Resource Adequacy Enhancements

Issue Paper

October 22, 2018

Table of Contents

1. Introduction and Background 3
2. Stakeholder Engagement Plan 4
3. Scope of Issues to be Addressed in this Initiative 5
3.1. RA counting and Eligibility Rules 5
3.2. Review of Resource Adequacy Import Capability provisions 7
3.3. Rules for RA imports 8
3.4. Must Offer Obligations, Substitution Rules, and RAAIM 9
3.5. System and Flexible Capacity Assessments and Adequacy Tests 11
3.6. Meeting Local RA Needs 12
3.7. CPM/RMR Review 17
4. EIM Governing Body Role 18
5. Next Steps 18
6. Appendix 19
6.1. Availability Assessment Hours 19

1. Introduction and Background

The rapid transformation of the resource fleet to a cleaner, more variable and energy limited fleet is generating the need to reexamine all aspects of the ISO's Resource Adequacy (RA) program. In 2006, at the onset of the RA program in California, the dominant technology used for energy production in California was gas fired generation paired with a large quantity of hydroelectric resources. While some of these resources were subject to use-limitations due to environmental, start limits or air permits, they were generally available to produce energy when and where needed. However, as the fleet is transitioning away from its traditional make-up to a fleet that can achieve the objectives of SB 100,[1] the ISO must rely on very different resource portfolio to reliably operate the grid. In this stakeholder initiative, the ISO, in collaboration with the CPUC and stakeholders, will explore reforms needed to the ISO's resource adequacy rules, requirements, and processes to ensure the future reliability and operability of the grid.

Currently, the California Public Utilities Commission (CPUC) is also developing a multiyear local RA framework as part of Track 2 of its RA proceeding under rulemaking R.17-09-020. The ISO is an active participant in this proceeding and believes that much of what the CPUC is contemplating will require minimal or no ISO tariff modifications. However, the ISO will continue to assess the CPUC's multiyear RA framework and its associated processes to determine if any new ISO tariff provisions are needed to support the CPUC's efforts.

Even though the ISO may not require new tariff provisions to support multiyear local RA, the ISO, through many of its stakeholder initiatives and CPUC proceedings, including the RA and Integrated Resource Planning (IRP) processes, has identified certain aspects of the ISO's current RA tariff authority that must be updated. If left unchanged, the existing tariff provisions could result in ineffective procurement, overly complicated rules, and inequitable cost allocation. The following issues are of growing concern to the ISO:

- The current RA counting rules do not adequately reflect resource availability, and instead relying on complicated replacement and availability incentive mechanism rules;
- Flexible capacity counting rules may not sufficiently align with system and locational operational needs;
- The current means for determining available import capability and allocation may result in efficient outcomes and withholding of import capabilities;
- The eligibility rules and must offer obligations for import resources may provide opportunities for economic withholding and/or non-delivery of energy;
- Current system and flexible RA showings assessments do not consider the overall effectiveness of the RA portfolio to meet ISO operational needs;
- The growing reliance on availability limited resources to serve local capacity areas where these resources may not have sufficient run hours or dispatches to maintain and serve the energy needs in local reliability areas and sub-areas; and

[1] The objective of SB 100 is "that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045."
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

- Local capacity backstop procurement cost allocation does not contemplate the effectiveness of the local RA resources procured, including effectiveness factors and expected energy output at peak for a local capacity area.

The ISO proposes to conduct a holistic review of its existing RA tariff provisions to make any necessary changes to ensure these issues are addressed and the ISO's RA tariff authority adequately supports reliable grid operations.

2. Stakeholder Engagement Plan

Table 1 below presents the schedule for this stakeholder initiative. Given the breadth of scope of this initiative, the ISO is planning to issue the straw proposal in two parts. The ISO will review the issues, incorporating feedback from stakeholders, and determine which ones to address first (part one) and which to address in a later iteration (part two). After both parts of the straw proposal have been developed (i.e., a proposal has been issued on all items), the ISO will post a revised straw proposal encompassing all issues in this initiative as part of a single proposal. As such, the ISO requests stakeholders include any refined scope and priority ranking of the issues presented in this issue paper in their comments to help focus staff's efforts.

The ISO will seek ISO board approval in November 2019.

Table 1: Stakeholder engagement plan

Date	Milestone
Oct 22	Issue paper
Oct 29	Stakeholder call on issue paper
Nov 12	Stakeholder comments on issue paper due
Dec 20	Straw proposal (part one)
Early Jan	Hold stakeholder meeting on straw proposal (part one)
Late Jan	Stakeholder comments on straw proposal (part one) due
Early Feb	Straw proposal (part two)
Late Feb	Stakeholder meeting on straw proposal (part two)
Early Mar	Stakeholder comments on straw proposal (part two) due
Apr 9-10	Working group meeting
Apr 22	Stakeholder comments on working group meeting due
May 20	Revised straw proposal
May 28-29	Stakeholder meeting on revised straw proposal
Jun 10	Stakeholder comments on revised straw proposal due
Jul 8	Second revised straw proposal
Jul 16-17	Stakeholder meeting on second revised straw proposal
Jul 31	Stakeholder comments on second revised straw proposal due

Sep 9	Draft final proposal
Sep 24-25	Stakeholder meeting on draft final proposal
Oct-9	Stakeholder comments on draft final proposal due
Nov 13	**Present proposal to ISO Board**

3. Scope of Issues to be Addressed in this Initiative

3.1. RA counting and Eligibility Rules

The California RA program supports the reliable operation of the grid by appropriately evaluating and assigning the capacity contribution of eligible RA resources. The accurate counting and qualifying of RA resources is also necessary to assess the adequacy and consistency of the RA fleet. Given the importance of counting and eligibility rules in the context of a transforming RA resource portfolio, the ISO believes it is both timely and prudent to reassess RA counting and eligibility rules.

