Reliability Services Initiative – Phase 2 and Flexible Resource Adequacy Criteria and Must Offer Obligation – Phase 2: Issue Paper

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1. Introduction

The Western energy landscape continues to evolve, presenting new challenges and opportunities such as integrating more distributed energy resources, renewable resources, and innovative new technologies, expanding the ISO's Energy Imbalance Market, and increasing regional coordination. On April 29, 2015, California Governor Jerry Brown issued an executive order targeting greenhouse gas reductions to 40 percent below 1990 levels by 2030,[1] illustrating that more changes are yet to come. The ISO is tasked with maintaining grid reliability as the energy landscape changes. Although this new landscape holds the promise of a cleaner energy future, it brings with it the challenge of maintaining reliability while managing a greater number of resources, a more diverse resource portfolio, and more variable loads and resources. If sufficient flexible capacity is available to the ISO's day-ahead and real-time market through forward procurement, then the ISO will have the tools to make a cleaner and more reliable energy future a reality. The ISO must define flexible capacity and establish flexible capacity requirements in a way that ensures the ISO can address several ramping concerns. Moreover, the definition must establish a simple, clear, and procurable flexible capacity product.

The Resource Adequacy (RA) framework has been designed to ensure that ISO has access to sufficient capacity to maintain grid reliability under peak load conditions. After the initial ground work was put in place, the ISO identified a need to enhance the RA framework to include a locational component. Although ensuring local resource adequacy was not envisioned at the onset of the RA program, it was a reasonable and necessary evolution of the program. As variable energy resource penetration expanded throughout California, the ISO identified a need to enhance the RA program to include physical attributes for flexible capacity. The initial steps towards addressing flexible capacity needs were taken in 2013 -14 in the ISO's Flexible Resource Adequacy Criteria and Must Offer Obligation (FRACMOO) stakeholder initiative[2] and in the CPUC's RA proceeding.[3] Including local and flexible capacity in the RA program demonstrates that the program must consider more than just peak load, and in particular must recognize the attributes of RA capacity.

As the ISO stated in the FRACMOO stakeholder process and in the CPUC's RA proceeding, additional work is needed to refine the flexible capacity product. Both of these processes considered a product defined solely on the need for upward ramping capabilities. However, as more variable energy resources come online, the ISO must have tools to address other

[1] http://gov.ca.gov/news.php?id=18938
[2] http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleResourceAdequacyCriteria-MustOfferObligations.aspx
[3] http://www.cpuc.ca.gov/PUC/energy/Procurement/RA/ra_history.htm

operational needs. One of these is excess generation, which can occur, for example, on non-summer days that are particularly sunny, breezy and/or have unusually low load. Further, ISO forecasts show increasing 10 minute and hourly net-load ramps, requiring the ISO to assess flexible capacity needs to cover steep ramps that last less than three hours. The goal of this initiative is to enhance the flexible capacity product definition and related provisions to better align with anticipated operational needs, to ensure adequate flexible capacity is available to reliably achieve state and federal energy and environmental goals.

2. Background

In 2014, the ISO filed, and FERC subsequently approved, tariff revisions to implement ISO's FRACMOO proposal. The ISO developed the FRACMOO proposal and accompanying tariff provisions through an extensive stakeholder process in conjunction with the CPUC, municipal utilities, investor-owned utilities, generators, and environmental groups. The FRACMOO proposal represented the first step towards ensuring that load serving entities procure and make available to the ISO through enhanced must-offer obligations sufficient flexible capacity to ensure a clean and reliable energy grid. The tariff provisions provide the ISO with a flexible capacity framework that complements the system and local capacity requirements already existing either through the local regulatory authorities' RA programs or ISO tariff provisions. Specifically, the FRACMOO tariff provisions establish:

- A study methodology for determining flexible capacity needs and allocating them 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
- Must offer obligations to ensure the ISO has access to flexible resources through its markets

The ISO also worked with local regulatory authorities to align the flexible capacity provisions established in FRACMOO with any flexible capacity program implemented by the local regulatory authorities. This would ensure that complementary rules are in place to facilitate procurement of the flexible capacity requirements. For example, the CPUC, in decision D.14-06-050, adopted flexible capacity requirements for its jurisdictional load serving entities. These flexible capacity requirements were based on the ISO's annual flexible capacity study.

In the Reliability Service Initiative – Phase 1 (RSI1), the ISO undertook additional efforts to address the ISO's rules and processes surrounding RA resources. The primary enhancements from RSI1 included:

- Default qualifying capacity rules for non-generator resources (NGR), distributed energy resources, and proxy demand resources
- A new RA Availability Incentive Mechanism (RAAIM) to ensure RA capacity is available to the ISO consistent with the RA capacity the resource is providing[4]
- Streamlined rules for providing substitute or replacement capacity for system and local capacity on planned or forced outages

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

> This simplified initial approach provides a smooth transition to establishing durable flexible capacity requirements. The CAISO 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.[5]

The ISO stated in its RSI1 tariff filing that it would evaluate and design those "durable flexible capacity products as part of RSI2." This stakeholder initiative will continue identifying enhancements to both the flexible capacity product specifically and the resource adequacy framework generally to ensure adequate system, local, and flexible capacity is available to the ISO.

In RSI1, the ISO proposed a two phase process to address potential enhancements to the RA framework. The ISO has reviewed the outstanding issues from RSI1 and FRACMOO and divided them into two distinct categories. The first category of issues pertains to the need to enhance the existing flexible capacity product. Issues in this category include (1) reviewing the need for downward flexible capacity to address over-generation, as well as fast upward and downward ramping, (2) allowing flexible capacity to be provided by intertie resources, and (3) assessing flexible capacity for storage resources that do not align with the ISO's NGR market design. The second category pertains to RA issues and processes not directly connected to the definition of the flexible capacity product. Table 1 provides a list of topics that the ISO proposes to cover in each of these categories.

