Comments of Powerex Corp. on FRAC MOO – Phase 2
Supplemental Issue Paper

Submitted by	Company	Date Submitted
Mike Benn 604.891.6074	Powerex Corp.	January 6, 2017

Powerex appreciates the opportunity to submit these comments on CAISO's Supplemental Issue Paper in Phase 2 of the Flexible Resource Adequacy Criteria and Must-Offer Obligation ("FRACMOO2") Initiative. In the Supplemental Issue Paper, CAISO explains that it is expanding the scope of the existing FRACMOO2 Initiative to consider broader enhancements and refinements to the existing flexible resource adequacy ("RA") framework than initially contemplated. CAISO explains that, based on its initial assessment of flexible RA capacity showings and updated forecasts of the need for flexible capacity, CAISO has concluded that the existing flexible RA framework may not be sending the correct price signals to maintain resources capable of meeting CAISO's flexible capacity needs in the long-term. For that reason, CAISO states that it is expanding the scope of this initiative to engage in a more holistic review of the existing flexible RA program, including whether CAISO should revise its approach to evaluating the resource showings submitted by load-serving entities ("LSE") to determine whether they include sufficient flexible resources and modifying the performance requirements that resources must meet to provide flexible RA.

Powerex strongly supports CAISO's decision to expand the scope of the present initiative to include a broader examination of the existing flexible RA framework. The decision of CAISO and the California Public Utilities Commission ("CPUC") to add flexible capacity procurement targets to the existing RA program was a novel solution to meeting the growing challenges of renewable integration and maintaining grid reliability. As CAISO acknowledged when implementing the program, however, the existing flexible RA framework was designed as an interim solution to addressing emerging flexible capacity needs while CAISO worked with the CPUC and stakeholders to establish a durable, long-term solution.[1] More specifically, while the current program was designed to ensure that there is a sufficient quantity of flexible resources available to meet the largest expected three-hour net load ramp each month, CAISO recognized that more rigorous

[1] Cal. Indep. Sys. Operator Corp., Flexible Resource Adequacy Criteria and Must-Offer Obligation, Draft Final Proposal at 8 (Feb. 7, 2014) ("FRACMOO Final Proposal"), *available at* http://www.caiso.com/Documents/DraftFinalProposal-FlexibleResourceAdequacyCriteriaMustOfferObligation.pdf.

requirements and more responsive resources would be required as the quantity of renewable resources online increased intra-hour variability.[2]

As CAISO recognizes in the Supplemental Issue Paper, experience since the current FRAC-MOO framework was first implemented has highlighted the need to improve the existing flexible RA framework. In particular, it has become clear that the current flexible RA framework is ill-suited to meeting the actual flexibility needs being experienced by CAISO – needs that are only expected to increase as California progresses towards its goal of 50% of demand served by renewable resources by 2030.[3]

Powerex believes that there are two fundamental shortcomings of the existing forward flexible RA procurement framework:

- the determination of the flexible RA requirement, which is based on meeting the estimated maximum three-hour net load ramp, is too coarse, as it does not adequately reflect the CAISO's multi-dimensional flexible capacity needs; and

- the criteria that resources must meet to provide flexible RA do not encourage the efficient procurement of those resources most capable of meeting the CAISO's flexibility needs. Specifically:

    - the resource qualification requirements do not distinguish between resources based on their relative ability to provide ramping capability to meet flexibility requirements (*e.g.*, between those resources with significant ramp rates and slow ramping resources); and

    - the resource qualification requirements largely exclude external resources from participating, despite CAISO's recognition that real-time flexibility at the CAISO interties can be very helpful in meeting CAISO's flexibility needs in its operational markets.

With respect to the first issue, it is important to note that a three-hour net load ramp was chosen as the basis for determining the flexible RA requirements when the program was designed because it represented "a reasonable ramping period" that many internal generation resources could satisfy.[4] In other words, it appears this criterion was chosen

---

[2] *Id.* at 9.

[3] Supplemental Issue Paper at 6.

[4] *See, e.g.*, Cal. Indep. Sys. Operator Corp., Flexible Resource Adequacy Criteria and Must-Offer Obligation, Straw Proposal at 7 (Dec. 13, 2012), *available at* https://www.caiso.com/Documents/StrawProposal%E2%80%93FlexibleResourceAdequacyCriteriaMustOfferObligation.pdf.

not because it was representative of the type of flexible capacity that CAISO *needed*, but because it represented the type of flexibility that was *available* from the existing, in-state generation fleet. The result is a framework that allows much of the existing internal generation fleet to become eligible to provide flexible RA capacity, regardless of whether qualifying resources actually allow the CAISO to meet the full range of hourly and intra-hourly flexibility needs experienced by the CAISO grid.[5]

