California ISO

Flexible Resource Adequacy Criteria and Must Offer Obligation – Phase 2

Draft Flexible Capacity Framework

November 20, 2017

Table of Contents

1. Executive Summary

The original FRACMOO proposal was an initial step toward ensuring that adequate flexible capacity was available to the ISO to address the needs of a more dynamic and rapidly transforming grid. The FRACMOO proposal represented the first ever flexible capacity obligation in any ISO market, recognizing that a resource adequacy program should include both the size (MW) of resource needs and the flexible attributes needed (e.g., dispatchability and ramp rate). The ISO anticipated making enhancements to the original FRACMOO design and tariff provisions once it had experience operating under a flexible capacity paradigm and better understood the system's flexible capacity needs, especially in light of the ISO's changing operational needs as the system relies more on variable and distributed energy resources. The ISO's assessment of the current flexible capacity product shows that it is overly inclusive, and risks exacerbating the ISO's operational challenges by sustaining largely inflexible resources (long starting, long minimum run times, and high Pmins) at the expense and financial viability of more flexible resources.

The general concern is the current flexible RA product fails to address fundamental gaps between the ISO's markets and operational needs. The ISO seeks to close this gap by developing a new flexible RA framework that more intentionally captures both the ISO's operational needs and the predictability (or unpredictability) of ramping needs. Changes to the flexible capacity product and flexible capacity needs determination should align forward procurement with the ISO's actual operational needs and how the ISO commits and dispatches resources through the various market runs (i.e. Integrated Forward Market, fifteen-minute market, five-minute market runs).

Success of a flexible RA program must include meeting anticipated ramping uncertainty within the time scales of the real-time market. The most efficient way to address this anticipated uncertainty is to develop flexible capacity rules and products that are tied directly to two types of ramping needs:

1) Predictable: known and/or reasonably forecastable ramping needs, and

2) Unpredictable: ramping needs caused by load following and forecast error.

The new flexible RA framework should address both predictable and forecastable ramping needs with the unpredictable and uncertain ramping needs. First, by ensuring there is sufficient capacity economically bid into the ISO day-ahead market to establish a market solution (as opposed to solutions that rely on penalty parameters) that properly shapes resources in the day-ahead to the forecast load shape, and second by ensuring enough fast ramping and responsive resources are procured and available in real-time to address uncertainty.

The ISO also conducted an assessment of the distribution of real-time uncertainty. These distributions provide the basis for how much real-time uncertainty should be addressed in the planning horizon. The final determination regarding the appropriate level of uncertainty to procure must be determined through collaboration between the ISO, LRA's, and other stakeholders.

The results of the ISO assessment show that it must manage a significant quantity of uncertainty between the day-ahead and real-time markets. This uncertainty can be over 4,000 MW in either direction, swinging more than 6,000 MW in any single day, and can occur even during the largest net-load ramps. Therefore, the ISO requires flexible RA products that include eligibility criteria focused on the ramping speed and dispatch capabilities to address these needs.

To address these needs, the ISO is proposing to develop three flexible RA products:

1) Five-minute flexible RA

2) Fifteen-minute Flexible RA

3) Day-Ahead Shaping RA

These flexible capacity requirements will be structured such that procuring higher quality resources will meet other identified needs. The ISO will work with stakeholders to determine the final eligibility criteria and must-offer obligations; however, initial criteria will focus on a resource's ability to ramp over a given timeframe. This new framework will include improved opportunities for imports and VERs to provide flexible RA capacity.

Given the need to create a more interconnected market, the ISO is also exploring additional market enhancements to enhance reliability, improve system control, and address real-time supply and demand uncertainty. These enhancements include developing a fifteen-minute IFM market, developing a day-ahead load following reserve product, exploring means to better ensure resources follow their Dispatch Operating Target (DOT), and investigating the root cause of recent intertie declines and any potential market changes necessary to mitigate this as a recurring problem.

2. Stakeholder Comments on Working Group Presentation

The ISO received twenty-four sets of comments to the working group discussion. Many of the comments showed general support for the ISO's conceptual framework. However, based on comments, it was also clear that a significant amount of additional detail was required and that the needs and products required additional clarity. Therefore, as opposed to responding directly to individual requests for clarity and specific comments, the ISO, in this draft flexible capacity framework, has added significant study details, modified the needs determinant put forward in the working

group to better align with operational needs, and clarified the product sought. A brief synopsis of all comments received are included in Appendix A.

3. Stakeholder Engagement Plan

The FRACMOO2 flexible capacity framework initiative schedule is shown below. The ISO's intent is to move this framework into the CPUC's resource adequacy proceeding where parties can further discuss how the framework informs needed resource capabilities, and how it should be incorporated into the CPUC's resource adequacy program.

Milestone	Date
Revised straw proposal posted	May 1, 2017
Revised straw proposal stakeholder meeting	May 8, 2017
Stakeholder written comments due	May 22, 2017
Working group meeting	September 26, 2017
Draft Flexible Capacity Framework posted	November 17, 2017
Draft Flexible Capacity Framework stakeholder Meeting	November 29, 2017
Stakeholder Written Comments Due	December 13, 2017
Draft Final Flexible Capacity Framework posted	Late January 2017
Draft Final Flexible Capacity Framework stakeholder Meeting	Early February 2018
Stakeholder Written Comments Due	Mid February 2018
Next steps	Complete coordination with CPUC's RA proceeding prior to Board Approval of final flexible RA Framework

4. Background

In 2014, the ISO filed, and FERC subsequently approved, tariff revisions to implement the ISO's FRACMOO proposal. The ISO developed the original FRACMOO proposal and accompanying tariff provisions through an extensive stakeholder process in collaboration with the CPUC, municipal utilities, investor-owned utilities, generators, environmental groups, and other market participants. The FRACMOO proposal was a first step toward ensuring that load serving entities procured and offered resources to

the ISO that would ensure the ISO had sufficient flexible capacity to reliably operate a transforming grid that was growing more reliant on distributed and variable energy resources. The tariff provisions resulting from that effort provided the ISO with a flexible capacity framework. Specifically, the FRACMOO tariff provisions established:

- A study methodology for determining flexible capacity needs and allocating those needs to local regulatory authorities;
- Rules for assessing the system-wide adequacy of flexible capacity showings;
- Backstop procurement authority to address system-wide deficiencies of flexible capacity; and
- Must offer obligations to ensure the ISO has the authority to commit and dispatch flexible resources through its markets.

When the ISO filed the tariff revisions to implement the FRACMOO proposal with FERC, the ISO stated:

> This simplified initial approach provides a smooth transition to establishing durable flexible capacity requirements. The ISO has committed to re-evaluating the effectiveness of the flexible capacity requirements in 2016 to consider, among other matters, whether enhancements are needed to meet system flexibility needs or to allow resources that are dispatchable on a fifteen-minute basis to fulfill a portion of the flexible capacity needs.[1]

The original FRACMOO proposal was an initial step toward ensuring that adequate flexible capacity was available to the ISO to address the needs of a more dynamic and rapidly transforming grid. The FRACMOO proposal also represented the first ever flexible capacity obligation in any ISO market, recognizing that a resource adequacy program should include both the size (MW) of resource needs and the attributes of the resources providing them (e.g., dispatchability and ramp rate). The ISO expected to make enhancements to the original FRACMOO tariff provisions once it had experience with a flexible capacity paradigm and better understood the system's flexible capacity needs, especially in light of the ISO's operational needs.

One of the initial FRACMOO goals was simplicity and an opportunity for a variety of resource types to provide flexible capacity. The rules allowed for virtually all technology types to offer flexible capacity, regardless of operational attributes like start-up time and minimum run-time. These rules also did not impose requirements on the dispatch frequency of resources. This highly inclusive set of eligibility criteria gave LSEs broad discretion over how to meet their flexible capacity requirements. It has also allowed the

[1] Transmittal letter at p. 19.

ISO to gain important insights into how well-suited the flexible capacity resources shown would meet future ISO reliability needs, and what signals were being sent to the market for mid-term and long-term flexible resource procurement. The ISO's assessment shows that the current flexible capacity product is overly inclusive, and risks exacerbating the ISO's operational challenges by sustaining largely inflexible resources (long starting, long minimum run times, and high Pmins) at the expense and financial viability of more flexible resources.

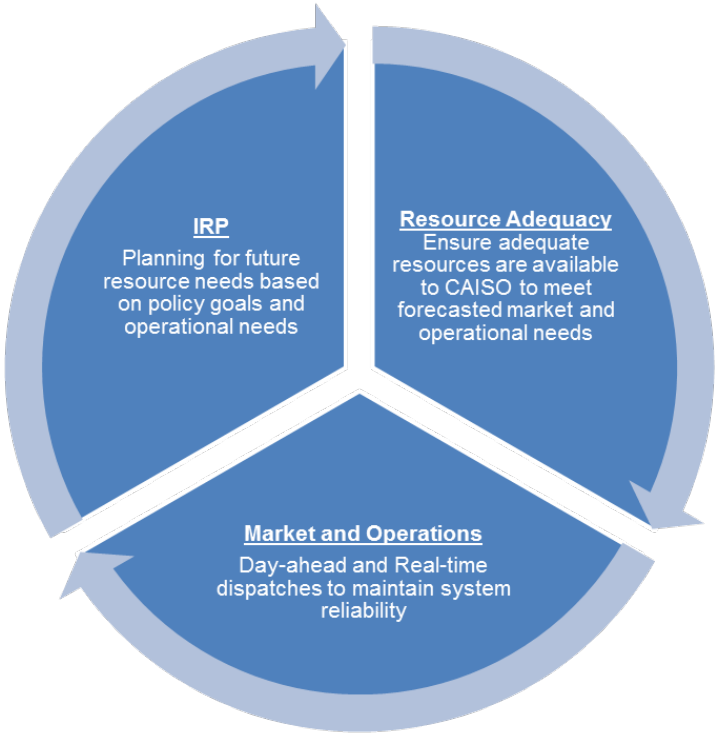
Ultimately, ISO grid operations and operation needs are determined by resource planning decisions, including resources additions and retirements. The selection of resources to build, maintain, and retire all impact the ISO ability reliably operate the grid with RA resources. Figure 1 shows how resource planning and procurement are critically connected to ISO operations. Any enhancements to the flexible RA program should inform both the Integrated Resource Plan at the CPUC and RA programs across all LRAs. Therefore, the ISO's flexible RA framework should achieve the following overarching goals:

1. Provide signals to help ensure the efficient retention and retirement of existing resources; and

2. Provide the ISO a resource portfolio that meets grid reliability needs through economic market dispatch, including a Flexible RA program that ensures access to the flexibility of the fleet to ensure reliable grid operation all hours of the year.