[4] As noted in the RSI1 Draft Final Proposal, the new RAAIM mechanism was designed to replace the existing Standard Capacity Product.
[5] Transmittal letter at p. 19.

Table 1: Issues identified in FRACMOO or RSI1

Issues directly connected to the flexible capacity product definition	**Issues <u>not</u> directly connected to the flexible capacity product definition**
Review the flexible product definition and develop any additional flexible capacity needs	Substitution for flexible capacity resources on planned outage
Provision of flexible capacity by intertie resources, including Effective Flexible Capacity calculation	Address the RAAIM exemption currently in place for combined flexible capacity resources
Flexible capacity from storage resources not using the NGR model	Separate local and system RA for purpose of forced outage substitution
Flexible capacity impacts of uncontracted/merchant VERs, for which no LSE has associated flexible capacity requirements	Clarify Local Regulatory Authority interaction and process alignment
	Process to update Effective Flexible Capacity list during the year

3. Process and Schedule

Given the clear division of the categories outlined in Table 1, above, the ISO proposes to conduct two independent processes: the Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2 and Reliability Services Initiative – Phase 2. Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2 will cover issues directly related to the definition of flexible capacity and flexible capacity product enhancements. Section 4 of this issue paper explains each of the topics the ISO will cover in the Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2 (FRACMOO2), including a discussion of each of the issues, why the ISO is addressing them in this stakeholder initiative, and an initial outline of the core elements that must be resolved. Section 5 provides the same details for the Reliability Services Initiative – Phase 2 (RSI2), which will cover issues that are not directly connected to the definition of flexible capacity.

Because the ISO intends to conduct these stakeholder processes independently, the ISO also proposes different approaches to these stakeholder processes. After the initial

stakeholder call to discuss this issue paper, the ISO will conduct the typical stakeholder process for the RSI2 initiative (i.e., post straw proposals, hold stakeholder calls or meetings, receive written stakeholder comments). The ISO is targeting Q1 2016 for completion of this stakeholder initiative. The ISO will commence a working group process to address those items within the scope of the FRACMOO2. The first working group meeting will be held July 22, 2015. The ISO will run the working group process as a series of meetings designed to discuss aspects of the needed flexible capacity enhancements. The ISO will conclude the working group process by the end of September 2015 and, in October 2015, will issue a straw proposal for flexible capacity product enhancements. This straw proposal will serve two purposes: start the regular ISO stakeholder process for FRACMOO2; and provide the CPUC with a proposal to consider in the RA proceeding. The ISO is targeting completion of this stakeholder process in late Q2 2016, which is at or about the same time the CPUC issues its final ruling in its RA proceeding.

The preliminary schedule for each of these initiative is:

Schedule: Reliability Services Initiative – Phase 2

Date	Reliability Services Initiative – Phase 2
June 25, 2015	Issue paper released
July 2, 2015	Stakeholder call on issue paper
July 10, 2015	Comments due on issue paper
August 5, 2015	Straw Proposal issued
Mid Sept, 2015	Revised straw proposal
Early Nov	Second revised straw proposal (if needed)
Early Jan 2016	Draft final proposal
Feb 2016	Board of Governors

Schedule: Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2

Date	Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2
June 25, 2015	Issue paper released
July 2, 2015	Stakeholder Call
July 10, 2015	Comments due on issue paper
July 22, 2015	Working Group Meeting #1
August 5, 2015	Comments due on Working Group Meeting
August, 2015	Working Group Meeting #2
September, 2015	Working Group Meeting #3
October, 2015	Straw proposal released
Early December, 2015	Revised straw proposal
Late January, 2016	Second revised straw proposal
March, 2016	Draft straw proposal
May, 2016	Board of governors

In stakeholder comments, the ISO asks stakeholders to provide input on the proposed scope of each of the stakeholder processes outlined in this issue paper and the proposed processes and schedules. Further, although the ISO has outlined questions and issues that require resolution for each these stakeholder initiatives, the ISO also seeks additional comments regarding questions or issues that have not been explicitly identified and pertinent to the identified scope of these initiatives.

4. Flexible Resource Adequacy Criteria and Must Offer Obligation Initiative – Phase 2

The FRACMOO proposal represented an initial step towards ensuring that adequate flexible capacity is available to the ISO to address a changing grid. Further, the FRACMOO proposal represented the first ever flexible capacity obligation in any ISO market, recognizing that an RA program should include both the size (MW) of resource needs and the attributes of the

resources providing them (dispatchability). The ISO expected that enhancements to the original FRACMOO tariff provisions would be needed based on actual experience with the programs and as flexible capacity needs became clearer. Both have happened, and, as such, it is appropriate to consider enhancements to the tariff provisions. In this stakeholder process, the ISO will seek to determine what modifications to the existing flexible capacity products or additional flexible capacity products are needed to (1) address upward ramping speed and (2) provide downward flexibility to manage reliability risks associated with over-generation. The ISO will work with local regulatory authorities to ensure parallel changes to their resource adequacy programs.

