Comments of Powerex Corp. on Flexible Ramping Product Revised Draft Technical Appendix

Submitted by	Company	Date Submitted
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Powerex appreciates the opportunity to comment on CAISO's November 11, 2015 Flexible Ramping Product Revised Draft Technical Appendix ("Revised Technical Appendix"). Powerex strongly supports CAISO's efforts to develop market-based mechanisms to ensure that CAISO has the flexible resources necessary to meet system ramping needs. The proposed design of the Flexible Ramping Product has evolved significantly over the past 18 months, and Powerex appreciates CAISO's responsiveness to stakeholder concerns with prior designs and suggested improvements. As a result of CAISO's revisions, Powerex now believes that the core elements of the Flexible Ramping Product proposal are sound, and it supports finalizing the design and moving forward with implementation.

The proposed Flexible Ramping Product will provide CAISO with the ability to procure upward and downward ramping capability in its real-time market under a compensation structure that is based on the opportunity cost of being "held back" from providing energy in the relevant dispatch interval. Although the Flexible Ramping Product does not provide for the procurement or compensation of flexible resources on a day-ahead or longer-term basis (*e.g.*, through a capacity commitment), it nevertheless represents an important step in the CAISO's development of market-based tools to ensure that it has the resources necessary to meet the challenges associated with the greater system variability that comes with increased reliance on variable energy resources. The concepts developed in the course of the Flexible Ramping Product stakeholder process provide a sound framework that can be extended to the design of market-based flexible capacity products across the full range of market timeframes. Two specific concepts are especially notable:

- The Flexible Ramping Product proposal appropriately distinguishes between the forecast movement of net load—which can be anticipated and mitigated by a variety of resources, including those that cannot be dispatched on a 5- or 15-minute basis—and the unpredictable variations in net load that can only be managed through real-time dispatch of flexible generating resources with short lead time. Without this critical distinction, all changes in net load might be regarded as stochastic, leading CAISO to overestimate the need for real-time dispatchable resources and increasing overall Flexible Ramping Product costs.

- The Revised Technical Appendix adopts a sound conceptual framework that allocates Flexible Ramping Product costs and credits based on the extent to which a market participant's activity increases or reduces forecast movements in net load. This will

provide the appropriate price signals for market participants to take actions that minimize the need for flexible ramping capability.

As described further herein, although Powerex supports much of the conceptual framework set out in the Revised Technical Appendix, Powerex believes that certain elements of CAISO's proposal merit further discussion and clarification. In particular, Powerex requests additional information regarding:

- the ability of CAISO market operators to manually adjust the Flexible Ramping Product requirement;
- the allocation of Flexible Ramping Product costs associated with uncertainty;
- CAISO's example of rescission charges applied to settlement of the Flexible Ramping Product; and
- CAISO's example of the settlement of intertie movement.

A. Separate Settlement of Forecasted Movements and Uncertainty

In the Revised Technical Appendix, CAISO outlines a revised proposal for allocating the costs of the Flexible Ramping Product. In particular, CAISO states that there will be two distinct settlements for the Flexible Ramping Product: (1) direct settlement with load, supply, and interchange for flexible ramping capability procured to meet forecasted movements in net demand; and (2) an uplift payment designed to recover the costs of flexible ramping capability procured to address uncertainty.

Powerex believes that one positive result of the stakeholder process has been CAISO's decision to modify the settlement of the Flexible Ramping Product to distinguish between costs associated with capacity used to meet forecasted movements in net demand and costs associated with capacity used to meet uncertainty. CAISO's proposal aligns the allocation of the costs of the Flexible Ramping Product with the separate and distinct factors that drive the need for flexible capacity: (1) interval-to-interval changes to energy schedules that CAISO can anticipate and accurately predict ("known variances"); and (2) changes to energy schedules that cannot be accurately forecast prior to real-time dispatch ("uncertainty"). Any energy schedule that changes over time will have a "known variance," even if the schedule cannot be altered or dispatched on a 5- or 15-minute basis. Such schedules nevertheless contribute to the overall system need for real-time ramping capacity. For example, as CAISO recognizes in its proposal, an increase in an hourly intertie schedule from one hour to the next has the potential to reduce the need for upward ramping capacity when overall system energy needs are increasing even though the resource may not be dispatchable on a 5- or 15-minute basis.[1]

In contrast, unpredictable movements in net load – such as due to load forecast errors, variable energy resource forecast errors and uninstructed intertie deviations – only serve to increase the

[1] Revised Technical Appendix at 24.

need for ramping capability. Because such movements are not predictable, it is the *potential* for such changes to occur that drives the need for flexible ramping capability in a particular interval. CAISO must ensure that it has sufficient ramping capability to respond to unexpected variations in load and variable energy resource output to maintain system balance, regardless of whether or not these deviations materialize in any specific real-time dispatch interval.