The current flexible RA product does not ensure either of these goals is met. For example, over 4,000 MW of once-through cooling resources have been shown as flexible RA resources. These OTC resources are planned to retire over the next couple years and are infrequently dispatched in day-ahead and, therefore, unavailable to address real-time market needs.

Figure 1: A unified vision guiding planning, procurement, and operations



Given the need to create a more interconnected market, the ISO is also exploring additional market enhancements to enhance reliability, improve system control, and address real-time supply and demand uncertainty. Specifically, the ISO will:

- Develop a fifteen-minute IFM market: This product will make IFM schedules more granular and allow the ISO to better shape dispatches, reducing the amount of load following required between IFM and FMM.
- Develop a day-ahead load following reserve product: This product is similar to the existing real-time flexible ramping product; however, it is designed to ensure there is sufficient load following capabilities (both up and down) reserved between day-ahead and real-time markets.
- Exploring means to better ensure resources follow their Dispatch Operating Target (DOT): ISO operators already manage a significant amount of uncertainty in real-time. Resources not following their DOT is a contributor. Therefore, the ISO will explore policy changes that set clearer standards and requirements for resources to follow their DOT, with potential performance charges for failure to do so. For example, the ISO may change DOT for VERs from forecast to commitments based on market outcomes. Significant deviations from DOT would result in additional charges beyond the current uninstructed energy charges.

- Investigating the root cause of recent intertie declines and any potential market changes necessary to mitigate this as a recurring problem: In its review of several days when the ISO system became capacity constrained, the ISO identified instances when significant quantities of imported energy committed in the IFM did not show up in real time. The ISO is analyzing the root cause of these declines and may modify market rules to correct this concern as necessary.

5. Proposed Flexible Capacity Framework

In November 2016, the ISO published a supplemental issue paper to expand the scope of the FRACMOO2 stakeholder initiative. As part of the supplemental issue paper, the ISO conducted a preliminary assessment of historic flexible RA showings finding "that the flexible capacity product is not sending the correct signal to ensure flexible capacity will be maintained long-term."[2] The ISO identified numerous issues and potential enhancements to mitigate these concerns in the supplemental issue paper, and explored these issues more thoroughly in the Revised Straw Proposal – Short-Term Solutions.[3]

The general concern is the current flexible RA product fails to address fundamental gaps between the ISO's markets and operational needs. The ISO seeks to close this gap by developing a new flexible RA framework that more deliberately captures both the ISO's operational needs and the predictability (or unpredictability) of ramping needs. Changes to the flexible capacity product and flexible capacity needs determination should closely align with the ISO's actual operational needs in alignment with the ISO's various market runs (i.e. Integrated Forward Market, fifteen-minute market, five-minute market runs).

Success is not simply whether the flexible RA fleet can meet a known *ex-ante* determined ramp, but whether it also can meet anticipated ramping uncertainty within the time scales of the real-time market. Under the current flexible RA paradigm, there is no assurance the flexible RA resources procured are capable of meeting real-time ramping uncertainty. Enhancing the flexible RA product to incorporate ramping speed sends an important longer-term procurement signal to the market to ensure the ISO has the resource's procured and available to satisfy anticipated, yet unpredictable ramping needs. The most efficient way to address this anticipated uncertainty is to develop flexible capacity rules and products that are tied directly to both known and unknown ramping needs. As such, the ISO will work with stakeholders to:

[2] http://www.CAISO.com/Documents/AgendaandPresentation-FlexibleResourceAdequacyCriteriaMustOfferObligationPhase2-SupplementalIssuePaper.pdf
[3] http://www.caiso.com/Documents/RevisedStrawProposal-FlexibleResourceAdequacyCriteriaandMustOfferObligationPhase2.pdf

A. Develop critical linkages between RA and energy markets to ensure the ISO is able to meet grid reliability needs through its markets, accounting for uncertainty (including load forecast error, VER forecast error, and outages and other resource deviations);
B. Provide a framework for intertie and VER resources to be part of the flexible capacity solution; and
C. Provide LSEs and LRAs flexibility to meet system, local, and flexible capacity needs in ways that best align with their business and policy objectives.

The remainder of this section provides the basis of a new flexible RA framework in three steps.

1) Identify the ramping needs that flexible RA should be procured to address;

2) Quantify the capacity needed to address all identified needs; and

3) Establish criteria regarding how resources qualify for meeting these needs.

The allocation of needed flexible capacity requirements is not addressed in this framework proposal. The ISO seeks stakeholder feedback regarding equitable allocation methods, which the ISO will take up in the next iteration of this framework.

Once a complete flexible capacity program is established that achieves goals A-C above, the ISO believes it will then be possible to replace the existing flexible capacity products with this new design construct.

5.1. Identifying Ramping Needs

The ISO reviewed the day-to-day operational system needs pertaining to flexible capacity.[4] The ISO sees flexible capacity needs breaking down into two categories:

1) Predictable: known and/or reasonably forecastable ramping needs, and

2) Unpredictable: ramping needs caused by load following and forecast error.

These two types of flexible capacity needs– predictable and unpredictable– drive different forms of flexible capacity procurement needs. Predictable and reasonably forecastable ramping needs require a fairly large set of resources economically bidding into the ISO's day-ahead market to properly shape the DA market to meet forecastable ramps. This allows the ISO to create a feasible market dispatch in the day-ahead market without relying on penalty parameters or exceptional dispatches. However,

[4] The ISO issued a revised straw proposal in the initiative on May 1, 2017. Based on stakeholder feedback and continued assessment of system operational needs, the ISO will not pursue further action on that proposal.

once the ISO produces a day-ahead dispatch solution the ISO must rely on real-time market dispatches to account for unpredictable ramps caused by uncertainty and load following.

The ISO's flexible capacity framework is based on connecting these two ramping needs into a single larger framework. The remainder of this section describes each type of ramping needs in greater detail.

5.1.1. Predictable and forecastable ramping needs

The current flexible RA product needs determination is based on the largest forecasted three hour net load plus 3.5 percent expected net load.[5] The net load ramp is driven largely by the setting of the sun during the non-summer months when the ramps are greatest. Numerous stakeholders have questioned the need for a specific RA product predicated on ramps that are largely predictable. The ISO agrees that these ramps are largely forecastable on a day-to-day basis; however, this does not mean forward procurement to meet these ramps is not important for continued reliable operations. Setting up a fleet of resources to meet day-ahead net load ramps allows the ISO to better shape day-ahead commitments. Specifically, a deeper pool of resources that can be flexible in the IFM through day-ahead hourly economic bids will improve the efficiency of the ISO dispatch and management of renewable resources.

To date, the ISO manages most resource commitments through the IFM process. The ISO does not expect this to change. However, the ISO expects net-load ramps to grow and minimum net-load to decrease over time. This will likely lead to ramp constraints within the RA fleet and require additional exceptional dispatches if not addressed. As such, the ISO proposes to maintain a product for, and assessment of, flexible capacity that ensures there is sufficient bid range to cover the forecasted maximum three hour net load ramps. The ISO envisions that this day-ahead shaping product will provide the resources the ISO needs to shape IFM commitments based on market based solutions and should mitigate the need for exceptional dispatches and CPM designations. The objective of this product will be to improve ISO market efficiency and send signal to the market about how well procurement profiles are able to facilitate increased VER penetration. Additionally, this tool will provide information about the likelihood and frequency of exceptional dispatch CPM designations.

5.1.2. Unpredictable and uncertain ramping needs

With the continued expansion of variable energy resources and behind the meter solar photovoltaic systems, both load and generation output will continue to create

[5] The 3.5 percent portion of this equation was originally established to address overlap between flexible RA provisions and contingency reserves. However, the basis for determining the quantity of contingency reserves needed has since been revised.

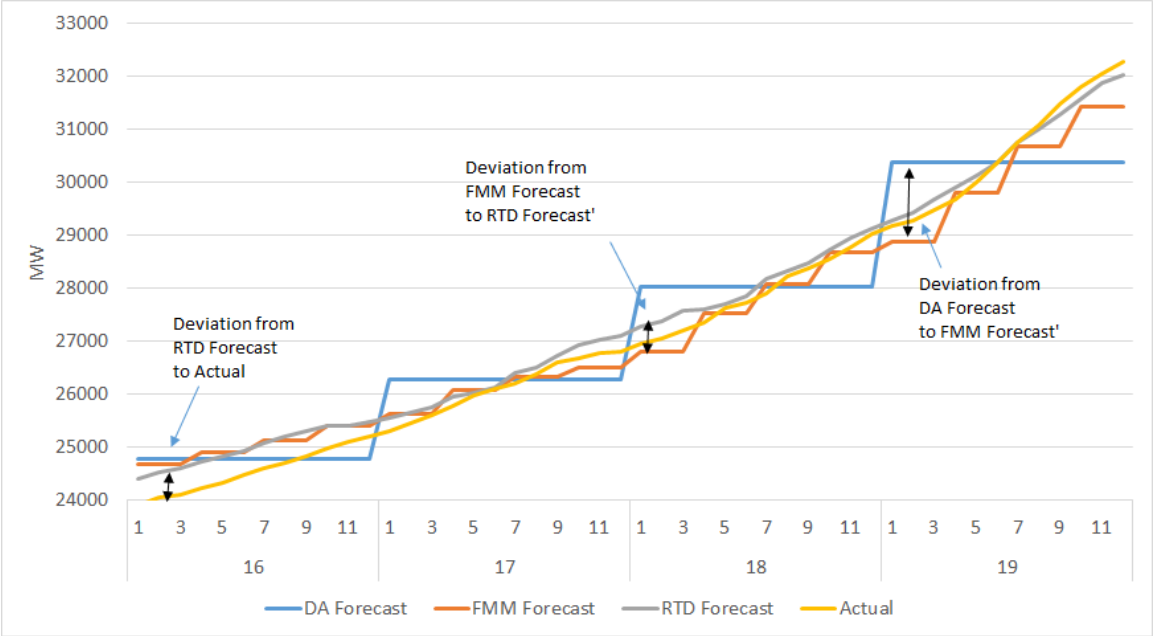
greater uncertainty between the day-ahead and real-time markets. The ISO has always faced this uncertainty. The ISO's IFM and residual unit commitment market is tasked with sending financially binding dispatch awards to generating resources to address forecast load. Once the day-ahead market closes and awards are made, the opportunity to commit additional long-start resources has passed. All remaining uncertainty, including both load following and forecast error, must be addressed by resources previously committed in the IFM or those faster more flexible resources that are committable during the real-time market runs.