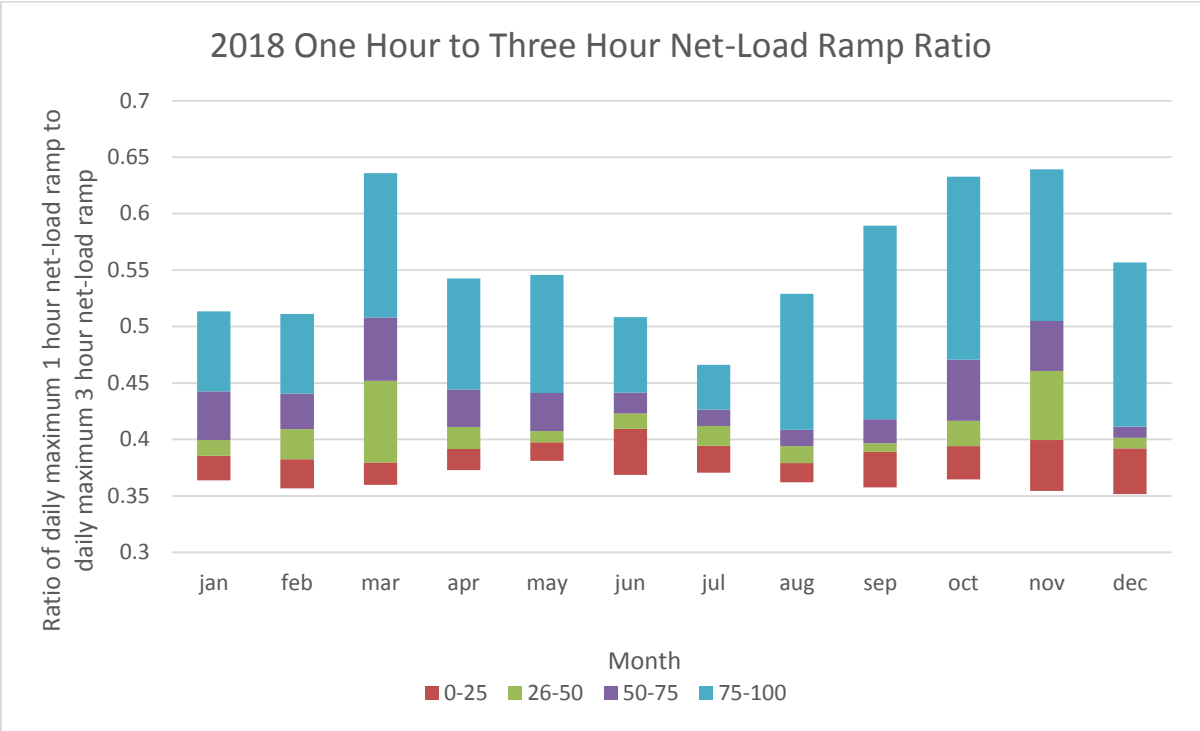
The goal of the FRACMOO tariff was to design a single flexibility product that could address multiple flexible capacity needs. With increased penetration of variable energy resources, the ISO continues to assess how well this single product works towards addressing the various flexible capacity needs. The remainder of the section explains why there is a need to enhance the existing flexible capacity product and identifies the enhancements the ISO considers to be within the scope of this stakeholder initiative.

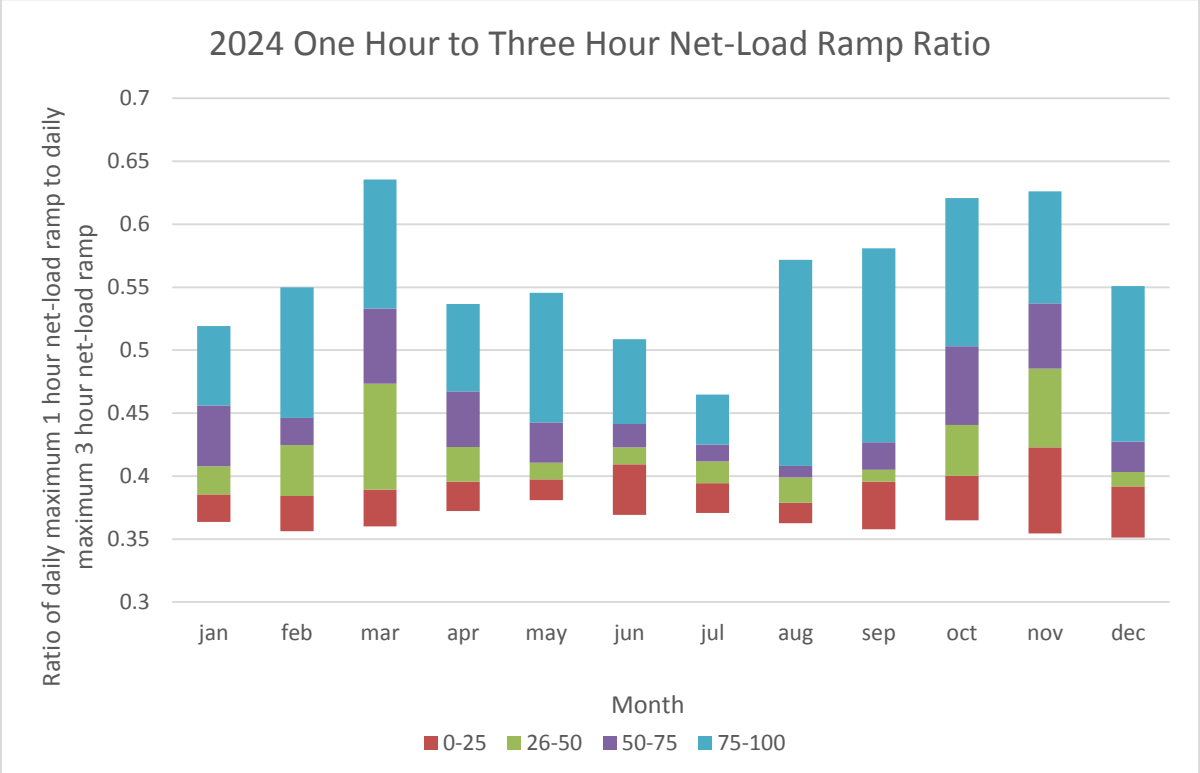
4.1 The need for upward ramping speed

At the onset of the first FRACMOO stakeholder initiative, the ISO recognized that a single three hour flexible capacity product would also temporarily provide sufficient flexible capacity to address five minute and hourly ramping needs. However, the ISO is now seeing shorter duration flexible capacity needs that might not be addressed using the single three hour net-load ramping measurement. The largest one hour net-load ramps are growing in size and are forecasted to grow as a portion of the three hour net-load ramps. The ISO has done preliminary studies using similar input assumptions as those used in the CPUC's 2014 LTPP scenario.[6] These results show that the largest single hour net-load ramp represents a growing proportion of the maximum three-hour net-load ramps. A distribution, by month, of the ratio of the maximum single hour net-load ramp in a day to the maximum three-hour net-load in a day is forecasted for the 12 months of 2018 and 2024 in shown in figure 1. These distributions are broken out by quartiles.[7]

