

**CALIFORNIA ISO  
FLEXIBLE RAMPING PRODUCTS**

---

**COMMENTS OF THE STAFF OF THE  
CALIFORNIA PUBLIC UTILITIES COMMISSION  
ON THE MARCH 6, 2012 THIRD REVISED STRAW PROPOSAL**

\* \* \* \* \*

**March 21, 2012**

The Staff of the California Public Utilities Commission (CPUC Staff) appreciates this opportunity to comment on the California ISO's (CAISO) March 6, 2012 Third Revised Straw Proposal ("Revised Proposal") and subsequent March 14 stakeholder web conference regarding proposed "Flexible Ramping Products" (FRP). The CPUC Staff understand that FRP are intended to provide increased electric system operating flexibility to respond to load and generation variations and uncertainties over the 15 minute forward timeframe. The CPUC Staff support the objectives and general framework of the proposal and appreciate the CAISO's efforts to discuss and refine the proposal over several iterations. However, additional clarification and refinement is required as discussed below. This is not surprising given that the proposal presents a complex and novel combination of day-ahead ("DA") versus real time "RT" procurement of new FRP products with significant probability of conversion to RT energy, leading to unique bidding, settlement and market power issues.

***1. Generally, the Final FRP Proposal Should More Fully Address the Compatibility and Integration of FRP with Other Initiatives or Proceedings at the CAISO and CPUC.***

The CPUC Staff is concerned that the Revised Proposal fails to adequately address how the FRP will be integrated with, and be consistent with, related concurrent CAISO initiatives and CPUC proceedings. These include allocation of FRP costs being addressed in a *separate* new CAISO initiative (Cost Allocation Guiding Principles plus FRP Cost Allocation); (2) assessment of *forward* (as opposed to DA and RT operational) system flexibility needs (see topic 2 below) as addressed in the CPUC's Long Term Procurement Planning, in the CAISO's new fast-moving Flexible Capacity Procurement initiative, and in the CAISO's renewables integration studies. .

***2. The Methodology and Estimated Quantitative Amounts for Setting Day Ahead (“DA”) and Real Time (“RT”) Operational FRP Procurement Targets Should be Clarified, and Should be More Clearly Related to How Forward (Several Years Out) Flexibility Needs Are Projected.***

The CPUC Staff requires greater clarity of FRP target-setting methodology or methodologies (for multiple time horizons) and approximate results to fully evaluate the cost and market impacts of this proposal. It is also needed to enable the CPUC and others to productively understand and engage in related CAISO initiatives and efforts regarding FRP cost allocation, forward procurement of flexible capacity, and renewable integration studies, and also to better understand implications of FRP requirements for the CPUC’s Long Term Procurement Plan process.

It appears (and CPUC Staff request confirmation and clarification) that the FRP operational DA and RT FRP procurement targets will be set as the 95th percentile range (2.5% upper and lower tails) of the statistical deviations of realized 5-minute net load (“NL”, i.e., net of variable generation) relative to NL forecasts used for 15-minute real time predispatch (RTPD) intervals. It should be clarified:

- whether statistical 95<sup>th</sup> percentile confidence intervals utilized for FRP procurement decisions will be derived for NL trend *uncertainty* on a 15 minute forward basis plus (separately but additively) NL 5 minute *variations within* 15 minute RTPD intervals - - or on some other basis, which then should be explained;
- whether statistical 95<sup>th</sup> percentile confidence intervals utilized for FRP procurement decisions will be based solely on historical NL data (for loads and variable resources), or also on modeling (including modeling of fundamental drivers of uncertainty and variations such as 15 minute uncertainty and 5 minute variations in irradiance impacting solar generation).

CPUC Staff request clarification that the methods and data used for determining FRP target amounts are different for calculating:

- FRP capacity procured (and settled) in the DA market, versus
- capacity committed in RTPD specifically for potential procurement as FRP in RTD, versus
- FRP capacity actually procured (and settled) in RTD.

And, the CAISO should describe the methods and data sources for determining each of the above three quantities, including how the methods and data sources differ and/or are interrelated, across the three kinds of quantities.