As CAISO appropriately recognizes in its proposal, the distinction between forecasted movements (*i.e.*, "known variances") and variances that cannot be predicted (*i.e.*, "uncertainty") warrants consideration when determining the need for flexible capacity, how to address that need, and how to allocate the associated costs. Because known variances can either reduce or increase the overall need for ramping capability, it is appropriate to provide credit to resources providing known variability that is complementary to system needs. Likewise, it is appropriate to charge resources whose known variations have the effect of exacerbating system needs and increasing the need for upward or downward ramping capability in a particular interval. Since unpredictable ramping activity can only increase costs, however, it is appropriate *not* to provide a credit to unpredictable ramping activity, which cannot be relied upon to reduce flexible ramping needs in either the upward or downward direction.

Powerex believes that the Revised Technical Appendix represents an important step towards recognizing the distinctly different flexible ramping needs created by known variability and uncertainty. Although the current proceeding is limited to CAISO's real-time Flexible Ramping Product, Powerex believes that it would be appropriate to consider utilizing this analytical framework in future initiatives to procure flexibility on a day-ahead or long-term basis. Starting with an assessment of the distinct drivers of flexible ramping needs when pursuing future initiatives will help CAISO clearly identify the need at issue – including the classes of market participants creating that need – and ensure that costs are allocated in a manner that is consistent with cost causation principles.

B. Calculation of Flexible Ramping Product Needs

CAISO states that it plans to calculate the expected error or uncertainty for each interval based upon a histogram reflecting CAISO's historical observation for five minute net demand errors during similar real-time conditions and to include information regarding the use of this data in its Business Practice Manuals ("BPM"). CAISO notes, however, that it may use additional information to refine these estimates as CAISO works to improve its forecast of ramping capability needs and commits to describe any additional factors used to scale the historical observations in its BPMs.[2]

Powerex supports CAISO's proposed approach to calculating the net demand error for each interval. CAISO's use of historical data can be expected to provide an objective and robust framework for estimating uncertainty needs on an ongoing basis. The use of histograms for each operating hour for similar days (*i.e.* weekdays treated separately from weekends or holidays) is a reasonable starting point for estimating the range of uncertainty that may be experienced in real-time. In particular, these histograms should provide a good estimate of uncertainty associated

[2] Revised Technical Appendix at 5.

with demand and solar output, which tend to follow a clear pattern of production throughout the operating hours of each day. As CAISO refines and learns from this initial approach, Powerex recommends that it consider comparisons based not just on the historical uncertainty that materialized in a given operating hour, but also include consideration of the level of forecast wind output for the respective interval. For instance, when wind resources are producing at or near maximum capacity, there is little risk that output may increase even more, and hence less need for Flexible Ramping Down ("FRD") capability. But there is an increased risk that output could fall unexpectedly and hence a greater need for Flexible Ramping Up ("FRU") capability. Conversely, when wind resources are producing at very low levels, there will be a much greater need for FRD than for FRU.

Powerex also strongly supports CAISO's decision to include in its BPMs detailed information regarding how it will use historical data and other information to determine the need for the Flexible Ramping Product. This approach provides CAISO with flexibility to modify the details of the methodology to improve the accuracy of its Flexible Ramping Product estimates. And by committing to document the methodology and to share the results of its analysis with stakeholders, CAISO will provide greater certainty and transparency to market participants regarding the calculation of CAISO's flexible ramping needs.

