

In light of the non-convexity issue identified above, the next CME proposal should cover the formulation details in the case where generators have dynamic ramp rates. The CAISO should show how the optimization will model the effect that a dynamic ramp rate has on the maximum Corrective Capacity that can be procured from a generator and how any resulting non-convexity will be handled.

We also note that the March 20, 2014 CME stakeholder call revealed some confusion among stakeholders regarding: (i) the role of 10-minute Operating Reserves in satisfying the preventive-corrective constraint; and (ii) the relationship between market-clearing ASMPs and LMCPs. Accordingly, PG&E requests that in the next CME proposal the CAISO specify precisely the optimization problem its software will attempt to solve in the case where 10-minute Operating Reserves are co-optimized with Energy and 30-minute Corrective Capacity. We also request that the CAISO include an additional example in which 10-minute Operating Reserves are procured jointly with Energy and Corrective Capacity in order to illustrate the simultaneous determination of ASMPs, LMPs, and LMCPs, as well as the overall market settlement in such a setting.

3. The CAISO should consider the implications of its proposed market changes for CRR revenue adequacy and include potential solutions in its next CME proposal

During the March 20, 2014 CME stakeholder call, SCE expressed concern that the CAISO’s proposed market changes could result in CRR revenue inadequacy. PG&E shares this

concern, and notes that discussion of CRR revenue adequacy is missing from the Proposal. Accordingly, PG&E requests that the CAISO address this issue in the next CME proposal.

The CAISO's CRR allocations and auctions incorporate a Simultaneous Feasibility Test (SFT) to try to ensure that congestion rents are adequate to pay the CRRs. These SFTs model base case constraints and N-1 contingency constraints. Under the proposed market changes, the SFT used in CRR allocations/auctions may no longer assure revenue adequacy because N-1-1 contingencies are not explicitly modeled in the CRR SFT. PG&E is contemplating a potential framework for addressing N-1-1 contingencies in a SFT that ensures CRR revenue adequacy while also funding the purchase of Corrective Capacity for use in an N-1-1 contingency. PG&E is happy to engage with the CAISO and other stakeholders to further discuss potential solutions to the dual issues of CRR revenue adequacy and CME cost allocation.

4. To afford the SCE alternative proposal a fair assessment, PG&E raises several questions about the design for the CAISO and stakeholders to reflect upon

PG&E shares SCE's concerns that the preventive-corrective framework is complicated and unproven in practice, and appreciates SCE's desire for a simpler market design. In an effort to help inform a constructive dialogue on the merits of SCE's design vis-à-vis the CAISO's proposed design, PG&E raises the following questions for stakeholders' consideration:

- How will the proposed flexibility sub-regions be defined?
- How will the AS requirement be determined for each flexibility sub-region to ensure that adequate capacity is available to manage the N-1-1 contingency while not procuring much more than would be needed?
- How likely is "trapped" or "stranded" flexibility, such that other tools are needed or that inadequate flexibility-driven power balance constraint violations occur?
- Will there be less concern about local market power under this construct than under the CAISO's proposed design?
- Given that Corrective Capacity needs are dynamic – i.e. they depend on changing system flow conditions – how should the SCE design's effects be evaluated?

5. PG&E supports the CAISO's efforts to identify enhancements to the LMPM procedures as part of the CME stakeholder process

PG&E recognizes that under the CAISO's proposed market changes, both Energy and Corrective Capacity can provide counterflow to congested transmission constraints. As such, we support the CAISO's efforts to identify enhancements to the current LMPM procedures as part of the CME stakeholder process.

6. The CAISO should specify what new market data it plans to make available to stakeholders after each market run

The CAISO's proposed market changes will generate *contingency-specific* data on (among other things): (i) shift factors; (ii) constraint shadow prices; (iii) Corrective Capacity awards; and (iv) LMCPs. The CAISO should inform stakeholders what new data it plans to make available to stakeholders publicly (e.g. via OASIS) and privately (e.g. via CMRI) after each market run so as to allow for stakeholder feedback.

7. The CME stakeholder process is an appropriate venue for the CAISO to consider allowing economic buy-back of Day-Ahead AS awards in Real-Time, a change likely to improve both grid reliability and market efficiency

Section 9.6 of the Proposal notes that because the preventive-corrective constraint will be re-optimized in Real-Time, economic buy-back of Day-Ahead Corrective Capacity awards can occur in Real-Time (similar to the case of Energy today). PG&E believes that the CME stakeholder process provides the CAISO with an opportunity to consider the merits of allowing economic buy-back of Day-Ahead awards for 10-minute Operating Reserves in Real-Time. This change would likely improve both grid reliability and market efficiency (e.g. lower Energy dispatch costs). Other RTOs – MISO, for instance – already allow Real-Time buy-back of Day-Ahead AS awards, and so this matter ought to be included in discussions of the CME design.