Comments of Pacific Gas and Electric Company

On Flexible Ramping Product Supplemental: Foundational Approach

Submitted by		Company	Date Submitted
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1. Introduction

Pacific Gas & Electric ("PG&E") appreciates the opportunity to participate in the stakeholder process for the California Independent System Operator's ("CAISO") Flexible Ramping Product ("FRP") Initiative and to submit comments regarding the CAISO's July 11, 2012 paper entitled, *Supplemental: Foundational Approach* (Supplemental).

PG&E applauds the CAISO's decision to delay Board consideration of this initiative from May to November. Given the inherent complexity of the FRP's design, stakeholders will benefit from having more discussion. We also recognize and appreciate the effort the CAISO has made in developing the FRP. We found the CAISO's historical analysis of its cost allocation proposal, as well as, the examples of the two Product definitions to be particularly helpful.

Although PG&E is supportive of the CAISO developing tools to help manage the flexibility needs of the system, we are concerned that the CAISO is proceeding to develop a new tool (FRP) to integrate renewables, without finalizing and implementing the Phase 1 Renewable Integration Initiative. PG&E is anxious to implement the Phase 1 changes, as well as changes to the PIRP program, that could help minimize the need for the FRP. PG&E asks the CAISO to prioritize completion and implementation of the Phase 1 integration work and reinitiate the PIRP stakeholder initiative.

Regarding the Supplemental, PG&E's principal comments are:

- PG&E is supportive of the Option 2 definition of the Product.
- PG&E is not convinced that the Supplemental methodology to determine the FRP requirement is superior to the Explicit approach. The new proposal seems overly complex. Without analysis stakeholders cannot make an informed judgment.
- PG&E recommends that Gross UIE, not UIE, be used to allocate cost to the supply category.

- PG&E does not support the CAISO proposal to allocate cost among load based on uninstructed imbalance energy as compared to the DA cleared load schedule.

PG&E also suggests that the Revised Draft Final Proposal discuss the following information that was not included in the Supplemental paper:

- Data used to determine upper and lower limits in interval RTD (t+5)
- Procurement Requirement - Confidence Level Thresholds
- FRP Bidding Rules
- Rules for conversion between the Day-Ahead Market ("DA") and Real Time Unit Commitment ("RTUC")

2. Summary of Supplemental

The CAISO addresses three issues in the Supplemental: 1) FRP definition, 2) determination of the FRP MW requirement, and 3) details of the cost allocation of FRP procurement cost.

Product Definition

The Supplemental describes and compares two possible mathematical definitions for the FRP.

- Option 1: Use the FRP to cover the unexpected ramp, which is the difference between the upper and lower limits of Real-Time Dispatch ("RTD") net load in t+5 and ("RTUC") net load[1]
- Option 2: Use FRP to cover the real ramp, which is the difference in net load from interval RTD (t) to and the upper and lower limits of interval RTD (t+5)

Determination of Product Requirement

The Supplemental proposes a new methodology to determine the Product requirements. The methodology relies on developing a distribution of power balance violations and a range of penalty prices for increasing violation levels.

Cost Allocation of Product Procurement Cost

The Supplemental describes how the FRP procurement cost would be allocated three categories: 1) load and 2) supply, and 3) fixed ramp schedules (intertie schedules and self-scheduled supply). The CAISO proposes a two-step allocation process. First, FRP cost would be allocated to the three categories based upon consumption of energy for netted load that require changes in real-time dispatch of resources, movement of production of energy for netted supply, and production of energy for netted fixed ramps.

Second, the costs would be allocated within the categories to load or supply schedules that make up the category based on their RT deviations from their baselines[2]:

[1] The lower RTD limit is used to determine the quantity of FRP down awarded in RTD, and the upper limit is used to determine the quantity of FRP up awarded in RTD. This is the case for both Option 1 and Option 2.

- For the load category, allocate costs based upon gross uninstructed imbalance energy;
- For internal resources, allocate costs based upon changes in uninstructed energy that is outside a 3% threshold based upon the resource's instruction;[3]
- For interties resources, allocate costs based upon the net SC movement.

3. PG&E Comments

A. Product Definition

PG&E supports Option 2 because it is more aligned with system conditions, bases procurement decision on more current information (i.e. the RTD (t) net load forecast) and does not present the possibility of FRP prices including false opportunity costs.

Using Option 1 presents a weakness in that it uses older information (i.e. the RTPD forecast performed 22.5 minutes before binding RTD interval).[4] This could cause the unnecessary procurement of FRP capacity.[5] The benefit of Option 2 is that it uses the RTD forecast performed 7.5 minutes before the binding RTD interval.