[6] Due to computational complexity, the ISO has conducted these models in GridView, instead of PLEXOS. Therefore, the results of these model will differ from those used in the LTPP proceeding. Additionally, the ISO is in the process of updating these models to utilize more current data sets, as is being done in the LTPP proceeding.
[7] The data used for Figure 1 are based on the 2014 LTPP Trajectory Scenario.

Figure 1. Ratio of maximum one hour net-load ramps to the maximum three hour net-load ramps for 2018 and 2024



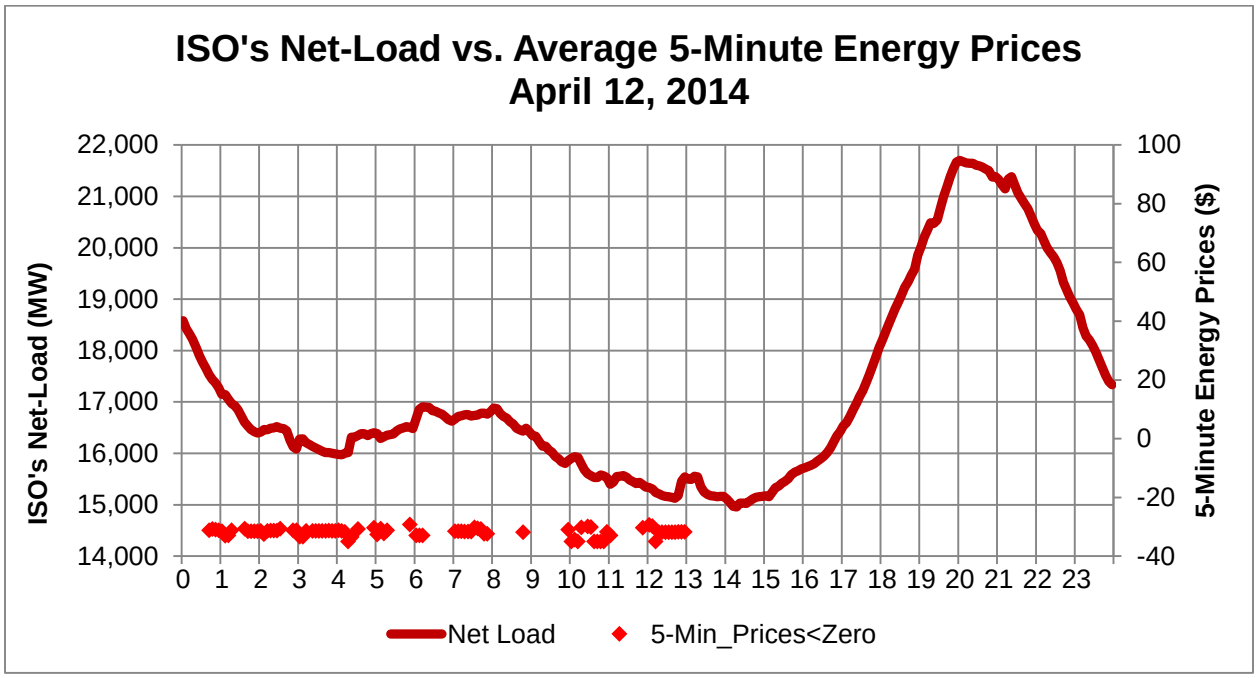


The greater the ratio, the larger the single hour ramp is a portion of the three hour ramps. For example, in March of 2018, the ISO expects that the largest one-hour ramps will be 50 percent or more of the largest daily three hour net-load ramps for 25 percent of the days. The ISO expects that it will be a fairly regular occurrence for as much as 45 percent of a three-hour ramp to occur in a single hour, and as much as 65 percent of a single three-hour ramp could occur in a single hour. This indicates that the three-hour flexible capacity metric (which assumes uniform ramps over the three hours) may need to include a component that assesses ramp rates to ensure that sufficient ramping speed is available to meet these faster one-hour net-load ramping needs.

4.2 The need for downward flexible capacity

At the time of the original FRACMOO tariff development, the primary focus was on upward flexible capacity needs. However, the ISO expressed a need to address downward flexibility in the FRACMOO stakeholder initiative.[8] Of primary concern to the ISO is the need for downward flexibility in times of over-generation. Figure 2 shows April 12, 2014.

Figure 2: Negative real-time prices at low net-load levels



For many intervals during this day there was excess generation in the ISO system. This resulted in negative prices during 43 percent of the real-time market intervals. These negative prices occurred when net-load was between 15,000 and 16,000 MW. In December 2014, the ISO had minimum net-loads fall well below 15,000 MW. Although there is nothing about negative prices that is an explicitly incorrect outcome, Figure 2 is indicative of a growing

[8] http://www.caiso.com/Documents/RevisedDraftFinalProposal-FlexibleRACriteriaMustOfferObligation-Clean.pdf at p. 30 footnote 26.

problem. Specifically, Figure 2 demonstrates the growing potential for over-generation. Based on the data submitted in the ISO's Flexible Capacity Technical Study, the ISO expects on the order of 11,500 MW of solar resources by 2018.[9] This will push the net-load even lower on low-load days, increasing the number of days with excess generation. Further, the ISO's LTPP studies show a growing frequency and magnitude of over-generation scenarios. In the ISO's 40 percent RPS study, there were frequent and large curtailments of wind and solar resources, potentially putting the state's renewable energy goals at risk.

