

**Comments of Powerex Corp. on the Flexible Resource Adequacy Criteria and
Must Offer Obligation – Phase 2 Revised Straw Proposal**

Submitted by	Company	Date Submitted
Mike Benn 604.891.6074	Powerex Corp.	May 22, 2017

Powerex appreciates the opportunity to comment on CAISO’s May 1, 2017 Revised Straw Proposal respecting Phase 2 of the Flexible Resource Adequacy Criteria and Offer Obligation (“FRAC-MOO2”). The focus of the FRAC-MOO2 initiative is to explore what enhancements should be made to the existing flexible resource adequacy (“RA”) framework to ensure that CAISO has the resources necessary to maintain reliability while helping California to meet its 50% renewable portfolio requirement.

Initially, the focus of Phase 2 of this initiative was on refining the existing flexible RA product and performance requirements, including modifying the framework to allow intertie resources to provide flexible capacity.¹ In November 2016, CAISO issued a Supplemental Issue Paper expanding the scope of this initiative to include a more holistic review of the existing flexible RA program after concluding that the existing FRAC-MOO framework may not be sending the correct price signals to maintain resources capable of meeting CAISO’s long-term flexible capacity needs.² In response, Powerex and a number of other stakeholders offered proposals regarding how the existing flexible RA framework could be changed to more effectively meet the full range of flexibility needs faced by the CAISO.

In the Revised Straw Proposal, however, CAISO steps away from the holistic review envisioned in the Supplemental Issue Paper and states that it is narrowing the scope of this proceeding to focus on a limited set of enhancements to the FRAC-MOO framework. CAISO explains that, while it believes a number of the proposals offered by stakeholders warrant additional consideration, CAISO does not believe that any of the proposals can be implemented in an expeditious manner due to policy gaps and implementation complexity. CAISO therefore states that the remainder of this

¹ Flexible Resource Adequacy Criteria and Must Offer Obligation – Phase 2, Straw Proposal (Dec. 11, 2015), *available at* <https://www.caiso.com/Documents/StrawProposal-FlexibleResourceAdequacyCriteria-MustOfferObligationPhase2.pdf>.

² Flexible Resource Adequacy Criteria and Must Offer Obligation – Phase 2, Supplemental Issue Paper: Expanding the Scope of the Initiative (Nov. 8, 2016), *available at* <https://www.caiso.com/Documents/SupplementalIssuePaper-FlexibleResourceAdequacyCriteria-MustOfferObligationPhase2.pdf>.

proceeding will focus on a narrow set of changes to the flexible RA eligibility criteria and performance requirements. Specifically, CAISO proposes to:

- require resources to have both a start-up time of less than 4.5 hours and a minimum run time of less than 4.5 hours in order to be eligible to supply flexible RA, which will have the effect of reducing the total qualifying flexible capacity within the CAISO BAA from 35,234 MW to 17,042 MW; and
- modify the must-offer obligation for super-peak flexible RA resources to require such resources to be available seven days a week.

As discussed further herein, while Powerex believes that CAISO's efforts to modify the flexible RA criteria to exclude long-lead time resources from qualifying as flexible RA represents a modest improvement over the existing framework, the proposals outlined in the Revised Straw Proposal will not address the fundamental shortcomings of the existing flexible RA program. At the same time, Powerex agrees with CAISO that implementing more fundamental changes necessary to fix the existing flexible RA framework is likely to take several years. Consequently, Powerex believes that it would be beneficial for CAISO to focus on pursuing two near-term enhancements to its day-ahead and real-time markets to ensure that these markets more accurately take into account the need for, and appropriately compensate, flexible supply. In particular, Powerex recommends that CAISO initiate stakeholder proceedings to consider:

- Elimination of the load bias limiter, which serves to blunt price signals for flexibility while doing nothing to improve the efficient dispatch of physical resources; and
- Extending application of the flexible ramping product ("FRP") to the day-ahead market.

Powerex believes that these two enhancements can be implemented in the near-term and would lay the foundation for the future design of a robust, cost-effective framework for forward flexible RA.