Powerex notes that CAISO's use of a transparent and sound data-driven approach to quantifying Flexible Ramping Product requirements provides a model that would be appropriate to emulate for other key CAISO determinations that impact market operation and compensation. For instance, the calculation of the flexible ramping requirement in the Energy Imbalance Market also entails a probabilistic assessment of the flexible resources that may be needed to meet the system needs of each EIM Entity in real-time. The CAISO's determination of the necessary level of the EIM flexible ramping capacity requirement has clearly changed in the past year, increasing by a factor of four over this period in each of the PacifiCorp BAAs. Additionally, it appears that this determination was initially subjective, but a more formal framework was implemented around April 2015, though the specifics of that framework have not been documented. The EIM could benefit greatly from the type of transparency and documentation proposed in the Draft Technical Appendix, and Powerex encourages CAISO to explore this possibility further.

Finally, Powerex is optimistic that CAISO will be able to develop objective and transparent methods to accurately determine the demand for Flexible Ramping Products based on historical data and other objective factors. This should minimize the need for CAISO operators to make manual adjustments to the results. However, at the November 18, 2015 workshop on the Revised Technical Appendix, CAISO representatives stated CAISO operators may be afforded the ability to "bias" the flexible ramping requirement on a real-time basis. In light of these statements, Powerex requests that CAISO confirm whether CAISO market operators will have the authority to bias the flexible ramping requirement. If so, Powerex further requests that CAISO take steps to ensure the transparency of this practice, including memorializing this authority in the CAISO Tariff or BPMs, and providing for ongoing and regular disclosure of the frequency of such adjustments and the reasons for use of this authority. For instance, CAISO could consider posting each instance in which market operators made such adjustments as well as the reasons for those adjustments on an ongoing basis.

C. Allocation of the Costs of Uncertainty

In the Revised Technical Appendix, CAISO states that it plans to allocate the total costs of Flexible Ramping Products procured to address uncertainty on a monthly basis using a three-step process. First, CAISO plans to separate the uncertainty costs for Non-Coincident Peak Hours and Coincident Peak Hours. Second, the total costs of uncertainty will be allocated among the load, supply, and intertie categories *pro rata* based on FRU and FRD values calculated in each settlement interval for each category. Third, the monthly cost allocated to each category in the second step, above, will be allocated to individual Scheduling Coordinators within each category based upon the following billing determinants: (1) load – the *pro rata* share of gross uninstructed imbalance energy over the month for the relevant operating hour; (2) supply – the observed forecast error plus any uninstructed imbalance energy; and (3) intertie – the *pro rata* share of gross operational adjustments by operating hour over the month.[3]

As discussed above, Powerex supports CAISO's effort to separately allocate the costs of flexible ramping capability procured to address uncertainty. The proposed allocation of the cost of the Flexible Ramping Product for uncertainty also appears to be consistent with the broad principle of cost-causation. In particular, CAISO's proposal supports an efficient allocation of costs by not treating an upward error as "offsetting" a downward error in a different interval. This is appropriate, as each error uniquely contributes to the need to procure the Flexible Ramping Product: the upward error contributes to the need for FRD, while the downward error contributes to the need for FRU. "Netting" of upward and downward movements would only be appropriate within the same interval, and CAISO's proposal provides for such netting in the allocation of charges to each Scheduling Coordinator.[4]

Powerex is also supportive of differentiating between costs based on hour of the day. CAISO's proposal to divide the costs into Non-Coincident Peak Hours (HE 7-22) and Coincident Peak Hours (HE 1-6 and HE 23-25) provides an adequate initial approach. Powerex suggests that CAISO consider a future enhancement in which costs are grouped for each operating hour. Since the histograms used to determine the need for the product are specific to each operating hour, it would appear sensible to align the cost allocation to do so as well.

Finally, Powerex believes that additional clarification would assist stakeholders in understanding CAISO's proposal. For instance, does CAISO propose to allocate the cost of FRU and FRD for uncertainty based on the *average* quantity of the billing determinant, or based on some other measure of it (*e.g.*, maximum, or 95th percentile)? While it is the potential for "outlier" outcomes that drives the amount of FRU and FRD to address uncertainty, the average error quantity may be the most appropriate initial approach as it mitigates the risk of volatile uplift charges for the Flexible Ramping Product. This may be revisited as a future enhancement in light of actual data.

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[3] Revised Technical Appendix at 27-28.