The ISO proposes to develop flexible capacity products to address forecast error and load following needs between IFM and real-time dispatch. While the benefits of having sufficient ramping capabilities to address the three hour net load ramp were addressed in great detail through the initial FRACMOO process, the challenges with uncertainty from forecast error and load following in the forward planning horizon did not receive comparable attention. Therefore, the ISO provides here the additional details and descriptions of the challenges and magnitude of issues that must be addressed.

5.1.2.1 Description of Real-Time Uncertainty

Uncertainty between day-ahead and real-time can be addressed at three levels of granularity: between the IFM's hourly dispatch to Fifteen-Minute Market (FMM), the FMM to the Real-time dispatch (RTD), and the RTD and actual operations. Figure 2 depicts each of these types of error/uncertainty.

Figure 2: Forecast error and load following needs between IFM and actual needs



The yellow line in Figure 2 shows the actual net-load the ISO served between hours ending 16 through 19 on a given day. The ISO's first full market run is its IFM. This market is currently run at an hourly granularity using a forecast between 14 to 36 hours ahead of actual operations. This is shown by the blue line. Given the large increments of time and the gap between the market run and operations, there can be significant differences between this commitment and actual operations based on forecast error. This is particularly true during the times surrounding sun rise and sun set. The next ISO market iteration is the FMM, shown by the orange line. It runs every fifteen minutes and uses more up-to-date forecasts and covers shorter time intervals. The FMM should improve on IFM commitments and ensure faster ramping resources are committed in instances were forecast error and/or load following requires it. The FMM represents a more temporally proximate and more granular forecast than the IFM.

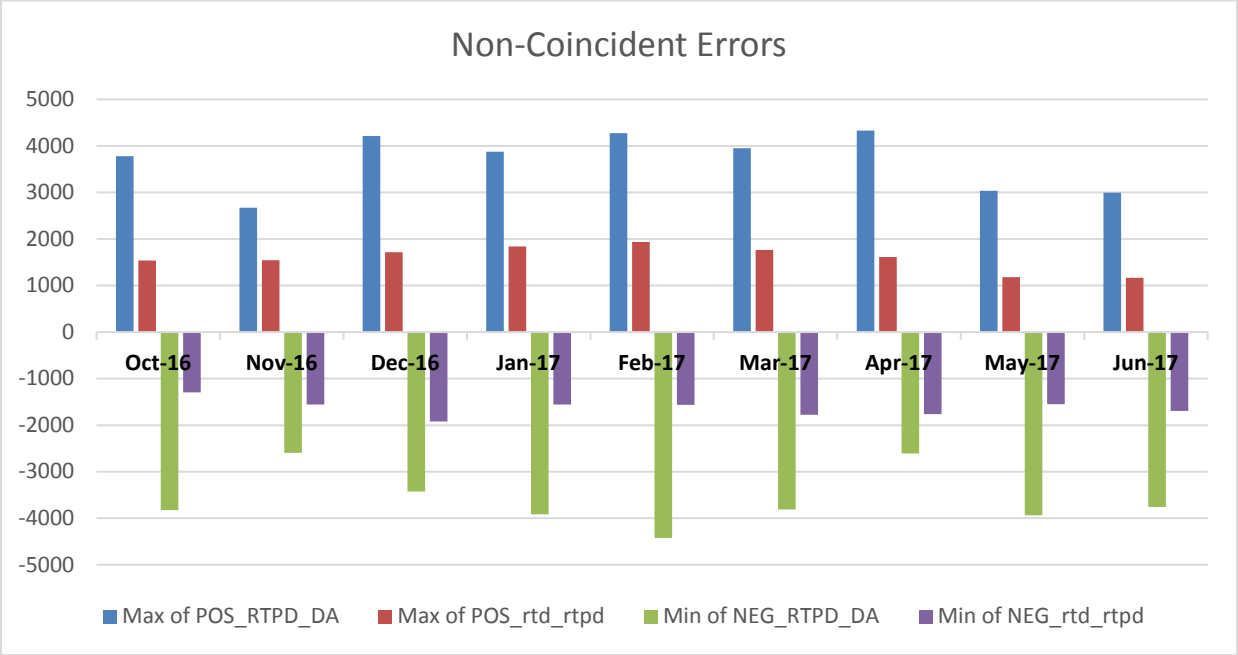
The RTD is even closer and more granular. The RTD is represented by the grey line and is the final market solution run to serve actual load. The RTD is run every 5 minutes, which occurs 12.5 minutes prior to real-time, with actual dispatches sent 7.5 minutes prior to real-time. The objective of each of these iterations is to refine the resource commitment and dispatches, once through IFM, then FMM and again in the RTD. Once RTD has run, forecast errors are still present. Thus, the ISO now relies on regulation to balance the system post RTD. Regulation is procured in the day-ahead market for upward and downward balancing needs. These needs are shown as the difference between the grey and yellow lines.

The ISO notes that regulation is distinct from the other types of uncertainty in three ways. First regulation is explicitly procured through the day ahead market. Second, a resource's ability to provide regulation is based on it having Automatic Generation Control (AGC). Finally there is sufficient regulation capacity available in the system. For these reasons, the ISO does not believe it is necessary to further complicate flexible capacity needs and explicitly consider an additional flexible capacity requirement based on the deviation between RTD and actual load.

5.1.2.2 Defining the Flexible RA Need

The ISO proposes flexible capacity products that address real-time uncertainty, including both forecast error and load following needs that occur between IFM and RTD. The ISO has conducted additional analysis on each of these levels of uncertainty. Figure 3 shows the maximum non-coincident errors for October 2016 through June 2017.

Figure 3: Maximum non-coincident error



As Figure 3 demonstrates, the range of maximum forecast errors (including both upward and downward errors) between FMM and RTD are fairly consistent over all months, ranging between 2,700 MW and 3,600 MW. While the range of maximum forecast errors between the IFM and the FMM shows slightly more deviation, between 5,200 MW and 8,700 MW, these deviations are likely due to weather sensitivity and weather conditions between the IFM and FMM.

Although, these uncertainties are non-coincidental and do not occur on the same day, they do provide a basis for determining how much uncertainty might be needed on a given day and the timeframe within which that uncertainty occurs. However, in recognition of the fact that these errors are non-coincident, the ISO is not seeking to address each source of error independently. The ISO has also conducted an analysis of the coincident errors for these same months. This is shown in Figure 4.

Figure 4: Maximum Coincident Errors

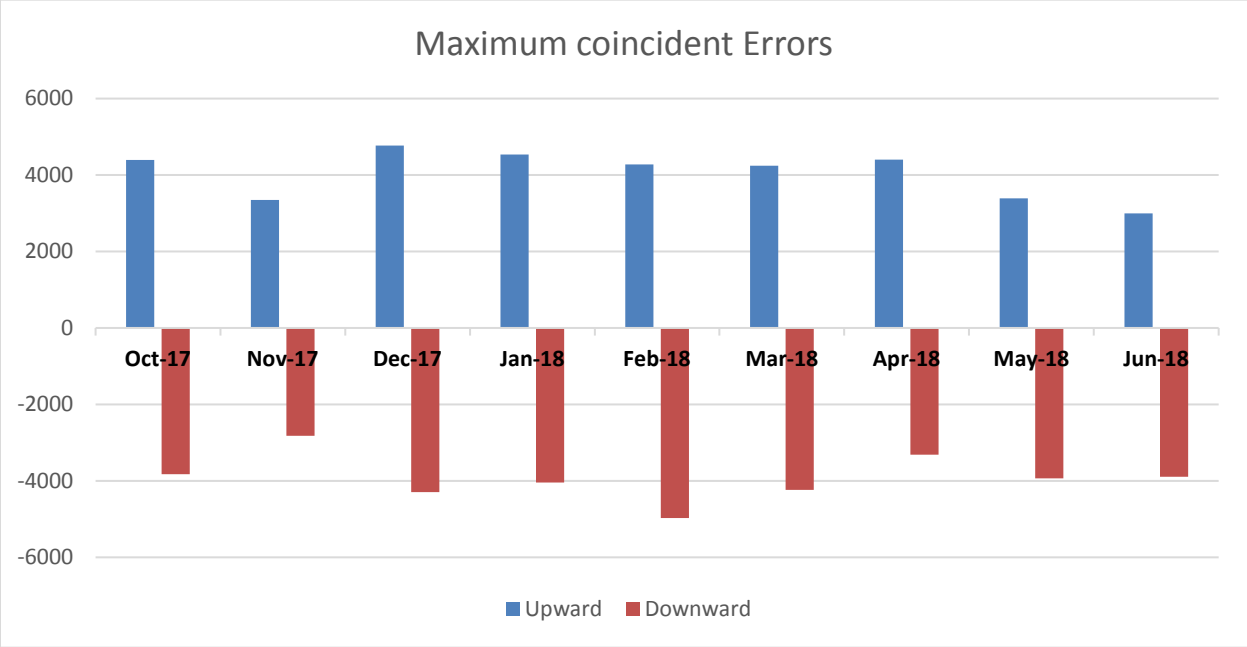


Figure 4 shows the maximum coincident real-time uncertainty by upward and downward ranges. On the days the ISO experienced the greatest coincident uncertainty, almost all the uncertainty was the difference between the IFM and the FMM. While these ranges do not occur on the same days, it is not possible to know which could occur until they are actually realized. Ranges of uncertainty realized on a single day are discussed below.