3.1.1. System RA

To determine RA resources capacity contributions, the ISO defers to the CPUC and other LRAs to determine Qualifying Capacity (QC) values for all resources interconnected to the ISO system. The methods applied for QC evaluations are commonly known as RA counting rules. Section 40 of the ISO Tariff defers RA counting rules and setting resource qualifying capacity values to the LRAs. The CPUC, for instance, publishes a QC methodology manual.[2] Once the CPUC establishes resources QC values, the ISO takes this information and develops Net Qualifying Capacity (NQC) values, which can result in potential resource qualifying capacity value reductions due to resource testing (Section 40.4.4), performance criteria (Section 40.4.5), and deliverability (Section 40.4.6).

The ISO proposes to review the RA counting and eligibility provisions related to RA resource NQC adjustments in this initiative. The ISO proposes the following issues be in-scope:

- Application of Effective Forced Outage Rate (EFOR) performance criteria and accompanying NQC reductions
- Review and clarification of RA counting rules for RA resources

<u>The ISO notes that any consideration of system RA counting rules beyond the NQC reductions described above are out of scope for this initiative</u>.

The ISO also notes that the potential changes considered in scope for this section of the proposal may also have some dependency and interrelation to the potential modifications

[2] CPUC QC Methodology Manual, Adopted 2017: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455533

considered in Section 3.4, below, for the ISO's review of the RAAIM provisions, outage substitution/replacement rules, and potential implementation of capacity performance penalties.

3.1.2. Flexible RA

As part of this initiative, the ISO will continue exploring enhanced flexible RA counting rules started in the FRACMOO2 stakeholder process. More specifically, the ISO will continue assessing the operational capabilities required from the fleet to align with both the Day-Ahead Market Enhancements (DAME) and the Extended Day Ahead Market (EDAM) and what flexible RA counting rule changes may be needed. As noted in the FRACMOO2 initiative:

> Changes to the flexible capacity product and flexible capacity needs determination should closely align with the ISO's actual operational needs for various market runs (i.e., day-ahead market, fifteen-minute market, five-minute market runs).[3]

Currently, the ISO's DAME stakeholder initiative is developing 15-minute day ahead market in its phase 1 and will be developing a day-ahead flexible capacity product in its phase 2. The ISO plans to complete the policy for phase 1 of the DAME by Q1 2019 and phase 2 by late Q2 2019.

Additionally, the ISO is planning to commence an initiative to Extend the Day-Ahead Market (EDAM) to EIM entities in the middle of 2019. As part of the EDAM initiative, the ISO will develop market rules that allow Energy Imbalance Market (EIM) entities to participate in the ISO's day-ahead market in addition to the real-time market. To benefit from economic transfers in the EIM and EDAM, resource adequacy resources must provide sufficient economic bids into both the day-ahead and real-time markets to ensure the ISO, like other EIM entities, provide sufficient resources to meet their forecast load and imbalance requirements. This is done through a resource sufficiency evaluation.

The EIM enables other balancing authority areas in the West to participate in the ISO's real-time market. The EIM includes an hourly resource sufficiency evaluation to ensure that each Balancing Authority Area (BAA) in the EIM has sufficient economic bids to independently balance its supply and demand prior to benefiting from economic transfers between the BAAs. The resource sufficiency evaluation ensures that BAAs in the EIM do not inappropriately lean on other BAAs capacity, flexibility, and transmission capability. The hourly resource sufficiency evaluation includes a series for tests for balance, capacity and upward/downward flexible ramping. In the event an entity fails the resource sufficiency evaluation, transfers into/out of the BAA are limited.

The day-ahead resource sufficiency evaluation will be designed to ensure that sufficient capacity and flexibility is economically bid into the day-ahead market. In the event that a BAA cannot pass the resource sufficiency evaluation, its benefits from economic transfers with other BAAs in the EDAM will be reduced. Each BAA will need sufficient capacity and economic bids

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[3] Second Revised Flexible Capacity Framework Proposal, at pp. 10-11. http://www.caiso.com/Documents/SecondRevisedFlexibleCapacityFrameworkProposal-FlexibleResourceAdequacyCriteriaMustOfferObligationPhase2.pdf

to independently meet its load forecast, ancillary services requirement, and flexible ramping product requirement, less its share of the diversity benefit.

