

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE
STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee
the Resource Adequacy Program,
Consider Program Refinements, and
Establish Forward Resource Adequacy
Procurement Obligations.

Rulemaking 19-11-009

**SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) AND CALIFORNIA
INDEPENDENT SYSTEM OPERATOR CORPORATION'S JOINT REPORT FOR
THE TRACK 2 HYDRO COUNTING WORKING GROUP**

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Dated: **March 11, 2020**

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Pursuant to the *Assigned Commissioner's Scoping Memo and Ruling* issued on January 22, 2020 ("Scoping Memo") and the *Administrative Law Judge's Ruling Modifying Track 2 Schedule* issued on February 28, 2020 ("Ruling"), Southern California Edison Company ("SCE") and the California Independent System Operator Corporation ("CAISO") hereby submit this joint report for the Track 2 Hydro Counting Working Group ("Working Group Report").¹

I.

INTRODUCTION

SCE and the CAISO are co-chairing the Hydro Counting Working Group in Track 2 of this proceeding. The Hydro Counting Working Group met on February 12, 2020 from 10:00 a.m. to 1:00 p.m. (the "February 12 Meeting") at the California Public Utilities Commission, Hearing Room A, 505 Van Ness Avenue, San Francisco, CA 94102. WebEx and conference call information were also made available to parties on the Rulemaking ("R.") 19-11-009 service list. SCE and the CAISO asked any party who wanted to present proposals at the February 12

¹ Pursuant to Rule 1.8(d) of the Rules of Practice and Procedure of the California Public Utilities Commission ("Commission"), the CAISO has authorized SCE to file this Working Group Report on its behalf.

Meeting to notify SCE and the CAISO and provide their presentations. At the February 12 Meeting, the CAISO presented on the background of various CAISO policy initiatives related to hydro resources and the hydro resource counting rules. SCE and Pacific Gas and Electric Company (“PG&E”) also presented qualifying capacity (“QC”) methodology proposals on Resource Adequacy (“RA”) counting rules for hydro resources. The CAISO, SCE, and PG&E presentations are included as Appendix A. A joint progress report for the Hydro Counting Working Group was served on February 14, 2020.

As communicated during the February 12 Meeting, SCE sent a draft version of the Working Group Report to the R.19-11-009 service list on February 24, 2020 for informal feedback from parties, and asked for such informal comments by February 26, 2020. PG&E was the only party that provided informal feedback on the draft report, which was incorporated into this Working Group Report. Parties will also have an opportunity to file comments and reply comments on this Working Group Report as provided in the Scoping Memo and Ruling.

II.

DESCRIPTION OF ISSUES AND PROPOSALS

A. Issues with Hydro Resource RA Counting

Due to their unique nature, all hydro resources are subject to precipitation, environmental, and regulatory constraints. Those constraints are typically outside of the resource owner’s control and can significantly impact the capacity and energy availability of hydro resources year-to-year. Further, much of the hydro fleet in California is located in CAISO-defined local capacity areas. The Commission requires that local resources, including hydro resources, are shown in RA plans in the October before the RA compliance year. These showings are for capacity that will be available on a three-year forward basis. This implies that the actual quantities of water available for bidding into the system at the time of operation are unknown at the time of the RA showings, as generally hydro resources only know their summer availability once snowpack and rainfall values are realized in April or May.

The CAISO requires that capacity from a resource be bid into the market, via a must-offer-obligation imposed on RA resources. Further, the CAISO has the Resource Adequacy Availability Incentive Mechanism (“RAAIM”), which incentivizes market participation of RA capacity by imposing charges for capacity that is shown but not bid into the energy market. Exposure to these charges, coupled with the lack of visibility into the actual amount of capacity available, can cause significant potential financial risk to hydro resources.²

It will therefore be important in this proceeding for the Commission to determine reasonable values for hydro resource RA counting that reflect the appropriate amount of reliance on such resources for reliability, while not excessively derating them and leading to potentially unnecessary procurement costs. Moreover, the current exposure to financial charges for insufficient water also makes it risky for a load-serving entity (“LSE”) owner of a hydro facility to sell RA from that facility so that other LSEs may meet their local RA showings due to the uncertainty of the cost exposure of the potential CAISO RAAIM charges. These issues are recognized by the CAISO and currently addressed under the CAISO Commitment Cost Enhancements 3 Tariff Clarification (“CCE3-TC”) Initiative for any CAISO process and/or tariff changes.