I. The Flexible RA Program Has Critical Flaws That Must Be Addressed To Meet CAISO's Long-Term Objectives

A. The Current Flexible RA Framework Does Not Ensure CAISO Has The Flexible Resources It Needs To Efficiently Manage The Grid

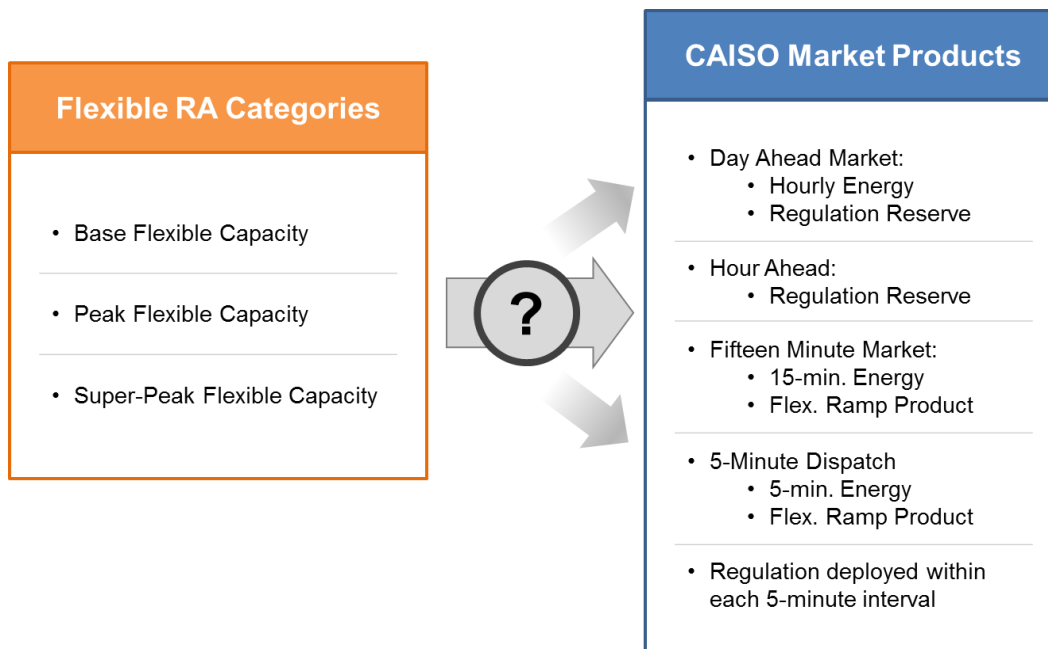
As explained in detail in its previous comments in this proceeding,³ Powerex believes that the design of the existing flexible RA framework prevents the framework from achieving its core objectives: **facilitating the efficient procurement of sufficient flexible capacity to ensure reliability**. In particular, the existing flexible RA framework was designed around the characteristics of the existing in-state generation **supply** rather than the multi-dimensional flexibility **needs** faced by the CAISO. The result is a program that fails to take into account the factors that drive the need for flexible capacity (*i.e.*, forecast movements and uncertainty) or the manner in which CAISO deploys resources in its operational markets to meet these needs (in hourly, 15-minute, 5-minute and regulation reserve increments).

This fundamental design flaw has led to a substantive misalignment between the flexible RA product procured by load-serving entities (“LSEs”) and the actual operational needs of the CAISO. As a practical matter, CAISO procures and deploys a number of distinct “products” in its day-ahead and real-time markets to maintain reliability on its system:

Category	Technical Requirement	Why it is necessary
Hourly Energy	Deployed/positioned in IFM (Day Ahead) Market Day-ahead lead time	<ul style="list-style-type: none"> Expected hour-to-hour variation in load or VER output within each day (<i>i.e.</i>, “forecast movement”)
15-minute Flexible Capacity	Deployed/positioned in Real Time Pre-Dispatch <ul style="list-style-type: none"> 22.5 minute lead time 	<ul style="list-style-type: none"> Error in hourly load or VER forecast (<i>i.e.</i>, “uncertainty”) Expected variation in load or VER output within each hour
5-minute Flexible Capacity	Deployed/positioned in Real Time Dispatch <ul style="list-style-type: none"> 2.5 minute lead time 	<ul style="list-style-type: none"> Error in 15-minute load or VER forecast Expected variation in load or VER output within each 15-minute interval
Regulation Reserve	Capacity procured in IFM and in Real Time; deployed every 4 seconds via Automatic Generation Control	<ul style="list-style-type: none"> Error in 5-minute load or VER forecast Expected variation in load or VER output within each 5-minute interval