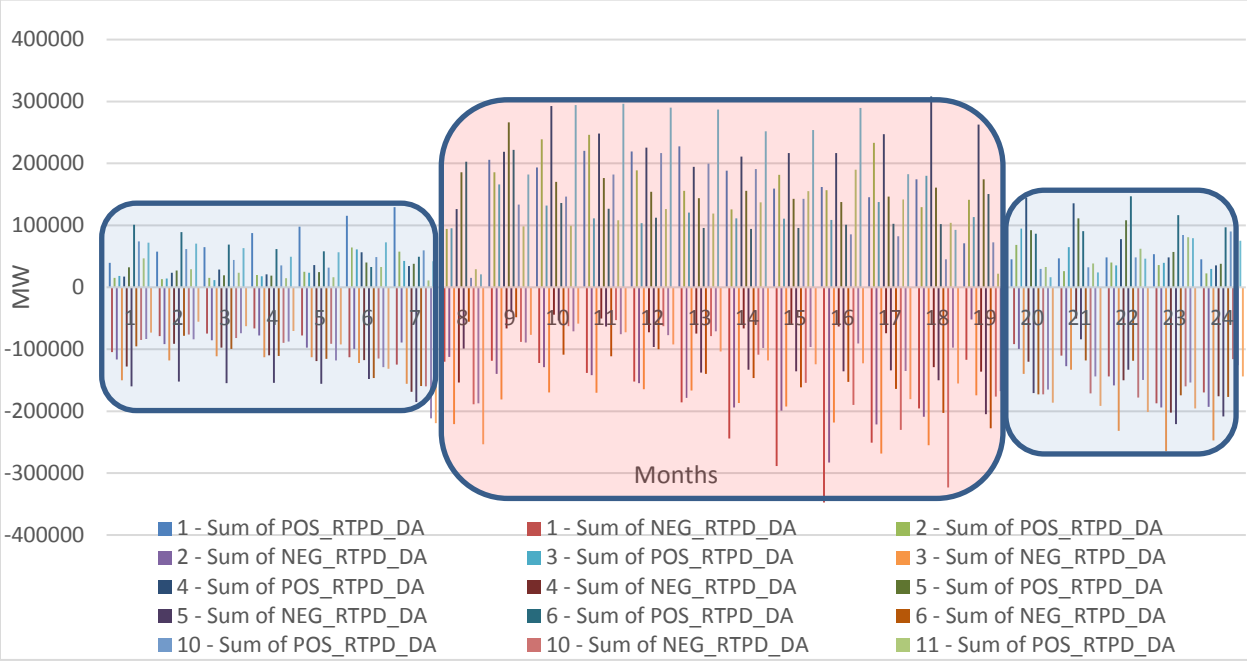
The ISO must be prepared to address the largest uncertainties that occur with the shortest notice. Therefore, Flexible RA needs should first plan for the uncertainty that occurs between FMM and RTD, then extending that planning to longer notice intervals, i.e. IFM to FMM. Resources capable of addressing FMM to RTD needs should also be capable of addressing the uncertainty between IFM and FMM, but additional capacity should be procured to address the larger remaining uncertainty that occurs between IFM and FMM.

Additionally, because the ISO does not know if the uncertainty will be due to under or over-forecast error, flexible RA needs should be procured to cover both upward and downward forecast error ranges. Therefore, while real-time flexible RA may not need to be greater than the maximum coincidental errors, flexible RA requirements should account for the both the upward and downward uncertainty between the FMM to RTD and IFM to FMM.

5.1.2.3 Assessing the timing of uncertainty

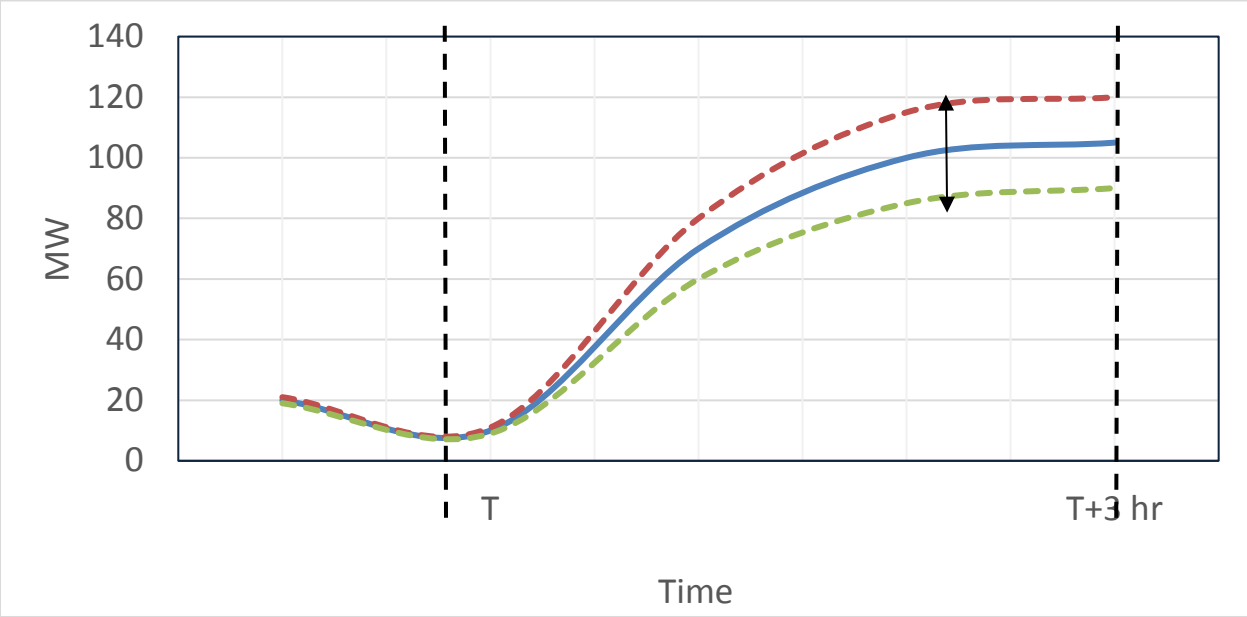
While this uncertainty can occur at any time, the greatest potential uncertainty occurs during daytime hours while load and solar output have the greatest potential for change, including during the largest three hour net load ramps. Figure 5 clearly demonstrates that more forecast error occurs during daylight hours. This is simply a function of more load and VER output leading to greater levels of uncertainty occurring between market runs. Additionally, Figure 5 shows that a fair amount of error occurs during net load ramping intervals, including upward ramping needs.

Figure 5: Timing of Observed Uncertainty



Since the vast majority of the flexible capacity will be ramping up during the three hour net load ramp there should be sufficient downward flexible capacity available during those times to address downward uncertainty. However, additional fast ramping upward flexible capacity may be needed to account for upward uncertainty. This uncertainty is demonstrated in Figure 6.

Figure 6: Uncertainty During the Maximum Three Hour Net Load Ramps



Given this potential need for additional upward ramping capabilities during the three hour net load ramps, the ISO has undertaken a preliminary assessment of the largest three hour net load ramps and the potential need for additional upward flexibility. The ISO's initial assessment compared the forecast error on the 5 largest three hour net load ramps between October 2016 and December 2016.[6] Based on this preliminary analysis, the ISO finds that there is still a fair amount of upward ramping capability required during three hour net load ramps to address uncertainty. Figure 7 shows the uncertainty that was observed during these ramps.

[6] At the time of publication, the ISO did not have the required 2017 PI data cleaned and prepared for this analysis

Figure 7: Observed Uncertainty During Maximum Three Hour Net Load Ramps (Oct 2016-Dec 2016)

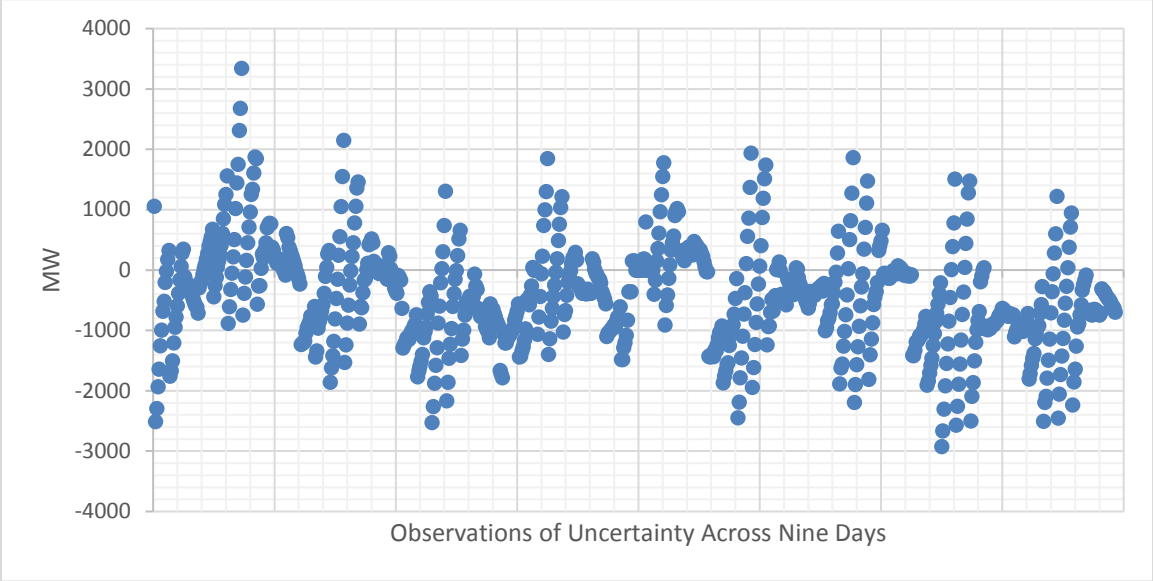


Figure 7 shows that it is fairly common (i.e. occurred on nine of the fifteen days studied) for the ISO to require an additional 1,000 MW to 2,000 MW of upward ramping capabilities to address forecast error and load following needs during the steepest 3 hour net load ramps.

5.2. Quantifying Flexible Resource Adequacy Needs

The new flexible RA framework should address both predictable and forecastable ramping needs with the unpredictable and uncertain ramping needs. First, by ensuring there is sufficient capacity economically bid into the ISO day-ahead market to establish a market solution (as opposed to solutions that rely on penalty parameters) that properly shapes resources in the day-ahead to the forecast load shape, and second by ensuring enough fast ramping and responsive resources are procured and available in real-time to address uncertainty.