[4] The different granularity for settlement of loads, interties and supply resources may make it impractical, at least initially, to permit netting across the entire portfolio of a given Scheduling Coordinator. This may be an area for future improvement.

D. Rescission of Payments for Flexible Ramping Product Awards

In the Revised Technical Appendix, CAISO states that it plans to rescind a portion of a resource's Flexible Ramping Product award in certain circumstances to avoid double payment. In particular, CAISO states that it will compare a resource's Flexible Ramping Product award with any assessment of uninstructed imbalance energy charges. In the event that the resource's meter indicates that there is any overlap between the resource's uninstructed imbalance energy deviation or operational adjustment and its Flexible Ramping Product award, CAISO will rescind this portion of the award based on the five-minute market Flexible Ramping Product price.

Powerex supports CAISO's effort to avoid the risk of double payment. A resource that is "held back" in order to provide FRU should only be compensated if it did, in fact, hold that capacity. While supportive of the concept, Powerex requests further information to understand the specific examples in the Draft Technical Appendix related to the calculation of rescission charges. For instance, Table 13 includes a "Generator 2" with a 50 MW FRU award for uncertainty and 900 MW FRU award for forecast movement. The text explains that "The meter showed that Generator 2 produced 75 MW which is 25 MW more than the awarded uncertainty, in which 25 MW will be charged to the generator as a payment rescission." Powerex believes the text should read that the meter for Generator 2 showed it produced 975 MW (not 75 MW). In this case, the meter would show that Generator 2 produced 75 MW more than the expected 900 MW of its energy schedule, consistent with Table 13. Powerex agrees that this example implies that the 50 MW of capacity awarded as FRU for uncertainty was not actually provided, and rescission of that payment is appropriate. However, Powerex does not believe that rescission of 25 MW of FRU for movement is warranted. The award for 900 MW of FRU for movement was fully satisfied; rescission for movement would be appropriate if Generator 2 showed output of *less* than 900 MW, but that is not the case here. The additional 75 MW produced in this example are more properly considered and settled as uninstructed imbalance energy (with 50 MW subject to rescission, as discussed above). Under CAISO's proposal, this uninstructed energy will increase the Scheduling Coordinator's allocation of the costs for FRD for uncertainty in the monthly allocation process.

E. Example of Intertie Movement Settlement

Finally, Powerex believes that the example provided in Table 11 of the Revised Technical Appendix may contain errors. Specifically, it appears that the table is intended to represent an intertie schedule ramping from a value of 100 MW during HE 2 to a value of 150 MW during HE 3. Consistent with WECC interchange standards, the ramp between the two hourly values will occur over a 20-minute period beginning at 01:50 (*i.e.*, at the start of RTD 11 of HE 02) and concluding at 02:10 (*i.e.*, at the end of RTD 2 of HE 03). This means that the schedule will increase by 12.5 MW during the course of each of the four 5-minute intervals. Table 11, however, shows values for the "prescribed hourly ramp" that increase by 10 MW in each 5-minute period, which would be inconsistent with this ramping procedure. Additionally, the "RTD incremental ramp award" values appear to imply that the intertie ramps by 10 MW during RTD 10 of HE 02, which would occur before the prescribed start of the schedule ramp at the beginning of RTD 11.

Powerex believes that Table 11 should be revised as shown below.

	HE 02						HE 03					
	RTD7	RTD8	RTD9	RTD10	RTD11	RTD12	RTD1	RTD2	RTD3	RTD4	RTD5	RTD6
Prescribed hourly ramp (Avg. MW)	100.00	100.00	100.00	100.00	106.25	118.75	131.25	143.75	150.00	150.00	150.00	150.00

	FMM3	FMM4	FMM1	FMM2
FMM Non-Dispatchable Energy	100.00	108.33	141.67	150.00
FMM Ramp Award (MW)	8.33	33.33	8.33	0.00

FMM Ramp Award (MW)	2.78	2.78	2.78	11.11	11.11	11.11	2.78	2.78	2.78	0.00	0.00	0.00
RTD Incremental Ramp Award (MW)	-2.78	-2.78	-2.78	-4.86	1.39	1.39	9.72	3.47	-2.78	0.00	0.00	0.00
Final Ramp	0.0	0.0	0.0	6.25	12.5	12.5	12.5	6.25	0.00	0.00	0.00	0.00