³ Comments of Powerex Corp. on FRAC MOO – Phase 2 Supplemental Issue Paper (Jan. 6, 2017), available at <https://www.caiso.com/Documents/PowerexComments-FlexibleResourceAdequacyCriteriaMustOfferObligationPhase2-SupplementalIssuePaper.pdf>.

These products stand in stark contrast to CAISO’s existing flexible RA supply categories, which have no direct relationship to the manner in which CAISO positions and dispatches its system to actually meet its flexibility needs:



This existing misalignment leads to several problems from the perspective of meeting CAISO’s forward flexibility commitment needs. As an initial matter, the existing flexible RA framework fails to provide efficient price signals to ensure that sufficient flexible resources are installed, maintained, and committed to meet CAISO’s need for real-time ramping capability. As CAISO has acknowledged, currently approximately 40% of the resources contained in flexible RA showings are long-start resources.⁴ This is problematic, as long-start resources are only obligated to be available to CAISO to meet real-time operational needs if they were scheduled for energy in the day-ahead market or committed in the day-ahead residual unit commitment (“RUC”) process. Because these resources only receive day-ahead commitments infrequently, “roughly 40 percent of the flexible capacity resources [included in flexible RA showings] are unlikely to be available to address real-time flexibility needs.”⁵ Stated differently, nearly half of the resources that have been committed on a forward basis to meet flexible RA requirements play little to no role in actually meeting the real-time flexibility needs of the CAISO grid.

⁴ CAISO, Flexible Resource Adequacy Criteria and Must-Offer Obligation – Phase 2, Revised Straw Proposal at 12 (May. 8, 2017).

⁵ Supplemental Issue Paper at 15.

In addition, the flexible RA design fails to differentiate between fast-ramping and slow-ramping resources; all resources meeting the *minimum* eligibility criteria are treated the same. The result is that slower-ramping resources can be committed to provide flexible RA instead of faster-ramping resources if the slower-ramping resources are a lower-cost option for LSEs to meet their defined flexible RA obligation. This can lead to inefficient procurement decisions—as the faster-ramping resources that are more valuable in meeting the CAISO’s flexibility needs do not receive a flexible RA contract—and exposes the CAISO to not having sufficient faster-ramping resources necessary to meet its intra-hour flexibility needs.

The existing flexible RA framework also impedes the efficient procurement of flexible supply by artificially limiting the pool of resources that may compete to provide flexible RA. Notably, while many of the internal resources included in flexible RA showings have limited ability to meet CAISO’s flexibility needs, external resources with short lead times, high ramp rates, and high availability – including the large, clean, hydroelectric systems in the Northwest – are prohibited from providing flexible RA. The result is that LSEs have little choice but to meet flexible RA requirements with resources that, in reality, make a limited contribution to meeting CAISO’s flexibility needs.

The net effect of the existing flexible RA framework has been the perpetuation of a program that is not only inefficient, but also is of limited use in ensuring that CAISO has sufficient flexible supply to reliably and efficiently operate its markets in real-time. It is thus unsurprising that CAISO continues to experience significant challenges in meeting hourly and intra-hourly flexibility needs, notwithstanding the fact that, at least on paper, the total flexible RA capacity included in LSE resource showings has consistently “met or exceeded the ISO’s predetermined flexible capacity requirements” since the program was implemented.⁶ For instance, during Q4 2016, it appears that CAISO was forced to rely on short-term procurements of flexible capacity to meet real-time ramping needs, particularly during the evening hours.⁷ CAISO also experienced a “high level of upward power balance violations during the evening ramp and during 4th quarter 2016.”⁸ In sum, it appears that the existing flexible RA program is of little or no material benefit to consumers or to reliability, with many of the generators compensated under the current program playing a limited role, if any, in meeting the CAISO’s growing need for real-time ramping capability.