With respect to the second shortcoming, the existing flexible RA framework largely focuses on one resource attribute—the ability to receive a 5-minute dispatch signal—but fails to appropriately differentiate between resources based on their ability to ramp in response to that 5-minute dispatch signal. As a result, existing in-state resources—which are subject to 5-minute dispatch—are generally eligible to provide flexible RA capacity. This includes resources that have relatively long lead times, low ramp rates, and limited daily and hourly availability, all of which limit a resource's effectiveness in meeting the CAISO's flexible ramping needs. It is therefore unsurprising that while the total flexible RA capacity included in LSE resource showings has consistently "met or exceeded the ISO's predetermined flexible capacity requirements" since the flexible RA program was implemented,[6] the CAISO nevertheless experiences hourly and intra-hourly flexibility challenges. At the same time, resources with short lead times, high ramp rates and high availability—particularly the clean, large hydroelectric resources that characterize the Northwest—have been largely excluded from providing flexible RA based solely on the fact that they are, with limited exception, only dispatchable in 15-minute increments. In Powerex's view, this has led to a highly inefficient situation in which California LSEs are required to procure a product that is of limited practical effectiveness, while existing external resources that are highly capable of addressing a large portion of CAISO's flexibility needs have been categorically excluded from the flexible RA framework.

The result is a program that reflects the capabilities of the *existing* in-state generation fleet, but fails to send price signals that encourage changes in the CAISO's resource mix to more effectively meet CAISO's *future* needs. Ultimately, a flexible RA program will only create incentives for the efficient development and maintenance of those internal and external resources needed for long-term reliability if it requires LSEs to procure resources with characteristics that are tied to, and most effective in meeting, the specific reliability needs at issue. Under the existing flexible RA program, however, LSEs have no incentive to do this. Instead, LSEs are required only to contract for the requisite quantity of the defined flexible RA product, even if this is achieved by contracting with resources that may have little ability to meet hourly and intra-hourly ramping needs, such as resources with low ramp rates and long-lead times. As a result, the current flexible RA framework inefficiently directs compensation to existing internal resources that do not meaningfully

---

[5] Indeed, the Supplemental Issue Paper notes that "the flexible fleet is not very different [from] the overall RA fleet[.]" Supplemental Issue Paper at 6.

[6] *Id.* at 5.

contribute to meeting CAISO's flexibility needs, while failing to encourage investment in, and the resulting commitment of, internal and external resources that do.

The consequences of such inefficient price signals to California's future resource mix cannot be overstated. Older, less efficient, fossil fuel resources may often receive flexible RA compensation, while providing limited assistance towards CAISO's flexibility needs, *instead of* such flexible RA compensation being directed towards more efficient, more capable resources such as new in-state storage resources and the clean, fast-ramping, hydro resources of the Northwest. Moreover, the existing flexible RA framework encourages new investment in resources that satisfy the technical requirements for the current flexible RA product, thus encouraging investment in resources that have similar characteristics to the existing fleet—since this was the basis for the current product definition—rather than in resources that can most efficiently meet the CAISO's future flexibility needs.

For the foregoing reasons, Powerex agrees with CAISO that the time has come to reevaluate the existing flexible RA requirements and establish a revised flexible RA framework capable of efficiently meeting the full range of CAISO's flexibility needs over the long-term. To facilitate CAISO's consideration of a potential long-term flexible RA framework, Powerex's comments address two critical issues identified in the Supplemental Issue Paper:

- Whether CAISO should modify the manner in which it evaluates the effectiveness of resources in meeting flexible RA needs.
- Whether CAISO should modify the flexible RA framework to preclude resources with high PMins from providing flexible RA.

Each of these issues is addressed below.

I. Defining Flexible RA Needs

While the existing flexible RA product was designed around the characteristics of the existing internal generation fleet, Powerex believes that the requirements of a long-term flexible RA framework and product must instead be driven by the specific nature of CAISO's future flexibility needs to be successful. For that reason, the first step towards establishing a long-term flexible RA program is to clearly define the nature of CAISO's flexibility needs.

Powerex believes that the analytical framework that CAISO developed as part of its Flexible Ramping Product ("FRP") initiative for determining flexible capacity needs provides a sound conceptual basis that can be extended to the long-term flexible RA framework, including the evaluation of annual and monthly showings submitted by individual LSEs. As recognized in that proceeding, there are two distinct drivers of the need for flexible capacity:

- Forecasted movements – interval-to-interval changes in load and non-dispatched supply that CAISO can anticipate and predict well ahead of actual operations; and
- Uncertainty – unpredictable changes in load and variable resource output resulting from forecast errors, uninstructed intertie deviations, and other factors.[7]