Pages 21 and 22 of the Revised Proposal describe “Procuring Flexible Ramping in RTD.” CPUC Staff request clarification of whether this refers to determining the *amount* of fast ramping capacity previously procured and settled on a DA basis plus additional fast ramping capacity committed (not settled) in RTPD - - that is actually utilized and settled as FRP (as opposed to energy) in the current RTD interval. Please also confirm that in the terminology of page 21 this means “procured” (used and settled as FRP) in RTD interval “t”. If any of the above is incorrect, we request correction.

Furthermore, a fuller and more intuitive explanation of the “15 minute bound” (a.k.a. “cumulative imbalance difference in the next RTD interval”) and “5 minute bound” (a.k.a. “5 minute incremental confidence interval”) is required. It appears that

- the “15 minute bound” represents where system NL 95<sup>th</sup> percentile deviations (looking ahead from interval t to t+1) currently lie relative to the RTPD-projected 15 minute trajectory, thus taking into account what NL deviations have already occurred since the RTPD forecast (such that the 15-minute upper bound deviation could actually be negative, indicating no need to reserve any FRP up in RTD interval t),
- whereas the “5 minute confidence interval” represents a 95<sup>th</sup> percentile confidence interval regarding how much NL could possibly go up (FRP up) or down (FRP down) in *any* 5 minute span regardless of what has happened in previous RTD intervals, such as based on historical statistics taken from a population of 5-minute intervals sufficiently similar to the present interval.

The above understanding needs to be (1) confirmed or corrected and (2) in any event, more fully explained.

CPUC Staff request confirmation or clarification that the amount of FRP “procurement” in any RTD interval is thus limited to (is a subset of) the amount of FRP capacity that was previously procured and settled DA plus the additional amount of fast ramping capacity committed in RTPD for potential RTD procurement - - that has not yet been converted to energy dispatch. We also request confirmation that FRP procured and settled at the DA FRP price will not receive the RT FRP price if used for FRP in RT, analogous to the way DA energy does not

receive the RT energy price. Also, the CAISO should clarify whether resources would update their RT FRP and energy bids hourly or with some other frequency.

The various kinds of FRP procurement-related information discussed above are also important for understanding FRP cost allocation issues that are now being addressed in a separate new CAISO initiative.

Lastly, and importantly, the CAISO should explain how methodologies, data and any actual results for calculating operational FRP requirements in the short term (DA and RT) as discussed above compare with methods, data and results regarding projection of FRP or other flexibility requirements on a *forward* basis looking out several years up to 10 years where the resource mix will change, such as via the CAISO's ongoing renewables integration studies. It is important that there be a clear relationship and not a disconnect, between determination of operational flexibility requirements for near term market operations versus estimation of analogous requirements on a forward basis looking out up to 10 years.

***3. The FRP Proposal and Its Vetting Should be Explicitly Informed by Discussion of Experiences and Lessons From Flexible Ramping Constraint (FRC) Deployment to Date.***

Experiences and lessons learned from FRC deployment should provide valuable, concrete, and unique information on procurement and settlement issues for FRP. For example, information similar to but more detailed than what was briefly discussed at the March 19 stakeholder meeting on Cost Allocation Principles would be very helpful.<sup>1</sup>

***4. The Amount of FRP Procured in DA versus RT Warrants Further Analysis and Should be Reassessed Based on Post-Deployment Monitoring and Analysis.***

The CPUC Staff agree with the CAISO and other stakeholders that there are arguments for both procuring more FRP in the Day Ahead (DA) market (in order to access a broader pool of resources) versus in the Real Time (RT) market (when estimated needs are better known). Striking the right balance between DA versus RT procurement depends on multiple factors,

---

<sup>1</sup> For example, the March 19 information included quantitative levels of procurement per interval (e.g., 700 MW dropping to 400-450 MW), procurement costs (e.g., \$70,000/day but initially significantly higher), and prices (e.g., as much as \$200-400/MWh when the constraint is binding but zero otherwise).

