Commitment Cost Enhancements

Policy Clarification

September 26, 2019

Market & Infrastructure Policy

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1. Introduction

The purpose of this document is to clarify policy discussed in the commitment cost enhancements initiative and to clearly reflect those clarifications in the ISO tariff. These clarifications are focused on use limited and conditionally available resources. This paper also includes a discussion of run-of-river hydro resources, offers a new definition for these resources to be included in the tariff, and proposes that they be exempt from the resource adequacy availability incentive mechanism (RAAIM). The paper goes into details about bidding obligations, notification of outage requirements to the ISO, and RAAIM obligations for these resources.

The principle driver in the commitment costs enhancement initiative was to allow for expanded market participation from use limited resources, including the hydro fleet. Market rule changes that facilitate more frequent participation of these resources in the ISO market allows for greater system flexibility, increased competition, and more efficient market outcomes.

This document and the associated changes to the tariff language will be posted on September 26, 2019. The ISO will host a teleconference call following publication, on October 10. There will be a window for any comments or clarifications open until October 14. The ISO will file tariff changes with FERC shortly after the window for comments is closed, with no plans for further iterations on posted papers or stakeholder discussion.

2. Background

Use Limited Resources

The third phase of the commitment costs enhancements initiative (CCE3) formulated a new definition for use limited resources that could be applied to most resources operating with specific use limitations on the ISO grid.[1] A use limited resource does not have the ability to start or run indefinitely and these restrictions on usage could be the result of regulatory restrictions or facility design limitations. For example, a gas resource may have an air permit that only allows the resource to start a particular number of times per year, or a hydro resource may have a certain amount of water

[1] ISO completed and closed stakeholder initiatives: http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedClosedStakeholderInitiatives/Default.aspx.

stored and can only produce a certain amount of energy (MWh) with the limited amount of water available.

Use limitations create an interesting challenge for ISO market design. The principle market design allows resource owners to bid true costs into the market. The market then generates a least cost solution to operate the grid given expected conditions. This process leads to an elegant solution where least cost resources are dispatched first before more expensive units when solving for system needs. If use limited resources only include fuel costs in their bids, *i.e.*, their bids do not include the *opportunity cost* of using one of the resource's limited starts or run hours, these resources could quickly reach their use limitation even though the resource may have been more valuable for system operations later in the month or year.[2] This issue can be particularly problematic for hydro resources because their marginal cost, without accounting for opportunity costs, is generally very low.

Opportunity costs capture the idea that if a resource starts or runs now, it may be unable to do so in the future because of a use limitation. The ISO's opportunity cost adders measure how much the resource is giving up if it should run at a sub-optimal time. For example, if a hydro resource has enough water stored to only run for three hours per day, and the expected energy prices for the top three hours are $70/MWh, $60/MWh and $55/MWh, then the opportunity cost for the resource to run would be $55/MWh, or the revenue that the resource would give up if it ran at an earlier time. The same resource may incur an actual cost of $5/MWh when generating.[3] If the resource is bid into the market at $5/MWh cost, it may be dispatched very early in the day, and would not have any water available to serve load later in the day when the prices (and system needs for energy) are highest.

There are ways for a use limited resource to manage this issue on its own. A resource might elect to self-schedule energy into the market only during the times it expects prices to be highest, or it could bid into the market at extremely high prices during the periods it expects that market prices will be low so that the ISO does not exhaust the use limitations prematurely. These approaches to managing use limitations are

[2] The market could potentially internalize these costs, if the market were expanded and run for a longer time horizon. In addition to monthly and annual limitations, many resources on the system have daily limitations. These limitations are considered by the market model, which optimizes use given all of the market constraints, including daily use limitations, when calculating dispatch instruction and market results.

