RDRR Bidding Enhancements

Final Proposal

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1. Executive Summary

The purpose of the Track 2 Final Proposal is to better reflect Reliability Demand Response Resources' (RDRR) operational capabilities in the market. The CAISO continues to propose select enhancements to real-time bidding for discrete RDRR by:

- Addressing infeasible RDRR real-time dispatches (i.e., dispatch to a Pmin of zero) through a market enhancement, recognizing known RDRR operational capabilities. The CAISO proposes a solution for discrete RDRRs, whereby the CAISO would re-rate the resource's Pmin below the resource's upper economic limit and a formula will be used to represent to the market the resource's minimum load cost. This ensures the resource is not viewed as "free" by the market, which will help ensure feasible dispatches. This automatic adjustment will occur after the day ahead market, and will not require any action from scheduling coordinators.

- Increasing the discrete RDRR registration cap from 50 MW to 100 MW and allowing for exceptions to this cap. Any exception to the cap would require the resource to attest that it cannot be operationally or safely split, that it cannot operate continuously, that it is not an aggregated resource, as well as indicate the source of the load curtailment. This will be reviewed by the CAISO in context of existing market and operational conditions to ensure safety and reliability. The CAISO's previous concerns regarding an imbalance caused by an increase to the RDRR discrete cap are solved with the Pmin re-rate functionality being implemented and will allow for a higher discrete RDRR cap. As a result, this enhancement is contingent on the Pmin re-rate functionality being implemented.

2. Background

On June 24, 2010, in D.10-06-034 the CPUC approved a multi-party settlement in its demand response proceeding (R.07-01-041) that required investor-owned utilities to transition their CPUC-approved retail emergency-triggered demand response programs into a CAISO reliability demand response product.[1] The settlement specified the minimum operating and technical requirements for retail emergency-triggered demand response resources. The CPUC settlement also required these resources be made available for emergency operating procedures. While previously emergency demand response, like RDRR, were triggered under a "Warning" notice it will now be referred to as an "EEA 2".[2]

Consistent with the terms of the CPUC settlement, the CAISO developed the RDRR product. On October 26, 2010, the CAISO Board of Governors authorized the RDRR product. The Board

[1] Details on the CPUC Reliability-Based Demand Response Settlement are available at https://docs.cpuc.ca.gov/publishedDocs/published/Graphics/119817.PDF and https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/119815.PDF

[2] The CAISO's Operating Procedure 4420 outlines when RDRR can be enabled into the market http://www.caiso.com/Documents/4420.pdf

of Governors memorandum approving the RDRR product specifically noted that it would enable the CAISO "to dispatch these emergency-triggered programs when and where they are needed and, appropriately, reflect their value in the [CA]ISO market."[3]

Fast forward ten years to the August 2020 load shedding events, the Final Root Cause Analysis of these events found that RDRRs were manually dispatched out of market by the CAISO system operators versus through the "market" as originally envisioned.[4] As a result, in its 2021 Summer Readiness initiative, the CAISO modified its tariff to dispatch RDRRs in the real-time pre dispatch (RTPD) market run so that RDRRs could be more optimally dispatched through the market provided they have a longer dispatch horizon. Additionally, the CAISO updated its tariff to allow RDRRs to register as 5-, 15-, or 60-minute dispatchable resources to better elect and reflect an RDRR's operating parameters. Resources registered as 15-minute dispatchable are allowed to set the marginal energy price in the fifteen-minute market. Resources registered as 5- minute dispatchable are allowed to set the marginal energy price in RTD. These changes were accomplished by reflecting discrete RDRRs as discrete in the scheduling run, but treating them as continuous in the pricing run. Continuous RDRR's bid curve submitted by the scheduling and pricing runs allows RDRR to set the price. RDRRs registered as 60-minute dispatchable that clears in the hour-ahead scheduling process (HASP) will receive a fifteen-minute market schedule and settle at the corresponding locational marginal price during each fifteen-minute market interval like all other HASP eligible resources.

