California ISO
Shaping a Renewed Future

Stakeholder Comments

Flexible Ramping Product Technical Workshop

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Southern California Edison (SCE) offers these comments regarding the California Independent System Operator's (CAISO) Flexible Ramping Product (FRP) Technical Workshop and related technical product design issues. SCE found the technical conference informative and useful.

The current proposal has grown too complex to anticipate its effects without detailed simulation. The CAISO's diligent work has produced a proposal with a strong foundational structure. However, throughout the stakeholder process, the product design's complexity has become apparent. This product is now too large in scope and intricate in detail to rely on theory and intuition to model its effect on the market. The CAISO should plan to simulate market performance with FRP for at least six months, followed by three months of review (what worked, what didn't, what changes would improve performance), before filing a finalized proposal with the FERC.

While the CAISO builds its capability to simulate the market with FRP, it can continue to refine the product design. Four areas that require further exploration include the following: establishing FRP's place in the hierarchy of products (i.e. substitution and conversion); the process through which day-ahead FRP is bought back in real-time, with settlement details; requiring units to carry their day-ahead energy bid associated with FRP over to real-time; and the co-optimization of the IFM and RUC.

While the fundamental design of the proposal appears reasonable, market simulations and the investigations identified above will help refine and prove the concept such that market participants should have confidence that the ultimate implementation will work in an understandable and economically rational manner.

1. **FRP should be simulated and refined before finalizing the design and going live. The product is largely unprecedented, too complex to evaluate on paper alone, and its potential impact on the market is too large simply to "roll the dice" with an immediate implementation.**

   SCE supports the purpose and basic structure of the current product design. However, the stakes are too high to take undue risks with by implementing prior to testing the design concept. The downside risk of introducing an untested and unprecedented product of this scale is too large to proceed

along the typical implementation path used for minor enhancements to the market. Simulation may cause some delay and add some costs to implementation, but the design complexity merits prudent, measured action. Small variables and unanticipated consequences could harm the overall performance of FRP, and simulation and testing could weed out minor as well as major problems.

SCE does not desire to unduly delay the product's implementation. Instead, this is an opportunity to validate the theory behind the design and evaluate its performance in unanticipated situations. Our goal should not be "make sure you do it fast" but rather "make sure you get it right." A test period offers the opportunity to carefully refine and tweak the product before it becomes financially binding. This approach will help ensure the long-term success of FRP.

SCE recommends the CAISO seek Board approval to build out and simulate FRP, and perhaps file the design concept with FERC in parallel. The construction period may take up to a year, during which stakeholders will continue to refine the product's design. When the simulation capability is available, the CAISO should simulate FRP using real bid data from the current market and run the new process in parallel with the actual market, if possible. These simulations should continue for several months (e.g. six months), followed by a three month review period by the CAISO, stakeholders, the MSC and perhaps other independent evaluators. If the product is functioning well, the CAISO should then file with the Board and FERC any recommended changes to the product, tariff amendments, and set a go-live date. If simulations show the FRP design to be fundamentally unworkable, the proper response is not to implement the product. Deciding not to implement FRP is a perfectly valid outcome of the simulation and test period. Even in this scenario, the money and time put into the simulation would have been well-spent. The costs of building the simulation are very small compared to the potential damage that could result from the introduction of a flawed product.

This strategy preserves the momentum of FRP development while adequately protecting the market from undue risk during the implementation of a complex and broad-reaching proposal.

2. The CAISO should clarify FRP's position in the ancillary service substitution/conversion hierarchy.

FRP's position in the hierarchy relative to the ancillary services is unclear. Earlier proposals provided for day-ahead non-contingent spin to convert to either contingent spin or flexible ramping up in RTUC, and the technical workshop considered ways for units with regulation awards to participate as FRP in the real-time market.

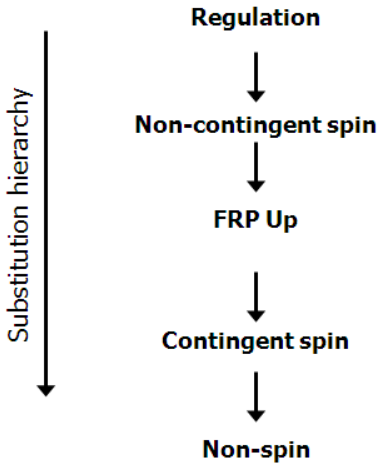
Flexible ramping's status should be clearly established so that the optimization can develop accurate, informative shadow prices for each product. As a rational buyer, the optimization should be able to purchase a higher quality product if it is priced beneath a lower quality product. While the CAISO has resisted this approach, we recommend they at least develop an alternative where a hierarchy is created and compare the pros and cons of both approaches before finalizing the design.

The natural inference from the proposals so far is that FRP is a higher quality product than contingent spin and non-spin, but a lower quality product than regulation. However, as non-contingent spin can function as FRP Up but FRP Up cannot always function as non-contingent spin, non-contingent spin appear to be a superior "bid". This observation allows the construction of a bid substitution hierarchy, seen in Table 1. This structure implies a bid price hierarchy, seen in Diagram 1.

Table 1
List of Products That Satisfy Procurement Targets for Each Individual Product

Product	Regulation	FRP Up	Spin	Non-Spin
Bids Available for the Product	Regulation	Regulation (Non-Contingent Spin) / 2 FRP Up	Regulation Non-Contingent Spin (FRP Up) x 2 Contingent Spin	Regulation Non-Contingent Spin (FRP Up) x 2 Contingent Spin Non-Contingent Non-Spin Contingent Non-Spin

Diagram 1
Substitution and Bid Quality Hierarchy



We note that spin and non-spin ramp rates are measured over ten minutes, and FRP is a five-minute product. Five-minute ramp rates could be approximated by dividing ten-minute ramp rates by two, and conversely multiplying the 5-minute FRP rate by two approximates 10-minute FRP capability.

