Effective Flex Capacity Eligibility
Cogentrix Preliminary Proposal

R14-10-010

Resource Adequacy Phase 3 Workshop

California Public Utilities Commission

February 7, 2017

Cogentrix Preliminary Effective Flexible Capacity Requirement Proposal

- In its December 16, 2016 filing, Cogentrix offered a preliminary proposal outlining the following characteristics that should be required for resources to qualify as Flexible Capacity to better meet the needs of a rapidly changing and challenged grid:
  - Can meet forecasted operating levels;
  - 5 to 10 minutes start time (amended to 15 minutes);
  - Ability to start and stop multiple times per day;
  - Minimum run time of no more than 2 hours (amended to less than 2 hours);
  - Sustain upward or downward ramp; and
  - Change ramp directions quickly
- The improvements to the current Flex Capacity product recommended by Cogentrix address one of the several fundamental issues facing the grid today: the Flex Capacity product, as currently defined, does not enable the CAISO to properly address the evolving needs of the grid
  - The current Flex Capacity product was designed explicitly to address the growing 3-hour ramp; however, the rapid rate of renewables penetration has created new ramp needs, such as the intra-hour and single hour ramps, that the current Flex Capacity product is not properly designed to address
- As stated by the CAISO, long start resources make up ~40% of the Flex Capacity fleet as currently defined, of which ~30% are OTC resources; long start resources must be dispatched day-ahead in order to be available to meet real-time flexibility needs, which works against state and grid goals of reducing GHG emissions
  - The CAISO assessment concluded that, with intra-hour variability as high as 17,500 MW last March and at least 12,000 MW each month, roughly 40% of the Flex Capacity fleet is unlikely to be available to address real-time flexibility needs
- Cogentrix recognizes and applauds the CAISO and CPUC for initiating the FRACMOO2 and RA Phase 3 processes in light of the above issues; however, based on the CAISO's analysis and prevailing market conditions, Cogentrix believes there is a more urgent need for change to address rapidly evolving grid conditions and market signals

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Cogentrix Proposed Changes to Current Flex Capacity Categories

- Cogentrix's proposed changes to the current Flex Capacity categories are aimed at accomplishing two goals: 1) Drawing more distinction between different types of flexible resources to better match their characteristics with the evolving needs of the grid, and 2) Compensating resources properly for the incremental reliability services that they provide to the grid
- **Proposed Category 1:**
  - Defined to prioritize the most flexible resources available to the grid that are able to cycle multiple times during the day due to fast start times and short minimum run times
  - The start time requirement of 15 minutes is aligned with the current Fifteen Minute Market ("FMM")
  - Procurement of capacity that qualifies for proposed Category 1 is important to ensure that the intra-hour and one hour ramp needs can be met without relying on longer start resources that would need to be dispatched out of merit and lead to increased risk of over-generation and excess GHG emissions
    - The Flex Capacity product, as designed today, is not equipped to address the intra-hour and one hour ramp needs
- **Proposed Category 2:**
  - Prioritizes resources that are still relatively fast start, and are able to be committed based upon hour-ahead forecasts, but are unable to achieve the shortest start times necessary to meet the intra-hour ramp needs
  - The primary role of proposed Category 2 resources is to ensure that that the maximum 3-hour ramp needs can be met without relying on long start resources that may need to be dispatched out of merit and increase the risk of over-generation and excess GHG emissions
- **Proposed Category 3:**
  - Preserves the flex definition for longer start resources that are still dispatchable for optimization and day-ahead planning
- CAISO should be making a determination of each level of product required on both a one-year ahead and a five-year ahead basis, and the CPUC should require the priority of Category 1 procurement

Cogentrix Proposed Changes to Current Flex Capacity Categories (cont.)