3. RDRR Bidding Enhancements Draft Final Proposal

3.1 RDRR "Infeasible Dispatch" Issue

The CAISO in its Summer Readiness initiative modified its tariff to dispatch RDRRs in Real Time Pre-Dispatch (RTPD) so they could be optimally dispatched within a longer time horizon to increase the efficiency of the market dispatch. Market dispatch is impacted by the Pmin registration of a RDRR coupled with its minimum load costs. If the Pmin of a RDRR is set at zero, the resource can also be committed as a zero cost resource at Pmin which could result in dispatch instructions that toggle between Pmin to their upper economic limit and back to Pmin multiple times under a single start-up instruction. Any movement to a Pmin of zero may appear as a shut down to the RDRR thus producing an "infeasible" instruction for the resource. From the CAISO's perspective, a resource with zero Pmin is considered to be on-line, even at zero, unless it operates at zero for the entire period. While this infeasible dispatch was possible prior to Summer Readiness, with the move to make RDRR dispatched by the market more often, stakeholders raised concerns that the infeasible dispatch could occur more frequently.

This initiative started by examining minimum load costs as a means of correcting the issue that RDRRs are receiving real time dispatches that may be infeasible, not from a market perspective but from the perspective of a resource. The CAISO's hypothesis was that allowing resources to represent their minimum load cost could enable resources that have also represented the

[3] The CAISO Memorandum. Decision on the Reliability Demand Response Product. October 26, 2010. http://www.caiso.com/Documents/101101DecisiononReliabilityDemandResponseProduct-Memo.pdf
[4] Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave, January 13, 2021, available at: http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

operational capabilities of their resource as their Pmin near their Pmax, to receive compensation and appropriate dispatch. However, the CAISO has observed that RDRR bids are not cost based and the retail tariffs underpinning RDRR do not incorporate the concept of minimum load or a Pmin.

This enhancement has pivoted to focus on the infeasible dispatch issue and developing the functionality to recognize RDRRs operational capabilities. The CAISO proposed a solution for discrete RDRRs, whereby the CAISO would re-rate the resource's Pmin below the resource's upper economic limit and a formula will be used to represent to the market the resource's minimum load cost. This is to ensure that the resource is not viewed as "free" by the market, thus preventing a real time infeasible dispatch from occurring.

Proposal:

The CAISO continues to propose adjusting discrete RDRRs operating range to reflect operational capabilities by re-rating their Pmin just below the RDRRs upper economic limit. This enhancement is intended to prevent an infeasible dispatch (e.g., movement up and down between the upper economic limit of the bid and a 0 MW Pmin) of discrete RDRRs from occurring as a result of the resource appearing free as well as limitations in the current discrete dispatch functionality. In this proposed solution, while there would still be movement between the upper economic limit to the re-rated Pmin, the difference would be small enough to be negligible. This fully solves the infeasible dispatch issue but creates a challenge where the resource appears to be free for a large number of MW. To solve that issue, the CAISO plans to calculate a minimum load cost adder based on the bid.

The process will use the CAISO's systems and will not require additional action on behalf of the participant:

1. For resources without day ahead schedules, the CAISO will set the minimum operating limit to a value just below the upper economic limit of the bid (i.e., the maximum megawatt limit of the bid), using existing Pmin-rerate functionality
2. The CAISO will add the value of the product of (bid price)*(upper economic limit) to the existing minimum load cost

This proposed solution, to automatically re-rate the Pmin and input a default minimum load cost, would be automatic and compatible with all discrete RDRR bidding options (5, 15, or 60-minute dispatch options). This will enable the market to commit discrete RDRRs like a generator with a non-zero Pmin and recognize that the resource is not "free" from a startup perspective. The market would then publish the Pmin re-rate and minimum load cost to pre-settlement systems for Bid Cost Recovery purposes. Mirroring RDRR's current BCR eligibility, only 5-minute and 15-minue RDRRs will be eligible for BCR.