Distinguishing between the drivers of flexibility needs is important, as the technical characteristics of resources capable of addressing forecast changes in load may be very different than the characteristics of resources necessary to meet uncertainty needs. Because forecasted movements are, by definition, determined in advance, a wide range of internal and external resources can potentially be used to meet this category of flexibility need. For instance, long-lead time resources, slower ramping resources, intertie deliveries "shaped" within a day, and resources with a limited number of starts each day can all play a role in meeting the need for flexible capacity to meet forecast changes in load. The primary limitation of many of these resources is often the lead time needed to achieve a particular level of output; critically, this lead-time constraint is significantly less important when the target output can be established in advance, as is the case for forecast movements. For example, a resource that requires 4 hours' notice to start up and move from one level (*i.e*. 0 MW) to another level (*i.e*. the unit's PMin) is fully capable of assisting CAISO in meeting a forecasted intra-day ramp—such as forecasted increases in load during the morning or evening peak—whereas this resource would be ill-suited to providing stand-by flexible capacity to respond to unpredictable changes in load or variable resource output.

Addressing uncertainty, in contrast, requires resources that are capable of responding to variations in load and non-dispatched changes in supply that are *not* forecast well in advance, and that materialize only closer to real-time. Since these movements are not predictable at the time of the annual or monthly RA showing, CAISO must be continuously prepared to meet its uncertainty needs regardless of whether those uncertain changes actually materialize. The resources used to meet CAISO's uncertainty needs must therefore be dispatchable with relatively short lead times, and have relatively high ramp rates.

Powerex believes that a long-term flexible RA framework must reflect the distinction between forecast movement and uncertainty, including the different attributes of resources needed to meet each type of need. In this regard, Powerex agrees with Southern California Edison that the need for flexible capacity is "multi-dimensional" and that annual and monthly resource showings must provide verification that the full range of CAISO's flexibility needs will be met.[8] Rather than simply comparing the effective

---

[7] *See generally* Cal. Indep. Sys. Operator Corp., Revised Draft Final Proposal (Dec. 17, 2015) (distinguishing between flexibility needs associated with forecasted movements and uncertainty), *available at* http://www.caiso.com/Documents/RevisedDraftFinalProposal-FlexibleRampingProduct-2015.pdf.

[8] *See* Southern California Edison, Durable Flexible RA Proposal at 11 (Apr. 5, 2016) ("Durable Flexible RA Proposal"), *available at* http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=10648.

flexible capacity of resources contained in resource showings with a single flexibility requirement (which itself is based on a single, coarse measure of the respective LSEs' flexibility needs), LSEs' portfolios of flexible RA resource showings must be required to meet a variety of metrics to ensure that the portfolios include resources with the range of operational characteristics needed to meet both forecasted changes in load and uncertainty.

A. Evaluating Adequacy of LSE Portfolio to Meet Forecast Needs

With respect to forecast changes, Powerex believes that each LSE's year-ahead and month-ahead resource showing should be designed to demonstrate that the LSE's portfolio of committed resources is capable of meeting a forecast hourly load shape for designated day types over the relevant compliance period. Each month would include three day types: weekdays, Saturdays, and Sundays (or holidays). Powerex recommends these three day types as a way to recognize that the load shape is markedly different between weekdays, Saturdays and Sundays (or holidays), but generally follows a similar pattern within each of these day types for any given month. As a practical matter, this would result in an LSE's year-ahead showing for flexible RA for forecast movement being evaluated against 36 days of hourly-level forecast load. The month-ahead showing, in contrast, would be evaluated against 3 days of hourly-level forecast load for each month.

For each evaluation day, an LSE would be required to submit a resource plan that includes a combination of resources with characteristics capable of meeting forecast load in each hour. The submitted portfolio would need to meet the hourly load forecast taking into account minimum start times, minimum output levels, lead times, ramp rates, and other operational limitations.