These challenges regarding hydro resource RA counting can be and should be addressed for the next RA year. As described below, proposals have been developed and there is broad consensus among the parties on the high-level conceptual solution. Although there are some differences of opinion on the implementation timeline, since this is an optional counting mechanism,³ solutions should be implemented in 2020 for the 2021 RA year. The CAISO is committed to conclude the CCE3-TC Initiative after the March CAISO Board of Governors meeting with an effective date of June 1, 2020. If the Commission implements an update to the

² See PG&E Hydro Counting Working Group Presentation at 2-4 (included in Appendix A).

³ Parties would be able to claim RA up to the original QC if above this methodology, but doing so would subject the resource to RAAIM for all outages including those for water availability.

RA counting rules through this proceeding, then the CAISO would time tariff or business practice manual changes to be effective as these rules are applied.⁴

B. Hydro Resource RA Counting Proposals

Two proposals were submitted to the Hydro Counting Working Group and both were presented and discussed during the February 12 Meeting. The first proposal was submitted by SCE and the general approach was supported by the CAISO (“SCE Proposal”). The second proposal was submitted by PG&E (“PG&E Proposal”). Both proposals are described briefly below.

The SCE Proposal provides a methodology based on historic bid-in availability to calculate reasonable QC values for hydro with storage, paired with a RAIM exemption for water availability. Outages due to mechanical issues would continue to be subject to RAIM. Specifically, the methodology uses the weighted average of three years of availability to determine the capacity of the resource, similar to the CAISO’s proposed UCAP concept in its RA Enhancements Initiative.⁵ SCE proposes to use an average availability during a 5:00 a.m. to 9 p.m. assessment window from May to September to calculate an annual capacity number. An “Effective QC” would then be calculated based on a weighted average of the past two years of history, plus a third year based on the lowest capacity of the past ten years. Initially, SCE proposes to use a 50% weighting for the prior year, 30% for two years prior, and a 20% weighting for the lowest year in the last ten. In this initial calculation, the Effective QC represents approximately a 30-35% derate of the current QC methodology.

The PG&E Proposal addresses the existing QC counting rules by proposing an exceedance methodology that calculates the QC value of a hydro resource at the 50th percentile (i.e., median) of bid-in availability in the last rolling ten years during either the availability

⁴ See CAISO Hydro Counting Working Group Presentation at 8 (included in Appendix A).

⁵ See CAISO, *Resource Adequacy Enhancements Third Revised Straw Proposal*, December 20, 2019, Section 5.1.2, available at <http://www.caiso.com/InitiativeDocuments/ThirdRevisedStrawProposal-ResourceAdequacyEnhancements.pdf>.

assessment hours (4:00 p.m. to 9:00 p.m.) or 24/7. The assessment window would be based on the hydro resource's must-offer-obligation as outlined in the CAISO Business Practice Manual. The PG&E Proposal would perform this ranking and calculation for all hydro resources at the monthly level to derive monthly RA values. The PG&E Proposal would not differentiate mechanical outages from water availability in deriving monthly RA values at this time.

Other resources that face elements beyond the control of the generator are not exposed to RAAIM when those elements occur. This is true of wind and solar resources where the ambient conditions are not in the control of the resource owner, but the resource owner does not face RAAIM charges when the ambient conditions do not provide for electricity generation. Instead, the calculation of the RA capacity value derates the resource for expected energy based upon an effective load carrying capability methodology. The changes for hydro resource RA counting described above are consistent with a methodology that appropriately recognizes the difference between elements which the resource owner can control and those which it cannot.