The need for flexible capacity to account for over-generation is more than just an economic issue, it is a reliability issue. Over-generation can negatively affect grid reliability in a variety of ways, depending on magnitude, duration and location. The immediate effect is higher than normal system frequency (typically 60 Hz, +/- ~ .02 Hz) and higher than normal Balancing Authority Area Control Error, or ACE. The more severe effects of over-generation include grid facility overloads, potential generator damage and placing a Balancing Authority Area at risk of non-compliance with NERC's Control Performance Standard 1 (CPS1) and NERC Standard BAL-001-1.

NERC Standard PRC-024-1, Generator Frequency and Voltage Protective Relay Settings,[10] is intended to ensure that Generator Owners set their generator protective relays such that generating units remain connected during defined frequency and voltage excursions. Extended high magnitude over-generation events, in the extreme, can result in generator over-frequency tripping based on duration and magnitude to prevent equipment damage. This type of unit tripping event could result in extended periods of generating unit unavailability, including unavailability to fulfill IFM awards.

Although out-of-market dispatches and resource curtailment may remain solutions needed to resolve some over-generation scenarios, it is not appropriate to defer large over-generation and reliability challenges to the real-time and non-market based solutions. Shifting the burden of managing over-generation into real-time instead of ensuring sufficient flexible capacity ahead of time is not an optimal solution. As the probability of over-generation increases, so will the frequency of manual, pro-rata, non-economic curtailment of resources or manually soliciting Balancing Areas WECC-wide to accepting the excess energy from the ISO uneconomically. The ISO believes that ensuring flexible capacity is available to the ISO day-ahead and real-time markets through the RA procurement is essential to avoid these situations. The need for forward procurement of flexible capacity is essentially the same as the need for the RA program in general:

1) Forward capacity procurement ensures that adequate capacity is available to clear the ISO's markets efficiently while maintaining reliability (i.e., it ensures the ISO can

[9] This includes all solar PV, solar thermal, and behind-the-meter solar.
[10] NERC Standard PRC-024-1 has an enforcement date of July 1, 2016.

maintain supply-demand balance in nearly all circumstances without out-of-market dispatches or shedding firm load);

2) Capacity payments enable resources that provide energy to recover costs that are not recoverable through energy markets (i.e., the "missing money" concern)

FERC's and the CPUC's approval of flexible capacity requirements recognize that RA should include operational attributes and that there is a need to value upward ramping capabilities. The logic for including upward ramping capabilities in forward procurement is the same as for capacity generally. If the ISO is ramp constrained, prices for additional ramping capacity may not fully reflect the benefits of incremental ramping because of the ISO's bid cap. Additionally, if there is insufficient ramping capacity, no matter how well real-time market tools like the ISO's flexible ramping product are designed, the ISO will not be able to maintain reliability with market based solutions and will have to resort to out-of-market actions such as exceptional dispatch or firm load shedding.

As the probability of over-generation increases, it is reasonable to ask if there is a need to include downward flexibility in forward procurement. Because of bid floors, the costs caused by inflexible resources during over-generation conditions may not be fully reflected. Further, without sufficient downward flexible capacity, the ISO would still experience downward constraints and would, once again, have to resort to out-of-market solutions to maintain reliability. This could include manual curtailments and exceptional dispatches. As such, the ISO believes it is reasonable and prudent for the RA program to include downward flexibility as an attribute of flexible.

Figure 3 shows the ISO's forecasted minimum net-load for 2018, 2021, and 2024 using the 33 percent trajectory model assumption in the CPUC 2014 LTPP.[11]

[11] As noted above, these results are calculated using GridView. Further, the ISO is working to update these results using more current data.