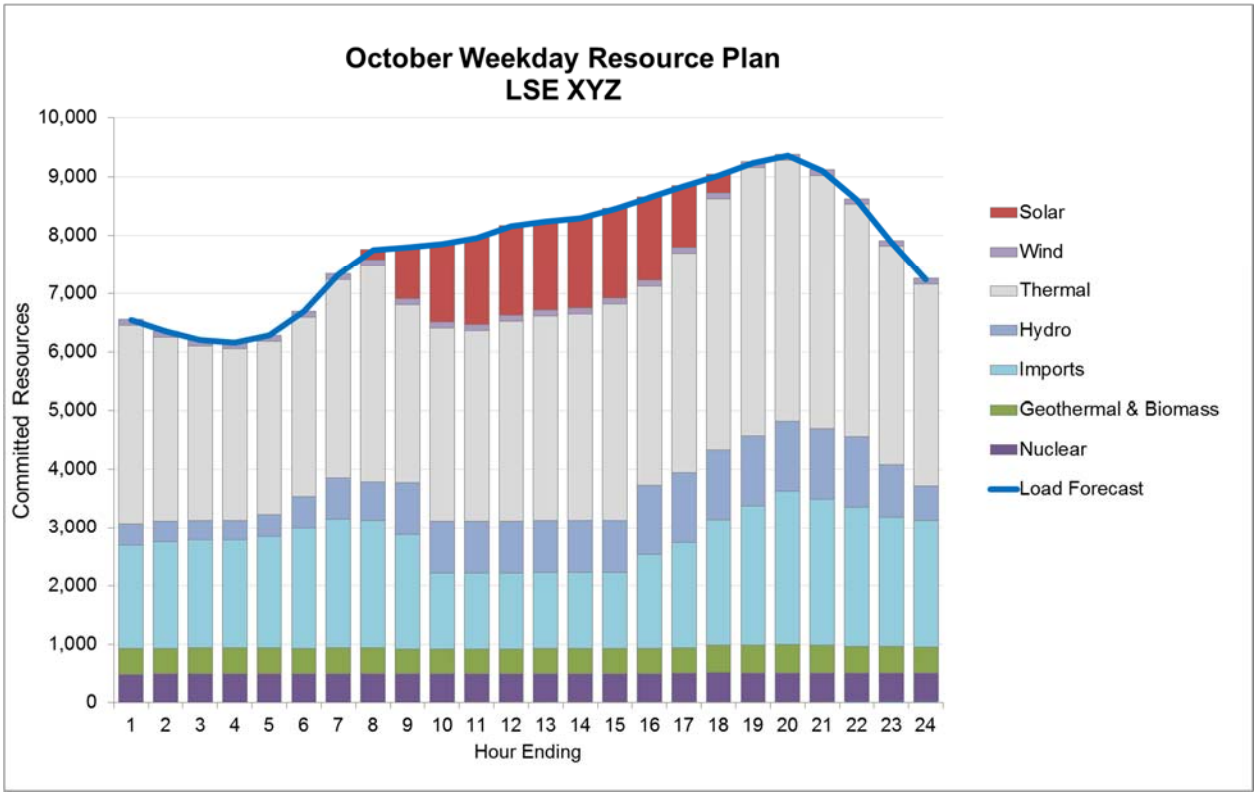
A hypothetical sample of an hourly load and resource plan is shown below, for selected hours:

October Weekday Resoure Plan - LSE XYZ									
		Maximum	Ramp Rate			Committed Resources			
Resource Type	Plant Name	Capacity (MW)	(MW/Min)	PMin	Schedule Type	HE 3	...	HE 12	... HE 19
Load Forecast						**(6,196)**		**(8,163)**	**(9,240)**
VER (Solar)	Solar 1	1725	0	n/a	Self	0		1157	0
VER (Wind)	Wind	600	0	n/a	Self	100		100	100
VER (Curtailable Solar)	Solar 2	500	50	0	Economic	0		400	0
Nuclear	Nuclear-1	500	0	500	Self	486		484	484
Imports	Tie-1	1300	0	1300	Self	1300		1000	1300
	Tie-2	650	0	650	Self	500		500	500
	Tie-3	650	50	0	Economic	500		19	587
Geothermal	Geo-1	400	0	400	Self	260		260	276
Biomass	Bio-1	100	0	100	Self	78		84	84
Biogas	Biog-1	75	0	75	Self	58		62	62
Hydro	Hydro-1	300	100	250	Self	300		300	300
	Hydro-2	300	50	250	Self	48		300	300
	Hydro-3	300	50	250	Self	0		300	300
	Hydro-4	300	100	250	Economic	0		162	300
Thermal	Combined Cycle -1	800	10	350	Self	800		800	800
	Combined Cycle -2	800	10	350	Self	800		800	800
	Combined Cycle -3	700	10	300	Self	700		700	700
	Combined Cycle -4	600	10	300	Economic	265		500	600
	Combined Cycle -5	500	10	250	Economic	0		235	500
	Combined Cycle -6	500	10	250	Economic	0		0	500
	Peaker-1	300	25	100	Economic	0		0	300
	Peaker-2	300	25	100	Economic	0		0	300
	Peaker-3	250	25	75	Economic	0		0	147
	Peaker-4	200	25	50	Economic	0		0	0
	Peaker-5	200	25	50	Economic	0		0	0
	Peaker-6	200	25	50	Economic	0		0	0
	Peaker-7	200	25	50	Economic	0		0	0
	Peaker-8	200	25	50	Economic	0		0	0
	Peaker-9	150	25	50	Economic	0		0	0
	Peaker-10	150	25	50	Economic	0		0	0
Total Resources		**10925**				**6,196**		**8,163**	**9,240**
Imbalance (must equal zero)						*0*		*0*	*0*

*Resource plan must balance generation with load while adhearing to Ramp Rates, Pmin/PMax and any other generation contraints

*Qualifying Imports must include sufficient contractual documentation

For the entire 24 hours of the evaluation day, the resource plan might be shown graphically as below:



In addition to meeting the forecast level of load in each hour, the portfolio would also be required to include additional unloaded resource capacity equal to 15% of the maximum hourly forecast load for that day.