including the methodology and data used to calculate FRP procurement requirements (for which clarification is requested under topic 2 above); the ability to reduce uncertainty in RT compared to DA; the likelihood that flexible capacity will be converted into RT energy or spinning reserves; liquidity and robustness of FRP markets; and sellers' FRP and energy bidding strategies. The CAISO should present additional analysis of how revising the breakdown between DA and RT FRP procurement might impact overall market efficiency and market power issues before deciding on a final breakdown. The goal should be to lower costs and the breakdown should aim to achieve that goal. The CASIO should also structure the final proposal to require close monitoring and reporting of FRP implementation results, plus refinement of FRP DA and RT procurement targets as needed, based on those results.<sup>2</sup>

***5. The FRP Market Design and Performance Should be Assessed Based on Analogy with Spinning Reserves, with Bids and Prices Capped at those for Spinning Reserves.***

In simplest terms, FRP up represents a variation on spinning reserves having a greater probability of being deployed and paid for RT energy. Thus CPUC Staff agree with capping FRP up bids (and prices) at those for spinning reserves. We also emphasize that if FRP up market outcomes diverge substantially from what might be reasonably expected based on the relationship to spinning reserves, market design refinements should be pursued. (We note that in its December 2011 ruling regarding the Flexible Ramping Constraint the FERC requested clarification of the relationship and interaction between flexible ramping and spinning reserves services.)

***6. The CAISO Should Provide More Analysis on Procurement and Settlement for FRP Down (as Opposed to Up).***

The CAISO's FRP proposal and accompanying discussion have largely focused on the FRP up requirements and issues. The CAISO should also describe the expected amounts of FRP down requirements, both in absolute terms and relative to FRP up requirements, and should provide additional explanation and discussion of market design and economic efficiency issues for FRP down, including DA versus RT procurement, RT conversion to energy, settlement and

---

<sup>2</sup> CAISO should place the details of the final proposal in the Business Practices Manual, not the tariff, in order to allow timely and efficient revision.

market power mitigation. FRP down requirements, costs and concerns may be significantly smaller compared to those for FRP up, but the CAISO should provide further information in the next version of the proposal. The CAISO should also consider whether there is an appropriate way to cap FRP down bids analogous to capping FRP up bids at spinning reserve bids.

**7. *The CAISO's Assumptions Behind its Conclusions Regarding False Opportunity Cost/Double Payment should be Better Explained and Vetted.***

The CAISO's explanation regarding false opportunity costs and potential for double/over-payment is helpful but incomplete. The CPUC Staff understand that in any RTD interval a resource may provide either energy or FRP but not both, so that the FRP prices include opportunity costs (shadow prices from co-optimization) for selling energy. Further, as shown in the Table on page 25 and as stated on page 16,<sup>3</sup> DA FRP prices *also* represent co-optimization shadow prices that include energy opportunity costs, in this case reflecting opportunity to sell DA energy since a resource cannot simultaneously sell DA FRP and DA energy from the same increment of capacity. However, the DA co-optimization and shadow prices do not explicitly reflect a DA FRP provider's potential for selling energy in the RT market (RT energy bids are not even known at this time). The opportunity to sell RT energy is *not* lost by selling DA FRP, thus raising the double payment/false opportunity cost issue.

Consider an energy market analogy in which a resource provides 100 MWh of DA energy then provides only 90 MWh of energy in RT. That resource is paid for 100 MWh of DA energy at the DA price, and then must essentially buy back (at RT market prices) the 10 MWh that it did not actually provide in RT. By analogy, if a resource provides and is paid for 100 MWh of FRP (presumably prorated from 5 minutes of ramp) in the DA IFM, and is then dispatched for *energy* in a given RT 5-minute interval, that resource could be viewed as buying back (for that RT interval) at RT FRP prices the FRP that it sold in the DA market.

This is an imperfect analogy because there is a difference between fast-ramping capacity and energy, and there is option value in making capacity available on a DA basis regardless of how it is ultimately used in RTD. Nevertheless, the important point that we wish to make is that the

---

<sup>3</sup> See Revised Proposal, p. 16: "The day-ahead flexible ramping procurements are financially binding. The opportunity cost of providing energy will be included in the marginal prices of flexible ramping products."

market paradigm of mutually exclusive markets conveniently (computationally) giving rise to shadow price (opportunity cost) based settlement prices breaks down if those mutually exclusive markets do not fully encompass the seller's revenue opportunities, since a seller of DA FRP can still sell RT energy.