B. CAISO’s Proposed Changes Do Not Eliminate The Need For Comprehensive Redesign Of The Flexible RA Framework

⁶ *Id.* at 6-15.

⁷ Scott Harvey, *The Load Bias Limiter, Price Formation, and the Need for Flexible Capacity at 24* (May 2017), *available at* <https://www.aiso.com/Documents/LoadBiasLimiterandFlexibleCapacityFTIConsulting.pdf>.

⁸ *Id.* at 25

Although Powerex agrees that CAISO's proposal to modify the flexible RA eligibility criteria to prevent long-start resources from qualifying to provide flexible RA is an incremental improvement over the status quo, CAISO's proposals will not address many of the shortcomings of the existing program. Even with these proposed changes:

- The flexible RA framework will continue to prevent flexible resources located outside of the CAISO from qualifying to provide flexible RA.
- The flexible RA framework will still fail to differentiate resources based upon their relative contribution to meeting CAISO's flexibility needs. For example, a highly flexible resource – with a short lead time and high ramp rate – will be treated the same as a resource with a start-time of 4 hours that barely qualifies to provide flexible RA.
- The flexible RA framework will not ensure that sufficient capacity is committed to meet the full range of flexibility needs experienced by the CAISO (*i.e.*, resources that are able to meet needs in the hourly, 15- and 5-minute market processes, as well as regulating reserve needs).

It is clear that a more comprehensive re-design is necessary if the flexible RA framework is to play a role in allowing CAISO to meet its long-term need for flexible capacity. It is also clear, however, that a comprehensive redesign of the flexible RA framework will require extensive work and collaboration among CAISO, the CPUC, and stakeholders and may not be feasible in the near-term. The question thus becomes: what meaningful near-term steps can CAISO take to help meet the pressing and growing need for flexible supply?

II. CAISO Should Focus On Short-Term Changes To Its Operational Markets That Can Address The Need For Flexible Supply

Given the challenges that prevent material improvements to the forward flexible RA framework in the near term, Powerex recommends that CAISO instead focus its current efforts on modifying its day-ahead and real-time markets to ensure that they more efficiently value and commit flexible capacity. In particular, Powerex believes that CAISO should pursue two near-term enhancements to the CAISO markets that could more directly meet the need for flexible supply: elimination of the load bias limiter; and implementation of a day-ahead FRP. Powerex believes these two enhancements will not only help CAISO more efficiently procure the right quantity and quality of flexible capacity needed to maintain reliability, they will also assist the CAISO in defining and quantifying its evolving needs for forward flexible capacity commitments. Each of these enhancements is addressed below.

A. CAISO Should Reevaluate Its Use Of The Load Bias Limiter

Ultimately, the task of ensuring that there are sufficient flexible resources available to meet real-time needs must begin with ensuring that there are robust and accurate short-term price signals for flexible capacity. Getting short-term locational prices “right” is

critical to a well-functioning market and ensures non-discriminatory compensation to all resources that contribute to meeting the actual needs of the grid and maintaining reliability. It also provides transparent price signals to suppliers, thereby encouraging resources to be available, precisely when and where they are needed.

Powerex believes that CAISO's continued application of the load bias limiter acts as a significant barrier to achieving these goals and must be reassessed. Notably, based on Dr. Scott Harvey's presentation at the May 5th Market Surveillance Committee ("MSC") meeting, it appears that the load bias limiter is being applied in a manner that suppresses prices during those periods in which the need for flexible capacity is greatest. As Dr. Harvey observed, data from the CAISO Department of Market Monitoring ("DMM") demonstrates that the load bias limiter "directly reduces the market value of flexible capacity during . . . high ramp hours."⁹ For instance, "Department of Market Monitoring data in the 2015 annual Market Report show that the application of the 'load bias limiter' eliminated a substantial proportion of the shortages of upward ramp capability in [the CAISO real-time dispatch], with the most frequent impact falling during the evening ramp hours of 16-21."