C. Incorporating Working Group Discussion

During the February 12 Meeting, similarities and differences between the SCE Proposal and the PG&E Proposal were discussed.

Similarities between the two proposals as initially formulated and discussed during the February 12 Meeting include:

- Both proposals use historical availability information at the resource-specific level to calculate an RA value for the resource to more reasonably reflect the resource's availability and be exempted from RAAIM.
- Both proposals differentiate outages for mechanical issues and for water conditions. Because of this, and since historical data does not identify the outage cause in this manner, the calculation of QC in the first year would need to develop an agreed upon method to define such outages for the initial QC value. This issue will be resolved in

each proposal as new data that does account for the cause of the outage (mechanical vs. water availability) in the future.

Differences between the two proposals as initially formulated and discussed during the February 12 Meeting include:

- The proposals differ in proposed time duration (i.e., look-back period), along with the weightings applied to those prior years, including how a proper 1 in 10 dry year is determined.
- The SCE Proposal initially calculates annual or seasonal RA values, while the PG&E Proposal would develop monthly RA values.
- Depending on specifics, e.g., how relevant data are gathered and whether mechanical issues should be differentiated from fuel-availability issues, the effort required to phase in the two proposals may differ.
- The proposals differ in the treatment of whether forced outages related to mechanical failures should be differentiated from fuel-availability in the historical look back.

Following discussion and stakeholder feedback from the February 12 Meeting, SCE agrees that the details of its proposal can be reconsidered while preserving the high-level concept. For example, SCE received feedback that a monthly calculation more reasonably represents the seasonality of hydro resources, and SCE agrees that the calculation can be done at a monthly granularity, similar to the PG&E Proposal. SCE has also received input that lower volatility around the capacity number is preferred, and that a calculation based on the last ten years of availability could provide that lower volatility. The lowest capacity year of the prior ten could be weighted 20% with the remaining years weighted at 80%. Some parties commented that it may be difficult to identify how much of past outages were due to mechanical issues or water availability due to how the information is captured in the CAISO's systems. SCE and PG&E agree that the task can be challenging, and SCE clarified that it did not intend that all past outages must be distinguished between mechanical and water availability. SCE's intention is that any outages that could be clearly identified as mechanical issues (such as a powerhouse

being serviced) may be excluded from the calculation. SCE and PG&E have made slight modifications to their respective proposals and will work towards consensus, where possible, to develop a joint proposal.

III.

CONSENSUS ITEMS

Parties generally agree that the issues around hydro resources exist today. Parties agree that the issues should be addressed in a timely fashion as practical. SCE, PG&E, and the CAISO agree with the general approach to base RA counting for hydro resources on historical availability, based on bid information submitted to the CAISO markets. SCE, PG&E, and the CAISO also agree that, under this approach, RAAIM should be exempted for water availability as water availability would already be reflected in the RA capacity of the resource. SCE, PG&E, and the CAISO agree that RAAIM would only apply to mechanical-related forced outages. No other parties expressed opposition to these positions.

The table below illustrates the consensus and non-consensus items between the two proposals. SCE and PG&E have modified their original proposals to create better alignment by using feedback from other stakeholders. Although there are still some differences, SCE, CAISO, and PG&E are working together to develop a joint proposal.

SCE initially proposed an annual QC while PG&E preferred a monthly approach. PG&E's reasoning on the monthly QC is that it provides better alignment with system RA requirements and the monthly granularity better aligns with resource availability. SCE's reasoning on the annual QC is that it provides better alignment with local RA requirements and an annual QC facilitates transactions since local and system RA cannot be unbundled. After further thinking on this issue, SCE acknowledges that monthly QCs will be necessary to appropriately demonstrate the monthly resource expectations for system.

| CATEGORY | | PG&E | SCE |
|--------------------------|--|--|--|
| Hydroelectric Categories | | Categorized Based on CAISO Designation | Hydro with Storage (Optional) |
| Methodology | | Median | |
| Years | | Rolling 10 Years | Rolling 2 years plus low water year from past 10 years |
| Weighting | | 20% for the lowest year of the past ten 80% for the remaining years | |
| QC Value | | Monthly Value | |
| Based On | | Self-Schedules and/or Economic Bids | |
| Hours | | Based on Respective Bidding Obligation | 24/7 |
| Outages | | Exclude Mechanical Outages | |
| Application of RAAIM | | RAAIM-Exempt for water availability capacity derates | |
| Implementation Timeframe | | 2022 | 2021 |

IV.

