Comments of Pacific Gas & Electric Company
Flexible Ramping Product Revised Straw Proposal

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Pacific Gas and Electric Company (PG&E) respectfully submits the following comments on the California Independent System Operator's (CAISO) Flexible Ramping Product (FRP) Revised Straw Proposal.

Overview: PG&E continues to support the general direction and approach of the FRP design. PG&E's comments focus on critical details of the design and on areas where further clarifications and design details are needed. To this end, PG&E requests further mathematical representations of the FRP formulations, including the aspects of the Security Constrained Unit Commitment and Security Constrained Economic Dispatch that will be replaced or modified through the FRP. The complexity of the design also again signals a need for more robust simulation or "sand-box" capabilities by which to assess the impacts of the design on aspects of market performance. For instance, understanding the effects of the buy-back features and averaging factors on Day-Ahead (DA) and Real-Time energy prices could provide important certainty that market distortions are unlikely.

PG&E's main comments are as follows:

1. The CAISO must specifically define the upward and downward flexible ramping requirements for the day-ahead market and the fifteen minute market. PG&E remains unclear on the formulation of the maximum real-ramp procurement level for the IFM and FMM. PG&E requests the CAISO confirm its proposed approach by reviewing and noting which if any of the examples in the attachment represent the CAISO's proposed approach for the IFM (and similarly for the FMM). A clear understanding of this requirement is integral to developing a broad level of stakeholder support on this initiative.

2. PG&E supports the megawatt bid capability for the day-ahead FRP. Allowing market participants to bid in a quantity for FRP for a given resource (in both the up and down direction) in the day-ahead market with no dollar value in the bid provides resources with the ability to signal willingness to allow CAISO to dispatch FRP on a resource through the quantity of FRP offered on that resource. As previously mentioned, PGE&E opposes the idea of providing a price bid associated with FRP megawatts. No compelling justification has been made for what such a bid might represent, particularly since the "value" of selling to external markets is already represented in the CAISO through export bids.

Moreover, such dollar bids would require the development of a new class of Market Power Mitigation protocols to safeguard against market power if CAISO implements regional requirements for FRP.

3. PG&E supports a probabilistic determination for the demand curve for each procurement interval as articulated by the CAISO Department of Market Monitoring in prior comments. As PG&E understand it, the proposed process for creating a demand curve is a calculation based on:

a) forming a probability distribution function of the error in net load forecast over a relevant dispatch period based on historical observation
b) treating any forecast error as resulting in an equivalent violation of the power balance equation as if ramping capability were not available
c) pricing the violation calculated in step (b) at the administrative penalty price used to price power balance violations in SCUC and SCED.

PG&E could support this approach in general. The relevant dispatch interval used to determine forecast errors must match the interval used to define the period for which FRP is to be procured to cover the uncertainty. As discussed in the attachment, the period over which the demand curve is to model the effects of uncertainty in the different markets remains unclear to PG&E. The interval for the demand curve is clearly a five minute period in RTD. However, it is unclear for what period FRP is being procured to cover forecast uncertainty in IFM and FMM.

The current approach should produce very high demand curve prices in the lower parts of the demand curve near zero if the administrative price for power balance violations is used as described in (c) above. This approach sets the maximum price that could be paid for ramp capability to meet errors in net load forecast at or below the administrative cost used to price power balance violations. The administrative cost used to price power balance violations would set the maximum price that could be paid for ramp to meet the forecast net load ignoring forecast errors. The ramp demand curve and administrative price for power balance violations jointly would be used to procure FRP. There is no need to set a minimum requirement for FRP with an administratively set price of $247/MWh in the demand curve, as previously mentioned by comments in past FRP Straw Proposal filings by the CAISO Department of Market Monitoring.

PG&E also recommends that CAISO investigate using a lower price than the administrative price for power balance violations of $1000/MWh as the administrative price used in calculating the demand curve. It is unclear whether basing the demand curve on the $1000/MWh penalty price used to price power balance violations in SCUC and SCED will result in unreasonably high prices for FRP. The goal should be to balance to cost of procuring FRP with the cost of operating the system without FRP. Some numerical experiments with the administrative price used to from the demand curve could help determine the proper balance.

4. With complex changes to the market and optimization, the use of a simulated environment to test the interaction of FRP procurement with the energy and ancillary service markets becomes crucial. Market distortions or perverse outcomes have previously occurred in light of market design changes. These changes caused large market inefficiencies or open opportunities for strategic bidding behavior or

gaming, resulting in unreasonable costs being borne by some market participants. For example, a flaw in the design of virtual bidding created millions of dollars in unjust and unreasonable profits, the costs of which were borne by CAISO loads[1]. Such outcomes should be avoided, and the use of a simulation tool that can support the market design (rather than just the market design implementation process) seems necessary.

