

Powerex Presentation CPUC Flex RA Workshop February 7, 2017



Improvements to the Flexible Resource Adequacy program should focus on the responsiveness quality of flexible capacity, rather than the total quantity

A well-designed Flexible Resource Adequacy program will result in forward procurement of:

1. The right total quantity of flexible capacity to meet maximum continuous ramping requirements each day
 - Setting the requirement too low may jeopardize CAISO's ability to reliably serve load
 - Setting the requirement too high raises consumer costs without providing any reliability benefit
2. The right responsiveness quality of flexible capacity – with the flexibility characteristics capable of meeting the full range of variability and uncertainty conditions each day
 - At one extreme, all Flexible RA requirements could be met through the forward procurement of regulating reserves from fast-ramping, short lead-time resources, but this would be **very expensive**
 - At the other extreme, permitting the entire Flexible RA requirement to be met by any resource that receives a 5-minute dispatch, even if it is relatively inflexible, could **jeopardize reliability**
 - Achieving the **right mix** of flexible resources **at least cost** requires defining different quality “buckets,” and setting procurement requirements and performance criteria for each “bucket.”

Powerex believes that the current total quantity of Flexible RA requirement is reasonable, but improvements are needed to better define flexible capacity responsiveness quality requirements

Flexible Resource Adequacy Requirements Should Distinguish Between Forecasted Net Load Changes and Uncertainty

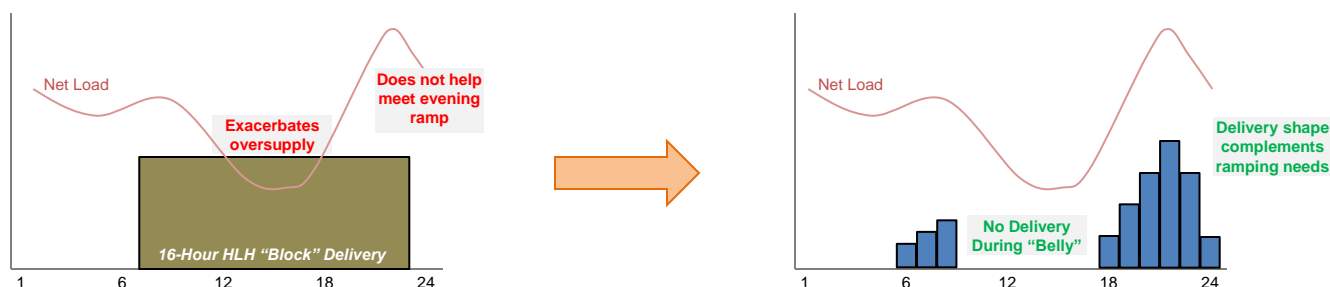
- 1. Forecasted net load changes can be met by a wide range of flexible resources**
 - Long lead time resources
 - Flexibility range of units from Start-up to P_{\min} (not just P_{\min} to P_{\max})
 - Forward import contracts for intra-day “shaped” deliveries
- 2. Real-time uncertainty needs can only be met by flexible resources with short lead times**
 - Fewer options available: e.g., fast ramping natural gas resources, hydro resources on “stand-by”
 - Resources positioned to provide “stand-by” flexible capacity may often incur opportunity costs
 - These factors imply that meeting forecast net load changes can be met more inexpensively than real-time uncertainty needs
- 3. CAISO has recognized the distinction between forecasted changes in net load and uncertainty in its operational markets (in the Flexible Ramping Product design)**

Separating Flexible RA requirements for meeting forecasted net load changes from those for meeting uncertainty would enable a wider range of resources to compete to provide Flexible RA, supporting cost-effective procurement

Forward Import Contracts For Intra-Day “Shaped” Deliveries Can Lower the Cost of Meeting California’s Forecast Net Load Changes

External, clean, large hydro systems can provide substantial flexible capacity, but are currently prevented from competing to provide Flexible RA to California LSEs. Improvements to the Flexible RA program can expand options and lower costs to consumers.

1. A substantial portion of California’s specific flexibility needs are known a month or a year ahead
2. Large, integrated hydro systems can provide additional flexibility through advanced planning
 - Large, integrated hydro systems can provide some amount of “stand-by” flexible capacity
 - But a larger amount of flexibility can be provided through forward planning of hydro system output
3. Current Flexible RA program encourages forward contracting of inflexible “standard block” imports
 - Standard blocks fail to provide flexibility and exacerbate oversupply challenges
 - Lack of incentives to contract for intraday “shaped” deliveries – no LSE credit towards Flexible RA requirement



One potential approach would be to include forward import RA contracts (including any intra-day “shape”) in the calculation of expected net load (similar to the treatment of VERs)

Aligning Flexible RA Requirements for Uncertainty With CAISO's Market Optimization Process

- CAISO currently meets its flexibility challenges through the positioning and deployment of resources in four different intervals (hourly, 15-min, 5-min, regulation)
- The Flexible RA quality “buckets” could be defined based on CAISO’s resource optimization process
- LSEs could procure additional Flexible RA of a higher quality category to meet requirements for a lower quality RA category

Flexible RA Category	Required Quantity	CAISO Energy Market Dispatch	Resource Effective Qualifying Capacity	
Regulating Reserve Up Flexible RA	P95(?) maximum total upward movement within any 5-minute interval in the applicable month	Regulation Up Deployment	Maximum upward capability over 5-minutes	Uncertainty and Intra-Hour Variability
5-Minute Flexible RA	P95(?) maximum total upward movement within any 15-minute interval in the applicable month	RTD Dispatch	Maximum upward capability over 15-minutes	
15-minute Flexible RA	P95(?) maximum total upward 15- movement within any 60-minute interval in the applicable month	RTPD Dispatch	Maximum upward capability over 60-minutes	
Hourly Flexible RA	<u>Remainder</u> of quantity to meet total Flexible RA Requirements (i.e. Max 3-hour net load ramp +3.5% load – 15-min Flex RA – 5 min Flex RA – Regulating Reserve Up Flex RA)	IFM (and HASP)	Maximum upward capability over 180-minutes	Forecast Net Load Changes

Higher Cost
↓
Lower Cost

This approach appears to better achieve the key objective of a Flexible RA program: to procure the right quantity of the right types of flexible capacity resources, supporting grid reliability at least cost to consumers