Figure 3: ISO forecasted minimum net-load 2018, 2021, and 2024

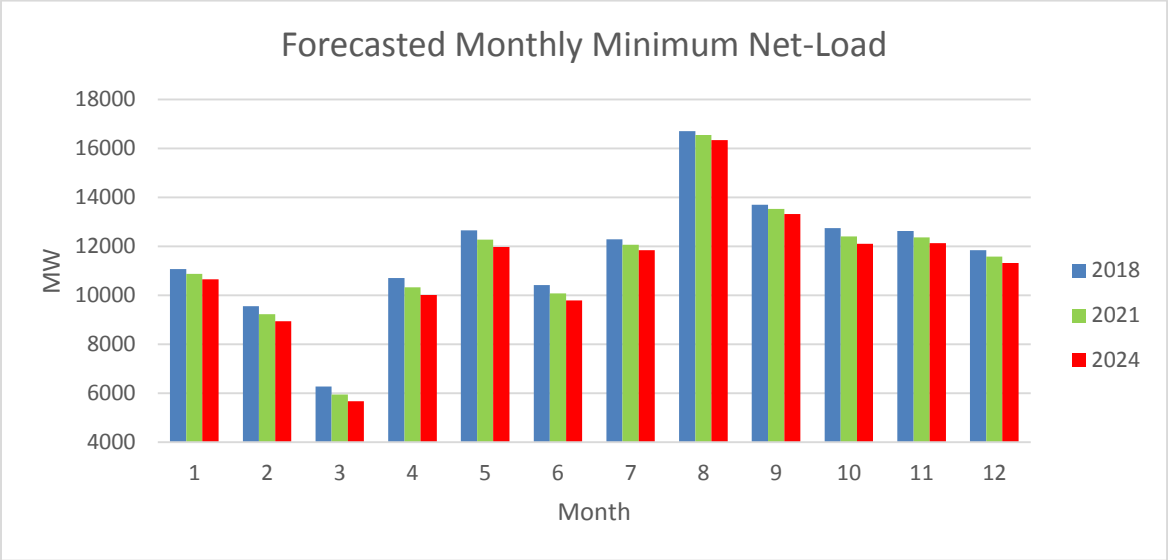


Figure 3 highlights two important points. First, the net-load is forecasted to drop below 6,000 MW in non-summer months, and often could be at or below 10,000 MW. With such low minimum net-loads, the ISO believes it is prudent to assess the ability to ramp resources down to avoid over-generation. At the same time, this must be balanced against the need to have sufficient ramping capability available to follow the evening net-load ramp (which could be as large as 15,000 MW by 2024). Many of the resources needed for that ramp have minimum operating levels, or PMin MWs. These minimum operating levels create a "PMin burden" that requires the ISO to maintain minimum operating levels for upcoming ramps while managing low net-load at the current time. Although the current Effective Flexible Capacity (EFC) counting methodology, described in detail below, accounts for the time to get a resource to PMin in its upward ramping capability, it does not consider how long that capacity must be online. The duration of this PMin burden, which is based on a resource's PMin and minimum run time, is important when the ISO has excess generation. Therefore, the ISO will also examine means to account for resources' PMin burden in meeting the flexible capacity needs. This demonstrates the need for additional flexible capacity with downward ramping capability to mitigate over-generation when needed, without the ISO having to reduce the PMin burden by shutting down resources that will be needed later to meet large upward ramping requirements.

4.3 Background and review of the existing flexible capacity product

The existing flexible capacity product is defined based on a resource's upward ramping capability over a three hour period. A resource's Effective Flexible Capacity (EFC), the

measurement of the resource's ability to meet the flexible capacity definition, is calculated as follows:

<u>If start-up time of a resource is greater than 90 minutes:</u>

EFC is limited to the MW range between Pmin and Net Qualifying Capacity (NQC) as limited by ramp rate

EFC = minimum of (NQC-Pmin) or (180 minutes * RRavg)

<u>If start-up time of a resource is less than or equal to 90 minutes:</u>

EFC is limited to the MW range between zero and NQC as limited by start-up time and ramp rate

EFC = minimum of (NQC) or (Pmin + (180 minutes – SUT) * RRavg)

Where: SUT = Longest (cold) start-up time in minutes

RRavg = average MW/min ramp rate between Pmin and NQC

The ISO uses this calculation to assess the average ability of resources to ramp over a three hour period. In this stakeholder initiative, the ISO will examine at least two aspects of the current calculation. First, this calculation assumes constant ramps. However, most units have non-linear ramp functions. This means the resource is faster during some portion of this three hour ramp and slower through others. The magnitude of one-hour ramps is, necessitating a review of the impact this measurement has on the ISO's ability to address hourly ramps. As discussed above, the ISO will also assess the impact of resources PMin and minimum run time as it impacts the availability of downward flexible capacity.

4.4 Study enhancements

The ISO developed a study process to determine the flexible capacity needs for each month of the upcoming year. Flexible capacity needs are calculated:

$$Flexibility\ Requirment_{MTH_y=}\ \ Max\left[\left(3RR_{HR_x}\right)_{MTH_y}\right] + Max\left(MSSC, 3.5\% * E\left(PL_{MTH_y}\right)\right) + \varepsilon$$

Where:

$Max[(3RR_{HRx})_{MTHy}]$ = Largest three hour contiguous ramp starting in hour x for month y

E(PL) = Expected peak load

MTHy = Month y

MSSC = Most Severe Single Contingency

ε = Adjustment factor to account for overlap between contingency reserves and flexible capcity (Set at zero by default and adjusted only as needed)

Although this calculation only addresses upward ramps, the methodology the ISO employs to calculate this number provides the data required to calculate hourly ramping needs and downward ramping needs, including PMin burden allowances. Because the flexible capacity study process uses minute-by-minute forecasted net-load data, the ISO can easily apply additional calculations to determine other flexible capacity needs. Therefore, the ISO is not proposing large scale changes to the study process (covered in tariff section 40.10.1), but instead intends to examine the data from previous studies to determine how it can use the data to ascertain and define enhancements to the existing flexible capacity product.

The ISO will explore two modifications to the existing study methodology. In previous years, the ISO has experienced somewhat anomalous weather patterns. For example, the actual system peak in 2013 occurred in June even though peaks typically occur in July or August. This June peak was caused by an unseasonable heat wave. Because the ISO uses actual load data, the data used in the 2014 study captured this heat wave. This heat wave resulted in atypical net-load ramps in June compared with the other summer months.[12] Therefore, the ISO will explore options to address the impact of anomalous load and weather events in calculating flexible capacity requirements. The ISO will also explore alternative treatments for allocating of flexible capacity requirements to LRAs when an LRA has a negative contribution to the flexible capacity requirement. This occurs when a LRAs allocable share of the flexible capacity requirement is less than zero. If an LRA has a negative contribution to the flexible capacity requirement, its requirement is set at zero. However, there may be benefits from allowing this LRA's flexible capacity requirement to be negative and then allowing the LRA's LSE to sell this credit to an LRA's LSEs as part of its flexible capacity showing.

4.5 Including intertie resources in Effective Flexible Capacity list

As part of its conditional approval of the ISO's FRACMOO tariff provisions, FERC instructed the ISO to:

> [A]ssess the feasibility of permitting static import resources to provide flexible resource adequacy capacity and to include this assessment in the informational report ordered above. [Footnote omitted]. We also direct CAISO to indicate in the report whether it is feasible to expand the eligibility to include imports and, if so, when it will do so.[13]

[12] http://www.caiso.com/Documents/Final_2014_FlexCapacityNeedsAssessment.pdf.
[13] FERC decision on ISO FRACMOO tariff filing at p. 32.