3.2. Review of Resource Adequacy Import Capability provisions

Each year, the ISO establishes maximum import capability values for import paths, which are allocated to scheduling coordinators for load serving entities in the ISO BAA for resource adequacy purposes. The ISO tariff defines maximum import capability to mean “a quantity in MW determined by the ISO for each Intertie into the ISO BAA to be deliverable to the ISO BAA based on ISO study criteria.”[4]

The ISO calculates available import capability for each intertie by using historical import schedule data during peak load periods for the prior two years. The ISO selects the sample hours from these years by choosing two hours in each year, on different days within the same year, with the highest total import level when peak load was at least 90 percent of the annual system peak. The ISO then adds theses scheduled net import values for each intertie with unused existing transmission contract rights and transmission ownership rights, averaged over the four selected historical hours, to determine the available import capability for resource adequacy purposes.[5]

The ISO tariff defines available import capability to mean “the Maximum Import Capability of an Intertie into the ISO Balancing Authority Area in MW deliverable to the ISO Balancing Authority Area based on ISO study criteria minus the sum in MW of all Existing Contracts and Transmission Ownership Rights over that Intertie held by load serving entities that do not serve Load within the ISO Balancing Authority Area.”

Simultaneous import limitation studies quantify the simultaneous transmission import capability into a market or BAA from its aggregated first-tier area (i.e., balancing authorities directly connected to the importing BAA). The purpose of these studies is “to provide a reasonable simulation of historical conditions” and not necessarily “a theoretical maximum transfer capability or best import case scenario.”

The ISO has also developed a forward-looking methodology, known as expanded maximum import capability, which the ISO uses in its transmission planning process. This methodology reflects future upgrades to the transmission system and attempts to ensure that sufficient import capability exists to support resource adequacy contracts in future years.

The ISO posts its available import capability calculations on its public website. For 2018, the overall available import capability number is 14,852 MW. This number reflects historical operating data from the prior two years and excludes existing transmission contract (ETC) or transmission ownership rights (TOR) held by non-ISO load serving entities over the applicable

[4] See CAISO tariff section 40.4.6.2 and Appendix A to the CAISO tariff

[5] CAISO Business Practice Manual for Reliability Requirements at 69-72. https://bpmcm.caiso.com/BPM%20Document%20Library/Reliability%20Requirements/BPM%20for%20Reliability%20Requirements%20Version%2038.docx.

scheduling paths. ISO internal load serving entities also held 1,000 MW of ETC and TOR. However, when load serving entities do not use these commitments in the hour-ahead timeframe, the majority of this capability is released to the ISO market.

The ISO assigns the total Available Import Capability on an annual basis for a one-year term to Scheduling Coordinators representing Load Serving Entities serving Load in the ISO BAA and, in limited circumstances, to Scheduling Coordinators representing Participating Generators or System Resources, through the 13 step allocation process detailed in the ISO tariff, Section 40.4.6.2.1, Available Import Capability Assignment Process. This multi-step process for assignment of Total Import Capability does not guarantee or result in any actual transmission service being assigned, and it is only used for determining the import capability that can be credited towards satisfying the Reserve Margin of a Load Serving Entity under ISO tariff Section 40.

Following the 13 step Available Import Capability allocation process, LSEs have the opportunity to trade their assigned Import Capability with other entities bilaterally. This trading opportunity is detailed in the ISO tariff Section 40.4.6.2.2, Bilateral Import Capability Transfers and Registration Process.

The ISO has received numerous requests from stakeholders regarding review of the MIC calculation and allocation provisions, detailed above, through previous RA related initiatives and the ISO initiative catalog stakeholder process. Stakeholders have indicated that the ISO should consider alternative calculation methods, as well as indicated numerous challenges presented by the current Import Capability Assignment process. Due to the overall comprehensive scope of this initiative and in response to this prior Stakeholder input and feedback, the ISO proposes to conduct a comprehensive review of the ISO's Import Capability provisions, including; calculation methodologies, allocation process, and reassignment/trading provisions. The ISO believes that is may also be necessary to consider multi-year assessments and allocations as a component of the scope of this proposed comprehensive Import Capability review.

3.3. Rules for RA imports

The ISO coordinates with the CPUC, California Energy Commission (CEC) and other local regulatory authorities to set system-level RA requirements. System RA requirements are based on LSE's forecasted monthly peak load plus a planning reserve margin, typically 15 percent of monthly peak loads. LSEs are able to meet these system RA requirements with a mix of RA resources that may include imports from outside of the ISO BAA.

Resource adequacy imports are not required to be resource specific or to represent supply from a specific balancing area, but only that they be on a specific intertie into the ISO system. Further, scheduling coordinators are only required to submit energy bids for resource adequacy imports in the day-ahead market. Imports can be bid at any price and do not have any further obligation to bid into the real-time market if not scheduled in the day-ahead energy or residual unit commitment process.

Imports were used to meet an average of around 3,600 MW (or around 7 percent) of system resource adequacy requirements during the peak summer hours of 2017. In the summer of 2018, this increased to an average of around 4,000 MW (or around 8 percent) of system resource adequacy requirements. [6]

In other prior stakeholder forums, some stakeholders expressed concerns with RA import rules potentially allowing some speculative supply to count for RA, which may have negative impacts such as undermining the integrity of the California RA program and threating system reliability. Additionally, the ISO's Department of Marking Monitoring's (DMM) expressed similar concerns in their September 2018 DMM Special report on import resource adequacy, where DMM felt the existing rules could allow a significant portion of resource adequacy requirements to be met by imports that may have limited availability and value during critical system and market conditions. For example, resource adequacy imports could satisfy their RA must offer obligation by routinely bidding significantly above projected prices in the day-ahead market to help ensure they do not clear the market, relieving them of any further obligations in real-time. [7]

The ISO proposes to include a review of RA import rules and provisions in the scope of this initiative, including a reassessment of the requirements and rules for the sources behind RA imports. This is increasingly important as the ISO considers extending the day-ahead market to EIM entities to ensure that resources outside of the ISO BA are not double counted in meeting resource sufficiency requirements. Additional details regarding RA import MOOs is provided in section 3.4, below. Price caps for import RA bid submissions are out of scope for this initiative.