It appears that the CAISO is assuming that DA FRP sellers will recognize their potential opportunity to later sell energy (or be converted to higher-priced spinning reserves) in the RT market, and will thus lower their DA FRP bids accordingly, which would in turn lower DA FRP shadow prices. This may be reasonable in the abstract, but obtaining such results requires fully competitive and robust markets for FRP and other services, as well as very good FRP bidder understanding of the probabilities of FRP being converted to energy or spin in real time and how these probabilities vary under different market conditions as viewed from the DA perspective. Thus, the CAISO should further explain if and why the above assumptions are being utilized, and must provide for thorough monitoring and communication of market results after FRP deployment, to determine if mitigation or other process refinements are needed.

***8. The CAISO Should Better Justify and Refine its Approach for Biasing FRP Procurement Against Sellers Having High Energy Bids.***

The Revised Proposal would penalize (increase) a FRP bid by the \$/MWh extent to which an FRP up bidder's energy bid exceeded \$300/MWh, weighting this exceedance by 2.5%, which represents the upper tail of the 95<sup>th</sup> percentile confidence interval for 5-minute imbalances for which FRP are being procured. The CPUC Staff have several questions about this proposal, including:

- Would this bid adjustment occur only for DA FRP procurement or also for selection of resources for FRP commitment in RTPD, for potential FRP procurement in RTD?
- Why is it assumed that resources having high energy bids would be deployed for energy only about 2.5% of the time? If procured for FRP then by definition they are procured to meet conditions falling within the 95% confidence interval.
- Would it be more economically efficient to bias (perhaps on a sliding scale) FRP procurement against FRP up bidders having energy bids that are *relatively high* but still below the \$300/MWh cutoff?
- Does a similar need exist to bias (adjust upward) those FRP *down* bids having low corresponding energy bids?

The Revised Proposal also proposes a mechanism to avoid unnecessary high energy costs caused by strategic RT energy bidding by FRP providers. Under this mechanism, a DA FRP bidder must specify a RT energy bid floor and cap within which its own RT energy bids must fall.<sup>4</sup> The CPUC Staff agree that this could effectively motivate DA FRP bidders to moderate their energy bid floors and caps, but only to the extent that DA FRP bidders risk bid rejection if setting energy bid caps too high (FRP up bidders) or energy bid floors too low (FRP down bidders). If FRP up bids are penalized (less likely to be selected) only if associated with energy bids exceeding \$300/MWh (weighted only by 2.5% of the excess above \$300/MWh), and/or if FRP down bids are not penalized at all for low associated energy bids, then this may be insufficient to incentivize DA FRP bidders to specify appropriately narrow RT energy bid ranges. The CPUC Staff recommends that the CAISO implement a more robust FRP bid adjustment based on applying FRP up bid penalties to a wider range of high energy bids (not just those over \$300/MWh), and also applying suitable FRP down bid penalties when accompanied by low energy bids. The CPUC Staff is concerned that, unless modified, the proposed penalty mechanism may not result in an efficient and least cost market.

***9. The CAISO Needs to Explain in the Next Proposal how it will Allow for Self-Provision of FRP in the DA Market.***

The Revised Proposal does not clearly explain how the CAISO will set DA FRP procurement targets in a manner that will support self procurement, or how (such as via the CAISO's separate cost allocation initiative) this self procurement could be credited against FRP costs that would otherwise be specifically allocated to the entity that is self-scheduling FRP. The CPUC Staff supports (at least in concept) allowing for self provision of FRP, but request more complete explanation of how self provision would occur. Furthermore, this question calls attention more generally to the important relationship between FRP design being addressed in this initiative and FRP cost allocation being addressed in a separate, new initiative. FRP design in the present initiative should be cognizant of potential FRP cost allocation issues, but the cost allocation method itself should not be designed until design of the FRP itself is more fully completed and vetted.

---

<sup>4</sup> See Revised Proposal, p.14.



**Contacts:**

Keith White, [kwh@cpuc.ca.gov](mailto:kwh@cpuc.ca.gov)

Ed Charkowicz, [eac@cpuc.ca.gov](mailto:eac@cpuc.ca.gov)

Candace Morey, [cjm@cpuc.ca.gov](mailto:cjm@cpuc.ca.gov)