NON-CONSENSUS ITEMS

After the February 12 Meeting, PG&E and SCE discussed the use of different local and system quantities from the same resource in monthly RA showings. This has raised a difficult issue in that the showing for local RA is an annual showing and the subsequent monthly showings for local RA require the LSE to show those resources claimed in the annual showing or a replacement. The system RA monthly showing on the other hand can differ significantly and has historically shown expected monthly capacity from hydro resources.

This difference functions sufficiently when the entire capacity of the resource is being shown by a single LSE. Looking forward, as load migration occurs, it will be necessary to sell portions of hydro capacity so that other LSEs can meet their local RA obligations. However, since local and system RA are a bundled product and without knowing the monthly quantities ahead of time, the purchasing LSE will likely expect to show all of the local hydro as a system resource in each month. This would then require the Scheduling Coordinator to submit a supply

plan to the CAISO for a quantity that it does not believe it can deliver. This could result in a quantity of system RA insufficient to satisfy monthly reliability needs. SCE, PG&E, and the CAISO are discussing this topic to identify potential resolution.

On the length of historical look back, PG&E prefers the lower volatility and greater certainty associated with a longer term. The CAISO is considering the impacts of both shorter and longer historical periods with appropriate weighting. SCE is open to CAISO's preference on this issue.

While SCE prefers an implementation in 2020 for the 2021 RA year, PG&E expressed a desire to implement solutions in 2021 for the 2022 RA year.

V.

JOINT PROPOSAL

After further discussion, the CAISO, PG&E, and SCE have developed a joint proposal to address the RA qualifying capacity value of hydro resources. The proposal is attached to this report as Appendix B and resolves all of the non-consensus items discussed above.

Respectfully submitted on behalf of
Southern California Edison Company and
California Independent System Operator Corporation

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March 11, 2020

Appendix A

CAISO, SCE, and PG&E Presentations



Hydro Resource Counting Rules

CPUC Workshop
February 12, 2020

Gabe Murtaugh

ISO PUBLIC

Agenda

| | | |
|------------------|---------------------------------------|----------------------|
| 10:00-10:10 AM | Introduction | <i>CPUC</i> |
| 10:10-10:40 AM | Background | <i>CAISO</i> |
| 10:40 – 11:40 AM | Presentation on SCE/CAISO Proposal | <i>SCE</i> |
| 11:40 – 12:30 PM | Proposals from Other Parties | <i>PG&E</i> |
| 12:30 – 1:00 PM | Discussion | <i>All Attendees</i> |

- Objective: Generate a potential alternate hydro counting option for proposals into the RA proceeding

ISO policies related to hydro resources

- 2015 – Reliability services initiative
 - Established RAIM tools coupled with AAH for RA resources
- 2019 – Commitment costs Enhancements Phase 3
 - Opportunity cost adders are applied to use limited resources
 - Conditionally available resources (CAR) established
- Current – CCE Tariff Clarifications
 - Run of river resources established, with treatment similar to VERs
 - Clarified that CAR resources should not be RAIM exempt
 - Clarified that resources could be both CAR and use limited
- Continued concern from market participants that this system does not accommodate all hydro resources

This construct has incentives in place to ensure availability, through RAAIM and bidding rules