The ISO notes that the review of RA import rules and any modifications being considered through this section of the proposal may be related to the review of general RA Must Offer Obligations being considered in Section 3.4, below.

3.4. Must Offer Obligations, Substitution Rules, and RAAIM

The RA program is designed to ensure the ISO has sufficient capacity available to reliably serve load. Any resource providing RA capacity to the ISO has an obligation to offer that capacity into the ISO market. The MOO for various RA products and technology types is listed in the ISO's Reliability Requirements BPM.[8] Additionally, RA resources that wish to take planned outages may be required to provide substitute capacity or have that outage denied. Finally, resources that go on forced outage, depending on the cause of the outage, may be subject to the RA Availability Incentive mechanism (RAAIM) if the resource does not provide substitute capacity. RAAIM is designed to provide an incentive for resources on outage to provide substitute capacity for forced outages. RAAIM does not apply to all hours, only to the Availability

[6] 2017 CAISO DMM Annual Report, p. 259:
http://www.caiso.com/Documents/2017AnnualReportonMarketIssuesandPerformance.pdf

[7] DMM Special Report: Import resource adequacy, September 10, 2018:
http://www.caiso.com/Documents/ImportResourceAdequacySpecialReport-Sept102018.pdf

[8] See the Reliability Requirements BPM, pp. 77-82 for system and local RA obligations and pp. 93-96 for flexible RA obligations.
https://bpmcm.caiso.com/BPM%20Document%20Library/Reliability%20Requirements/BPM%20for%20Reliability%20Requirements%20Version%2038.docx

Assessment Hours (AAH). These hours and days differ depending on the RA product the resource is providing the ISO. All of the 2019 AAHs for each product are included in the Appendix of this document. While RAAIM provides an incentive to provide substitute capacity, it also provides an incentive to only show the bare minimum RA capacity types and amounts.

The above is a brief summary of the relationship between MOOs, RA substitution rules, and RAAIM. The reality of these relationships is that they combine to create a very complicated system of processes that differ vastly from other ISOs/RTOs. As part of this initiative, the ISO will conduct a holistic review of all these concepts and these relationships. For example, the ISO receives many questions regarding the differences between a resource's MOO and the AAHs, often using the two concepts interchangeably, or considering a resource's RA MOO to only be applicable during the availability assessment hours.

The following represents an initial list of issues the ISO will explore and look to resolve as part in this stakeholder initiative. Additional items may by be added, depending on stakeholder feedback.

Need for substitution rules and RAAIM

By considering outages as part of the NQC calculation (see Section 3.1, above) the ISO can reassess the need for, and value of, existing substitution rules as well as the current RAAIM construct. Even though substitution rules and RAAIM provide incentives to provide the ISO with adequate capacity, they both come with their own challenges. For example, although RAAIM provides an incentive to provide substitute capacity, it also provides an incentive to only show the bare minimum of any RA capacity type. Additionally, the substitution rules may lead to LSEs holding back capacity under contract (i.e., not showing it as procured RA capacity or offering to sell the capacity to another LSE), just in case it is required to provide substitute capacity.

Developing an emergency or event based RAAIM trigger

FERC recognized that having both a capacity performance/availability derate and an availability incentive mechanism does not necessarily constitute a double penalty for capacity resources. The ISO's RAAIM provides an incentive to provide capacity that has been sold while the capacity derate reflects the quantity of dependable deliverable capacity going forward. However, that does not mean that the ISO's current application of RAAIM is the best tool. For example, ISO-NE has provisions similar to RAAIM, but only triggers the mechanism during system emergencies. If the ISO determines it needs a RAAIM, it will assess with stakeholder input if the tool should be triggered only under certain grid conditions as opposed to applying it regardless of system conditions.

Must Offer Obligation for RA imports

As noted above, several stakeholders and DMM have expressed concerns regarding RA imports. One of the noted concerns is the MOO for RA imports. Currently, RA imports have a day-ahead MOO, but only have a real-time MOO if they receive a day-ahead award. The ISO will reexamine the MOO for RA imports, with a goal of creating more comparable obligations between internal and external RA resources. This will include consideration of bidding obligations into both day-ahead and real-time markets.

3.5. System and Flexible Capacity Assessments and Adequacy Tests

In 2006, at the onset of the RA program in CA, the dominant technology used for energy production was gas fired generation paired with a large quantity of hydroelectric resources. While some of these resources where subject to use-limitations due to environmental restrictions, start limits, or air permits, they were generally available to produce energy when and where needed. However, the CPUC noted that, if overly restrictive, some of the use-limitations could degrade reliability. As a result, the CPUC developed a concept known as the Maximum Cumulative Capacity (MCC) buckets. These buckets were designed to ensure that CPUC jurisdictional LSEs did not over-rely on use limited resources in their procurement practices. The most recent MCC bucket list is provided in Table 2, below.