Additionally, Option 1 determines the dispatch of FRP based on the interval RTD (t+5), while the requirement is being met with ramping capability in interval RTD (t). This could lead to over (or under) generation in any given RTD interval.[6] This problem could be corrected by modeling unexpected ramping in advisory interval RTD (t+5), but as the CAISO correctly suggests, this could lead to the FRP capacity price incorrectly including the opportunity cost of not providing energy.[7] The use of Option 2 does not present difficulty dealing with FRP prices including false opportunity costs.

B. Determination of Product Requirement

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[2] The baseline for load would be DA schedules; the baseline for Variable Energy Resources would be 15 minute expected energy; the baseline for internal generation would be 5-minute real-time instruction; the baseline for intertie resources would be modeled ramp.

[3]Renewable resources will be allowed to utilize the 15 minute forecast as the baseline to measure uninstructed energy to calculate the billing determinant in the supply category.

[4] The term binding RTD interval can be used interchangeably with the term RTD (t).

[5] This was the case in the example found in page 7 of the Supplemental paper. The net load in interval RTD (t) is lower than the RTD (t+5) lower limit. Yet Option 1 would still lead to the procurement if FRP down. Option 2 would not award FRP down capacity.

[6] Continuing with the example on page 7, generation would have to be dispatched to a relatively higher level to allow for the possible release of downward FRP capacity in future RTD intervals. This relatively high dispatch of generation is what could lead to over generation.

[7] The CAISO uses the example of a100 MW resource has binding 20 MW upward flex ramp award in interval RTD (t+5) (with energy opportunity cost) based on 80 MW advisory energy dispatch, but later the binding energy dispatch for interval t+5 changes to 85 MW.

PG&E is not convinced that the method proposed in Supplemental is superior to the simpler Explicit method.

PG&E appreciates the new methodology proposed by the CAISO in the Supplemental. This new method is another variant of the implicit approach which uses a demand curve to determine procurement levels of FRP. The new method would construct the demand curve through the use of a distribution of power balance violations and administratively determined penalty prices.

The new method is complex and relies on the development of distributions and penalty prices. The methodology seems overly complicated, and PG&E has a continuing concerned about the complexity of the FRP. Moreover, there is no evidence that this method would result in more efficient outcomes than the simpler Explicit approach.

PG&E cannot support a more complex Implicit methodology until the CAISO provides analysis that shows the benefits of such an approach is greater than its cost to implement and the loss of transparency that comes with complexity. In PG&E's comments on the May 29th Technical Workshop, PG&E offered suggestions on specific analyses that could help stakeholders make a decision on this design question. These suggestions are provided at the end of these comments as an Addendum.

C. Cost Allocation

Gross UIE, not UIE, should be used to allocate cost to the supply category

In the Supplemental paper, the CAISO proposes to allocate FRP capacity costs to supply category based on 10 minute changes in uninstructed deviations, and seeks stakeholder comments on the advantage of using changes in Uninstructed Imbalance Energy ("UIE") versus gross UIE, where changes in UIE is the measured as the difference of subsequent two 10-minute UIE.

In order to evaluate whether changes in UIE or gross UIE is an appropriate measure for cost allocation, a fundamental question to answer is whether a constant deviation by a resource causes constant FRP cost to the system. For example, suppose a resource (resource A) negatively deviates 10 MW in each of the five-minute intervals for the entire hour, and another resource (resource B) is dispatched 10 MW from its FRP up capacity in the first five-minute to make up for the shortfall. In the second five-minute interval, the operator still needs to dispatch another 10 MW from a resource that provides the least cost FRP up capacity given all system constraints, in this case, it could be resource C. That is to say in each 5-minute RTD interval over the entire hour, the operator needs to procure 10 MW FRP up capacity based on the least cost solution of the system, and highly likely from different resources. As such, gross UIE should better align with the FRP capacity procurement compared to changes in UIE. Another way to look at this issue is whether the CAISO will procure FRP capacity based on changes in UIE or gross UIE, based on the logic above, procuring FRP capacity based on changes in UIE will not satisfy system needs in most situations.

PG&E does not support the CAISO proposal to allocate cost among load

The CAISO proposes to allocate FRP cost to load based on uninstructed imbalance energy as compared to the cleared day-ahead load schedule. The CAISO asserts that if load serving entities more accurately predict hour-to-hour load ramp in the day-ahead market, the ISO should be able to reduce the amount of flexible ramping procured to meet variability and uncertainty that results from hourly ramps. The CAISO has not shown evidence that this is the case.