Powerex believes that applying the load bias limiter when there are shortages of ramping capability is counterproductive and undermines the goal of ensuring that CAISO has sufficient flexibility capacity to meet operational needs. As Dr. Harvey observed, "[i]f the California ISO needs flexible capacity and upward ramp during these hours, real-time prices should reflect this need and not be artificially depressed through the application of the load bias limiter."¹⁰ Suppressing prices during these periods prevents flexible resources from being appropriately compensated for the valuable services that they provide to the grid, with the result that the compensation received by a highly flexible resource may not be materially different from the compensation received by inflexible resources. This, in turn, reduces the incentive for internal and external flexible resources to be available to meet CAISO's operational needs and mutes investment signals for the development, maintenance, and commitment of flexible resources.

While Powerex recognizes the need to prevent inaccurate load adjustments from undermining efficient dispatch or distorting prices, there is no evidence that the load bias limiter does anything to achieve these objectives. For example, the load bias limiter has no effect on the dispatch or commitment of resources, as it is only applied in the pricing run and not the scheduling run; thus, application of the load bias limiter does nothing to promote the efficient use of resources. In addition, the load bias limiter appears unnecessary to catch data-entry or "fat finger" errors based on statements made at the May 5, 2017 MSC meeting, where CAISO staff acknowledged that CAISO

⁹ *Id.* at 14.

¹⁰ *Id.*

has other tools to address such errors (e.g., CAISO's authority to correct prices under the tariff).

Instead, it appears that the primary effect of the load bias limiter is to significantly reduce the application of the CAISO's current penalty prices. In particular, application of the load bias limiter appears to be based entirely on an assessment of the price impact of a load adjustment rather than on any objective assessment of the accuracy of the adjustment. The result is that, by definition, the load bias limiter is being applied in cases where the operator adjustment accurately reflected a genuine supply shortage. The problem, of course, is that the application of the load bias limiter in these cases prevents the penalty prices from serving their intended purpose: ensuring that supply infeasibilities are appropriately reflected in market prices.

For the foregoing reasons, Powerex believes that CAISO should commence a stakeholder proceeding to further evaluate the use of the load bias limiter. Absent an objective demonstration that the load bias limiter indeed advances a legitimate reliability or market efficiency purpose (e.g., to improve the accuracy of the load forecast used in the market processes), then the load bias limiter should be substantially modified or eliminated.

B. CAISO Should Commence Efforts To Extend The FRP To The Day-Ahead Market

Powerex believes that the current lack of a day-ahead FRP results in a disconnect between CAISO's day-ahead and real-time markets. Notably, while CAISO uses the real-time FRP to position resources on stand-by (in its 15- and 5-minute markets to ensure that there is sufficient upward and downward ramping capability to meet both forecast and uncertain changes in net load), CAISO's day-ahead market currently only positions resources to meet forecasted load, including ramping needs, across the day. Unlike the real-time market optimizations, the day-ahead market optimization does not position resources on stand-by to maintain adequate ramping capability in reserve to address uncertain changes in net load.

When CAISO was initially considering implementation of an FRP in the real-time market, Powerex and other stakeholders encouraged CAISO to include the FRP in the day-ahead market optimization. Powerex, in particular, believed that extension of the FRP had the potential to reduce overall flexible capacity costs by ensuring that CAISO appropriately sets aside flexible capacity on a day-ahead basis to meet real-time flexible ramping needs using the least-cost combination of resources.¹¹ CAISO ultimately decided to defer consideration of a day-ahead FRP until it obtained operational

¹¹ See Comments of Powerex Corp. on Revised Draft Final Proposal, *available at* <https://www.caiso.com/Documents/PowerexComments-FlexibleRampingProduct-RevisedDraftFinalProposal.PDF>.

experience with implementation of a real-time FRP. Now that CAISO has over 6 months of experience with the real-time FRP, Powerex believes that extension of this product to the day-ahead market is the next logical step towards ensuring that CAISO efficiently sets aside sufficient flexible capacity to meet real-time needs.

As a practical matter, extension of the FRP to the day-ahead market will help CAISO meet its flexibility needs by giving CAISO the opportunity to commit internal and external resources that may not otherwise be available if procurement is left solely to the real-time market. This, in turn, will help ensure that CAISO is able to meet real-time flexible ramping needs using the broadest pool of resources possible. Limiting procurement of the FRP to the real-time market, in contrast, forces CAISO to meet flexibility needs using only the subset of the flexible capacity remaining and offered in the real-time energy market.