Table 2: CPUC's MCC buckets[9]

Summary of Resource Categories	
Category	Resources may be categorized into one of the five categories shown below, according to their planned availability as expressed in hours available to run or operate per month (hours/month):
DR	Demand Response resources available for "Greater than or equal to" 24 hours per month.
1	Greater than or equal to the ULR [Use Limited Resource] monthly hours. These are for May through September, respectively: 30, 40, 40, 60, and 40.
2	"Greater than or equal to" 160 hours per month.
3	"Greater than or equal to" 384 hours per month.
4	All Hours (planned availability is unrestricted)

For many years, this MCC bucket construct, paired with system and local RA requirements, worked well to ensure the ISO had a fleet of resources that could reliably operate the grid. However, over time, the portfolio of resources has shifted from a fossil based system to one that is increasingly supported by clean, renewables resources such as wind, solar, DR, and storage, which have use and availability limitations. This transition has lead the CPUC's Energy Division staff to question the on-going usefulness of MCC buckets.[10]

As part of this stakeholder initiative, the ISO is considering a new tool to assess the adequacy of the system and flexible RA fleet. The ISO agrees that the effectiveness of the MCC buckets has been eroded, but requested they remain in place until an alternative assessment can be

[9] Source: CPUC 2019 RA Guide, at: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442459140
[10] For example see Energy Division proposal, p. 4. http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442451951

developed to ensure the fleet of resources can be developed. As noted above, the ISO will be assessing new NQC counting rules and replacement obligations. Additionally, the CPUC's transition to ELCC values for wind and solar resources is an important first step towards improved RA counting values. However, the ELCC values derived for wind and solar are derived using a different fleet than the one that is shown for RA. The difference can result in different reliability contributions from wind and solar resource between the studied fleet and the shown RA fleet.

Although the above enhancements improve the RA counting rules for specific resources, they do not fully assess whether the shown RA fleet is able to meet the ISO's operational needs. Specifically, as part of this stakeholder process, the ISO will explore how to develop a tool to assess all RA showings to ensure they provide adequate system and flexible RA capacity. To ensure the ISO is better able to meet both EIM and EDAM sufficiency tests, as noted in section 3.1.2, above, this test will look to ensure the resource adequacy program ensures that the ISO BAA has sufficient generation capacity and flexibility to meet its operational needs on its own, independent of other entities.

3.6. Meeting Local RA Needs

As a part of California's RA program, the ISO preforms studies to ensure adequate capacity is procured in local areas to mitigate potential local reliability issues in those areas. As California transitions to a lower carbon grid, the ISO will likely depend more heavily on resources with availability limitations, such as limitations on run-time duration or event calls. It is important the ISO enhance its processes to ensure the RA program considers these limitations when determining the amount of procurement required in local areas.

Additionally, the ISO must be able to use the availability limited resources procured for local RA to mitigate local reliability concerns within the appropriate time constraints under real-time operating conditions. This concern specifically relates to slow demand response resources. These resources require an extended "notification period" between an ISO dispatch instruction and resource performance. To enable slow demand response resources to qualify for local RA, the ISO must develop a pre-contingency dispatch solution that allows these resources to mitigate local reliability concerns within acceptable timeframes.

3.6.1. Local capacity assessments with availability limited resources

In its testimony submitted for Track 2 of the CPUC's RA proceeding, the ISO discusses the importance of considering resources' availability limitations when evaluating resource adequacy.[11] The ISO defines availability limited resources as those that have significant dispatch limitations such as limited duration hours (e.g., per year, season, month, or day) or event calls (e.g., per year, season, month or consecutive days) that would limit the resources'

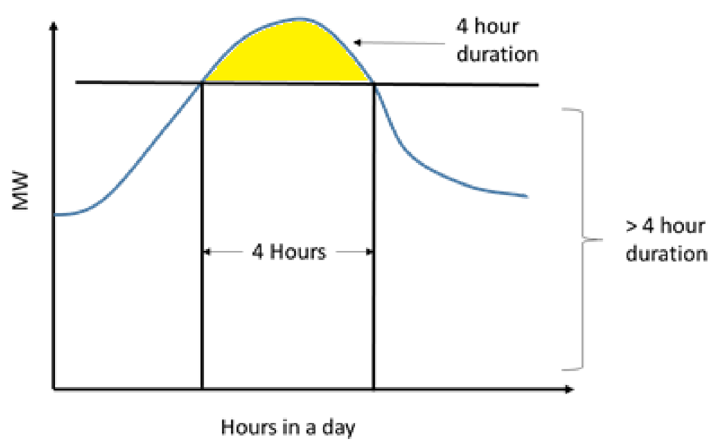
[11] http://www.caiso.com/Documents/Jul10_2018_RAProceedingTrack2Testimon-Chapter6-AvailabilityLimitedResources_ProposalNo5_R17-09-020.pdf

ability to respond to a contingency event within a local capacity area.[12] As these resources continue to make up an increasingly greater portion of the ISO's resource mix, the ISO believes it is important to evaluate local capacity needs considering these resources' availability limitations to help guide the effective procurement of local resource adequacy resources.