- Resource adequacy resources are shown to the ISO during the annual and monthly RA processes
 - The ISO may use the CPM backstop mechanism to procure additional resources if needed
- Most RA resources have a 24x7 bidding requirement
- RA resources are incentivized through the RAAIM tool to be available during availability assessment hours (AAHs)
 - RAAIM has a target availability of 96.5% with a +/- 2% dead band
 - Resources performing above this threshold are eligible for incentives
 - Resources performing below this target are subject to a penalty
 - RAAIM does not apply to some resources, like variable energy resources (VERs), which are generally considered price takers

The ISO and stakeholders have concerns with the treatment of hydro resources

- Resources may be shown up to their full qualifying capacity uninformed by forward looking water conditions
 - ‘Non-Dispatchable’ hydro resources receive credit based on 3 years of historic availability
 - ‘Dispatchable’ hydro resources can claim full nameplate capacity as RA
- Some LSEs have expressed concern that there is pressure to show or offer their full RA capacity, which may exceed capabilities if below average hydro year
 - Dispatchable may show full nameplate capacity for RA
 - The ISO depends on accurate showings to inform reliability conditions and make potential backstop designations
 - Resources with limited water may use opportunity cost adders – which will not impact availability – applied to bids to conserve limited usage
 - Resources with conditional availability will be subject to RAAIM

SCE offered a potential alternative to the current counting rules for hydro resources

- Hydro resources with limited water or other constraints will knowingly be unable to deliver their full capacity
 - The full shown capacity value of resource will be subject to RAIM
 - Significant accrual of RAIM penalties indicate unavailable and undependable RA capacity, which can jeopardize reliability
- SCE's solution proposes a reduced NQC for dispatchable hydro resources
 - Updated methodology to calculate capacity value could be based on historic availability of the resource
 - Place additional weight on 'dry' hydro conditions to prevent:
 - Showing or offering unavailable and undependable capacity
 - Shifts to a paradigm where a resource is incentivized to offer in because it effects future capacity values, rather than a RAIM mechanism

The ISO supports an alternate counting approach where RA capacity based on historic performance

- The ISO supports allowing an alternate counting approach
 - Use historic output with additional weight on a dry year to determine QC
 - Exempting these resources from RAIM for water availability outages
 - Although resources may be subject to RAIM for mechanical outages
 - Resources would still be incentivized to offer as much capacity as possible into the market because not offering reduces future showing potential
 - This methodology would align with direction of the UCAP counting approach being developed in the RA Enhancements initiative
- Hydro resources may elect to continue applying existing counting methodologies
 - Resources likely would have higher qualifying capacity values
 - Would continue to be subject to RAIM for all shown capacity
- ISO would also be supportive of a paradigm where capacity values reflecting a dry hydro year were used, then were updated to reflect more current conditions

Implementation for this solution will take additional changes for the ISO to accommodate

- The ISO is planning to conclude the current commitment cost enhancements initiative after the March ISO Board of Governors meeting with a effective date of June 1, 2020
- If the CPUC implements an update to the counting rules through the RA proceeding as proposed by joint parties, as a result of this workshop, then the ISO would time tariff or BPM changes to be effective as these rules are applied
 - The ISO envisions the CPUC may implement alternative counting rules that could be effective as early as 1/1/2021
 - The ISO will continue to stay engaged in hydro counting developments within the CPUC's RA proceeding
 - The ISO will commit to updates to the ISO systems and processes, as changes occur within the CPUC, when appropriate

Additional Discussion Questions

- How should qualifying capacity values be established for the initial year?
 - Would there be a phase in period?
- Should resource owners be required to submit data to LRAs each year to determine qualifying capacity values for these resources?
- If resources can opt for existing or new counting methodologies, how will the ISO be informed?