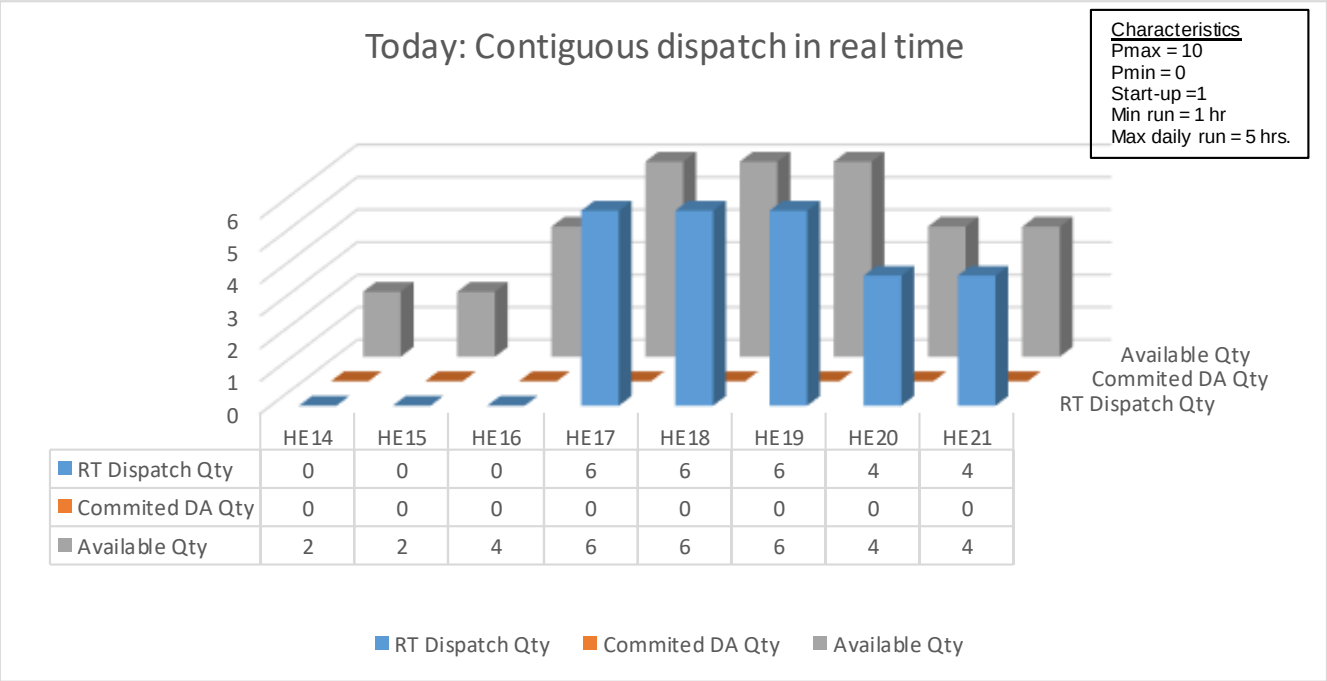
Examples:

Example A: State of the world today

Figure 1 and 2 below illustrate the situation RDRRs face today where in real time they can be dispatched either contiguously or non-contiguously (also referred to as "infeasible" by market participants).