Powerex notes that this evaluation is intended to ensure that an LSE's portfolio of committed resources is capable of meeting forecast load—rather than forecast *net* load. In other words, the forecast output of variable energy resources ("VERs") is not simply assumed to be "must take," as occurs when basing an assessment on forecasts of *net* load. Conceptually, Powerex sees no reason to treat the forecast output[9] from VERs differently from other arrangements for self-scheduled energy deliveries. Moreover, explicitly showing VER output in the resource plan, as opposed to reflecting it in net load, appropriately recognizes the operational ability of certain VERs to submit economic bids and adjust their output subject to a CAISO instruction.[10]

Since forecast movement can potentially be met using a variety of resources, Powerex believes it would be appropriate for each LSE to have broad discretion to procure a

[9] Powerex suggests that CAISO implement an objective method based on historical VER production data during comparable periods to calculate the hourly VER forecasts to be included in each LSE's monthly resource plans. Variations in actual VER production relative to the forecast would be included in the CAISO's assessment of the LSE's total uncertainty requirements, as discussed further below.

[10] Relying on VER output curtailment to satisfy RA needs may or may not be the most economically efficient approach, but that is not what the flexible RA showings are intended to demonstrate.

portfolio of resources capable of passing the multi-dimensional assessment described above. In other words, rather than requiring forecast movement to be met through the procurement of pre-defined "standard" flexible RA products, it would be incumbent upon each LSE to assemble a portfolio of resources and contractual arrangements with a range of operational characteristics sufficient to meet the hourly load forecasts in the year-ahead and month-ahead showings.

Powerex believes this approach will not only better ensure that each LSE has procured in advance a portfolio of resources that can meet its expected peak capacity and flexible capacity needs, but it will also greatly improve the efficiency of LSEs' procurement decisions. One clear example of this is the new price signals such a framework would provide to LSEs to enter into forward contracts for "shaped" deliveries on the interties. Under the current framework, LSEs often forward contract for standard 16-hour and 8-hour blocks of energy on the interties to meet their monthly resource adequacy requirements in all hours. LSEs often submit self-schedules in the CAISO's integrated forward market to deliver these forward blocks of energy to the CAISO footprint, which can exacerbate over-supply challenges during the "belly of the duck." In contrast, under the new framework Powerex proposes above, LSEs would be encouraged to contract for "shaped" imports, as such contracts not only would meet load in the highest load hours, but would also mitigate the hour-to-hour changes in load and non-dispatched supply before and after the peak hour.

B. Evaluating Adequacy of Resources to Meet Uncertainty

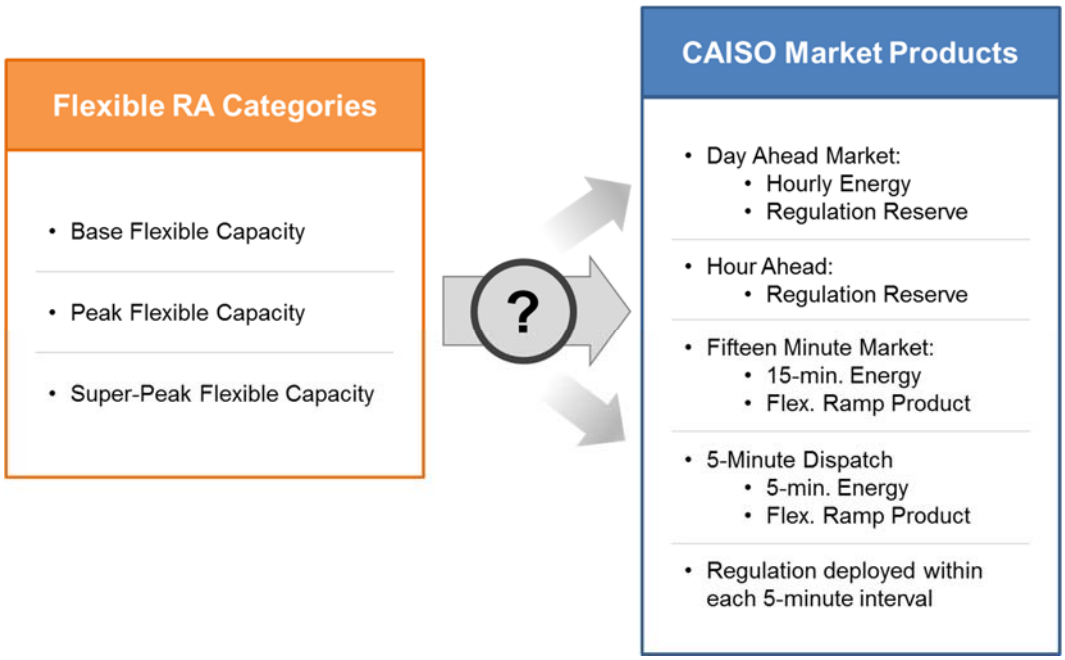
In addition to securing the resources necessary to meet hourly load on a forecast basis, a flexible RA framework should also require LSEs to secure resources that can allow CAISO to (1) meet load on a sub-hourly basis; and (2) respond to conditions that differ from the forecast, such as differences from forecast load or from forecast VER output. Therefore, in addition to the resource plan discussed above, each LSE's annual and monthly showings would also be required to include a specified quantity of resources with the technical characteristics necessary to respond to uncertain load and supply changes that arise closer to real-time. As when designing the FRP, CAISO could calculate the required quantity of flexible capacity to meet uncertainty needs based upon a desired confidence level, developed from actual recent historical experience.