The ISO has continued to assess the potential benefits of flexible capacity from intertie resources. The ISO believes that, with the proper rules and parameters in place, 15 minute intertie schedules can provide valuable upward and downward flexible capacity. Further, as the ISO forecasts predict situations where over-generation may create reliability concerns, allowing flexible capacity from interties resources can be an important tool in managing over-generation. In RSI1, the ISO committed to reviewing the provision of flexible capacity by intertie resources. Further, as discussed in the comments provided by Powerex in RSI1, the ISO will include dispatch timing as part of its assessment of how much flexible capacity intertie resources can provide. Like upward flexibility, intertie resources likely can help provide downward flexible capacity. The ISO must assess how much flexible capacity 15-minute dispatchable intertie resources can provide without risking five-minute reliability. Further, the ISO must specify the rules for import transfer capacity for flexible RA intertie capacity resources using the ISO's Maximum Import Capacity allocation procedure as well as establish EFC counting provisions.

4.6 Treatment of non-generator resources for Effective Flexible Capacity

Another issue pending from the ISO's FRACMOO stakeholder initiative is to determine flexible capacity counting rules for storage resources that do not comport with the ISO's NGR rules. The ISO's NGR model can dispatch a single energy storage resource as either positive or negative generation. This means that charging and discharging portions of the resource cannot conflict with one another. However, the NGR model requires that a resource be able to transition continuously between the charge and discharge cycles. Not all storage resources are capable of this. Enhancements to the NGR model in the Energy Storage and Aggregated Distributed Energy Resources stakeholder initiative and are not within the scope of this stakeholder process.[14]

In contrast to the NGR model, the ISO's existing pumped storage hydro model treats the pumps and generators as two separate resources. Although this model works reasonably well to ensure the resource can charge to prepare to meet peak load, it is not clear that such a model is well suited for addressing the ISO's need for five-minute dispatchability or for resources that can transition from charge to discharge during peak net-load ramping hours. The pumped storage hydro model, unlike the NGR model, does not require both the charge and discharge components to be dispatchable and lacks details regarding the parameters for the load component of the resource (i.e. start-up time, ramp rates) that are present in the NGR model.

[14] See http://www.caiso.com/Documents/AgendaandPresentation-EnergyStorageandDistributedEnergyResourceParticipation.pdf

For the reasons stated above, the ISO determined, and FERC agreed, for the initial flexible capacity requirements, non-NGR storage resources would only qualify for an EFC for the discharge portion of the resource. However, as part of FRACMOO2, the ISO will examine whether it is possible to modify existing EFC rules to allow energy storage resources that do not fit into the ISO's NGR model to provide flexible capacity from both their charging capabilities and their discharge capabilities.

Although resources such as pumped hydro may provide flexibility by charging the resource (i.e. in pumping mode), the ISO also has to determine whether the charging portion of the resource can be fully utilized during periods in which it is expected to be needed. If a pumping resource is in a transmission constrained load pocket and can only provide pumping load by dispatching local generation, then it might not be capable of providing its charging mode to relieve over-generation on the system or even within the generation pocket. If both charging and discharging modes are going to count toward EFC, then the full flexible capacity must be usable for meeting the ISO net-load ramping needs.

4.7 Merchant Variable Energy Resources

The ISO's annual flexible capacity needs technical study provides flexible capacity needs allocations to LRAs based on its jurisdictional LSEs' contribution to the three hour net-load ramp. An LRA's allocable share is determined based on its LSEs' contracted VER capacity. However, as noted by several stakeholders in comments on the ISO's FRACMOO proposal tariff filing, there are VERs in the ISO's balancing area that are not under contract or are contracted to an LSE not located within the ISO's balancing area. FERC, in its conditional approval of the ISO's FRACMOO proposal, declined to impose a flexible capacity requirement on these "merchant VERs." Instead, FERC instructed the ISO to assess the potential magnitude and impact on flexible capacity needs caused by merchant VERs.[15] The ISO will conduct this assessment as part of this stakeholder initiative, make the required filing with FERC, and recommend any modifications that it determines are necessary to address the potential impact of merchant VERs and the allocation of flexible capacity requirements.

5. Reliability Services Initiative - Phase 2 issues

5.1 Substitute and replacement capacity for resources on outages

In RSI1, the ISO reexamined many of the core principles underlying the replacement and substitution rules for resource adequacy resources on planned and forced outage, respectively. The ISO redesigned the framework outlining the roles and responsibilities of both the LSE SC and the resource SC for planned outages of system RA capacity and enhanced forced outage

[15] FERC decision on ISO FRACMOO tariff filing at p. 20.

substitution rules. The ISO also developed substitution rules for flexible capacity resources on forced outages. These rules require flexible capacity on forced outage to provide the ISO with the same category or better flexible capacity resource.

Although the provisions developed in RSI1 significantly improved the replacement and substitution rules, the CAISO has identified the following three issues regarding replacement and substitution rules that need to be resolved in this initiative:

1) Substitution rules for flexible capacity resources on planned outages,
2) Combination flexible capacity resource RAAIM exemptions, and
3) Enhance substitution rules for Local RA resources on planned outages.

5.1.1 Substitution rules for flexible capacity resources on planned outage

The ISO deferred replacement rules for flexible capacity to RSI2 because the ISO first needed to adjust the processes, and it was not clear how replacement capacity would depend on the definition of the flexible capacity product. Although some aspects of the replacement requirement may be connected to the definition of flexible capacity, the ISO must still develop the processes to facilitate replacement for flexible capacity on planned outages. Therefore, the ISO will develop these core processes as part of the RSI2 stakeholder initiative.

