Stakeholder Comments

Flexible Ramping Product Technical Conference

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Southern California Edison (SCE) offers these comments on the California Independent System Operator's (CAISO) Flexible Ramping Product (FRP) Technical Conference and related technical product design issues.

SCE found the technical conference very useful in educating stakeholders on critical design aspects of FRP, setting the stage for the critical technical assessments necessary to continue to secure ample stakeholder support and to finalize the product. SCE believes that stakeholders and the CAISO need additional time to finalize the numerous critical technical issues remaining in the product design[1] and so supports extending the stakeholder process through September or November. SCE offers the following comments on some of the many matters discussed at the technical conference.

1. **The CAISO is right to extend its FRP design process timeline. SCE found the Technical Workshop valuable for issue discussion and stakeholder education.**
   SCE appreciates the CAISO's extra effort to inform stakeholders of key design issues in an appropriate and well-executed forum. Such a meticulous approach empowers stakeholders to participate more actively in the stakeholder process, join the CAISO in evaluating trade-offs and options to resolve difficult design issues, and better support the end design during both board and FERC approval processes.

2. **SCE supports the use of FRP Demand Curves and features that improve competition.**
   SCE supports the use of demand curves for the procurement of FRP. Similar to the PJM Regional Transmission Operator's use of a demand curve in its forward capacity market (RPM), sufficient FRP capacity should be procured for reliability yet be mindful of the tradeoff between reliability and costs.

   Accordingly, the CAISO should consider a demand curve that considers both reliability and costs. By comparing the reliability improvements and approximate costs, stakeholders can better evaluate an appropriate DA procurement strategy, the need to consider "Real-Time (RT) buy-back" in the event of over-procurement, and the benefits of DA procurement in the typically deeper DA supply pool.

[1] The CAISO's Technical Workshop on FRP noted over nine technical issues remaining with the product: http://www.nyiso.com/public/markets_operations/documents/technical_bulletins/index.jsp

To better assess DA demand curves and procurement targets, the CAISO should also provide analysis on the expected changes in its total procurement target between DA and RT, e.g. the difference in the total MWs associated with a 95% confidence interval target in DA versus in RT. Such an analysis, perhaps evaluated hourly and seasonally, will reveal how and if up-to-date insights into the renewable mix for RT changes the total procurement target. SCE believes that such information, if significant, should factor into procurement targets.

In evaluating DA FRP capacity, the CAISO should use the full five-minute ramping capacity for awards and should not de-rate the capacity by dividing it by twelve. Dividing the capacity implies that the capacity is for *hour-long* ramping, rather than for managing *intra-RTPD forecast error*. It also produces perverse market results, e.g., to get 500MW of Flexi-ramp up you would need to set aside 500MW*12 = 6000MW of flexible generation capacity. SCE believes that hour-long ramping should not be addressed through FRP.

3. **The CAISO should stay with the explicit approach to "releasing" DA FRP in RT. The implicit approach should not be pursued.**
   The CAISO's explicit "releasing" approach involves a clear, non-biased decision made by the optimization. It also allows full release of FRP capacity when appropriate. This design seems highly appropriate and workable, and the CAISO should seek ways to reliably calculate the "realized uncertainty" in a timely manner coincident with RTD assessment and dispatch processes.

   The implicit approach infers that the optimization should limit release of FRP capacity for use in a later RTD interval. This approach presents problems to the extent that it withholds product through adjustments to capacity or energy bids. Although such adjustments may be useful for "tricking" the optimization in certain situations for other purposes, FRP dispatch is not one of them. FRP should never be withheld based on the amount of realized uncertainty if it is "needed" , especially since it's been bought and paid for. SCE believes that RTUC commitment changes and incremental procurement of FRP in RTD can help address this issue, and that DA procured FRP should be released as needed per the explicit approach.

4. **Further review of RTUC timing changes are warranted, though SCE sees the current RTUC design, RTUC positioning for FRP, and subsequent RT FRP approach as workable at this time.**
   Discussion at the technical workshop touched upon methods to reform RTUC to potentially a 10-minute or 5-minute process. Potential changes to RT Ancillary-Services procurement and RT FRP unit positioning and subsequent procurement were also discussed. These discussions hold promise for improving market efficiency. The crux issues in this regard are likely to be technology limitations, processing speeds, and costs. Discussions on these changes should continue, although they could occur separate from the FRP initiative.