Without evidence to the contrary, there seems to be no causal relationship between an LSE's DA cleared schedule and how much Flexible Ramping is procured. This is because the CAISO only procures enough FRC capacity to manage the real-time variability around a real-time forecast. Whether an LSE under-schedules a lot or a little in DA does not impact the FRC requirement or cost, and, therefore, is not an appropriate basis for cost allocation. That is not to say that under-scheduling in the DA does not impact commitment uplift. It does. DA under-scheduling can result in increased RUC costs (both RUC awards and RUC BCR). These costs (Total RUC Allocation Amount) are allocated in Tier 1 (CC 6806) based on Net Negative CAISO Demand Deviation (which compares the hourly DA cleared load to the hourly metered demand for an LSE).

Moreover, an LSE's DA cleared schedule is not the same as load forecast and should not be viewed as such. The cleared schedule results from the load bids clearing with supply bids. The resultant cleared schedule is likely different from the load bid into the market since the cleared amount is dependent on supply bids.

Finally, this allocation methodology seems to create an incentive to self-schedule all load in the day-ahead market. In order to encourage market efficiency and flexibility, PG&E understands the CAISO encourages economic bids for both load and supply. This would seem to run contrary to that encouragement.

Clarification Requested on Cost Allocation to Fixed Ramp Category

The Excel example posted to the CAISO's website on July 11th raises two questions regarding the cost allocation to the Fixed Ramp category. PG&E asks the CAISO to clarify two issues.

1. <u>The example does not appear to fully allocate costs for the entire 20 minute ramp</u>

   The CAISO proposes to procure flex ramp capacity to cover static hourly schedule changes for imports and exports over a twenty-minute ramp. The cost allocation will be based on the scheduling coordinators' net import and export position between hours. The example discussed in Section 5.2.4 of the CAISO's April 9th Draft Final Proposal ("April 9th proposal") illustrates the FRP cost allocation over a twenty-minute ramp when as the hourly schedule changes, and we support that method. The example allocates costs to the first 10-minute within the hour only, which does not align with the twenty-minute ramp period.

2. <u>The example does not include operational adjusts in allocation cost to the Fixed Ramp category</u>

It has been proposed in the April 9th proposal that deviations captured by operational adjustments (OA1 and OA2) will also be allocated the flex ramp cost because operational adjustments for intertie resources are similar to UIEs for internal generations and will result in additional flex ramp capacity procurement. The July example does not included the Operational Adjustments PG&E supports the CAISO retain the Operational Adjustments as part of the calculation.

D. Information that should be Included in the Revised Draft Final Proposal

PG&E's recommends that the Revised Draft Final Proposal discuss the following information that was not included in the Supplemental

1. Procurement Requirement - Confidence Level Thresholds

In its April 9th proposal, the CAISO proposes to use the imbalance distribution to procure to a 60% confidence level in the DA market. The remaining amount of FRP capacity would be committed in the RTPD to reach a 95% confidence level. Using a 95% confidence level as a target might be excessive. As SCE suggested in its previous comments, an 85% confidence level might save considerable costs with minimal risk.

There has been no quantitative justification provided as to why 60% and 95% are appropriate thresholds in the DA and RTD markets. Thus, PG&E is not comfortable with the level of details provided by the CAISO on this issue, and alternative options should be considered.

A possible alternative is coupling a confidence level threshold with a price level threshold. For example, an average FRP RTD capacity price could be calculated based on historical data. All DA FRP capacity bids lower than that price would receive an award up to the total requirement; potentially all of the total FRP requirement could be procured in the DA market. In the event that there are a small number of low priced bids in the DA, the CAISO could defer to the confidence level threshold.

2. Data used to Determine Upper and Lower Limit in Interval RTD (t+5)

PG&E appreciates the examples that show how CAISO would review historical data and determine the upper and lower limit using the 95% confidence level. However, what was missing from the example was a discussion on much historical data would be used (e.g. one month, six-months, or a year)? Would FRP requirements for, say, RTD interval 12:00 – 12:05 be determined by only performing historical analysis on the same interval?[8] Or would the CAISO look at other intervals? Would FRP requirements in the weekend only use historical data from the weekend? Or would the CAISO look at weekdays? We request that the CAISO consider these questions as it develops its Revised Draft Final Proposal.

[8] For example, to determine the dispatch of FRP capacity for the interval 12:00-12:05, the CAISO could compare the historical difference in net load between 12:00 – 12:05 and 12:05-12:10 to determine the upper and lower limits. This is in contrast to CAISO's example in its presentation in which it looked at historical differences in net load across several consecutive RTD intervals.