5.1.2 Combination flexible capacity resources Resource Adequacy Availability Incentive Mechanism exemptions

After FERC conditionally approved the ISO's FRACMOO tariff, Six Cities sought rehearing regarding a specific provision of the must-offer obligation for "combination" flexible capacity resources. Combination flexible capacity resources are a pair of flexible capacity resources that individually do not meet the requirements for a higher flexible capacity category, but when combined are able to meet the requirements for the higher category. Originally, the ISO had proposed that both resources in the combination be subject to the economic bidding must-offer obligations. Six Cities asserted that the ISO should not hold both resources in the combination to the flexible capacity must-offer obligation. The ISO worked with Six Cities and proposed alternative tariff language providing that at least one of the combinations must provide economic bids during the must-offer obligation window. FERC approved this language. However, approval of this language occurred after the RSI1 policy had been approved by the ISO Board. This meant that the ISO could not develop the provisions and structure needed to appropriately apply the RAAIM proposed in the RSI tariff amendment filing to combination resources consistent with the agreement between Six Cities and the ISO. As a result, the ISO proposed a temporary exemption from the RAAIM calculation for combination flexible capacity resources. The ISO will develop the tools needed to apply the RAAIM to combination flexible capacity resources in this stakeholder process.

5.1.3 Local resources on outage

The ISO may require replacement capacity for local resources that go on *planned* outages. However, the ISO does not have specific provisions regarding the attributes or location of the replacement capacity, even though such specificity may be needed to ensure local reliability. As part of this stakeholder process, the ISO will assess the need to provide greater specificity regarding the attributes and or location of replacement capacity for planned outages of local RA resources.

Local RA resources that go on *forced* outages must provide comparable capacity. In other words, RA resources in local capacity areas that go on forced outage should provide local substitute capacity, when needed, or be subject to availability charges. Some stakeholders have asserted that the ISO should only require that substitute capacity come from another local capacity resource if the resource is required for local reliability issue or has been explicitly procured to provide local RA capacity. If the capacity on outage is not needed to meet an LSE's local requirement or was not procured to provide local RA capacity, these stakeholders argue, then the ISO should only require substitute capacity from system resources to avoid availability charges. The ISO will assess the implications and feasibility of allowing an RA resource in a local area to count only as a system RA resource for purposes of outage substitution. Specifically, the ISO will assess the implications on the structure of the year-ahead and month-ahead RA showings (potentially splitting local into a separate showing) and conducting local capacity assessments that would exclude resources in a local area not shown explicitly as a local RA resource. Due to the complexity of the local studies, the ISO will not consider doing case-by-case assessments during the RA month.

5.2 Local Regulatory Authority and Load Serving Entity interactions and process alignment

The ISO has identified certain areas in the RA tariff provisions that, if further clarified, will provide additional benefits to both LRAs and LSEs. Specifically, the ISO will clearly identify the timelines and processes the ISO will use when reviewing RA showings and RA plans. The goal is to provide LRAs and market participants clear guidance on when LRA or ISO default provisions apply. Clearly defining these timelines and processes allows market participants to better understand their obligations under the ISO tariff and mitigate potential deficiencies and or backstop procurement cost. For example, the ISO tariff requires an LRA to set a planning reserve margin, or the ISO will assess the LRA's LSEs resource adequacy showings as 15 percent of their shares of the forecasted coincident system peak.[16] However, there is no date by which LRAs must provide this requirement. Further, although most California LSEs forecasted peak is

[16] See section 40.2.2.1 of the ISO tariff.

determined by the CEC, the ISO may need to develop a more general rule, so that non-California LSEs could have similar provisions, but do not have their peak load forecasted by the CEC. Another area where further clarity is needed results from the CPUC and other LRAs allowing for various RA credits to LSEs or across LSEs. For example, a CPUC LSE may receive a credit towards meeting their RA requirement because of a demand response program or a Cost Allocation Mechanism (CAM) resource allocation. It is not always clear how the ISO's validation processes should treat these credits. Therefore, in this stakeholder initiative, the ISO will develop clear guidelines regarding the timing and content that both LRAs and LSEs must provide the ISO. Matters the ISO will look to resolve include, but may not be limited to, communication of an LRA's planning reserve margin and credits and reallocation of requirements to account for demand response or resources covered by the CPUC's CAM.

5.3 Process for updating resources' Effective Flexible Capacity and/or operational parameters

In the FRACMOO stakeholder initiative, the ISO established the methodology for calculating a resource's EFC. Specifically, the ISO would calculate a resource's EFC annually using a resource's NQC as a basis and other operational attributes of the resource. Now that flexible capacity requirements are in place, resources have requested adjustments to their operational parameters that either increase or decrease its flexible capacity quantity. The ISO has seen requests to increase the EFC of a resource based on an NQC increase, switch from non-dispatchable to dispatchable (making a resource eligible for an EFC), and change the number of starts for a base flexible capacity resource in the ISO Masterfile from two starts per day to one start per day. Without a clear change management process in place, the ISO cannot make these changes or account for the impact these changes may have on the resource's availability. The ISO will develop a process by which the changes can be addressed. This will include dates by which requests must be received and responses provided and implications to a resource's qualification for a category of flexible capacity on an LSE's monthly flexible capacity showing.

6. Next Steps

The ISO will host a stakeholder call on July 2, 2015 to discuss the contents of this issue paper. Stakeholder comments on this straw proposal will be due July 10, 2015. In stakeholder comments, the ISO asks stakeholders to provide input on the proposed scope of each of the stakeholder processes outlined in this issue paper and the proposed processes and schedules. Further, although the ISO has outlined questions and issues that require resolution for each these stakeholder initiatives, the ISO also seeks additional comments regarding questions or issues that have not been explicitly identified and pertinent to the identified scope of these initiatives. The ISO anticipates seeking ISO Board approval for the Reliability Services Initiative –

Phase 2 in the first quarter of 2016 and the Flexible Resource Adequacy Criteria and Must-Offer Obligation Initiative – Phase 2 the second quarter of 2016.