   The CAISO should clarify the frequency and scale of occasions where RT FRP unit-positioning (in RTUC) could prevent the sale of RT Ancillary Services. This single and potentially rare issue seems to be a major concern of some parties and should be clarified. While SCE agrees the CAISO should not

commit units outside of a reasonable forecast of need, beyond this issue, SCE finds no merit in concerns that FRP positions in RTUC do not constitute binding FRP awards. Throughout the CAISO market, units are committed such that future energy or other market sales are possible, i.e., the units are now "in the game". Moreover, make-whole rules ensure these units recover costs if their services are ultimately not needed.

5. **The costs due to inefficiencies of the sequential RUC may be material. The CAISO should measure the inefficiencies of a sequential vs. a simultaneous RUC.**

SCE understands that RUC reform, including a co-optimized IFM and RUC may constitute a significant market enhancement.[2] Accordingly, prudent analysis on the inefficiencies of the current structure should occur prior to pursuit of any major change.

SCE believes two simple analyses could gauge the inefficiency of withholding RUC capacity from DA FRP procurement. First, the CAISO should develop a price-impact estimate to assess the total FRP costs. For instance, the CAISO could estimate that every 100 MWs of RUC capacity withheld could reduce DA FRP costs by 10%. The CAISO should assess the sensitivity of such an analysis to ensure the assumptions in the analysis and its interpretations are well-reasoned. Second, the CAISO should use market models to assess price outcomes (for all products) using a co-optimized RUC. To approximate the co-optimized RUC, the CAISO would need to run the market simulation using the CAISO's demand forecast, rather than only enforcing such a forecast in the after-market RUC run.[3] SCE expects this later analysis could be highly informative in assessing the inefficiency of a serial RUC.

SCE also offers a rough, "back of the envelope" assessment by which to gauge the order of magnitude of the serial RUC inefficiency associated with future DA FRP purchases. Any assessment on cost would involve two variables: 1. Price and 2. Quantity, to estimate Total Cost. As the relevant sequential process is RUC and the relevant product here is flexible ramping, lesser of the procured RUC volume or FRC volume serves as the best, conservative proxy for incremental quantity committed past the IFM. The best proxy for the price variable is the flexible ramping constraint shadow price. Since total capacity commitment determines whether the FRC is binding or not, it also determines whether there exists a non-zero shadow price. Thus, the shadow price of the FRC is the best proxy to use to determine the costs of a sequential RUC by not including RUC supply information in the IFM. In sum, the estimated inefficiency cost of the sequential RUC = P_{FRC} x min (Q_{FRC}, Q_{RUC}).

[2] One version of a co-optimized RUC is found in the NYISO's IFM-RUC equivalent: http://www.nyiso.com/public/markets_operations/documents/technical_bulletins/index.jsp. Alternately, a co-optimized RUC could be approximated by using a "Minimum Commitment Run" prior to the IFM market run in which all committed units from the "Minimum Commitment Run" are forced "on" in the actual market run. The Minimum Commitment Run will use the CAISO forecast of CAISO demand for all products (energy, ancillary services, flexible ramping), likening it to the RUC run under the current design. SCE does not endorse any model at this time, but believes assessments of these models could prove useful.

[3] See other approaches for a co-optimized RUC in Footnote 2.

The table below shows, by hour, average RUC and FRC purchase quantities, and the hourly average FRC prices for the periods noted in the table. Based on this very rough estimate, the sequential RUC process is creating an annualized cost inefficiency of $37 million.

Average Daily Value

HE	$/MW FRC Price	MW RUC Volume	MW FRC Volume	$ Avoided Cost
1	0.13	650	418	53.03
2	0.03	574	401	13.44
3	0.01	598	391	4.83
4	0.00	577	399	0.05
5	0.00	623	425	0.07
6	4.79	610	445	2,135.02
7	13.42	437	450	5,866.74
8	8.04	357	452	2,874.68
9	9.44	392	451	3,706.23
10	5.25	407	450	2,134.45
11	7.23	375	448	2,712.34
12	8.93	362	445	3,230.96
13	11.21	402	444	4,503.53
14	10.11	406	445	4,101.83
15	8.81	429	447	3,779.89
16	9.07	414	454	3,752.11
17	19.29	472	465	8,973.83
18	36.96	423	470	15,623.70
19	23.83	469	466	11,096.54
20	27.40	466	464	12,721.24
21	24.68	480	456	11,248.91
22	5.39	647	451	2,432.15
23	3.37	733	450	1,517.58
24	0.04	762	439	18.67
		Daily Total		**$ 102,501.81**
		Annual Total		**$ 37,413,160.59**

*RUC volumes averaged over Feb 2011 - May 2012

*FRC prices averaged over Jan 2012 - May 2012

Note that this only provides an estimate of the costs toward flexible ramping procurement. Since RUC is also used to provide "headroom" to other products, not just flexible ramping, the $37 million likely underestimates the total costs to the system from a sequential RUC.