[3] These costs might include operations and maintenance costs related to running the resource and grid management charges.

imperfect from the perspective of both market-wide efficiency and the resource's self-interests. If the resource self-schedules into the market, then the ISO loses all flexibility from the resource. Resource flexibility is becoming more critical as net load ramps increase year over year with the increase of solar generation. If the resource bids in at very high prices, it might trigger the market power mitigation process which reduces the resource's bids to their expected cost to run. Further, if the resource takes either of these actions, it may miss capturing market rents during the highest priced hours of the day. These opportunities can be particularly valuable to hydro resources, as they are generally fast ramping resources and have the ability to respond quickly to price spikes in the 5-minute market.

An elegant solution to these challenges was outlined in the Commitment Cost Enhancements initiative. Use limited resources are now allowed to include an opportunity cost adder, which is determined by the ISO, in addition to operating costs to set the default energy bids when local market power mitigation is triggered. Further, if resources bid in such a way that included the opportunity cost adders, the resources would be dispatched when prices were above those costs and, therefore, enhance rents earned when additional dispatches were made. This solution allows a use limited resource to bid its capacity into the market during all hours, enabling the ISO to respect the resource's use limitations and dispatch it most efficiently and effectively.

Creating opportunity cost adders also has implications for use-limited resources providing resource adequacy capacity. Units providing resource adequacy capacity generally have a 24x7 must offer obligation. However, use limited resources providing resource adequacy capacity historically only were required to submit bids for periods when their use limitations allowed them to operate. This has been problematic because use-limited resources are a growing percentage of the resource adequacy fleet and they may not be available to meet ISO reliability needs when and where needed. Specifically, use-limited resources that were hydroelectric, pumping load, and non-dispatchable use-limited resources that provided resource adequacy capacity had to bid "their expected available Energy or their expected as-available Energy" into the market, while all other types of use-limited resources that had to bid into the market where able to do so per the limitations specified in their use plans, which were filed with the ISO.

These units also were exempt from ISO bid generation, but generally were not exempt from RAAIM. To the extent they did not submit bids during RAAIM availability assessment hours, they would be exposed to non-availability charges. Use limited

resources did, however, have access to RAAIM exempt outage cards to use in the event that the resource exhausted, or was in danger of exhausting its use limitations.[4]

Conditionally available resources

The commitment cost enhancements initiative narrowed the scope of units that could qualify as "use-limited" resources. The initial proposal and filing, however, did not provide clarity about the bidding obligations for the units that were losing use limited status. The existing rules required those resources to bid 24x7, however it was likely that these resources would continue to have difficulty meeting a 24x7 must offer obligation because of the limitations that originally classified the resources as use limited. A question arose if the commitment cost enhancements policy had effectively made these resources ineligible to provide resource adequacy capacity because they could not meet the bidding obligations.

Prior to the commitment costs enhancements policy, the ISO submitted a supplemental tariff filing clarifying this issue.[5] This filing included details that the same must-offer obligation would continue to apply to units that could not qualify as a use-limited resource under the new policy. The ISO also created a new resource category called "conditionally available resource" that would also qualify for the as-available must-offer obligation.

The logic of creating the designation for conditionally available resources was to prevent resource types not covered under the prior version of the must-offer obligation from being ineligible for resource adequacy by implication. One example was a generating unit with a noise permit issue that prohibited it from operating during certain hours of the day. Another was a hydroelectric resource that had limitations on its maximum output that could not be modelled by opportunity cost adders, such as regulatory obligations. There was no intent to create RAAIM exemptions for the resources that could model constraints with the use-limited framework.

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[4] This card may be used infrequently because of the design of the opportunity cost adder. The adder is recalculated by the ISO generally on a monthly basis and is updated based on historic use of the limitations facing a resource. For example, if a resource is limited to 100 starts at the beginning of the year and uses 50 in January, the opportunity cost adder is recalculated at a new value considering that there are only 50 starts available for the remainder of the year, prior to February. This should result in a significantly high opportunity cost adder that prevents the resource from running too frequently for the remainder of the year.

[5] The filing was made in FERC docket no. ER19-951-000, filed on April 1, 2019. This filing included changes to tariff section 40.6.4.1.