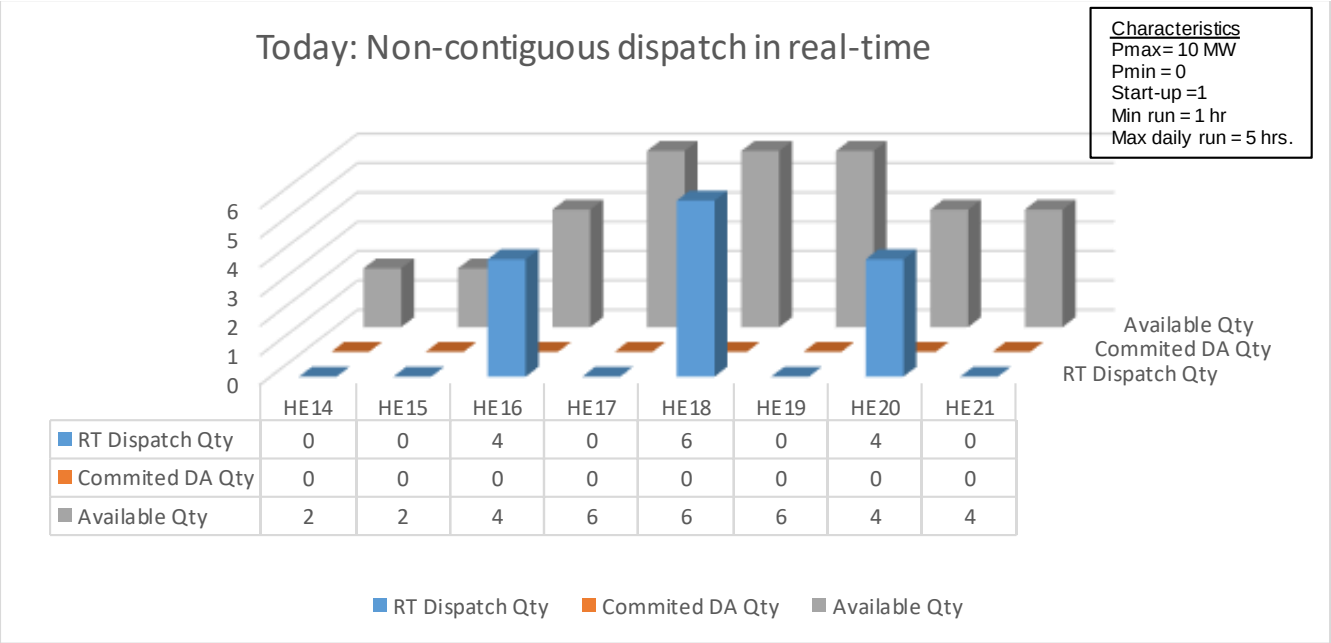
Figure 1 and Figure 2 represent a resource with a Pmax of ten, Pmin of zero, a daily number of start-ups of one, a minimum runtime of one hour, and a maximum daily run time of five hours. Both figures demonstrate how the CAISO's optimization views both scenarios as respecting the max daily run time parameter. In general, a resource with zero Pmin and zero commitment costs will be considered on-line, even at zero, unless at zero for the entire period. In Figure 1 the resource is dispatched at HE 17 and contiguously on for five hours, which respects the max run time parameter. In Figure 2, the resource is dispatched starting in HE 16 and is moved between its upper economic limit and Pmin over the course of five hours and is an example of also respecting the max daily run time parameter.

Figure 1: Contiguous dispatch in the real-time market



	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
RT Dispatch Qty	0	0	0	6	6	6	4	4
Commited DA Qty	0	0	0	0	0	0	0	0
Available Qty	2	2	4	6	6	6	4	4

Figure 2: Non-contiguous dispatch in the real-time market



	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
RT Dispatch Qty	0	0	4	0	6	0	4	0
Commited DA Qty	0	0	0	0	0	0	0	0
Available Qty	2	2	4	6	6	6	4	4