- Cogentrix's proposal aims to change the some characteristics of generation that qualifies as Flex Capacity under the current criteria
  - The primary objective is to realign the categories to ensure the survival of the most flexible resources by tightening, mainly, the Category 1 definition
  - Flexible resources are not currently differentiated from less flexible resources, and the proposed criteria is based on differences between widely understood types of dispatchable generation technologies
  - Cogentrix does not prescribe the amount of each Category required, the CAISO will need to do so upon further analysis of the various ramp needs, but simply proposes that the expedient solution is to base criteria upon what is practicable and rooted in real technological differences
- The start time criteria is intentionally based on the Fifteen Minute Market interval, which allows the most flexible resources to recognized for the flexibility they bring the market in which those resources are committed, and aligns the energy and RA markets
- Availability requirements and multi-year forward procurement requirements as proposed are CAISO best practices
  - Cogentrix is not attempting to reinvent the wheel with its own analysis, and the CAISO's efforts and analysis should be relied upon
  - CAISO, along with many other stakeholders, has supported concepts related to multi-year forward RA procurement in its comments on this proceeding

Increasing Ramp Needs Drive Urgency for Change

- The Cogentrix proposal is responsive to known facts
  - The belly of the duck, as reported by the ISO, is materializing deeper and faster than anticipated
  - The CAISO FRACMOO2 process is anticipated to take another year to complete and could be potentially delayed until the 2019 RA season
  - The economics of existing generation continue to deteriorate
    - Witness the layup of Sutter, the bankruptcy of La Paloma and the early retirement of Moss Landing 6&7
  - Encina scheduled for OTC shutdown 12/31/17
- There is no debate that shorter start times, shorter run times and more starts per day improve flexibility of the resources available to CAISO
- The Cogentrix proposal takes known facts about the conditions on the grid, combined with known facts about the capabilities of resources on the grid, to:
  - Align Flex criteria with how the grid is currently operated,
  - Be consistent with findings around the intervals at which the grid will need to operate in the future
  - Prioritize those units, and
  - Make a proposal that can be implemented quickly

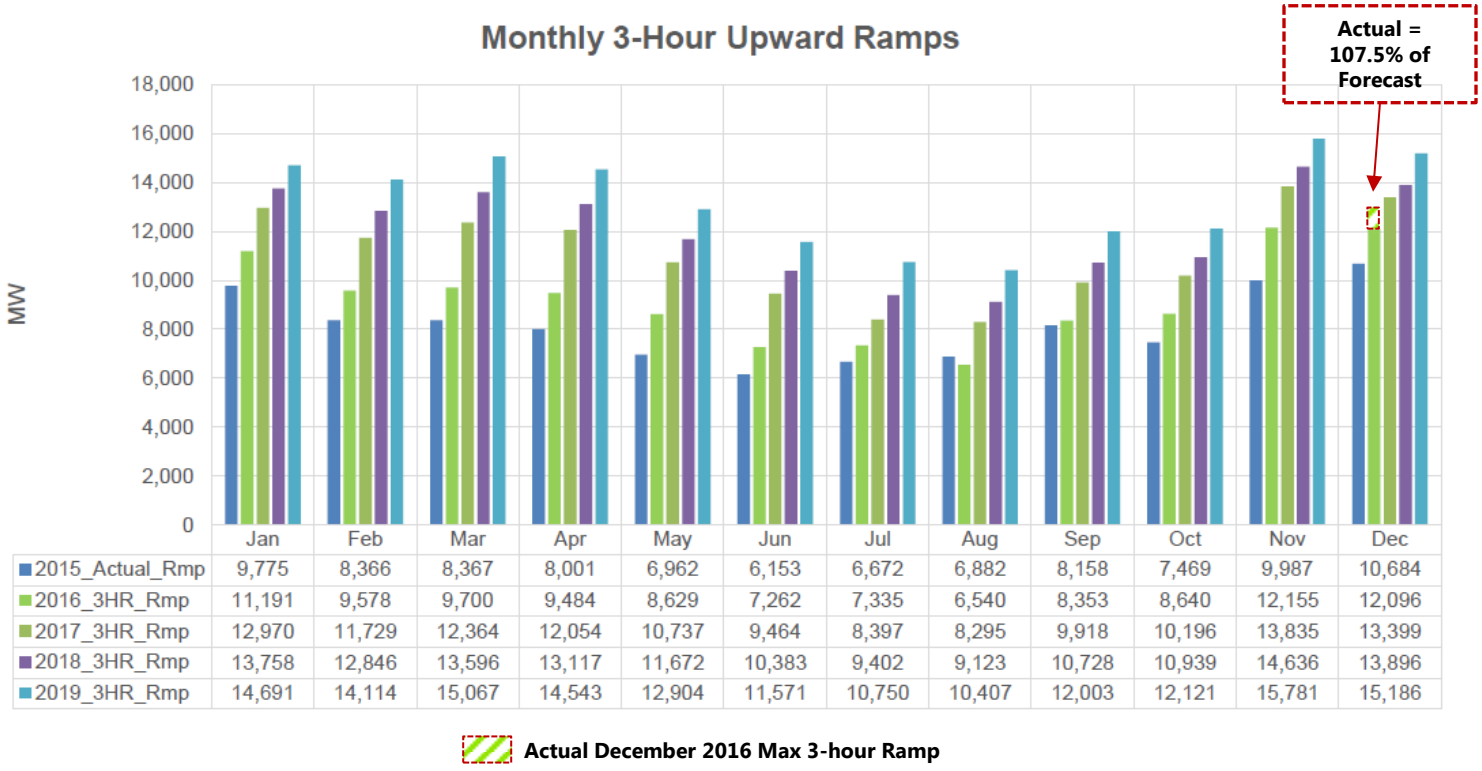
State Energy Agencies Agree on Urgent Need for Flex Capacity Changes