Powerex believes that the forward procurement of flexible resources to meet demand and supply uncertainty should have a direct relationship to the products optimized and deployed by CAISO in its markets. Currently, CAISO schedules and deploys resources in the day-ahead market, the 15-minute real-time market, and the 5-minute real-time market. CAISO also deploys regulation reserve to balance load within each 5-minute interval. In Powerex's view, the categories of forward flexible RA products adopted in any long-term framework should be linked directly to the nature of the energy deployments the CAISO will make to address uncertain changes and demand and supply as they arise. Specifically, Powerex recommends exploring up to three specific categories of flexible RA products:

Category	Technical Requirement	Why it is necessary
15-minute Flexible Capacity	Deployed/positioned in Real Time Pre-Dispatch • 22.5 minute lead time	• Error in hourly load or VER forecast • Variation in load or VER output within each hour
5-minute Flexible Capacity	Deployed/positioned in Real Time Dispatch • 2.5 minute lead time	• Error in 15-minute load or VER forecast • Variation in load or VER output within each 15-minute interval
Regulation Reserve	Deployed every 4 seconds via Automatic Generation Control	• Error in 5-minute load or VER forecast • Variation in load or VER output within each 5-minute interval

Powerex believes that by aligning the definition of flexible RA products with the CAISO's operational deployments of energy, and by requiring a specified quantity of each product that is based on CAISO's expected needs, the CAISO can be confident that the flexible RA program will result in the forward procurement of the right quantity and quality of flexible capacity necessary to meet its operational needs.

This stands in contrast to the CAISO's existing flexible RA supply categories, shown below, which appear to be based on the characteristics of CAISO's existing internal supply, and have no direct relationship to the specific energy products CAISO actually deploys to meet its flexibility needs.



Powerex's proposed framework comprised of three flexible capacity products also appropriately recognize that a tradeoff needs to be made between limiting the number of defined products that are created while making meaningful distinctions between resource characteristics. For example, at one extreme, *all* system conditions that differ from the hourly forecast used in the year-ahead or month-ahead RA showings could be met by procuring a large amount of regulation reserve. While this would maintain reliability, such an approach would be prohibitively expensive because it would require the use of very fast-responding resources to address needs that become apparent far earlier than the second-to-second changes such reserves are designed to manage. Powerex believes the use of three standard flexible RA products (including one product—regulation reserve—which is already defined) strikes a workable solution by directly aligning the forward flexible RA products that must be procured with the timeframes in which CAISO's organized markets operate.

Importantly, adopting multiple flexible RA products would allow each resource to more accurately reflect (and be compensated for) its ability to meet flexibility needs over a range of different timeframes. Rather than using a single measure of a resource's flexibility (*e.g.,* a three-hour ramping period) a resource would be qualified to provide maximum specified quantities of each of the defined flexible RA products outlined above based on the portion of their capacity that can be deployed within the timelines for that product. For instance, in the case of resources seeking to address 5-minute needs, CAISO might define the eligible 5-minute flexible capacity quantity as the maximum change in output the resource can achieve in 5 minutes, with just 2.5 minutes of lead time. In the case of meeting 15-minute needs the maximum change in output the resource can achieve in 15 minutes (with 22.5 minutes of lead-time) might be appropriate. A 100 MW unit with a ramp rate of 2 MW per minute could therefore be qualified to provide 10 MW of 5-minute flexible capacity and an additional 20 MW of 15-minute flexible capacity.[11] Similarly, a 50 MW unit with a ramp rate of 20 MW per minute could be qualified to provide 50 MW of 5-minute or 15-minute flexible capacity.