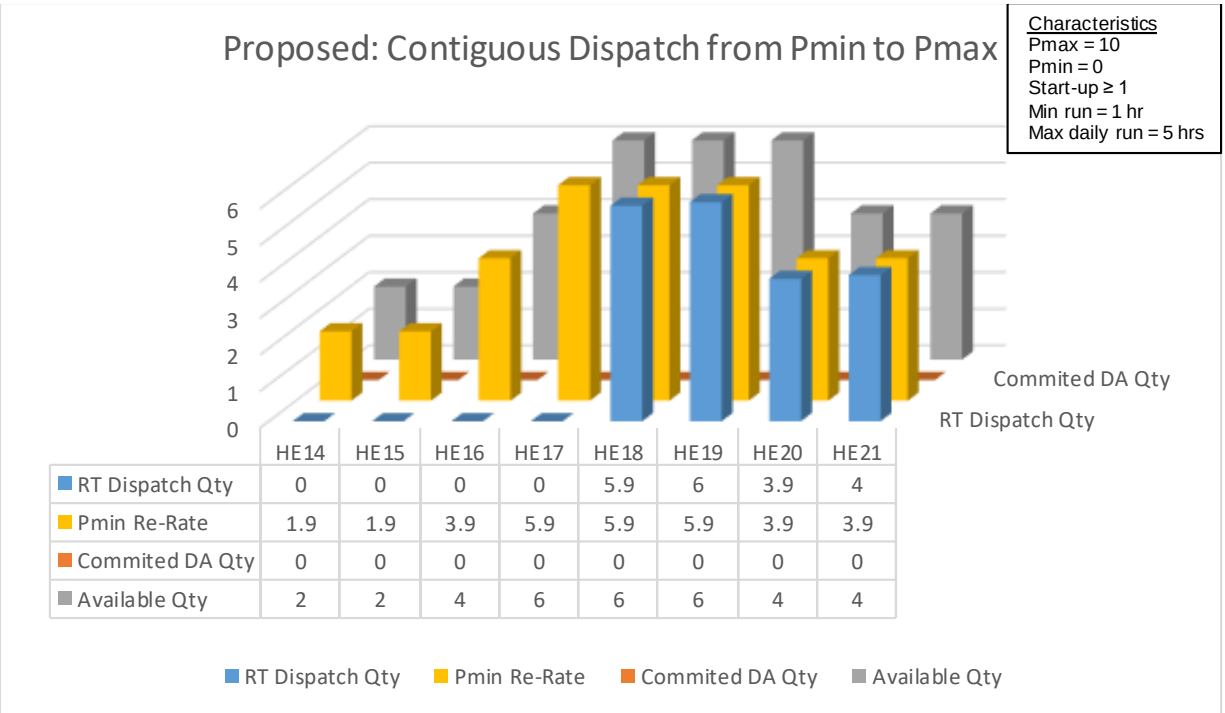
Example B: Proposed solution

This example demonstrates how the CAISO's proposed solution of a Pmin re-rate and value for minimum load cost help resolve the infeasible dispatch issue. In this example the RDRR has a Pmax of ten, Pmin of zero, a daily number of start ups of one, a minimum runtime of one hour, a maximum daily run time of five hours, and a minimum load cost of zero. The resource has submitted real time bids for $950 for all real time intervals. The resource does not have any day ahead awards. As a result, the CAISO will automatically:

- Re-rate the minimum operating level (Pmin, reflected as the yellow bar in Figure 3) to below the upper economic limit (bid, reflected as the grey bar in Figure 3). As a result, the market will now view the re-rated Pmin as the resources Pmin in real time.
- Set the minimum load cost to ($950/MWh) * (5.9 MW) = $5,605/hour. The CAISO will consider this value the resource's commitment costs.

If committed the resource could be dispatched to 5.9 MW (re-rated Pmin) or 6 MW (bid). If we look at a single interval, in HE 18 when the resource is dispatched to 5.9 MW, their minimum operating limit of 5.9 MW and minimum load cost of $5,605/hour will be eligible for Bid Cost Recovery consideration if the resource is short over the course of the day.

Figure 3: Pmin re-rate and value for minimum load cost



	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
RT Dispatch Qty	0	0	0	0	5.9	6	3.9	4
Pmin Re-Rate	1.9	1.9	3.9	5.9	5.9	5.9	3.9	3.9
Commited DA Qty	0	0	0	0	0	0	0	0
Available Qty	2	2	4	6	6	6	4	4

Stakeholder Feedback

Both the California Energy + Demand Management Council (Council) and the Department of Market Monitoring (DMM) submitted comments supportive of the enhancement. SCE commented that the CAISO has addressed most of their concerns. The Department of Market Monitoring did suggest the CAISO could further improve RDRR modeling in a future initiative by allowing continuous RDRRs to submit non-zero minimum load costs.

Response to Stakeholder Feedback:

The CAISO appreciates the stakeholder support. In response to DMM's suggestion that CAISO allow continuous RDRRs to submit non-zero minimum load costs, the CAISO outlines some suggested preconditions for developing those minimum load costs. First, the CAISO suggests that the RDRR Settlement Agreement would need to be updated to reflect the pivot to RDRR as a cost-based resource. Second, the CAISO suggests the underlying retail tariffs that participate as RDRR would need to include the concept of minimum load. If both of these preconditions are met, the CAISO agrees that it could support exploring allowing non-zero minimum load costs for RDRRs. Alternatively, CAISO suggests price responsive demand response use the Proxy Demand Resource model.