The remainder of this section quantifies how much capacity is needed to address each type of ramping need. Although the ISO will provide as much detail as possible, the final determination regarding the appropriate levels procured for each identified need must be determined through collaboration between the ISO, LRA's, and other stakeholders. Therefore, the ISO seeks stakeholder input regarding the information provided below and different potential procurement levels and their implications.

5.2.1. Determining the overall flexible capacity need

The ISO believes maintaining the existing flexible capacity needs determination using the maximum forecasted three hour net load ramp plus contingency reserves

should continue serving as the preliminary starting point since the interplay between contingency reserves and flexible capacity identified in the original FRACMOO process still exists. However, with the modifications to NERC standard on calculating contingency reserve "WECC Standard BAL-002-WECC-2a "Contingency Reserve", the means for determining the quantity of contingency reserves has changed. Based on the new requirement, the Operating Reserve - Spinning portion of the contingency reserve requirement is about 3% of the expected load. As such, the ISO will modify the existing 3.5 percent expected peak load portion of the flexible capacity requirement to be consistent with the revised standard. Specifically, the ISO proposes to change the flexible requirement formula to the following:

Maximum 3-Hour ramp + 3% of the monthly expected peak load

Further, the ISO proposes to add a portion of the upward uncertainty measure to the overall flexible capacity need. As detailed in section 5.1.2.3, above, the ISO also requires additional upward flexible capacity to address uncertainty, even during the largest three hour net load ramps. While the uncertainty during the largest three hour net ramps is less than required during other times, including morning ramps and even smaller three hour net load ramps, it can still routinely reach 2,000 MW.

The ISO's analysis on this matter is still preliminary. Therefore, it is not possible to fully quantify this need. However, for purposes of this proposal, the ISO proposes to use 50 percent of the identified real-time uncertainty. As the ISO completes its analysis, this percentage can be adjusted.

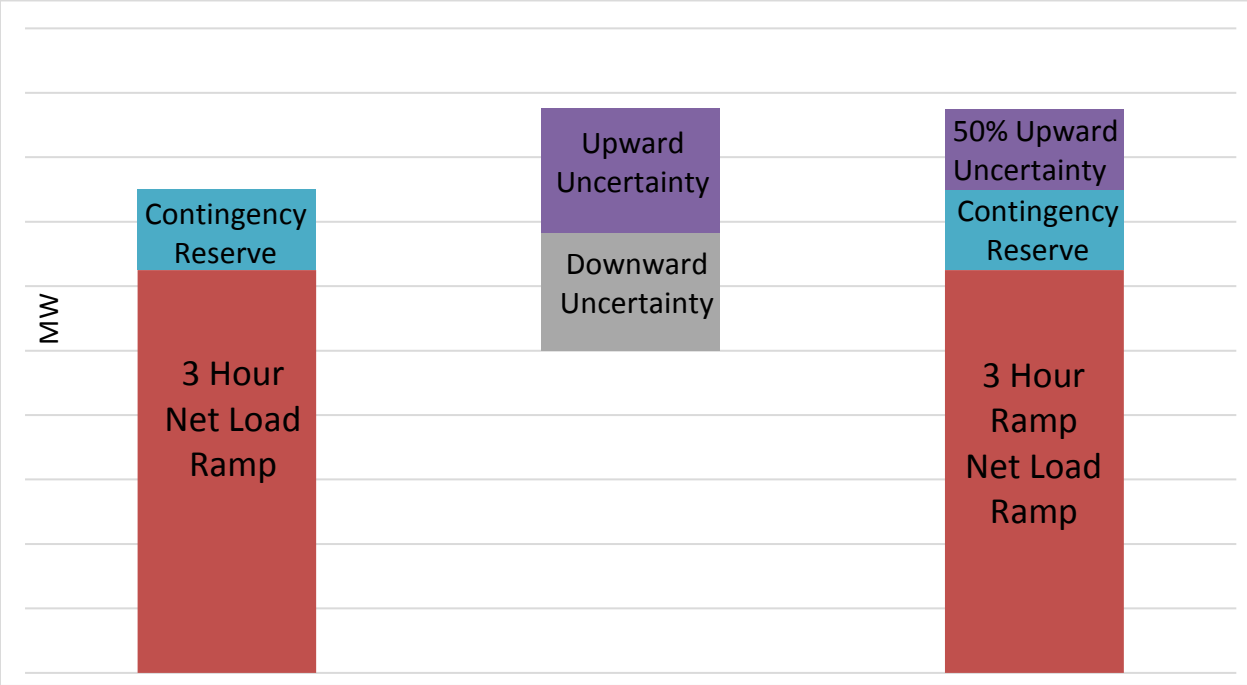
Finally, since the inception of the flexible capacity product there has been an increase in ISO dispatches of VER resources, both through economic bidding and curtailed self-schedules. This makes forecasting the three hour net load ramp more challenging. As a result, the ISO will enhance its forecasting study to account for these dispatches. Therefore, the ISO will reconstruct overall available wind and solar output and include this quantity into the formulation of the three hour net load ramp. However, this means that the ISO must also modify how wind and solar resources are considered in meeting the flexible RA requirements. The ISO's proposed changes to the treatment of wind and solar resources for EFC are discussed in greater detail below.

Combining all off these elements yields an overall flexible capacity needs determination of:

Maximum 3-Hour ramp + 3% of the monthly expected peak load + 50% of incremental real-time incremental flexible capacity need

Figure 8 provides an illustration of how these needs stack to establish an overall flexible RA need.

Figure 8: Establishing Overall Flexible RA Needs



5.2.2. Determining the need for real-time flexible capacity

The ISO has also conducted an assessment of the distribution of real-time uncertainty. These distributions provide the basis for how much real-time uncertainty should be addressed in the planning horizon. Again, the final determination regarding the appropriate level of uncertainty to procure must be determined through collaboration between the ISO, LRA's, and other stakeholders. Table 1 shows the maximum observed MW range of potential upward and downward uncertainty between October 2016 and June 2017.

Table 1: Observed Uncertainty, Maximum Positive and Negative Ranges

Month	Max Positive error DA-FMM	Max Negative error DA-FMM	Max Error Range DA-FMM	Max Positive error FMM-RTD	Max Negative error FMM-RTD	Max Error Range DA-FMM
October	3781	-3826	7606	1537	-1297	2834
November	2673	-2591	5264	1542	-1557	3099
December	4210	-3428	7638	1715	-1921	3636
January	3877	-3912	7789	1842	-1559	3401
February	4276	-4421	8697	1933	-1565	3498
March	3950	-3813	7763	1761	-1779	3540
April	4331	-2610	6941	1615	-1765	3380
May	3033	-3938	6971	1178	-1548	2726
June	2996	-3753	6750	1164	-1693	2857

Table 1 shows that maximum of errors within a month for DA to the FMM (shown by the range between the maximum error of 4,276 MW of upward error and 4,421 MW of downward error) just under 8,700 MW, the minimum was 5,264 MW, and the average was 7,269 MW. The range of errors between FMM and RTD shows a maximum range of 3,636 MW of error, a minimum of 2,726 MW, and an average of 3,219 MW.

While these values represent the maximum monthly ranges, the ISO also conducted an assessment of the distribution of these ranges by both non-coincident percentiles (percentile of any given observed error) and by daily coincident ranges (i.e. the maximum swings that occurred on a single day). Table 2 and Table 3 show the distributions of non-coincident observed uncertainty ranges between October 2016 and June 2017.

Table 2: Percentile Rankings for observed error range: IFM to FMM

DA-FMM	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
100.0%	3781	2673	4210	3877	4276	3950	4331	3033	2996
99.5%	2617	1933	3324	2821	3154	2392	3254	2411	2346
97.5%	1597	1311	2244	2006	2281	1761	2332	1885	1671
95.0%	1200	1041	1798	1590	1575	1260	1865	1479	1426
87.5%	706	634	971	906	863	666	1164	886	901
75.0%	303	299	454	446	356	189	621	419	465
50.0%	-147	-149	-72	-49	-130	-278	-5	-79	-77
25.0%	-579	-541	-555	-636	-632	-780	-493	-591	-597
12.5%	-968	-845	-950	-1098	-1179	-1222	-868	-999	-1006
5.0%	-1367	-1207	-1435	-1728	-1811	-1708	-1254	-1467	-1497
2.5%	-1698	-1449	-1966	-2185	-2198	-1980	-1544	-1820	-2063
0.5%	-2286	-1902	-2765	-3046	-3049	-2587	-1981	-2789	-2958
0.0%	-3826	-2591	-3428	-3912	-4421	-3813	-2610	-3938	-3753

Table 3: Percentile Rankings for observed error range: FMM to RTD

FMM-RTD	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
100.0%	1537	1542	1715	1842	1933	1761	1615	1178	1164
99.5%	1041	1104	1027	974	1255	991	1016	723	780
97.5%	734	718	668	669	760	626	646	516	511
95.0%	566	534	504	536	572	464	497	404	405
87.5%	347	290	280	321	310	263	294	258	246
75.0%	183	145	147	167	160	115	155	129	113
50.0%	10	0	-2	13	-2	-33	-9	-37	-51
25.0%	-133	-137	-161	-134	-183	-217	-220	-223	-232
12.5%	-256	-275	-317	-283	-366	-391	-401	-376	-384
5.0%	-420	-447	-509	-471	-610	-611	-609	-575	-558
2.5%	-565	-583	-650	-632	-760	-770	-783	-704	-699
0.5%	-871	-871	-1019	-996	-1025	-1093	-1096	-1017	-1165
0.0%	-1297	-1557	-1921	-1559	-1565	-1779	-1765	-1548	-1693

Figure 9 and Figure 10 show the complete distribution of the uncertainty ranges. As these figures show, currently, the levels and distributions of uncertainty are fairly consistent across months. While there are observations with high quantities of uncertainty, these observations are infrequent, as shown by the steep drop off in each of the tails in each figure below. These distributions also show that average error is

approximately zero, meaning the uncertainty is fairly symmetric (i.e. the forecast is equally likely to be either over or under actual load).