Powerex emphasizes that any technical criteria established to qualify resources to provide flexible capacity should be technology neutral and should not discriminate between internal and external generation resources. The current focus on the ability of a resource to simply respond to 5-minute dispatch signals allows slow-ramping and long-lead time resources, which may be of limited value in meeting ramping needs, to qualify to provide flexible RA while external flexible resources with significant ramping capabilities are excluded from the market solely because they may only be able to respond to 15-minute or hourly dispatches. Such limitations ultimately prevent flexibility needs from being met on a least cost basis by excluding resources that may be able to

[11] While 30 MW could be deployed in 15 minutes in this example, only 20 MW could be committed as 15-minute flexible capacity if the resource has already committed to provide 10 MW of 5-minute flexible capacity. If the resource committed to provide less than 10 MW of 5-minute flexible capacity, it would be able to increase the amount of 15-minute flexible capacity it provides by a corresponding amount, up to a maximum of 30 MW.

meet flexibility needs more efficiently and effectively than the internal generation fleet. The above proposal would provide for non-discriminatory treatment across all types of resources based only on their ability to be used by the CAISO in the corresponding energy market runs.

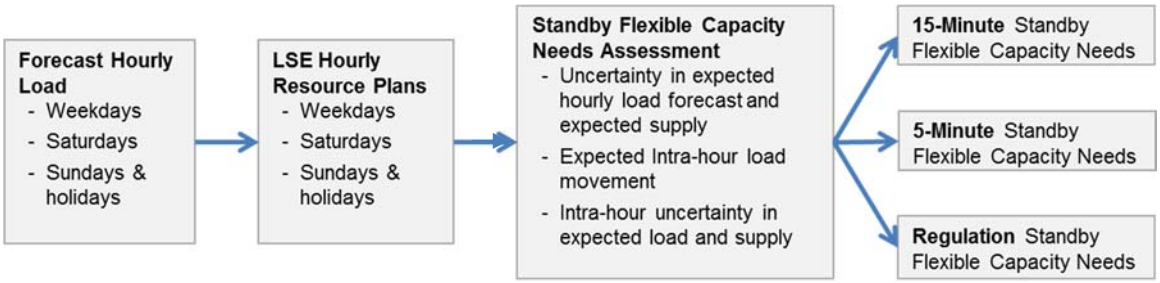
To the extent that an LSE's annual and monthly resource showings do not contain sufficient resources to meet both forecasted hourly demand plus uncertainty, Powerex believes that CAISO should continue to have the authority, subject to a reasonable cure period, to procure resources with the needed operational attributes using its backstop authority. In order to create an incentive for LSEs to procure needed resources in advance, Powerex believes that any resources procured through CAISO's backstop authority should be drawn from the pool of fast-start resources capable of meeting uncertainty needs, with the associated costs allocated to the deficient LSE. Because such resources can be expected to come at a premium over the slower starting resources that would otherwise be capable of meeting forecast hourly demand, using fast-start resources to meet any deficiencies will create a powerful incentive for LSEs to procure sufficient flexible resources in advance of each compliance period.

Powerex believes that applying the conceptual distinction between forecasted hourly demand and uncertainty to the flexible RA framework will ensure that CAISO has sufficient resources to meet the full range of inter- and intra-hour flexibility needs in the long-term. Rather than creating financial incentives to maintain the existing internal generation fleet, designing a flexible RA program around the nature of CAISO's flexibility needs will send price signals for the maintenance of those existing resources—as well as the development of new resources—that are best-suited to meeting CAISO's flexibility needs going forward.