The RA program is currently based on meeting a peak capacity requirement defined in MWs without full consideration of resource availability needs, like resource duration or use-limitations. For example, today, availability limited resources have a minimum duration requirement of four hours to qualify for resource adequacy. Under the current RA program, a 10 MW resource that is capable of producing for 4 hours, or 40 MWhs has the same resource adequacy capacity value as a 10 MW resource capable of producing for 8 hours, or 80 MWhs. However, if a local capacity area requires 10 MW of capacity for an eight hour period during a contingency event, only the latter is capable meeting this reliability need. Yet, from an RA perspective, these hypothetical resources are valued the same, because the current RA program does not consider the availability limitations of the resources when determining RA capacity values. This has the potential for the ISO to be sufficient in MWs to meet peak demand needs but insufficient in MWhs to meet energy needs across all hours of the day and year.

Figure 1 demonstrates how the ISO can use availability limited resources to meet the peak, but may need resources with a longer duration in order to meet energy needs in other hours of the day. The black vertical lines reflect a four hour minimum availability threshold. Below the black horizontal line is load that will need to be served with resources with greater than four hours of availability.

Figure 1: Hourly Load Shape with Four Hour Minimum Availability Threshold



Each year, the ISO conducts its local capacity technical study to determine the minimum amount of local capacity area resources needed to address local area contingencies. In preforming the study and setting local capacity requirements, the current process does not

[12] This definition is limited to resources that count towards meeting a local capacity area or sub-area need.

consider hourly load and resource analysis. However, in recent transmission planning studies, specifically the Moorpark and Santa Clara studies, the ISO developed and performed detailed hourly load and resource analyses to determine whether there were binding availability limits in the local capacity sub-areas.[13] This allowed the ISO to more precisely determine local capacity procurement needs, by determining both the capacity and energy needs in those local areas. These studies show that availability limited resources with a four-hour minimum duration were insufficient in meeting the energy (i.e., total MWhs) required to fully address the contingency events identified in the local capacity criteria.

In addition to run time duration limitations, availability limited resources can have other types of limitations. These include how many hours a resource can run or how many event calls a resource can respond to over a defined time horizon (i.e., per year, season, month, or consecutive days). As part of this stakeholder initiative, the ISO proposes to enhance the RA program so that our local capacity assessments consider availability limitations, including limitations on duration hours and event calls, when evaluating a resource's contribution to local reliability needs.

3.6.2. Meeting local capacity needs with slow demand response

For reliable operation of the grid, the ISO depends on adequate supply from resources in local areas to meet load. Demand response resources play a role in helping manage the system in local areas by reducing load when the system is constrained. However, the characteristics of certain demand response resources lead to potential challenges that impact how the market dispatches these resources and how the ISO can use them to respond to a contingency. Specifically, "slow" demand response cannot respond to dispatch instructions provided by the ISO within 20 minutes for the ISO to reposition the system within 30 minutes, due to the additional notification time required for the resource to perform after it receives a dispatch instruction from the ISO.

The ISO and the California Public Utilities Commission (CPUC) have been working to ensure both "fast" and "slow" demand response resources are capable of meeting local reliability requirements.[14] For the purposes of this paper, the ISO defines slow demand response as demand response resources that cannot respond to an ISO dispatch instruction within 20 minutes. After a contingency occurs or when the system enters an N-1 insecure state (loss of a single critical element), the ISO must dispatch resources to return the system to an N-1 secure state within 30 minutes to minimize the risk the next contingency poses on the reliability of the system, accounting for a small amount of time for ISO operators to perform their real-time assessment and react to the contingency condition. After the contingency and real-time

[13] CAISO, Moorpark Sub-Area Local Capacity Alternative Study, August 16, 2017, http://www.caiso.com/Documents/Aug16_2017_MoorparkSub-AreaLocalCapacityRequirementStudy-PuentePowerProject_15-AFC-01.pdf; and Santa Clara Sub-Area Local Capacity Technical Analysis, June 18, 2018, http://www.caiso.com/Documents/2023LocalCapacityTechnicalAnalysisfortheSantaClaraSub-Area.pdf.

[14] https://www.caiso.com/Documents/BPMChangeManagementAppealsCommitteeDecision-PRR854.pdf

assessment, the ISO is left with approximately 20 minutes for resources to provide generation and load drop within the 30 minute timeframe.

Based on the need to reposition the system within 30 minutes, the ISO has three options:

1. Post-Contingency Dispatch: By assessing the system, issuing dispatch instructions, and having a response within 20 minutes
2. Pre-Contingency Dispatch: By dispatching resources pre-contingency so as to have sufficient energy (or load reduction) available before the contingency occurs
3. Pre-Contingency and Post-Contingency Dispatch: Using a combination of pre- and post-contingency dispatch.

Figure 2, below, demonstrates how fast responding resources are used to restore system conditions after a contingency occurs. These resources are ready and able to respond to an event immediately after it occurs with very little lead time. The blue line represents the transmission line flow with all lines in service and under normal conditions, the red X represents the time at which the contingency event occurs, and the green line represents the reduction of transmission line flow in response to the contingency, in order to return the flow to within normal transmission line limits.