SCE Proposal for Hydro RA Counting
CPUC RA Working Group
February 12, 2020

Objective and Principles

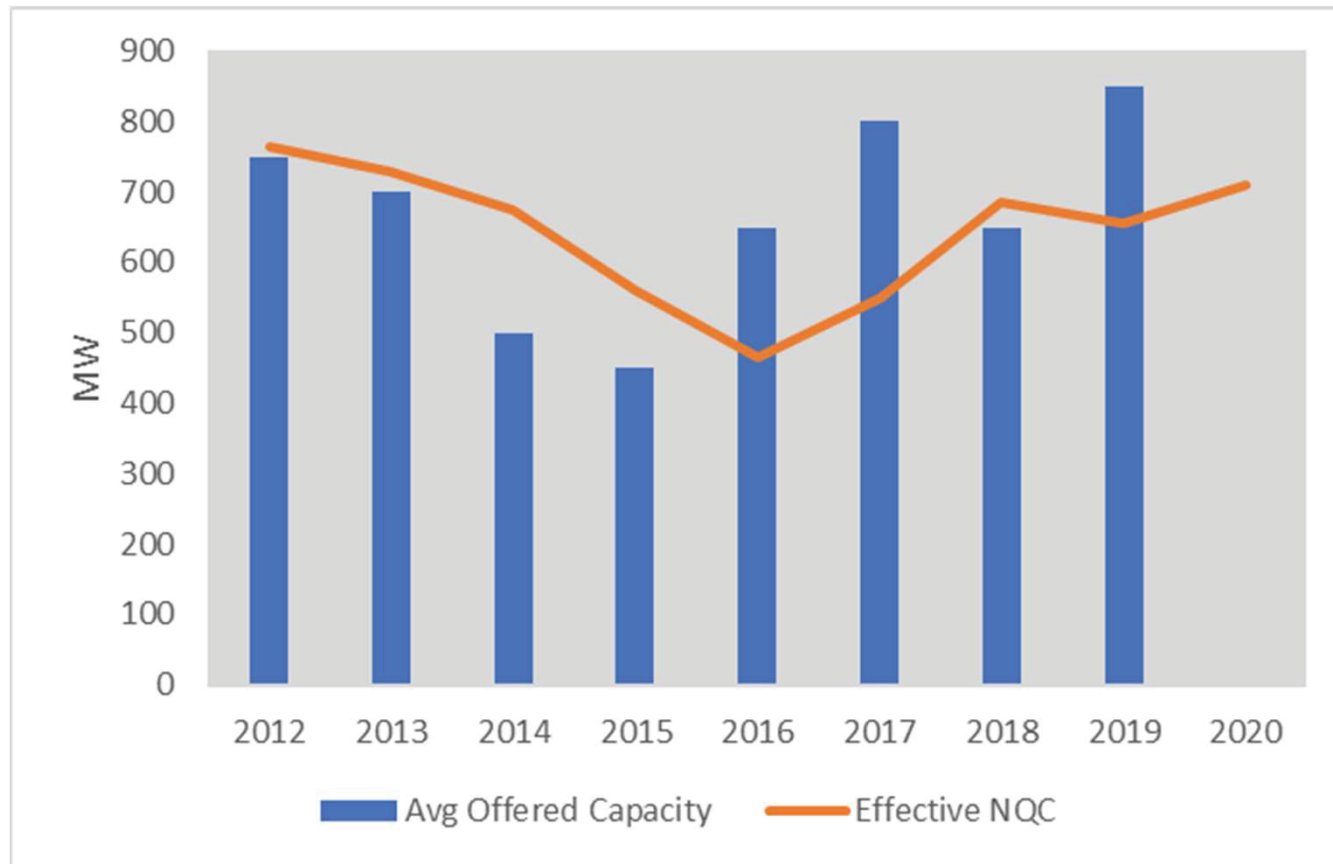
- SCE is proposing a methodology to calculate the NQC of Hydro RA resources
 - NQC derates accounts explicitly for water availability
 - RAAIM applies only for mechanical outages
- Hydro resources have been an important part of California's generation fleet for over a hundred years and they will be a key part of California's Clean Energy Future
- SCE's proposal tries to observe the following principles:
 1. Accounts for seasonality and uncertainty of hydro resources in the Local RA framework
 2. Minimizes over-procurement by balancing reliability and certainty
 3. Provides as much transparency as possible to all stakeholders
 4. Applies an appropriate incentive mechanism that recognizes that there are environmental and regulatory constraints that are out of the control of the resource

