PG&E's Comments

Flexible Ramping Product
Revised Draft Technical Appendix

Submitted by	Company	Date Submitted
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PG&E appreciates the opportunity to comment on the CAISO's Flexible Ramping Product Revised Draft Technical Appendix, dated November 11, 2015 and the workshop presentation dated November 18, 2015 and appreciates CAISO's staff efforts in providing the clarity and details included in this paper. While we support the approach in general, we would like more information on certain design aspects and tracking of their impacts. In summary, the changes to the CAISO's Revised Draft Technical Appendix were:

- The CAISO will financially settle FRP in two separate settlement calculations: (1) FRP procured for forecasted movement and (2) FRP procured for uncertainty.
- FRP for forecasted movement will be settled in each 5-minute real-time dispatch (RTD) interval and in each fifteen-minute market (FMM) interval. FRP for uncertainty in FMM and RTD will be settled at the end of each month.
- FRP awards to interties and resources will be included in the real-time market bid cost recovery calculations, and will include revenues attributable to both increased and decreased FRP schedules in RTD relative to the FMM, similar to energy schedule changes between FMM and RTD.
- There will be no grid management charges for FRP awards
- There will not be "no pay'' charges similar to that used for ancillary services for FRP.

In response, PG&E offers the following comments:

- PG&E requests that the CAISO track and report on the impacts of selected penalty prices associated with the demand curves for FRP procurement.
- PG&E supports the CAISO's decision to split the settlement into two components, forecasted movement and ramp procured for the uncertainty resulting from forecast errors.
- PG&E requests that the CAISO track and report on impacts of several effects (e.g., generation resource start up and shut down, updates in Variable Generation Resources (VER) forecast). Such information will help the CAISO and stakeholders evaluate the performance of the design and the possible need for incremental future improvements.

A. PG&E requests that the CAISO track and report on the impacts of selected penalty prices associated with the demand curves for FRP procurement to assure the values are appropriate.

A number of PG&E's previous concerns have been addressed in the Revised Draft Technical Appendix. The clarifications in this document and the workshop presentation are very useful to understand the design criteria of these products. PG&E would like the CAISO to evaluate the market impacts of the demand curve. PG&E is concerned that the penalty prices set by the CAISO might lead to unnecessary costs to obtain ramping capacity. PG&E supports the CAISO's current demand curve approach as long as the CAISO states the criteria it will use to determine when it will revisit the method used to set the demand curve.

B. PG&E supports the settlement modifications.

PG&E supports splitting the settlement payment in two parts, forecasted movement and the Flexible Ramp procured for uncertainty. The forecasted movement and the uncertainty portion of the ramping capacity should be settled differently due to the compensation differences. Resources in line with the forecasted movement of the net demand will be compensated on an interval basis with the market price. Whereas the uncertainty portion will be paid and allocated at the end of the month and divided between Load, Supply and Interties based upon the gross forecast error by splitting these payments apart, market participants will have more transparency on the drivers of their flexible ramping product costs.

PG&E also supports the decision to award FRP revenues to intertie resources. If intertie resources provide movement that is in the direction of the ramping need, it is fair to compensate them as any other resource would be compensated. In addition, PG&E supports the decisions related to the "no grid management" charges and elimination of "no pay" charges. These charges are unnecessary and makes settlement of FRP costs much simpler.

C. PG&E seeks further clarification of ramp modeling under specific conditions (e.g., generation resource start up / shut down, VER forecast updates). Current formulation may not capture all possible conditions.

The CAISO recognized in its recent FRP stakeholder meeting that changes in commitment for a resource may make it impossible to hold a ramp of 0 MWh between intervals on a dispatchable resource, which is central to the development of determining the ramping need in interval t+1. The CAISO proposes to treat the change in a resource's minimum output across intervals caused by a change in commitment as a change to non-dispatchable generation. The CAISO will continue to treat the energy above the minimum output as dispatchable generation. This seems to be a workable solution for resources whose commitment changes between the binding interval and the advisory intervals. As the CAISO stated at the stakeholder meeting, it may be difficult to capture in the forecast of non-dispatchable generation the changes that result from fast-start resources whose commitment is changing between the binding interval and first advisory interval. The discrepancies in the calculation of flexible ramp up and down that this may cause may be acceptable. While this may not be a reason to delay implementation of FRP, given the

expected benefits, the level of any deviations that may arise should be tracked and reported so that stakeholders can be sure that the impact on market results is acceptable.

Changes in forecast for dispatchable VERs may also cause issues. If the forecast for a dispatchable VER decreases from interval t to interval t+1, the formulation may over constrain the dispatch from that VER in period t. Let us assume that we are not procuring regulation, spinning reserve or non-spinning reserves on the dispatchable VER (call it resource i).

Let:

$UEL_{i,t} = Forecast\ for\ resource\ i\ in\ period\ t$
$EN_{i,t} = Dispatch\ for\ resource\ i\ in\ period\ t$
$FRU_{i,t} = Flexible\ Ramp\ Up\ scheduled\ on\ resource\ i\ in\ t$
$AF = Averaging\ Factor$

The Security Constrained Economic Dispatch (SCED) enforces

$$EN_{i,t} \leq UEL_{i,t}$$

According to the draft technical appendix, the FRP model would also enforce

$$EN_{i,t} + AF \cdot FRU_{i,t} \leq UEL_{i,t+1}$$
$$FRU_{i,t} \geq 0$$

Since we are assuming that the forecast for the resource decreases from t to t+1, we have that$UEL_{i,t+1} < UEL_{i,t}$. Consequently, the last two constraints imply that

$$EN_{i,t} \leq UEL_{i,t+1} < UEL_{i,t}$$

This means that the formulation would never allow SCED to dispatch all of the energy available from the VER in period t leading to a potential inefficiency.

It is unclear whether this potential inefficiency would be material. Consequently, we would again request that the CAISO track this effect and report to the stakeholders. If either commitment of fast-start resources or VER forecasting causes material problems with FRP in actual operations, the CAISO and stakeholders should revisit the formulation of the SCED that has included the FRP. Alternate formulations that track ramp resulting from schedule change and incremental ramp up and ramp down to cover uncertainty are possible and should be investigated if necessary.