- "The flexible capacity showings to date indicate that the flexible capacity product, as currently designed, is not sending the correct signal to ensure sufficient flexible capacity will be maintained long-term." - **CAISO 11/8/16[1]**
- "There is a growing need for flexible resources to compensate for hourly changes in variable renewable generation and energy demand, as well as outages for power plant maintenance and seasonal variations in hydropower generation. Currently, natural gas-fired power plants offer the most flexibility for quickly, reliably, and cost-effectively ramping up or down to balance supply or demand." - **CEC 10/7/16[2]**
- "In order to reach the best solutions to cost-effectively provide reliability, we must analyze the Phase 3 issues in context and we must be willing to make changes to the existing RA structure. . . Accordingly, while we consider additional modifications, we will also explicitly consider removing, simplifying, or modifying existing rules with the goal of ensuring that the revised RA program is cost-effective, based in clear reliability principles, and not more complex than appropriate to meet our goals." **- CPUC 9/13/16[3]**
- "A standard one-hour time resolution was sufficient to match large amounts of renewable resources with firming resources that can compensate for the intermittency of renewables. However, operational concerns in the California electrical system are increasingly focused on much shorter time scales. For example, there may be plenty of reserve generation capacity but a lack of fast-responding resources that can follow a rapid change in generation and load. Thus, key characteristics of firming resources include not only total capacity, but response times and ramp rates…" – **CEC 12/15/16[4]**

[1] FRACMOO2 Supplemental Issue Paper: Expanding the Scope of the Initiative, November 8, 2016
[2] Draft Integrated Energy Policy Report Update, Docket 16-IEPR-01, October 7, 2016
[3] Assigned Commissioner and Administrative Law Judge's Phase 3 Scoping Memo and Ruling, September 13, 2016
[4] California Energy Commission – Tracking Progress – Resource Flexibility, December 15, 2016

Increasing 3-Hour Ramp Needs Drive Urgency for Change

- Several parties question the timing of changes to criteria, but Cogentrix merely recognizes that system requirements are changing faster than proceedings and processes have been able to implement decisions
- As of the filing of the CAISO FRACMOO2 Supplemental Issue Paper (November 8, 2016), the expected maximum 3-hour upward ramp forecast in December 2016 was 12,096 MW



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015_Actual_Rmp	9,775	8,366	8,367	8,001	6,962	6,153	6,672	6,882	8,158	7,469	9,987	10,684
2016_3HR_Rmp	11,191	9,578	9,700	9,484	8,629	7,262	7,335	6,540	8,353	8,640	12,155	12,096
2017_3HR_Rmp	12,970	11,729	12,364	12,054	10,737	9,464	8,397	8,295	9,918	10,196	13,835	13,399
2018_3HR_Rmp	13,758	12,846	13,596	13,117	11,672	10,383	9,402	9,123	10,728	10,939	14,636	13,896
2019_3HR_Rmp	14,691	14,114	15,067	14,543	12,904	11,571	10,750	10,407	12,003	12,121	15,781	15,186