Run-of-river resources

Scheduling coordinators representing run-of-river hydro have argued that run-of-river hydro is similar to variable energy resources and should also be exempt from RAAIM as are VERs because their day-to-day operations are very similar. Both resources must estimate how much energy they can produce during each hour, and they often are unable to produce beyond these estimates because of fuel limitations – wind, solar, or river flow. One distinction between run-of-river hydro and VERs is the ISO does not receive forecast data for run-of-river hydro as it does for wind and solar. For this reason, the ISO maintains that run-of-river resources cannot be treated as variable energy resources because of this difference in data availability, but the ISO believes it is appropriate to not subject run-of-river resources to RAAIM for the same reasons variable energy resources are not subject to RAAIM. [6]

3. Proposal

3.1 Conditionally Available Resources

The commitment cost enhancements policy allows resources with legitimate operational or regulatory limitations to register as use-limited resources and utilize opportunity costs to manage their use limitations. The ISO created conditionally available resources to fill a policy gap for certain resources that could not always operate up at their full operating range due to certain limitations that the ISO could not model and resolve through market optimization. If non-dispatchable resources, hydro, or pumping load face limitations that cannot be captured through the ISO's opportunity cost modeling, they can seek conditionally available resource status.

When a conditionally available resource is unable to offer into the market because of conditionally available limitations, the ISO expects that the resource's scheduling coordinator will reflect that reduced availability through an outage ticket submitted to the ISO through the outage management system. This obligation to report reductions in

[6] FERC docket no. ER19-951-000 included language that prohibited run-of-river hydro resources from being variable energy resources, and continued to expose them to RAAIM. The Commission's order on this issue rejected the CAISO's amendments but offered no guidance about whether run-of-river hydro should be exempt from RAAIM. Notably, the order provided an incomplete account of the CAISO's initial rationale for the RAAIM exemption and did not address the arguments made for expanding the exemption to run-of-river hydro.

maximum output capability is a generally applicable requirement for all resources in the ISO market.[7]

A resource can potentially be both a use-limited resource and a conditionally available resource. Resources with both designations will be permitted to submit outage cards available to both designations.

However, the underlying limitations that qualify the resource for each of these designations cannot be the same. One of the criteria for use-limited status is that the limitation does not restrict the hours of operation of the resource, and that the resource limitation usage needs to be rationed over a fixed period of time. If the resource has one or more operational or regulatory limits that do not qualify as use limitations, but still impose frequent and recurring periods of unavailability, the resource may apply for conditionally available status.

Resources with both designations will be permitted to submit outage cards available to both designations. For example, a gas resource with an air permit limiting its annual starts and a noise permit restricting its availability in certain hours of the day can register the air permit limitation for use-limited status, and register the noise permit limitation for a conditionally available status.[8]

Scheduling coordinators are responsible for submitting the appropriate outage card when conditions arise that prevent the full dispatch of the resource. In the above example, if a resource is both use-limited and conditionally available, the resource may enter an outage card reserved for use-limited resources if the reduced availability is driven specifically by a use limit that justified its use-limited resource status. This is consistent with existing rules for resources submitting outages, in that outage cards need to reflect actual conditions limiting or preventing a resource from participating in the market.

3.2 RAAIM Application

The CAISO did not intend any unique RAAIM treatment for conditionally available resources. The policy intent was that these resources would be assessed RAAIM based on their full resource adequacy capacity – not their conditionally available capacity – during availability assessment hours. That is, a conditionally available resource that is shown for 100 MW of RA capacity may only be available for 20 MW at a particular time

[7] Section 9.3.10.3.1.

[8] For purposes of opportunity cost calculation, only the air permit limitation will be considered.

because of the regulatory limit that it cited to qualify for conditionally available status. The intent was for RAAIM calculations be based on the 100 MW of shown capacity, rather than the 20 MW of availability due to conditional limitations.