Figure 2: Post-Contingency Dispatch

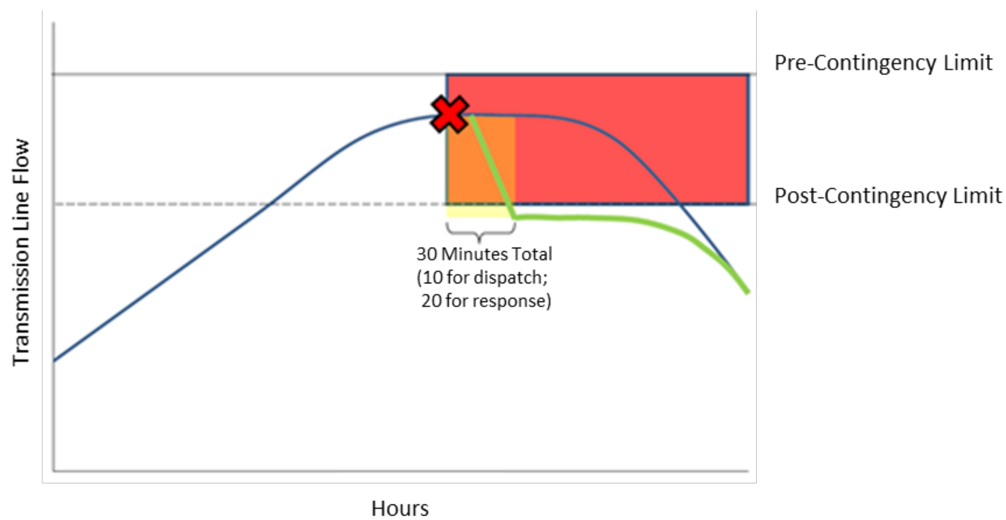


Figure 3, below, demonstrates how slow responding resources can also play a role in responding to contingencies if they can be dispatched ahead of a potential contingency, in case the contingency occurs. This means a slow responding DR resource would be dispatched in the preceding market runs (i.e., RTUC, HASP) to prepare for a potential contingency in real-time. The blue line represents the flow of electricity on the transmission lines with all lines in service and the green line represents the flow of electricity under the transmission line limit using pre-contingency dispatch to prepare for a possible contingency.

Figure 3: Pre-Contingency Dispatch

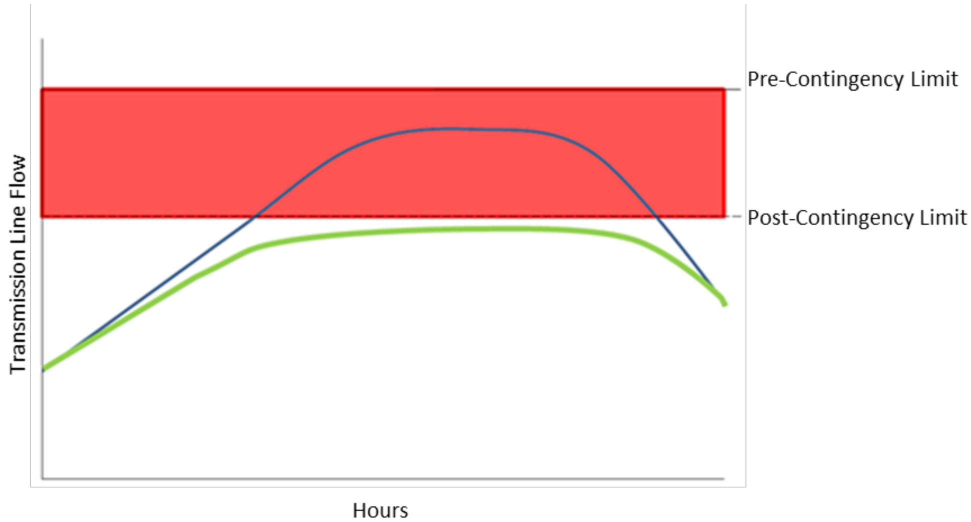
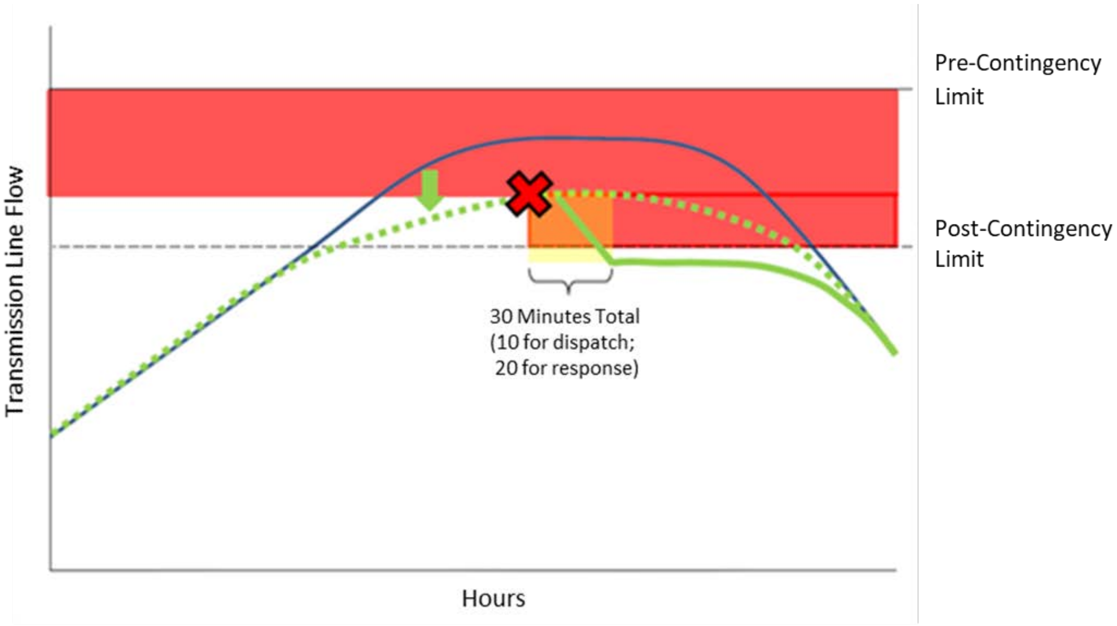