3.2 RDRR Registration

RDRRs may register as either continuous or discrete, depending on their abilities. Discrete registration indicates the resource has one bid segment and when dispatched will generate to its Pmax. Continuous (non-discrete) registration indicates that a resource can operate anywhere between its Pmin and Pmax, based on the cleared bid quantity. The CAISO currently has a 50 MW cap on discrete RDRR, and it may only participate in the real time market. There is no cap on the size of an RDRR that is registered as continuous. Continuous RDRR may participate economically in the day ahead market. The designation in the CAISO's Masterfile as continuous or discrete may be updated once per RDRR season.[5] It is a product of the RDRR settlement agreement that the CAISO allows RDRR to bid as a discrete resource. In general, blocky discrete resources do not promote efficient market outcomes—discrete bidding is an exception afforded to RDRRs and the constrained output generator (COG) model.

The current discrete RDRR cap exists to mitigate the discrete-to-continuous treatment. As described in the Market Enhancements for Summer 2021, the move towards minimizing exceptional dispatch of RDRRs and increasing the market dispatch included making changes to allow 15-minutue and 5-minute dispatchable discrete RDRR to set market prices. To allow discrete resources to set the prices, the CAISO reflects these resources as discrete in the scheduling run, but treats them continuous in the pricing run.[6]

Every resource that uses the discrete option it has to potential to create an imbalance. For example, the market may need to dispatch a resource at 25MW when in reality the resource can be at 50MW. The delta creates an inconsistency in the market which will drive some pricing problems and can also create an imbalance between what the market does and what the actual system sees. When this results in an imbalance (*i.e.*, energy generated does not equal energy consumed), area control error (ACE) could increase or decrease from zero, which can result in frequency deviations. If a discrete-continuous imbalance occurs it has to be absorbed in the CAISO's system through ACE or regulation. Larger impacts would require the CAISO to procure more regulation or take actions outside of the market more frequently.[7]

From a pricing perspective, when a discrete resource sets prices in the pricing run it will most often set a higher price than the price that the final and most expensive continuous resource dispatched in the scheduling run would have set. Coupled with a $0/hr min load cost, any final continuous resources in the bid stack will be dispatched to a point on their bid curve where their bid cost is less than the price set by the discrete resource. Thus the final continuous resource, whose costs are less than the price they could receive from the market have an incentive to deviate from dispatch instruction. The delta creates an inconsistency in the market which will

[5] A season is a six month period (summer and winter). Once selected, the status shall be maintained throughout the season.
[6] Market Enhancements for Summer 2021 Readiness Final Proposal, California ISO, March 19, 2021, p. 33: http://www.caiso.com/InitiativeDocuments/FinalProposal-MarketEnhancements-Summer2021Readiness.pdf
[7] Such actions could include load conformance, which refers to the process of updating the load forecast to account for observed system conditions.

drive some pricing problems and can also create an imbalance between what the market does and what the actual system sees.

As stated in the Draft Final Proposal, the CAISO observes that the imbalance issue identified as a challenge with increasing the cap is mitigated if the Pmin re-rate functionality is implemented. This is because the Pmin re-rate changes what the pricing run sees as available and eliminates the imbalance between the pricing run and scheduling run. So for example when previously a resource was hypothetically seen in the pricing run as operating as continuously and dispatched at 5 MW when it was actually 50 MW in size, a 45 MW imbalance could occur. However, with the Pmin re-rate functionality, the pricing run will see the resource as 49.9 MW and as 50MW in the scheduling run producing a possible imbalance of 0.1 MW.

Proposal:

The CAISO continues to propose to increase the discrete RDRR cap to 100 MW. In light of the mitigating measures produced by the Pmin re-rate functionality, the increase to the discrete RDRR cap is conditional on the Pmin re-rate functionality being implemented. The CAISO will also allow discrete RDRRs above 100MW, so long as they submit an affidavit as a part of the Master File registration process that attests:

- The RDRR resource is located at a single site;
- The RDRR load cannot be safely or operationally split;
- The RDRR does not have the ability to operate continuously based on the source of load providing curtailment; and
- To the type of load or technology providing load curtailment during RDRR events.

This affidavit and any supporting information will be reviewed by the CAISO to determine if there is potential for detrimental market or operational impacts associated with allowing these resources to register above the 100 MW cap. For example, if the load size was large enough to cause material operational impacts when coming back online after the load curtailment period ended, it would cause concern for CAISO to approve a resource. The CAISO proposes that discrete RDRRs above 100 MW would need to apply for these Master File exceptions annually, to ensure that future system conditions do not create market or operational challenges. Additional details may be established during the implementation phase of the initiative.