Figure 9: Distribution of IFM to FMM Uncertainty Ranges

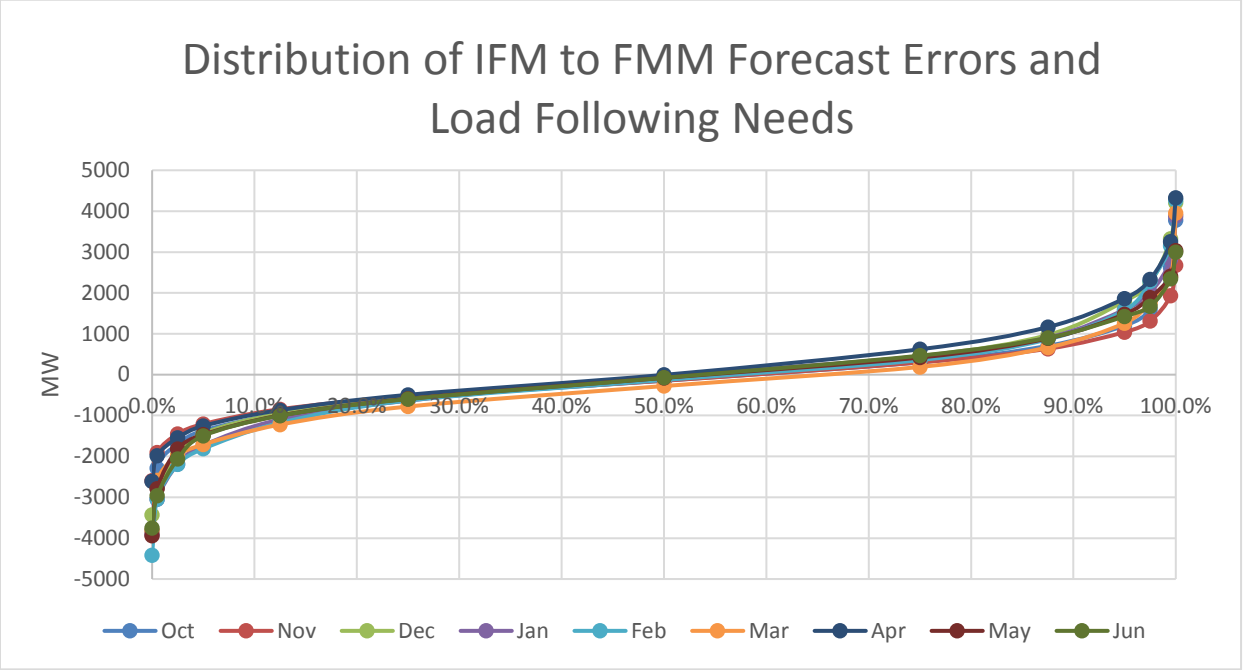
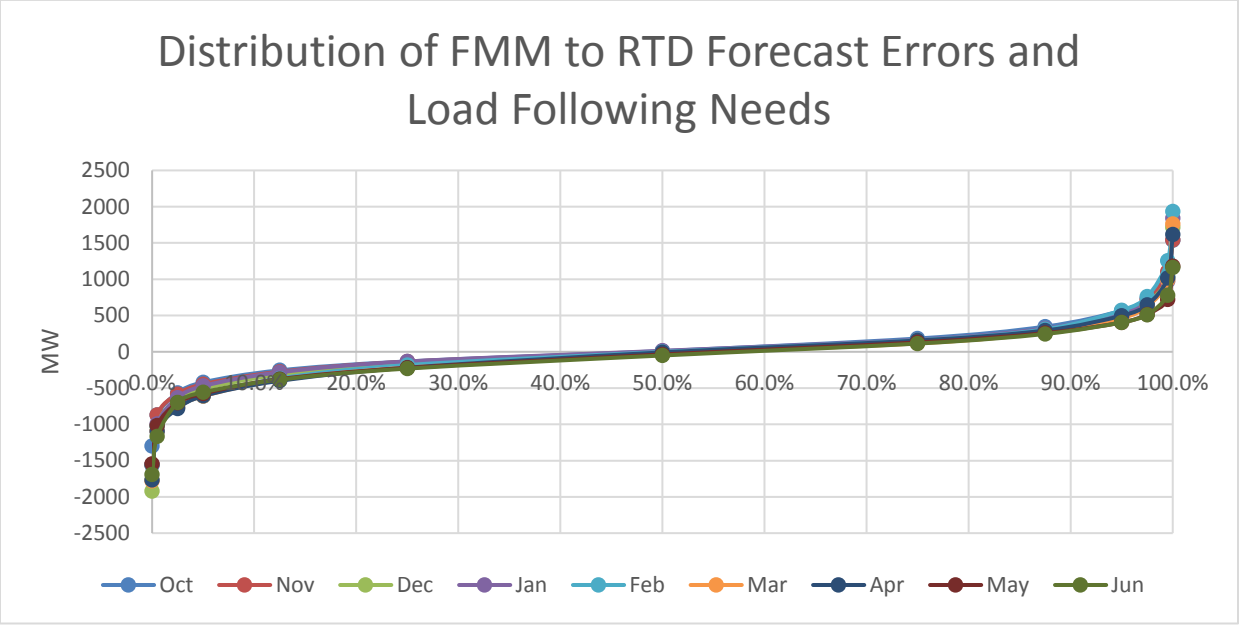


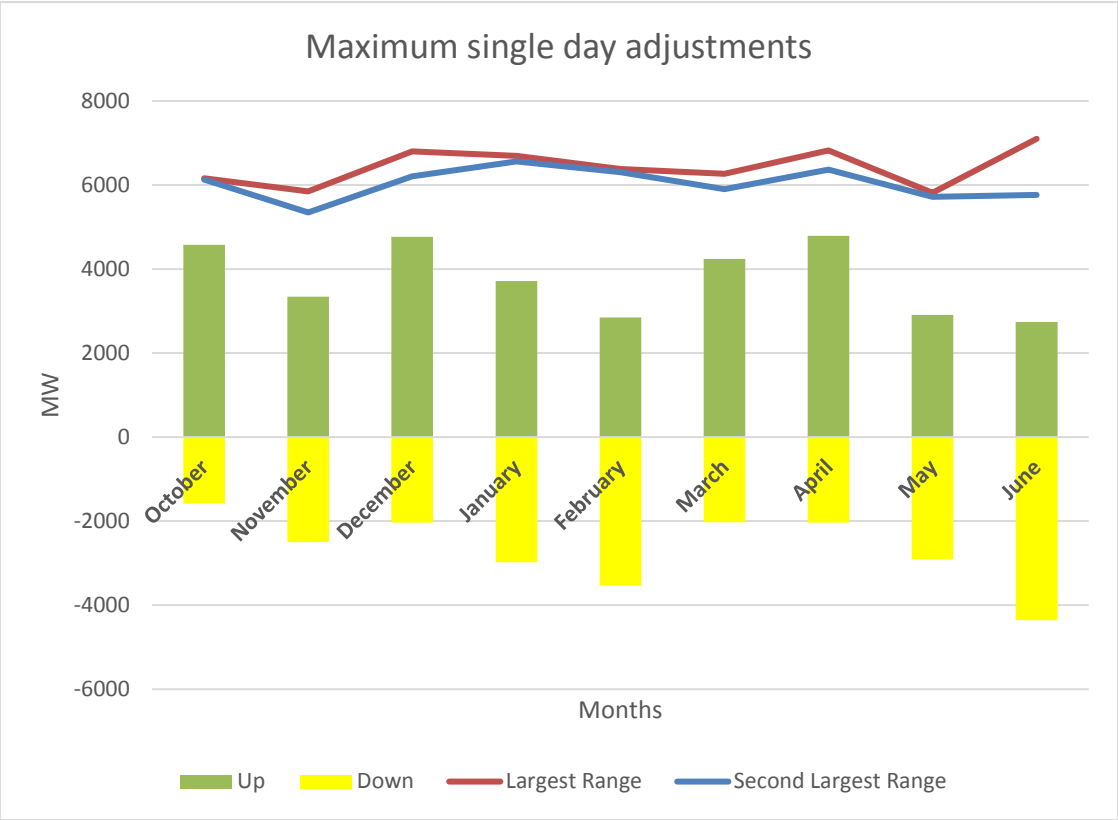
Figure 10: Distribution of FMM to RTD Uncertainty Ranges



Additionally, while monthly ranges are important to assess overall variability, it is critical to understanding what this range could look like within a single day. Figure 11 shows the two largest ranges observed on any given day within a month. These are

shown as the red and blue lines respectively. Additionally Figure 11 shows the positive and negative error that was observed on the days that had the widest range of error within each month.

Figure 11: Maximum Single Day Uncertainty Ranges



As Figure 11 shows, the maximum daily uncertainty range between positive and negative uncertainty is fairly stable between 6,000 to 7,000 MW. Additionally, it shows that the second largest daily swing between positive and negative uncertainty falls within a very similar range. Finally, Figure 11 shows that the uncertainty swings fairly unpredictably between positive and negative on these days.

In conclusion, the ISO must manage a significant quantity of uncertainty between the day-ahead and real-time markets. This uncertainty can be as be over 4,000 MW in either direction, swinging more than 6,000 MW in any single day, and can occur even during the largest net-load ramps. Therefore, the ISO requires flexible RA products that include eligibility criteria focused on the ramping speed and dispatch capabilities to address these needs.

5.3. Criteria for Resources to Meet the Identified Need

Given the short lag between realizing the need for flexible capacity and actual market operations, the ISO addresses the need for real-time flexibility and then the need for day-ahead shaping. The ISO seeks stakeholder comments regarding any criteria specifically identified here as well as how other operating characteristics should be considered in determining which resources can provide what products and how much capacity they can provide of each type.

5.3.1. Real-time flexible capacity

As noted above, the ISO will never see the maximum non-coincident largest errors between IFM and RTD on the same day; however, the ISO could see the maximum of any one of these errors on any given day. As such, the ISO will start by identifying basic counting rules for three basic Flexible RA products: A Five-minute Flexible RA product, a fifteen-minute Flexible RA Product, and a day-ahead shaping product.