As an interim measure, the ISO allowed use of the RAAIM-exempt outage card for certain resources.[9] Use of this outage card is temporary and, pending the clarifications in this proposal, no longer will be allowed. As a result of these changes, the must-offer obligation and RAAIM exposure may not align for conditionally available resources during some hours.

To create a more durable solution, the CAISO will further explore how resources with uncertain availability should establish net qualifying capacity (NQC) values. The effective load carrying capacity (ELCC) methodology addresses this for wind and solar, and CAISO will continue to refine methods for other resource types, including hydro and hybrid resources. This process will involve more in-depth stakeholder engagement and coordination with the CPUC and other LRAs.

3.3 Run-of-River Hydro

The output from run-of-river hydro is variable in some of the same ways as wind and solar resources. Wind and solar resources are required to bid into the market at their expected energy output, have limited control on their maximum output, and are not subject to RAAIM. The CAISO finds that run-of-river resources should be treated in a similar fashion.

Run-of-river resources have very limited control of their output from one interval to the next. For example, a run-of-river hydro resource with a maximum output of 10 MW may be capable of producing anywhere between 0 MW and 7 MW given current flow conditions. In the next interval, the resource may only be capable of producing between 0 MW and 3 MW based on existing flows. The resource producing at any point in the range of 0 MW and 7 MW during the earlier interval generally has no impact on the resource's output capability of between 0 MW and 3 MW in the next interval.

The ISO expects that run of river hydro resources will generally act as price takers and offer all generation capability into the market. Generally, when there is water available, the resource will generate and earn market revenues, and when water is not available, the resource will not generate. These resources can generally respond to ISO dispatches to reduce energy output below the maximum possible allowed by current hydro flow conditions. The ISO often experiences low or even negative prices during spring months when solar is online, hydro generation is high, and loads are relatively low. During

[9] These changes were made in PRRs 1168, 1169, and 1170.

periods with negative prices, these resources may choose to 'spill' (not run) and forego negative revenue (charges) for generating energy not needed.

Run-of-river hydro resources are similar in nature to variable energy resources (VERs). Variable energy resources, such as wind and solar resources, are also generally considered price takers, in that when the wind is blowing or the sun is shinning they produce energy and sell it into the market. These resources may also have technology to allow reduction from maximum output in response to ISO dispatch instructions. These resources are required to bid into the market at their expected energy output, and bid flexibility in the downward direction if possible. Like VERs, run-of-river hydro resources are allowed to count for net qualifying capacity in the resource adequacy process, but do not count for their full nameplate capacity. Capacity for these resources is derated based on historical performance, in a similar way to how VER NQC is set using the effective load carrying capacity (ELCC) methodology. As with wind and solar, a run-of-river unit's poor performance in the past will reduce its QC value in the future. This creates an incentive, independent of RAAIM, for run-of-river resources to maximize their performance.

These factors are significant enough to qualify run-of-river resources for a RAAIM exemption. The ISO proposes new tariff language to define run-of-river hydro resources as RAAIM exempt. Run-of-river resources providing resource adequacy capacity will not, by default, have a unique must-offer obligation. They may, however, apply for status as a conditionally available resource, in which case they would be eligible for the expected energy must-offer obligation.

Similar to some wind and solar resources, run-of-river resources may also be shown as flexible resource adequacy. This is acceptable when these resources can curtail output when generating and can consistently bid their flexibility into the market.

In defining run-of-river, the CAISO must address two issues: (1) how much pondage should disqualify a resource from being run-of-river; and (2) how should the CAISO account for cases where the operator of a run-of-river resource also controls releases from a reservoir directly upriver that materially impact the generator's operation.

Pond storage

The distinguishing feature of run-of-river compared to other hydro is that electricity production from run-of-river at one point in time does not influence its generation capability at a later point. If a reservoir-backed hydro resource does not release water now to generate electricity, then it will have more water with which to generate electricity later.