In addition, and perhaps more importantly, incorporating a FRP into the day-ahead optimization will allow CAISO to more effectively and efficiently manage the quantity of FRP that is procured. By the time that CAISO runs its real-time market optimization, the vast majority of resources that will run in real-time have already been committed. In real-time, the resource mix is largely a “given” and it is CAISO’s task to procure sufficient FRP to manage forecast and uncertain variations in net load. CAISO’s starting position in the day-ahead market is much different. At that point, CAISO is working with a “blank slate,” with many more options regarding the resources that are scheduled and committed to provide energy or capacity. As a result, it is in the day-ahead timeframe that CAISO can most efficiently co-optimize resource commitment and energy award decisions with the amount of FRP procured, while taking into account the incremental amount of FRP associated with different day-ahead dispatch decisions.

For example, in the day-ahead optimization, CAISO could recognize that the quantity of FRP it needs to procure will be a function of the following:

- Forecast load, including hour-to-hour changes;
- Committed physical supply, which, in turn, is a function of bid-in demand as well as any cleared net virtual supply;
- Committed solar output; and
- Committed wind output.

Notably, only the first of these factors (forecast load) is truly external to the day-ahead optimization; the other three are *results* of the day-ahead optimization process. Because CAISO has a choice regarding the quantity of physical supply committed, including the quantity of variable energy resource output it awards, a day-ahead market optimization process that includes FRP could explicitly recognize that each additional megawatt of solar or wind energy schedules that are accepted will increase the day-ahead FRP requirement by a certain amount. This would allow the day-ahead optimization to seek the least-cost solution taking into account both the economic benefits of the (relatively low) bid-in cost of solar or wind supply as well as the

incremental cost (or availability) of the additional FRP that is required in connection with that additional solar or wind supply (in the same or a future hour of the day). As a practical matter, it may be more cost-effective, in some circumstances, to reduce the quantity of intermittent resources that receive energy awards in order to realize a larger savings in the amount of required upward flexible capacity. In addition, this ability to co-optimize the quantity of intermittent resource day-ahead and real-time energy awards with the required quantity of upward flexibility would help ensure that CAISO always has sufficient flexible capacity to reliably manage its system. Under this approach, CAISO would only require enough flexible capacity to meet changes in load in order to have a feasible market solution. This is because this co-optimization approach effectively enables the CAISO to convert what is currently a **reliability challenge** (*i.e.*, having sufficient flexible capacity to respond to expected and uncertain real-time reductions in intermittent energy supply) into a day-ahead **economic optimization challenge** (*i.e.*, how much renewable resource output to accept in the first place, given the quantity and price of available flexible capacity).

Powerex also believes that CAISO should consider permitting day-ahead FRP to be “biddable” (at least for non-RA resources) in order to ensure that CAISO is able to procure FRP from the broadest possible set of internal and external resources. Powerex recognizes that this is an enhancement to the real-time FRP design, which only awards FRP to resources that have offered to provide energy (and compensates resources based on the marginal opportunity cost, inferred to be the difference between the clearing price of energy and the resource’s energy bid). It is important to recognize, however, that there are likely to be resources that may be willing and able to submit an offer to provide day-ahead FRP, but may not want to be committed to provide energy in the day-ahead market.¹² Similarly, there are likely to be resources that submit energy offers in the day-ahead market that are not able to offer FRP at all, because they cannot support a real-time (15-minute and/or 5-minute) market offer.¹³ For these reasons, it may be advisable for the day-ahead market to offer the following day-ahead bidding options:

1. Energy only (as today), with CAISO having no ability to “call” on the offer after the day-ahead market (*i.e.* in real-time);
2. Energy with an FRP “flag,” permitting CAISO to procure FRP from the portion of the energy offer that is not accepted for energy in the day-ahead timeframe. To the extent a resource’s energy offer is “in merit” for a day-ahead energy award, a similar approach to the real-time FRP could be used to determine the resource’s

¹² For example, a resource may desire to sell some of its output specifically in the real-time energy market rather than in the day-ahead energy market.