5.3.1.1 Five Minute Flexible RA product

A critical need for flexible capacity is during the final intervals when capacity must be dispatched to serve actual load. In other words, a reasonable approach is to start with the magnitude of forecast error between the RTD and actual load. Therefore, the ISO proposes that the new flexible RA framework must have a product to address uncertainty between FMM and RTD. Further, the ISO believes the system wide requirement for this product should be based on the range of historic forecast error detailed in Section 5.2.2. As an example, for March of 2017, this number was 3,540 MW (See Table 2, above). Additionally, as load and resource variability continue to increase, this requirement should include an additional growth factor.

At the most basic level, resource counting for this product would be based on the number of MWs the resource can ramp in 5 minutes. For example, a 100 MW resource with a 10 MW/minute ramp rate would be eligible to provide 50 MW of five-minute RA flexible capacity. However, other eligibility considerations must be considered. For example, one of the challenges the ISO identified with the current flexible capacity product is the quantity of long start resources eligible to provide flexible capacity. The ISO has not made any determination regarding what factors should ultimately be considered or how specifically they should be consider to qualify for this product. Therefore, the ISO seeks stakeholder input regarding what other operating parameters or threshold criteria a resource must meet to be eligible to provide this product. The ISO is considering potential eligibility factors such as:

- Minimum and maximum ramp rates
- Start-time

- Cycle time
- Capacity factor
- Start frequency
- Pmin
- Pmin-Pmax ratio

At this time, the ISO believes use-limited resources would be eligible to provide this product. However, the ISO will have to ensure adequate replacement obligations exist in case a resource reaches its use-limitation. In other words, once a resource reaches its use-limitation, it would be required to provide replacement capacity or be subject to availability charges.

If a resource provides this product, it will have a must offer obligation to make its capacity available to the ISO using economic bids for a range equal to the MW of flexible capacity for the full range for which it has been shown. In the ISO's real-time markets, this obligation can be fulfilled through either incremental or decremental bids. Additionally, the ISO must determine in what hours the resources must be available. The ISO's analysis demonstrates that uncertainty happens at all hours, but, as shown in Figure 5, the ISO observes more uncertainty during day-light hours. Therefore, the ISO is considering if all resources that provide the five-minute flexible RA product should have a 24 by 7 must offer obligation, or if there is an opportunity to create an additional day-time product with a shorter must offer obligation window.

5.3.1.2 Fifteen Minute Flexible RA Product

The general rules for fifteen minute flexible capacity are identical to the five-minute flexible capacity product. Specifically, the need determination would be based on the observed uncertainty between the IFM and FMM, and the quantity of fifteen-minute flexible capacity that a resource could sell would be based on the resource's ramping capabilities over fifteen minutes.

The ISO must also consider similar operational and performance criteria as well as must offer obligations for the fifteen-minute flexible capacity product as were detailed in the five-minute flexible capacity product above. One distinction between the fifteen minute and the five-minute product is the fifteen minute product would allow intertie resources to be eligible to provide this product, with the condition that intertie resources must be connected to specific resources. This may be a single specific resource or electrically connected system of resources, like a single hydrological system. The ISO will also change EIM ramp sufficiency tests to credit to the ISO any ramping capacity from these intertie resources and remove the resources from any EIM entity's ramp sufficiency test. Finally, currently if a RA import does not receive an IFM schedule, the resource is deemed to have met its must offer obligation and has no further real-time

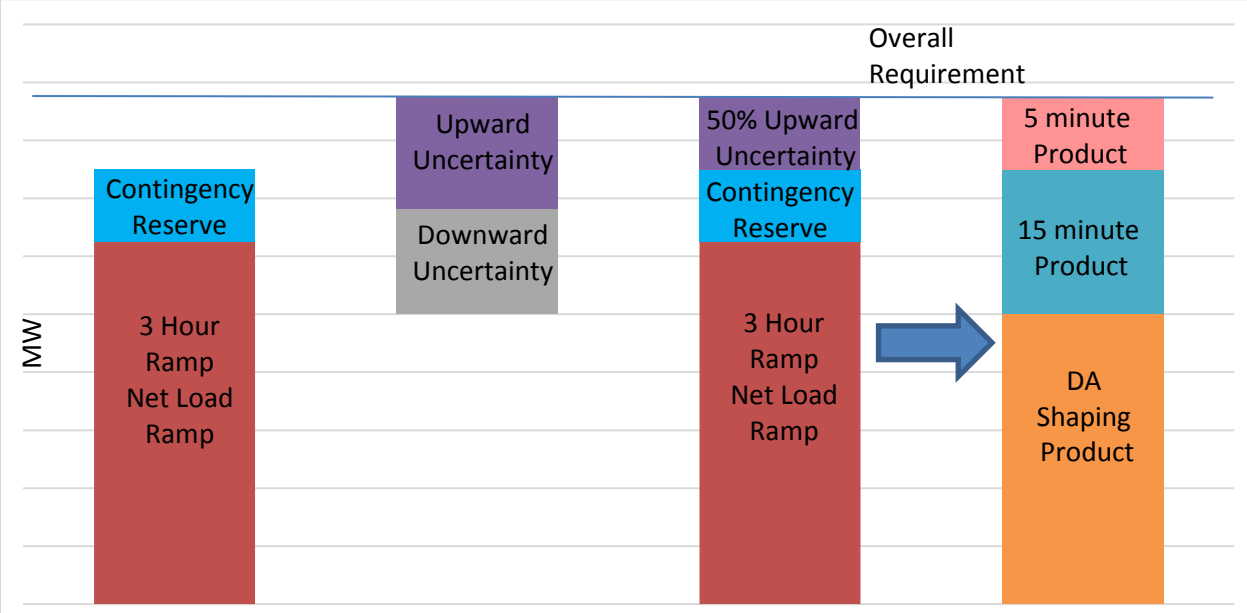
bidding obligation. As part of providing this, or any, flexible RA product, the ISO is considering modifying this rule. Specifically, the ISO is considering requiring external resources that provide flexible RA to be available in both the day-ahead and real-time markets.

Another distinction between the fifteen and five-minute flexible capacity product is the fifteen-minute flexible capacity needs determination will already account for flexible capacity procured to meet the five minute flexible capacity needs. As an example, the total IFM-FMM uncertainty error was 7,500 and the FMM-RTD uncertainty was 3,500 MW, then the total requirement for fifteen minute flexible capacity would be set at 4,000 MW.

5.3.2. Day-ahead shaping capacity

The ISO envisions the needs determination for this product to be based on the remaining capacity between the overall need determined in Section 5.2.1, above, and the capacity already addressed by the five-minute and fifteen-minute products. This is illustrated in Figure 12.

Figure 12: Determining the Requirements for Day Ahead Shaping Product



The basic counting rules for the day-ahead shaping product will remain the same as those used today for the effective flexible capacity (EFC) value for most resources.

Additionally, the ISO envisions that external resources, both outside and inside an EIM BAA, would be allowed to provide this product.[7]

The EFC for wind and solar resources are currently capped at the resources NQC. In non-summer months, this means that EFC value for a solar resource is very small relative to the resource's potential output during early afternoon hours when net load is at its lowest. However, VER resources that are willing to economically bid into the day ahead market help the ISO to better shape IFM commitments and address the net load ramp at quantities that far exceed the NQC of the resource. For example, a solar resource may have an NQC of 10 MW in March, but a maximum output during the middle of the day of 100 MW. By economically bidding this 100 MW into the IFM, the ISO can now dispatch the resource to less than full output during these hours, helping the ISO to better manage ramp constraints using market priced RA resources, instead of pro rata curtailments and CPMs of non-RA resources. Therefore, the ISO seeks stakeholder input on the following questions:

1) How should the ISO determine the EFC for VERs willing to economically bid into the ISO markets? (Note: this may apply to all of the flexible capacity product proposed)

2) What additional studies are needed to ensure that any EFC capacity is deliverable? (Note: this question need not apply only to VERs. The ISO is currently considering a deliverability study for flexible resources. This test could, and probably should, apply to all resources) More specifically, what types of inputs and assumptions would need to be studied to ensure all EFC capacity is deliverable when needed?

Finally, the current must offer obligation for flexible RA products depends on the category of flexible RA being provided. However, the ISO current proposal shifts the goal from simply addressing the three hour net load ramp to allowing the ISO to shape all hours of the IFM. This likely means eliminating the existing three categories of flexible RA. However, as with the five- and fifteen-minute flexible capacity products, much of the shaping challenges occur during daylight hours. The ISO is, therefore, seeking stakeholder input about how to structure the MOO windows for this day-ahead shaping product.

[7] As noted in the 15-minute product, additional changes will be required to identify EIM resources providing flexible RA capacity to ensure the EIM Balancing Area Ramping Requirement is properly adjusted, crediting the ISO with that flexible capacity and avoiding double counting. Additional modifications may be needed to base scheduling processes to ensure all MOOs are followed.

6. Next Steps

The ISO will discuss this Draft Flexible Capacity Framework proposal with stakeholders during a Stakeholder meeting on November 29, 2017. Stakeholders are asked to submit written comments by December 13 to initiativecomments@caiso.com.