- The actual peak three hour ramp in December 2016 was nearly 13,000 MW, closer to the forecasts for the spring of 2018 or December 2017; the challenges of the duck curve have effectively been advanced at least one year
- This follows the largest three hour net ramp load in 2015 of 10,684 MW versus a forecast of 9,940 MW
- As much as the ISO has adjusted for what is has learned, the maximum net load ramp continues to exceed forecasts

Sources: CAISO FRACMOO2 Presentation, December 9, 2016; CAISO Oasis.

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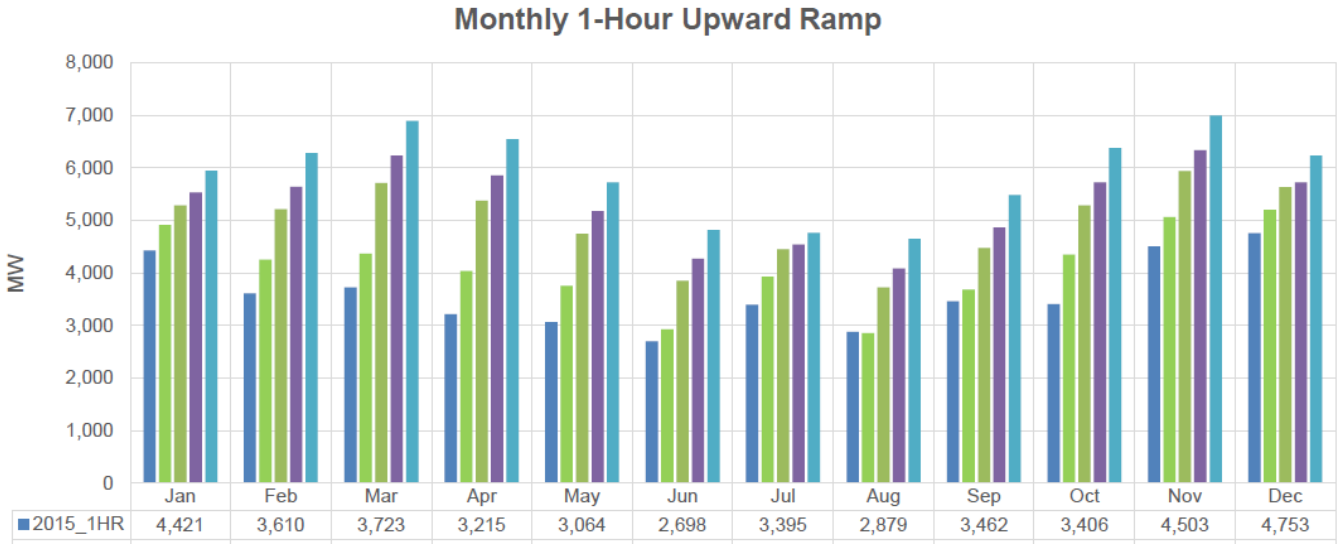
Increasing 1-Hour & Intra-Hour Ramp Needs Drive Urgency for Change

- The current Flex Capacity product was designed by the CAISO **explicitly** to address the growing 3-hour ramp
- In its FRACMOO2 Supplemental Issue Paper, the CAISO raises a concern that has not garnered enough attention to date; with the emergence of large single hour ramps, it is no longer only the 3-hour ramp that poses significant challenges to grid reliability
- The CAISO states a need to commit long start resources well in advance of the net load ramps to address both the single hour and 3-hour ramps
  - The need to commit more long start resources will result in increased over generation and/or curtailment of wind and solar resources, which works against state and grid goals