¹³ For example, a physical marketer may need to finalize delivery schedules prior to real-time operations, or may lack control to the underlying generating unit to be able to respond to real-time awards.

implicit FRP offer price (*i.e.*, at its foregone margin on its day-ahead energy sale); and

3. FRP only, at an explicit bid-in price for capacity, with accepted awards having an obligation to submit offers in the real-time market.

Powerex notes that CAISO may wish to require resources with RA obligations to offer energy in the day-ahead market with the FRP flag set to “yes,” and with their implicit FRP offer price set equal to their foregone energy sales in the day-ahead market, since these resources have received forward compensation in exchange for a capacity commitment. The ability to offer FRP only, at an explicit bid-in price for capacity, would be limited to internal and external resources without an RA obligation. This would give CAISO the ability to acquire additional flexible capacity from resources that do not have an RA obligation and may not have offered their supply into CAISO’s day-ahead market.

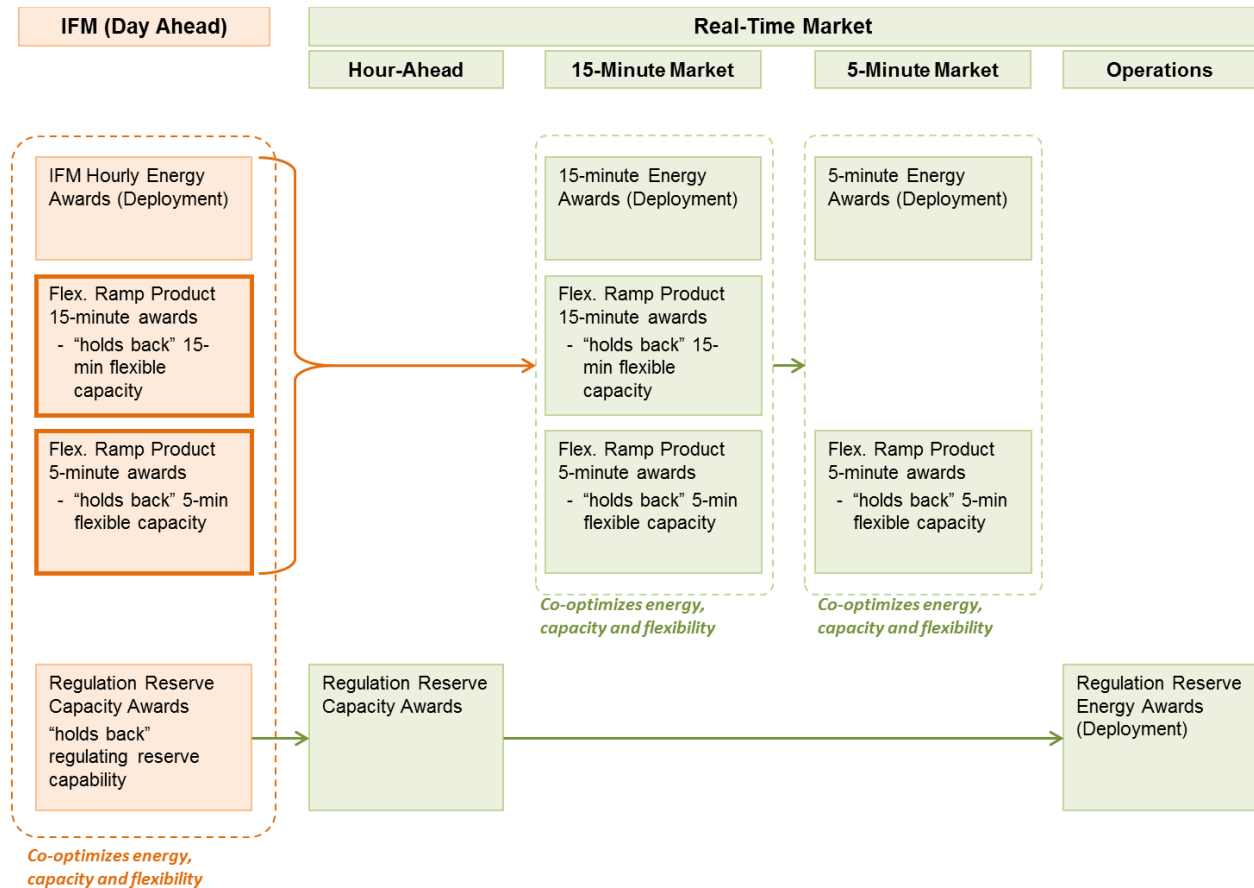
Furthermore, Powerex believes that a well-designed day-ahead FRP could replace the existing RUC process, as it would more efficiently commit capacity on a day-ahead basis in two important ways:

1. Co-optimization of residual capacity commitment with the CAISO’s integrated forward market processes, which has been a CAISO market design objective for many years; and
2. Commitment of *flexible* capacity in the right quantities of 15-minute and 5-minute increments to meet CAISO’s stand-by flexible capacity needs.

The amount of FRP that could be procured from each resource would depend on the ability of the resource to move from one dispatch interval to the next. For instance, non-dynamic inertia resources that are able to respond only to 15-minute dispatch instructions would only be eligible to provide 15-minute FRP in the day-ahead market. Internal resources that are able to respond in both the 15- and 5-minute markets would be eligible to provide both 15- and 5-minute FRP in the day-ahead market, just as they do today in the real-time market. Critically, the quantity of 15-minute and 5-minute day-ahead FRP that a resource is eligible to provide would be limited to the quantity that the resource can move from one interval to the next. This would ensure that fast-responding resources would be eligible to provide a greater quantity of 15- and 5-minute FRP in the day-ahead market than slower-responding resources. Powerex notes that day-ahead FRP requirements and products would likely need to be defined separately for 15-minute and 5-minute products in order to ensure that the day-ahead optimization procured the necessary quantities of each.

Powerex believes that incorporating FRP into the day-ahead market could significantly improve the alignment between the flexible supply CAISO needs to manage the grid in real-time and the flexibility products that are defined and committed to prior to real-time operations. The figure below provides a conceptual illustration of an enhanced day-

ahead market that includes FRP. The day-ahead market would continue to procure hourly energy (satisfying the need for hour-to-hour ramping capability), but it would also commit capacity as 15-minute and 5-minute FRP (i.e. stand-by flexibility) to be available in CAISO's real-time market. The new FRP components of the day-ahead market are shown with the thicker border in the illustration.



Implementation of a day-ahead FRP also has the potential to facilitate and inform the future redesign of a forward procurement framework for flexible capacity in several respects.

- First, day-ahead FRP will require CAISO to formalize the appropriate product definitions and procured quantities of 15-minute and 5-minute flexible supply. These product definitions can then be readily extended to any future forward procurement framework.
- Second, experience with a day-ahead FRP will reveal whether sufficient flexible supply can be counted on to be available on a day-ahead basis simply in response to short-term market signals. If the combination of the day-ahead FRP and more robust day-ahead and real-time market price formation (through modification or elimination of the load bias limiter), together with compensation

received through the standard RA product, are sufficient to ensure that there is ample *flexible* supply, then the need for formal forward procurement of flexible capacity may be less pressing than it currently appears. Conversely, if these products are not sufficient to ensure that there is adequate flexible capacity (with a high degree of confidence) to meet CAISO's operational needs, then CAISO can focus its efforts, together with the CPUC, on establishing a durable flexible RA framework for the forward procurement of the defined day-ahead flexible capacity products.

- Finally, CAISO's experience with the day-ahead FRP will provide it with information that it can use to determine whether there may be opportunities to reduce the cost of procuring flexible supply through longer-term contracting. That is, just like day-ahead FRP expands the pool of potential resources that can commit to provide flexibility beyond what is available through real-time procurement, this pool may be further expanded through procurement on a month-ahead or year-ahead basis.

III. Conclusion

Powerex believes that both of the measures discussed above are more likely to ensure that CAISO is able to procure the flexible supply necessary to balance its system than making additional, limited changes to the existing FRAC-MOO framework. Moreover, these two enhancements are fully consistent with longer-term efforts to re-design a framework for the forward procurement of flexible supply.