7. Appendix

Stakeholder	Summary of comments
BAMx	ISO describes real-time ramping needs, but the discussion presented at the working group goes far beyond that and becomes problematic. Any proposal to revise the flexible RA requirements must be designed to allocate the obligations consistent with cost causation principles.
BPA	BPA is supportive of expanding FRAC MOO to include external resources, and creating products that can meet ramping needs and uncertainty in different timeframes. It would be helpful if the CAISO would identify the changes in the Flexible Capacity Needs Assessment proposed for 2019 from the 2018 Assessment and state when the CAISO expects these changes could be implemented. BPA urges the CAISO to separately identify 2019 changes from ones it would like to consider in future years.
Calpine	The presentation does not contain any of the analysis that stakeholders, including Calpine, have requested with respect to exactly why the CAISO is experiencing operational flexibility problems. Calpine is not convinced that these products are necessary. Nevertheless, Calpine thinks that the conceptual proposal represents a positive step towards linking flexible RA products to operational requirements.
CDWR	Clarification is needed regarding flexible and inflexible capacity concepts and can participating load provide flexible RA
CEERT	The current flexible capacity requirement framework is insufficient and inefficient for meeting the flexibility needs of the grid. The CAISO has taken a critical step by defining the flexibility need with more granularity. The CAISO should address how flexibility-driven market products fit in the flexible capacity requirement framework. The proposed Must Offer Obligation framework enables low carbon regional resources to support the flexibility needs of the grid. CEERT and RNW are supportive of continued, expeditious development the proposed framework while addressing the questioned posed by CEERT and RNW.
CESA	CESA supports the findings by the California Independent System Operator (“CAISO”) on the real-time operational needs of the CAISO

Stakeholder	Summary of comments
	grid, which show how the Flexible Resource Adequacy Capacity ("Flex RA") product needs to be reformed to ensure system reliability in the future. Overall, the Working Group meeting highlighted how the current Flex RA product is important but insufficient in to meet all flexible ramping needs going forward. The CAISO importantly distinguished the need for ramping for variability (which is typically known) as well as for uncertainty, which may materialize via intermittency in some generation, outages, weather uncertainty, missed forecasts, etc. A fleet that meets both variability and uncertainty needs is important, and the fundamental goal of the RA program should be to ensure a fleet is lined up and bid with must-offer obligations to reasonably operate the grid in all circumstances of a given month. CESA supports multiple aspects of the CAISO's proposal. As the CAISO moves forward with developing this proposal, there are a number of areas that will need to be specified and clarified. CESA recommends that the CAISO move forward with this new framework to inform the CPUC in a timely way in the RA proceeding.
CLECA	The connection to planning requirements for RA is less clear. Despite numerous questions asking for an explanation of the failings of the existing flexible RA requirement, the CAISO has yet to provide such an explanation, other than to raise concerns about once-through cooling plants being considered flexible. CLECA found the most interesting part of the workshop to be the discussion of the changes in net load between the IFM and the FMM, the FMM and the RTD, and the need for additional regulation. To the extent that these differences represent the operational challenge that faces the CAISO in "shaping" the net load in the forward market and meeting variations in actual net load day-of, the discussion of changes to the IFM was illuminating.
Cogentrix	The data provided in the meeting presentation regarding hourly and intra-hour ramps and the associated challenges facing grid operators, particularly data revealing that consistently over 40% of the maximum monthly 3-hour ramp occurs in the first hour, presents a compelling case for change. Cogentrix supports the development of a market product that retains flexible generation, incentivizes generation to increase its flexibility and encourages the orderly

Stakeholder	Summary of comments
	retirement of assets that lack the flexibility attributes required for continued renewables integration. Another concern that Cogentrix reiterates is the desperate need for coordination between the CPUC and the CAISO. Cogentrix recommends measuring ramp rate as a percentage of the total capacity per minute, rather than the MW per minute calculation currently used. Measuring ramps in such a way ensures that units capable of the fastest ramp speeds on an absolute basis are prioritized.
CPUC Staff	Based on these assumptions, rather than the 20,000 MW example used in the workshop presentation, some months would have a flexible requirement of over 40,000 MW. Calculating this requirement based on the largest and smallest loads of the month rather than the projected ramping need for any individual day results in a capacity requirement that can exceed 200% of the actual projected need. The CAISO had provided descriptions of some challenges it is facing in the operational space and has proposed a new flexible framework, however much additional analysis is needed to demonstrate that the proposed framework would address operational challenges and is feasible both from a technical and procurement perspective.
First Solar	First Solar reiterates its comments made previously in this initiative, emphasizing the need for the CAISO to ensure that there is no discrimination against what types of resources will be eligible to provide these services. It is also unclear to us how the CAISO's framework will address procurement of flexible capacity. First Solar additionally requests a specific definition of what the CAISO is now considering a non-dispatchable resource. First Solar is concerned that the CAISO is attempting to merely put a patch on an identified problem rather than addressing the root cause and analyzing the availability of cheaper, more efficient solutions. Ultimately, First Solar believes more analysis must be done – both into identifying what the problems are and also into what services grid-connected resources can already provide.
LS Power	It is prudent planning to develop more flexible capacity products before the operational issues become unmanageable or needlessly expensive. LS Power supports CAISO's recommendation that a new

Stakeholder	Summary of comments
	Flexible RA framework needs to be developed and generally agrees with the initial conceptual framework presented by CAISO. CAISO's analysis shows the need for having enough Flexible Capacity to handle both upward and downward ramp needs.
Middle River Power	MRP sympathizes with CAISO and generally supports the CAISO's proposal to align flexible capacity requirements with operational needs. However, we would like to better understand when and how often these products are not available in sufficient quantities as well as the reason these products are not available or accessible. It is also unclear to MRP if responsibility for ensuring enough flexibly capacity exists should be addressed in the capacity construct but rather in supporting appropriate price formation and thus compensation for suppliers in the energy and ancillary service markets.
National Grid	National Grid supports the stated objectives of the FRACMOO2 process. National Grid supports the "Conceptual Framework" of four discrete products identified by the CAISO. National Grid would like greater insight into how the CAISO's co-optimization process works in the Integrated Forward Market to ensure that the generation units procured by LSEs to meet their Flexible Resource Adequacy requirements are deployed in the most efficient manner. National Grid urges the CAISO to consider the role of multi-year contracts in ensuring that the CAISO has access to a fleet of flexible generation in all hours of the year in sufficient quantity to ensure reliable grid operation and in providing signals to help ensure the efficient retention and retirement of existing resources.
ORA	The Office of Ratepayer Advocates' (ORA) recommends that prior to creating the four new types of RA products, the CAISO provide additional analysis of the reliability concerns the products are intended to address, along with the various options to address those concerns. ORA recommends that the CAISO provide stakeholders with comprehensive analysis and data supporting the need for the proposed new flexibility capacity obligations prior to issuing a revised proposal for the FRACMOO2 initiative.

Stakeholder	Summary of comments
Pacific Gas & Electric	The CAISO should develop an appropriate methodology for counting the operational flexibility of intermittent renewables in the Flexible Resource Adequacy (RA) program before the 2019 Flexible capacity needs technical study process. PG&E does not support using a Flexible RA structure that completely ignores the ability of self-schedules to adjust to load changes throughout the month. PG&E asks the CAISO to provide updates on the analysis discussed during the August 2nd Working Group meeting. While the CAISO is making progress on product definitions, the concept of multiple flexible capacity products still has the potential to greatly complicate the RA Process. PG&E requests more information to understand better the CAISO's operational needs.
Portland General Electric	PGE in general supports the ISO's "Conceptual Flexible RA Framework" as outlined in slides 40-54 of the ISO's presentation on September 26, 20171, and believes it is a good starting point for the upcoming draft proposal. However, PGE believes that energy market price-formation related actions need to be taken in concert with the Flexible RA proposal in order for the framework to be successful in delivering the desired outcomes in practice.
Public Generating Pool	PGP is encouraged by the analysis and the conceptual product framework provided by the ISO at the August and September Working Group meetings of the FRACMOO 2 process. PGP recommends that the ISO continue the data analysis to illustrate how the flexible capacity needs would be allocated to the different product concepts presented in the Working Group material. Further, PGP believes it could be useful to use existing Effective Flexibility Capacity determinations to assess how well the existing fleet of resources meets the estimated needs under the conceptual product design. The ISO should Maintain and further define product concepts that align with market dispatch intervals.
Powerex	Powerex strongly supports CAISO's efforts to conduct a holistic re-evaluation and re-design of the flexible RA framework. Powerex believes that the framework discussed at the September 26 working group meeting represents a sound conceptual structure for a long-term flexible RA framework. Powerex encourages CAISO to consider initiating a separate stakeholder process to consider

Stakeholder	Summary of comments
	enhancements to the day-ahead market that will be necessary for the implementation of a long-term flexible RA framework. Powerex believes that CAISO's proposal will address t issues with the current flexible RA product by aligning the assessment of CAISO's flexibility needs, and the products procured to meet those needs, with the manner in which CAISO deploys resources through its markets. Defining three flexible RA products will allow CAISO to appropriately differentiate and value resources based on their ability to ramp over various operational frameworks. CAISO should expand its flexible RA requirements to include external resource commitments backed by physical flexible capacity. Enhancements to the day-ahead market are necessary to ensure the success of the proposed Flexible RA framework.
SCE	The CAISO has not provided sufficient explanation whether the problem is the failure of the Resource Adequacy (RA) procurement process to acquire sufficient flexibility or if there is a failure to optimize the available resources to meet net load. SCE believes the proposed new flexible RA construct could result in a costly redesign, which provides an overly complex solution that may or may not resolve the problem at hand, which is that the market cannot appropriately optimize the resources provided.
SDG&E	While the presentation during the workshop indicated that ramping needs have increased and are expected to increase, it is unclear which need or product, the portfolio will be deficient respective to the CAISO forecast. SDG&E believes the CAISO must come up with solutions in the energy markets to address both downward and upward flexibility. The CAISO should also revisit lowering the bid floor to provide additional market signals to reduce the amount of self-scheduled generation in day-ahead. There is no rational reason to procure more flexible RA than needed in one single day. The CAISO's planning criteria is to meet RA needs in one day, not the difference of max and min of an entire month. SDG&E believes the proposed products are too vague at this point and additional opportunities must be provided to allow discussion.
Seattle City Light	Seattle supports further exploration of the CAISO's conceptual proposal to develop multiple dispatchable flexible capacity market products that are differentiated based on the ability of a resource to

Stakeholder	Summary of comments
	respond within a specified time. To allow stakeholders to better understand the CAISO's need for these flexible capacity products, the CAISO should publish data that shows its forecast or actual need for each product over the past 12 to 18 months.
Six Cities	The Six Cities support the conceptual objective of aligning Flexible RA requirements with operational needs. The ISO has not presented information sufficient to determine whether the existing Flexible RA fleet can meet the ISO's operational needs and, if not, what resource attributes are missing.
VEA	VEA continues to ask that the ISO consider small LSEs to ensure that an LSE's cost impact is proportionate to its contribution to the requirement, and the LSE has the ability to efficiently utilize its current procurement portfolio before incurring additional flexible RA costs through procurement. As the ISO further defines the framework and eligibility criteria, VEA asks that the ISO enable imports to meet flexible RA requirements. Having intermittent resources qualify to provide flexible RA would provide an incentive for economic participation.
WPTF	Flexible RA cannot be looked at in isolation of either the CAISO RA program or long-term procurement programs by Local Regulatory Authorities (LRAs). The CAISO needs to clearly state what the intents are of the flexible RA products.