3. FRP Bidding Rules

In its April 9th proposal, the CAISO proposed a bid range will also allow it to factor "extreme" energy bid into the costs of procuring FRP capacity. Specifically, upward FRP capacity with energy bids higher than $300/MWh will have a greater expected energy dispatch cost in the amount of 2.5%*(energy bid (at the last upward flexible ramping MW) – 300). Similar treatment will apply to down FRP capacity with energy bids lower than $0, which will have a higher expected energy cost in the amount of (-2.5%*energy bid).

We have concerns with the April 9th proposal. First, using a bid range of $0 - $300 provides too much room for a resource to game the market. For example, assume that in the DA market, Resources A and B bid the same price for FRP Up capacity. Also assume that Resource A provides an energy bid range of $1-$10 and Resource B provides an energy bid of $30 - $299. Under this proposal, the CAISO's might select Resource B to provide FRP capacity.[9] In order to avoid this scenario from occurring, the CAISO's DA optimization could consider both FRP bids and energy bids (at all levels – not only those bids less than $0 and greater than $300).

4. Conversion between DA and RTPD

It is unclear as to how conversion of FRP to spinning reserves (and vice versa) would work under various scenarios because of how spinning reserves are treated in the DA and RTPD. This was described qualitatively in the April 9th proposal (page 19), but there is considerable confusion among stakeholders on how this actually work. PG&E asks the CAISO to develop detail numerical examples reflecting the spinning reserves rules described in the April 9th proposal.

Of particular interest is the interplay between any FRP and non-contingent spinning reserves given the restrictions on spinning reserves procured in the RTUC. When the CAISO procures incremental spinning reserves in RTUC, the spinning reserves is contingent-only.[10] Also, if the resource providing the incremental spinning reserves in RTUC was also was awarded spinning reserves in DA, the total quantity of spinning reserves from the resource is considered contingent-only even if the DA award was previously identified as non-contingent.

[9] In this case Resource B is free to provide a Real-time energy bid of $299 without incurring the disadvantage of having an upward adjustment to it FRP Up capacity bid. Meanwhile Resource A, who would have bid at most $10 in the RT market, is ignored by the CAISO's optimization.

[10] Non-contingent spinning reserves cannot be procured in RTPD and can only be procured in the DA market.

Addendum:

PG&E's comments on the May 29th Technical Workshop - Suggestions for additional information or analyses regarding the Procurement Target (Explicit vs. Implicit)

Procurement Target – Explicit Versus Implicit

Illustrative Numerical Examples

1) Provide example for explicit approach - example should clarify the equations provided in slide 5. There was confusion about the meaning of some of the notation when discussing the equations with CAISO staff at the Workshop.

   It would be especially helpful if the example uses actual data to determine the imbalance distribution (which will measure the RTD net load deviation from RTPD load) and how it translates into a procurement requirement in the DA market and a commitment requirement in the RTPD.[11]

   Stakeholders also need more specific information to assess the explicit procurement approach including:

   - What is the statistical methodology to develop the distribution?
   - How much historical data will the CAISO use to determine the imbalance distribution (one month, six-months, or a year)?
   - How often will the CAISO review and revise the requirements?
   - How will the CAISO know whether the requirements are too high?

2) Provide example for implicit approach - example should clarify the equations provided in slide 5. It would be most helpful if the example shows how the benefits of flexible ramping capability would be calculated and how that would be translated in MW prices used to construct an FRP demand curve. The example should illustrate how the demand curves would be used to determine the procurement target in the DA, RTPD, and RTD market and should compare the results with the Explicit Approach.

Analyses

3) Market Simulation – Explicit Procurement with Different Confidence Intervals

[11] As PG&E understands it, the CAISO will use the same distribution to determine the total FRP requirement. But it is unclear as to how this can be the case when the procurement in DA market is based on an hourly FRP requirement and commitment in the RTPD is based on a 15-minute FRP requirement.

Reason for Analysis: What are the impacts on the market of procuring different levels of FRP in DA versus the RT?

Description of Analysis: For explicit approach, examine some representative hours. Perform multiple market simulations with differing confidence levels of FRP in the DA market. Simulation can use FRP bids that are some reasonable multiple of spinning reserve bids.[12]

4) Market Simulation – Implicit Procurement

Reason for Analysis: What are the impacts on the market of procuring FRP using an implicit demand curve? Comparison of the market results to the results of explicit procurement simulation results can help inform the explicit versus implicit procurement decision.

Description of Analysis: Create one or more reasonable demand curves. Examine some representative hours and simulate the market procuring FRP assuming FRP bids are some reasonable multiple of spinning reserve bids. Compare these results to the explicit approach. Are there advantages of one approach over the other?

[12] In previous proposals, the CAISO has proposed to use the imbalance distribution to procure to a 60% confidence level in the DA market. The remaining amount of FRP capacity will be committed in the RTPD to reach a 95% confidence level.