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015_1HR	4,421	3,610	3,723	3,215	3,064	2,698	3,395	2,879	3,462	3,406	4,503	4,753
2016_1HR	4,908	4,250	4,366	4,039	3,753	2,926	3,929	2,854	3,684	4,342	5,061	5,197
2017_1HR	5,285	5,214	5,711	5,372	4,745	3,847	4,445	3,725	4,474	5,280	5,938	5,632
2018_1HR	5,529	5,635	6,230	5,856	5,172	4,265	4,539	4,088	4,865	5,717	6,330	5,725
2019_1HR	5,941	6,279	6,891	6,544	5,725	4,818	4,763	4,648	5,479	6,372	6,990	6,232

- Many parties, including Cogentrix, agree that multi-year forward RA procurement would provide a strong market signal to generators; however, adopting multi-year forward RA procurement alone does not address and resolve the fundamental issue at hand, which is the fact that the Flex Capacity product, as defined today, does not enable the CAISO to properly address the flexibility needs of the grid
  - The evolution of the net load ramp(s) clearly indicates that Flex Capacity needs to be refined to better match resource characteristics with grid needs
- Cogentrix's call for urgency is grounded in the clear evidence that: 1) system requirements are evolving faster than the CAISO and CPUC have been able to implement proper market design changes, and 2 the current market construct fails to properly incentivize truly flexible capacity to stay online

Source: CAISO FRACMOO2 Presentation, December 9, 2016.

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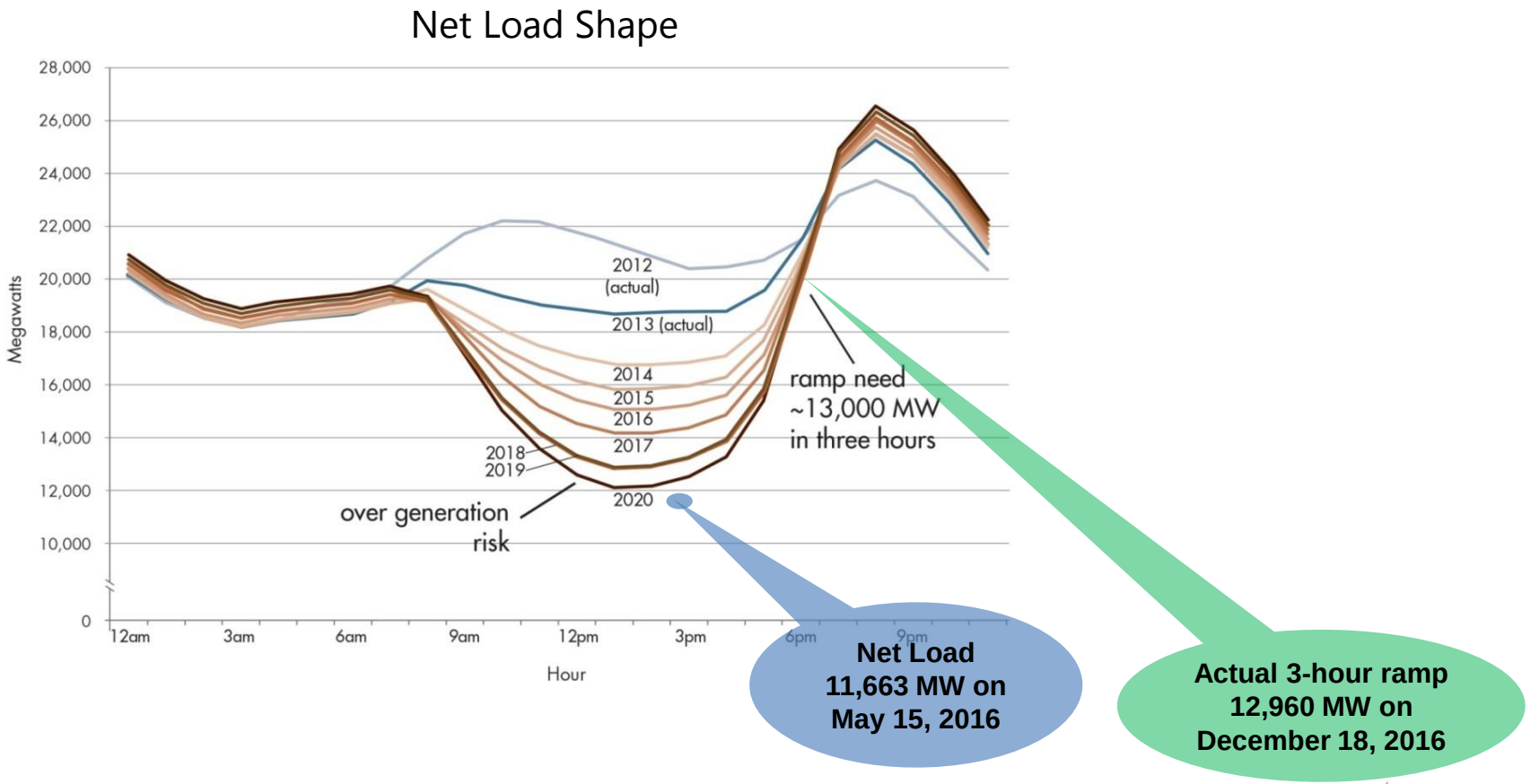
Additional Increasing Ramp Needs