Establishing a product hierarchy allows the optimization to formulate proper shadow prices, and to act as a rational buyer. The structure proposed above is a starting point, for consideration as an extension of the CAISO's current approach.

3. **SCE requests more detail on the process by which day-ahead FRP awards are bought back as a unit is dispatched for energy in real-time.**

   SCE is unclear on the conditions under which day-ahead FRP capacity awards are clawed back. Under the current understanding, when a unit with a day-ahead FRP award is dispatched for energy in real-time, the unit must buy back its FRP award at real-time prices if it can no longer honor its day-ahead FRP award. Additionally, the CAISO indicates the optimization guarantees that this redispatch will preserve or improve the unit's profit from its day-ahead award. This implies that if the real-time FRP price is higher than the day-ahead price, for a unit to be dispatched for energy, the difference between the real-time energy price and the unit's day-ahead energy bid must be greater than the difference between day-ahead and real-time FRP prices. The situation grows more complicated when we consider regulation participating as FRP.

   The tables below illustrate this point. The values in the table represent the information that Automated Dispatch System (ADS) has about a hypothetical unit awarded FRU in the day-ahead market. ADS is considering whether to dispatch the unit in realtime, where the price is $55 / MWh.

Table 2a

	Day-ahead	Real-time	DA / RT Spread
FRU Clearing Price	$10 / MW	$20 / MW	$10 / MW
Energy Bid	$55 / MWh	$55 / MWh	$0 / MWh

Table 2b

	Day-ahead	Real-time	DA / RT Spread
FRU Clearing Price	$10 / MW	$20 / MW	$10 / MW
Energy Bid	$30 / MWh	$55 / MWh	$25 / MWh

In both cases, the value of FRU increases by $10 / MW from day-ahead to real-time. This means that a unit dispatched for energy would be forced to take a $10 loss when it buys back its FRP award in real-time.

Since the dispatch algorithm guarantees to preserve or improve a unit's FRP profit in the day-ahead market, the optimization will only dispatch units that can recover their "lost" profit in the energy market. This means that in the scenario where the unit's day-ahead and real-time energy bids are both $55, the unit will not be dispatched for energy even if the energy price is $55. This occurs because even though the unit's energy bid is equal to the energy price, the unit cannot recover its lost profit from the real-time FRP clawback. This scenario is outlined in Table 2a.

In the second scenario, shown in Table 2b, the unit could be dispatched for energy in real-time, as the $25 increase in the unit's energy bid from day-ahead to real-time covers the loss it incurs from buying back its FRP award.

The current provision is likely to require consideration of real-time bids real-time prices, day-ahead awards and day-ahead bids. Units that would otherwise be economic are not dispatched because of high FRP prices. This rule could present significant adverse consequences. Because of the buy-back rule, high FRP prices will raise the effective energy bid of otherwise economic resources. However, high FRP bids will occur when capacity and energy are most valuable. This holds the potential to inflate real-time energy prices.

SCE does not fully understand this proposal, and it is possible the examples above do not reflect the CAISO's intent. As such, SCE seeks more clarity on the exact structure of clawback of DA FRP awards

and all settlement details, including a description of the impact this will have on real-time energy prices, and whether prices and bids from the day-ahead market will need to be considered in the real-time optimization.

4. **Units awarded day-ahead FRP should have their real-time energy bids capped at their day-ahead energy bid. This helps prevent resources from gaming the optimization or exercising market power.**

   The current proposal allows units to submit day-ahead energy bids along with their FRP bids, but these bids are not binding. This structure leads to sub-optimal selection of units to provide FRP, and leaves the market open to market power and gaming opportunities.

   The CAISO awards FRP with the expectation that at a portion of the capacity reserved will be dispatched for energy. The optimization considers a unit's energy bid when it awards that unit FRP, and optimizes the system around an expected energy cost. If the unit is then allowed to change its bid in a way that would raise system costs, the dispatch engine's original solution may no longer be optimal. This would harm market efficiency. [1]

   Additionally, allowing units to adjust their energy bid between day-ahead and real-time could provide gaming opportunities. If the unit sees that CAISO will be short energy come real-time, the unit can elevate its energy bid with the knowledge that it will still be dispatched and paid its higher price. To remove this incentive, the CAISO should restrict changes to the real-time energy bids associated with day-ahead FRP. This can be done in two ways. The first is to disallow any changes to the real-time energy bid between day-ahead and real-time. The second is only to allow changes that reduce costs (*ie* lowering the bid for upward dispatch, raising their offer for downward dispatch).

5. **SCE endorses a co-optimized RUC and IFM, and looks forward to cementing the details of the proposal.**

   The market stands to benefit greatly from a co-optimized RUC and IFM. The central structure of the proposal – pricing and committing resources in separate runs – holds great promise. SCE will look to the upcoming whitepaper and later proposals for further detail.

[1] Currently the market is observing problematic behavior related to Exceptional Dispatches. Generation resources, anticipating the CAISO's need to exceptionally dispatch their unit, raise their bid prices far above cost and extract rents from the market. SCE is concerned that resources with a day-ahead FRP award could similarly anticipate the CAISO's need for real-time energy, and raise their energy bid to exploit that need.