SCE strongly supports the CAISO performing its own analysis of the costs of a sequential RUC process.

6. **The CAISO should account for energy bids when selecting FRP.**
   In order to find the optimal unit commitment, the optimization must incorporate reasonably expected costs. Since such costs include the costs of energy dispatch from FRP providers, it seems logical to include some consideration of those costs in the IFM.

   Of the many approaches to factor in these energy costs into the DA FRP award consideration, a simple approach may be appropriate. For example, the CAISO could simply require via a constraint that any FRP provider must also provide some small amount of energy. Through this approach, the optimization gleans energy bid information associated with the FRP bid, and can choose the cheaper energy provider, all else being equal.[4] It is important in either of these approaches to "lock" the energy bids, as discussed in the next section.

   Other approaches may also resolve this technical design aspect, and SCE is open to other ideas. However, SCE opposes proposals where the CAISO "spikes" capacity bids beyond the submitted price at some predetermined level because this approach creates a blocky rule that may be ineffective and also increases costs and impairs economically efficient outcomes by potentially paying FRP providers arbitrarily more than required by their bid.

7. **DA FRP awards should require that energy bids associated with the DA awards be locked (or be allowed adjustments that reduces costs) for RT dispatch.**
   Resources that are awarded FRP capacity and energy in the Day-Ahead Market should not be allowed to change their energy bid after the market clears if such changes would increase costs. For example, assume energy prices clear at $30. A unit bids $50 for energy and a low FRU bid for the associated capacity. As a result, the unit does not sell energy, but is selected for FRU. In real-time, the unit should not be allowed to bid more than $50 for the energy associated with the FRU capacity. However, they should be allowed to lower their energy bid at their discretion. Conversely, if the unit had a lower energy bid (say $30) and was selected for FRD, in real-time, they should be allowed to increase the associated energy bid (since they will pay this increased price if they are dispatched downward), but they should not be allowed to lower the energy bid.

   In addition to a demand curve, the CAISO should explore substitution between FRP and energy. That is, Flexible Ramping Up (FRU) can be "created" by procuring energy plus a like amount of Flexible Ramping Down (FRD). Conversely, FRD can be "created" by procuring less energy plus FRU. Although such procurement approaches or other ideas seem novel, they may offer least cost solutions in support of the objective function's goals and facilitate Flexible Ramping price formation.

[4] Another option might be to embed an additional variable in the IFM objective function that multiplies a unit's FRP energy bid by a very small probability of dispatch. This may increase the overall objective function results and lead to excessive payments via a somewhat higher shadow price for FRP awards. Effect on the congestion component of the LMP, implications toward CRR revenue adequacy and BCR, etc., would need to be explored before progressing on such an alternative.

Finally, SCE likens DA FRP awards to a financial option with a strike price not-to-exceed the energy bid. The entire value of the option will change if the unit is allowed to change the strike price after it has sold the option. Further, since the DA market optimizes around the energy bid resources submit, allowing such changes that would decrease the value of the option is nonsensical. For these reasons, energy bids associated with FRP should only be allowed to move in a direction that increases the value of the original "option".

8. **Discussion is needed regarding cost allocation for variability versus uncertainty and regarding equal treatment among market participants.**

The CAISO provided a cost-allocation structure that allocated costs to both generation and load based on cost-causation principles. SCE fully supports cost allocation to all market participants (load, generation, VERs, Inter-ties) based on cost-causation principles.

SCE recommends fine-tuning such a structure going forward. For example, SCE finds an allocation of load's portion of cost based on gross deviation preferable to allocation based on metered load for determining cost-allocation to load. This structure provides incentives for more accurate DA scheduling, which in turn reduces the CAISO degree of uncertainty, and in turn should work to reduce overall FRP procurement needs.

SCE believes cost-allocation rules could potentially differ for resources with known variability, such as interties ramps, from resources with uncertainty. Uncertainty seems to require a different amount of FRP than known variability. Discussion, examples, and analysis should evaluate the differences between variability and uncertainty in FRP procurement and subsequent cost-allocation.

SCE also maintains that rules that allow the provision of updated schedules are worth consideration, but such rules should not unduly advantage certain types of market participants, particularly if the schedule updates fails to reduce the FRP procurement. For this reason, a two-tier cost-allocation structure may be needed. SCE continues to support exploring a statistical basis for cost-allocation, similar to the FERC-approved Westar method for Regulation cost-allocation. Such a method applies rules in a non-discriminatory way based on portfolio interactions. SCE requests that the CAISO provide time series data (perhaps at the 1 or 5-minute level) of generation deviations (perhaps by fuel type) and load deviations so that market participants can perform additional analysis to help refine a cost allocation proposal.