- Incremental resources, such as behind-the-meter solar, will continue to drive unexpected increases in net ramp
  - ScottMadden notes, "No appreciable effect of distributed, behind-the-meter solar resources is detected in the data…yet: system load continues to remain fairly constant with historical patterns."[1]
    - So, for all of the maximum 3-hour ramp forecast exceedances, behind-the-meter solar has not even begun to have significant effect
  - In addition to what has been installed over the past several years, 10,200 MW of permitted utility-scale renewable resources have yet to be built
    - Incremental resources will place as much as a 1:1 requirement for fast-start resources on the system
    - This effect is not dissimilar from "Saturation", as defined by Calpine in its ELCC proposal filed in response to the CPUC Phase 3[2]
- Fast-start and dispatchable in-ISO resources are limited
  - The total amount of gas-fired CTs in the state is just over 12,000 MW[3], an amount that, anecdotally, cannot cover the maximum net ramp experienced in CAISO even if 100% of the units were fast-start, which they are not
  - As reliance upon imports grows and becomes more critical, EIM ramping capacity testing has been below expectations[4]
  - Additionally, nearly 3,300 MW of OTC units are slated for retirement by the end of this 2017; 7,200 MW of OTC units have compliance dates in the next four years

1. ScottMadden, Energy Industry Update, Fall 2016, Page 36
2. Calpine Corporation Preliminary Phase 3 Proposals, December 16, 2016, p. 4.
3. CEC data
4. RTO Insider, "EIM Sees Sharp Increase in Flexible Ramping Test Failures," January 19, 2017

Increasing Duck Curve Ramp

- Three hour ramping requirements are several years ahead of the 2014 forecast
- The ISO has more recently reported that the 2020 maximum three hour net ramp is forecast at 15,000 MW
  - The 2014 forecast was approximately 14,400 MW
  - The current forecast is 3,000 MW more than available from dispatchable CTs inside the ISO
  - Simple interpolation, however imprecise, implies a 2018 ramp of 14,000 MW, two years earlier than the 2014 forecast
- Net load is fully 4 years ahead of the 2014 forecast



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Flex RA Bridge Procurement Proposal

- Due to potential delays in the schedule for implementation of proposed changes to criteria for EFC, delays in new Flex Capacity coming online and ramp rates continually exceeding forecasts, Cogentrix proposes a new interim backstop procurement
- The Flexible RA Bridge Procurement program would only be eligible to existing merchant peaking plants that meet an eligibility test consistent with the proposed Category 1 criteria
  - Eligibility test would include full ramp startup in 15 minutes or less, minimum run time of less than 2 hours, multiple starts per day and the ability to ramp up and ramp down
- Based on long-standing precedents for RA procurement and cost allocation
- Depending upon CAISO analysis may also prioritize Local Area resources
- Serves as an insurance policy for the delays mentioned above as the ISO's FRACMOO2 process and the CPUC's RA Phase 3 process continue to find a comprehensive long-term solution, while maintaining consistency with the current market construct and limitations of existing resource technologies
- Meets the primary goal of the CPUC of ensuring that any revised RA program is cost-effective, based in clear reliability principles, and not more complex than appropriate to meet its goals