Figure 4, below, demonstrates how the combination of fast and slow resources can work together, relying on slow responding resources to prepare the system for a possible contingency by scheduling slow demand response in advance, and then relying on fast responding resources to respond post-contingency should a contingency occur. In other words, slow response resources are dispatched before the contingency while fast responding resources are dispatched after the contingency. The blue line represents the transmission line flow with all lines in service and the red X represents the time at which the contingency event occurs. The dashed green line represents the flow on transmission lines using pre-contingency dispatch and the solid green line represents the reduction of flow on the transmission lines from post-contingency dispatch of resources that can respond immediately after the contingency occurs.

Figure 4: Combination of Pre- and Post-Contingency Dispatch



In 2017, the ISO performed a study to assess the availability requirements of slow-response resources, such as demand response, to count for local resource adequacy.[15] The study found that at current levels, most existing slow-response DR resources appear to have the required availability characteristics needed for local RA if dispatched pre-contingency as a last resort, with the exception of minimum run time duration limitations. Minimum run time and other availability limitations are discussed above in greater detail. The study did not consider the use of these resources purely for economic purposes.

3.7. CPM/RMR Review

The ISO is planning to identify any needed changes to the capacity procurement mechanism (CPM) or reliability must run (RMR) mechanisms, particularly focusing on the existing cost allocation tools. The ISO does not currently plan to expand backstop procurement authority to include multiple years backstop for any multiyear requirements that may be established by the CPUC beyond current authority already in place and outlined in the active RMR-CPM enhancements stakeholder initiative. As such, multiyear CPM or RMR will not be in scope of this initiative.

The ISO is currently making changes to the accounting practices for local constrained resources, through the BPM change process. These changes will impact the 2020 RA year and the technical studies used by the ISO in preparation for that RA year and future years. These updates will impact how local constrained resources are considered based on expected energy output at peak periods for local areas. As part of this initiative, the ISO will examine how these

[15] CAISO-CPUC Joint Workshop, Slow Response Local Capacity Resource Assessment: https://www.caiso.com/Documents/Presentation_JointISO_CPUCWorkshopSlowResponseLocalCapacityResourceAssessment_Oct42017.pdf.

changes may impact the aggregate amount of RA procurement, and if changes should be made to cost allocation for backstop procurement. Additionally, the ISO will consider changes to cost allocation that accounts for the effectiveness factors of particular resources procured for local RA.

Finally, the ISO is developing an annual list of resources that are critical for maintaining reliability at local area and sub area levels, called Essential Reliability Resources (ERRs). It is critical that ERRs are retained each year for the ISO to reliably operate the electricity grid. Through this initiative, the ISO will specify the process for backstop procurement of these resources if they are not procured through the RA process.

4. EIM Governing Body Role

For this initiative, the ISO plans to seek approval from the ISO Board only. This initiative falls outside the scope of the EIM Governing Body's advisory role because the initiative does not propose changes to either real-time market rules or rules that govern all ISO markets. This initiative is focused on ISO RA planning, procurement, and performance obligations. This process applies only to LSEs serving load in the ISO BAA and the resources procured to serve that load, and does not apply to LSEs outside the ISO balancing authority area. The ISO seeks stakeholder feedback on this proposed decisional classification for the initiative.

5. Next Steps

The ISO will discuss this issue paper with stakeholders during a stakeholder meeting on October 29, 2018. Stakeholders are asked to submit written comments by November 12, 2018 to initiativecomments@caiso.com.

6. Appendix

6.1. Availability Assessment Hours

2019 System and Local Resource Adequacy Availability Assessment Hours

Summer – April 1 through October 31

Availability Assessment Hours: 4pm – 9pm (HE17 – HE21)

Winter – November 1 through March 31

Availability Assessment Hours: 4pm – 9pm (HE17 – HE21)

2019 Flexible Resource Adequacy Availability Assessment Hours and must offer obligation hours

Flexible RA Capacity Type	Category Designation	Required Bidding Hours	Required Bidding Days
January – April October – December			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	2:00pm to 7:00pm (HE15-HE19)	All days
Super-Peak Ramping	Category 3	2:00pm to 7:00pm (HE15-HE19)	Non-Holiday Weekdays*
May – September			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	3:00pm to 8:00pm (HE16-HE20)	All days
Super-Peak Ramping	Category 3	3:00pm to 8:00pm (HE16-HE20)	Non-Holiday Weekdays*