The FRP design affects many aspects of the market optimization and runs the risk of creating unforeseen outcomes or problematic market incentives. Without a simulation that allows CAISO staff as well as market participants to investigate and fully understand the interactions of the new product with the other market features, it will be difficult to determine likely performance and identify potential pitfalls. For example, is it possible that the Averaging Factor for the day-ahead FRP product could bias the IFM awards to slower units that might be unable to provide the RTD ramping needs, necessitating a predictable buy-back from certain resources in certain hours? Would such an outcome create systematic price differentials between the day-ahead and real-time markets? Could such a persistent pattern create market problems or inefficiencies? A simulated environment would allow market participants to fully understand these interactions prior to the expense of launching a new product.

5. PG&E supports the current cost allocation for FRP Procurement Costs between Load, Supply, and Fixed Ramp Resources. PG&E supports the cost allocation for the FRP procurement between load, supply, and fixed ramp resources as well as the monthly re-settlement and reallocation of procurement costs. Settling the procurement costs based on the performance of entities within each type of resource will meet the goals of assigning cost to causation for FRP procurement as well as insuring again large swings in charges due to small deviations in single hours.

6. Correct and Expand the Model Details in Appendix B. The ramp limit inequality in Appendix B appears flawed. For example, the ramp limit would require that 10-minute reserves (spin, non-spin, regulation) must be able to be deployed in 5 minutes in RTD. CAISO should show the formulas that are used in SCED and SCUC to enforce ramp constraints for energy and AS in IFM, FMM and RTD today. They should then show in detail how those constraints will be modified or new constraints added to enforce ramping constraints when FRP is added to these markets. Such mathematical detail would also serve to eliminate confusion as to how FRP will be procured to cover the uncertainty over what intervals in IFM, FMM and RTD.

[1] Concerns over market manipulation drove the CAISO suspend virtual bidding at interties on February 8, 2011. These changes were authorized by FERC in subsequent filings. See 136 FERC ¶ 61,156.

Attachment: Potential Interpretation of the FRP requirement in the Day Ahead Market

As noted in comments under #1 above, there could be multiple interpretations for the FRP requirement in both the Day Ahead and Fifteen Minute Markets. Below are three potential interpretations for the Day-Ahead market. Similar interpretations could be applied to the Fifteen-Minute Market FRP requirement:

a) Ramp requirement over an hour could consist of ramp needed to follow hour-to-hour changes in IFM cleared load plus ramp to cover the x-percentile of historic differences between realized 5-minute net load in RTD minus forecast of 5-minute net load in real time in the hour[2]. The model would assume that the additional 5-minute ramp (including capacity) to meet the x-percentile requirement would be held in each 5-minute period in the hour; however, it would not assume that the additional 5-minute ramp would be deployed in each 5-minute period. Consequently, the ramp capability would be available in each five-minute period, but capacity would not be held aside to support deployment in more than one five minute period. This mimics the look-ahead dispatch in RTD where ramp capability is held in each advisory five minute period of the look-ahead time frame to meet the forecast change in net load in each 5 minute period plus the x-percentile of the historic difference between realized 5-minute net load minus forecast 5-minute net load in the look-ahead time frame. The dispatch in each five minute interval of the look-ahead period is to the forecast demand only and so capacity is only consumed to meet forecast demand.

b) Ramp requirement over an hour could consist of ramp needed to follow hour to hour changes in IFM cleared load plus additional ramp capability to meet historic estimates of intra-hour ramp requirement beyond the linear ramp needed to meet change in IFM cleared load from hour to hour. To set the latter, some multiple of 5 minutes could be selected, say 30 minutes. Then the ramp requirement over an hour could consist of ramp needed to follow hour to hour changes in IFM cleared load plus the x-percentile of historic difference between realized 30-minute net load in real-time minus forecast 30-minute net load in real-time over a 30 minute period in the hour. The model would assume that the additional 30-minute ramp (inculding capacity) to meet the x-percentile requirement would be held in each 30-minute period in the hour; however, it would not assume that the additional 30-minute ramp would be deployed in each 30-minute period in the hour. Consequently, the ramp capability would be available in each 30-minute period, but capacity would not be held aside to support deployment in more than one 30 minute period.

c) Ramp requirement over an hour could consist of ramp needed to follow hour to hour changes in IFM cleared load plus additional ramp capability to meet historic estimates of uncertainty in hourly load in real-time. The ramp requirement over an hour could consist of ramp needed to

[2] Alternatively ramp requirement over an hour could consist of ramp needed to follow the greater of hour-to-hour changes in IFM cleared load or hour-to-hour changes in mid-term forecast of hourly loads plus ramp to cover the x-percentile of historic differences between realized 5-minute net load in RTD minus forecast of 5-minute net load in real time in the hour.

follow hour to hour changes in IFM cleared load plus the x-percentile of historic difference between realized hourly net load in real-time minus forecast hourly net load in real-time. The model would assume that the additional hourly ramp to meet the x-percentile requirement would be procured in each hour in IFM; however, it would not assume that the additional ramp would be deployed in each hour. Consequently, the ramp capability procured would be available in each hour, but capacity would not be held aside to support deployment in more than one hour of the day.