Stakeholder Feedback:

Both The Council and DMM submitted comments in support of the increase to the discrete RDRR cap to 100 MW and the provision to allow for exceptions if certain criteria is met. SCE acknowledged the CAISO addressed most of their concerns.

Response to Stakeholder Feedback:

The CAISO appreciates the stakeholder support of this policy.

3.3 Other Issues

Stakeholder Comments:

SCE and PG&E submitted comments related to two of SCE's open CITI tickets described as: 1.) the policy change to use the 5/15/60 minute notification option instead of the master file start up time for RDRRs and 2.) use limited status for RDRRs and the issue that RDRRs are not able to submit outage cards for hourly/monthly/annual use limitations.

Feedback to Stakeholder Comments:

The first issue, regarding the CAISO's use of default notification time rather than the default start-up time for 5/15/60 minute dispatch, goes back to the ESDER 3 policy. In ESDER 3, PDRs were treated similar to 60-minute and 15-minute dispatchable inter-tie resources. There are tradeoffs to being a 60-minute dispatchable inter-tie resource. For example, a 60-minute PDR resource gets a fixed dispatch which is communicated in advance, in exchange for no BCR. A 15-minute PDR resource gets a fixed dispatch for a shorter period but must be capable of ramping very quickly between 15-minute intervals with less notification time. For the summer 2021 Enhancements, existing PDR dispatch options were extended to RDRR along with the functionality implemented with those options including assumptions used in RTM for purposes of making commitment decisions. The CAISO will work to understand the magnitude of the issue highlighted by SCE for their RDRRs and seek a resolution through the CITI ticket process.

The second issue, pertaining to which outage card should be used for RDRR and if RDRR will receive use limited status, will be resolved through the CITI ticket process and a BPM update. The CAISO does not plan to change its policy that RDRRs are not use limited.

4. Western Energy Imbalance Market (WEIM) Governing Body Role

This initiative proposes changes in the representation of discrete RDRR to the CAISO market. The CAISO staff believes that the WEIM Governing Body has joint authority with the Board of Governors over each of these elements.

The role of the WEIM Governing Body with respect to policy initiatives changed on September 23, 2021, when the Board of Governors adopted revisions to the corporate bylaws and the Charter for WEIM Governance to implement the Governance Review Committee's Part Two Proposal. Under the new rules, the Board and the WEIM Governing Body have joint authority over any proposal to change or establish any CAISO tariff rule(s) applicable to the WEIM Entity balancing authority areas, WEIM Entities, or other market participants within the WEIM Entity balancing authority areas, in their capacity as participants in EIM. This scope excludes from joint authority, without limitation, any proposals to change or establish tariff rule(s) applicable only to the CAISO balancing authority area or to the CAISO-controlled grid. Charter for WEIM Governance § 2.2.1.

The tariff changes to implement the elements of this initiative would be "applicable to EIM Entity balancing authority areas, EIM Entities, or other market participants within EIM Entity balancing authority areas, in their capacity as participants in EIM." WEIM balancing authority areas may use the RDRR model assuming they have approval from their local regulatory authority and meet the requirements of RDRR participation. Accordingly, the proposed changes to the RDRR model fall within the scope of joint authority.

This proposed classification reflects the current state the initiative and could change as the stakeholder process moves ahead. The CAISO did receive comments from PG&E regarding this misalignment with the current BPM language. The CAISO plans to update the RDRR BPM to align with this WEIM governing body role during the implementation phase.

5. Stakeholder Engagement Plan

Date	Track 2 Milestone
4/12/2022	**Publish final proposal an draft tariff language**
4/18/2022	Stakeholder conference call on final proposal an draft tariff language
4/28/2022	Comments due on final proposal an draft tariff language
7/20/2022	**Present RDRR Bidding Enhancements to Joint Session of WEIM Governing Body and CAISO Board**

6. Next Steps

The CAISO will hold a stakeholder call on April 18, 2022 to review this Final Proposal and the accompanying draft tariff language. The CAISO encourages all stakeholders to submit comments on the final proposal and draft tariff language by April 28, 2022.