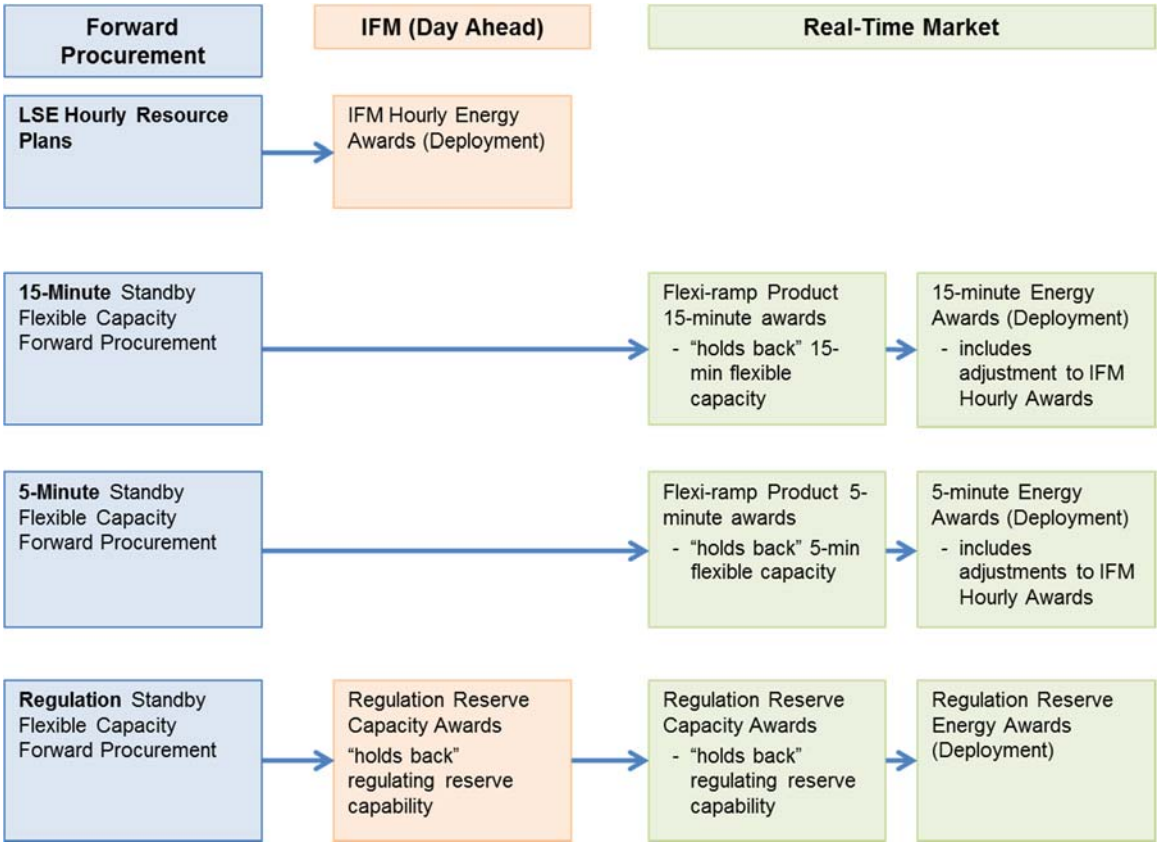
In addition, designing a flexible RA program around the distinct drivers of flexibility needs, defined in a manner that is consistent with the deployment of those resources in the CAISO's operational markets, will align the CAISO's flexible RA program with the design of CAISO's existing market optimization processes. By securing resources in advance and requiring committed resources to submit corresponding offers in the day-ahead and real-time markets, CAISO's flexible RA program will ensure that there are sufficient resources offered into the day-ahead and real-time markets to meet changes in load under a wide range of circumstances.

In summary, Powerex proposes the following approach:

NEEDS ASSESSMENT AND LSE HOURLY RESOURCE PLANS



FLEXIBLE CAPACITY FORWARD PROCUREMENT AND DEPLOYMENT



II. High PMin Resources

In the Supplemental Issue Paper, CAISO states that it is considering changes to its flexible RA framework to avoid exacerbating oversupply conditions. In particular, CAISO states that it is concerned that the high PMins of resources providing RA and flexible RA can result in, or exacerbate, oversupply conditions and the need to curtail renewable resource output.[12]

[12] Supplemental Issue Paper at 12-13.

Powerex cautions against attempting to manage oversupply conditions through the design of a long-term flexible RA framework. Powerex agrees with Southern California Edison ("SCE") that the issue of the extent to which flexible RA resources with high PMin values are contributing to oversupply conditions is a separate and distinct issue from ensuring that there is sufficient flexible RA for CAISO to balance its system.[13] Resources with high PMins do not create a need for additional flexible capacity, and a high PMin does not make a resource any less flexible within its dispatch range. Moreover, there is no evidence suggesting that limiting the ability of resources with high PMins to provide flexible RA would eliminate oversupply concerns. As SCE observed, "[i]n some cases, over-generation cannot be solved even if every flexible resource has a 0 Pmin."[14]

Ultimately, any concerns that the use of high PMin resources to meet RA requirements is contributing to oversupply is appropriately addressed by ensuring accurate pricing signals and cost allocations when over-generation conditions occur. During periods of oversupply, prices in CAISO should decrease, eventually hitting the bid floor set out in the tariff (currently -$150/MWh), to provide generators with an incentive to reduce output. To the extent that a resource with a high PMin is required to stay online to meet its RA obligations, the owner of the resource will bear the financial consequences of the resource's restrictive operating parameters by facing a low or even negative price for its output while operating at PMin. Owners of resources with high PMin will therefore need to include the costs of operating at PMin into the cost of committing to use that resource to provide flexible RA. This, in turn, will create a disincentive for LSEs to use high PMin resources to satisfy RA requirements and, ultimately, encourage LSEs to commit more flexible resources.

Thus, rather than attempting to address oversupply concerns within the flexible RA framework, Powerex believes this challenge is more appropriately addressed by ensuring accurate and efficient pricing when these conditions occur, and by limiting unnecessary impediments to efficient export transactions.

---

[13] *See* Durable Flexible RA Proposal at 11.

[14] *Id.*