This distinction, however, is not as simple as defining run-of-river as a hydro resource with no storage capability. The ISO understands all resources commonly thought of as run-of-river have some level of water storage. A minimal amount of storage is necessary to generate sufficient water pressure to operate the generating unit. Once the pond is large enough to "store energy" and permit the resource to make a trade-off between generating now or generating later, then the element of inherent variability is lost and the resource does not qualify as run-of-river.

Common Control of Water System

A second issue is run-of-river resources are often part of a larger hydro system with multiple reservoir-backed hydro resources under the same operator's control. Where the operator of a run-of-river unit also controls water releases from a reservoir directly upriver, then there is a question as to whether the run-of-river operator actually lacks control over the unit's output. The CAISO sees this as a legitimate concern but has concluded that trying to accommodate it in either defining a run-of-river resource or creating the RAAIM exemption raises too many additional complications.

First, it would be difficult to define any generating resource based on the characteristics of a separate resource. For example, if a reservoir-backed hydro resource upriver changes ownership, would that change whether the downstream resources under a different owner now qualify as run-of-river? The CAISO found it would raise too many other questions to allow run-of-river to be defined based on the ownership and operating characteristics of upstream, reservoir-backed generating units.

Second, the common operator of the run-of-river and reservoir-backed hydro units may not always have control over when it must release water from the reservoir. Sometimes the operator may hold regulatory requirements to release water from the reservoir. Also, it would not necessarily control the flow of water into the reservoir. If it must release water because there is too much water flowing into the reservoir from natural waterways, then the release of water that influenced the generating output on the run-of-river unit arguably is beyond the operator's control.

The CAISO does not believe it can administer a RAAIM exemption that accounts for these varied scenarios. The CAISO will not seek to define run-of-river hydro or determine its RAAIM exemption based on what other resources the operator of a given run-of-river resource may control.

Proposed Run-of-River Definition

Based on these considerations, the ISO proposes the following definition for run-of-river hydro.[10]

> "A hydroelectric Generating Unit that has no physical ability to control or store its fuel source for generation beyond whatever pondage is necessary to maintain sufficient water pressure to operate the Generating Unit."

Net Qualifying Capacity

Similar to solar and wind resources, run-of river hydro resource can be beneficial to the system and help to ensure reliable operations. They can also reduce the needs to procure other resource adequacy resources to meet these needs. The ISO uses net qualifying capacity as an upper bound for the amount of capacity that resources can be shown for in the resource adequacy construct. The ISO will continue discussing how the net qualifying capacity for run-of-river hydro resources should be set to ensure they do not qualify for more capacity than they can reasonably provide to maintain system reliability.

3.4 Other Tariff Clarifications

The ISO will also update tariff language regarding how multiple internal resources can provide substitute capacity.[11] Also, the inclusion of external resources as substitute capacity for forced outages will be updated as well.[12]

4. Next Steps

The ISO will host a public stakeholder call on October 10, 2019 beginning at 10:00am. This call will be to review the clarifications outlined in this paper and to discuss associated tariff clarifications. The ISO will allow verbal comments during the call and

[10] The CAISO considered the definitions from other ISOs/RTOs but did not find these met its specific needs. The New York ISO defines a "Limited Control Run-of-River Hydro Resource" as "A Generator above 1 MW in size that has demonstrated to the satisfaction of the ISO that its Energy production depends directly on river flows over which it has limited control and that such dependence precludes accurate prediction of the facility's real-time output."

[11] The updated language is in section 40.9.3.6.4 (d). Current language is identical to the language in 40.9.3.6.4 (c), which discusses substitution from a single resource, but should not be.

[12] The updated language is in section 40.9.3.6.5(d) of the tariff and will mirror language in section 9.2.3.2 of the Reliability Requirements BPM.

written comments shortly afterwards so stakeholders can seek additional clarifications. All written comments are required by October, 14. The ISO intends to file at FERC shortly after the public phone call and comments window and will incorporate appropriate suggestions in the FERC filing.

Comments can be submitted in regard to this paper or the proposed tariff language to: initiativecomments@caiso.com.