Proposed Hydro RA Counting Methodology

- Use an average of historic availability based on offered capacity to derate the NQC of the Hydro resource (UCAP-like calculation)
 - Calculate average availability during a 5am-9pm assessment window for May-Sep
 - Past two years of May-Sep availability weighted 50% and 30%
 - Third year is based on the lowest water year from the prior ten years, weighted 20%
- Create a RAIM-exempt outage card only capacity derates due to water availability
- Mechanical outages will not be included in the NQC derate and will not be RAIM-exempt

$$\text{Effective NQC} = 0.5 * \text{AvgCap}_{y-1} + 0.3 * \text{AvgCap}_{y-2} + 0.2 * \text{AvgCap}_{1in10}$$

Example: Effective NQC vs Avg Offered Capacity



Values are for a theoretical 1000MW hydro resource loosely reflective of historical hydro conditions

Rationale for RAAIM Exemption for Water Availability

- Performance is incentivized by the potential QC derate
- Limited storage capacity and dependency on winter precipitation and ambient weather conditions
- Complexity of hydro systems, with interdependencies between multiple streams, reservoirs, and powerhouses
- Safety – high lake levels in certain areas can flood campgrounds and recreational areas
- Federal regulations establish flow and lake level requirements
- Year-ahead Local RA showing establishes a year-round Must Offer Obligation
- Outages due to mechanical issues will not be RAAIM-exempt

Backup

Energy for What's AheadSM



Example: Table of Sample Data for 1000 MW Hydro Resource

| | Avg Offered Capacity (May-Sep) | 1 in 10 Low Year | Effective NQC |
|------|--------------------------------|------------------|---------------|
| 2002 | 850 | NA | |
| 2003 | 800 | NA | |
| 2004 | 500 | NA | |
| 2005 | 550 | NA | |
| 2006 | 650 | NA | |
| 2007 | 600 | NA | |
| 2008 | 800 | NA | |
| 2009 | 850 | NA | |
| 2010 | 800 | NA | |
| 2011 | 850 | NA | |
| 2012 | 750 | 500 | 765 |
| 2013 | 700 | 500 | 730 |
| 2014 | 500 | 500 | 675 |
| 2015 | 450 | 500 | 560 |
| 2016 | 650 | 450 | 465 |
| 2017 | 800 | 450 | 550 |
| 2018 | 650 | 450 | 685 |
| 2019 | 850 | 450 | 655 |
| 2020 | NA | 450 | 710 |

Values are for a theoretical 1000MW hydro resource loosely reflective of historical hydro conditions

Hydroelectric Resources

Working Group for QC Counting Rules

February 12, 2020



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QC Counting Rules for Hydroelectric Resources

- **Background**

- Current RA proceeding is considering changes to counting rules for several resources, including hydroelectric.
- The current qualifying capacity (QC) counting rules for hydroelectric resources do not reasonably reflect resources' availability to the CAISO market.

- **Rationale**

- Disconnect between Commission's RA program and CAISO's operational requirements for RA.
- The existing QC counting rules for hydroelectric resources likely overstates the availability because it does not reflect variability driven by hydrological conditions, weather patterns, FERC licensing, upstream powerhouses, and storage levels.



Current QC Methodology for Hydroelectric

Current State

- Hydroelectric resources are divided into two categories for QC counting purposes: (1) dispatchable and (2) non-dispatchable
 - Dispatchability is based on a flag from the CAISO's Master File
 - No overall consensus on the definition of dispatchability
 - No clear criteria to “qualify” for dispatchability

| CPUC Category | QC |
|------------------|---|
| Dispatchable | P-Max |
| Non-dispatchable | Three-year rolling average of generation production during the RA measurement hours |



Challenges with Current State

QC values do not mirror the CAISO's bidding obligations for RA resources

- Hydroelectric resources are categorized differently by the CPUC and CAISO

| CPUC | CAISO | QC | CAISO Bidding Requirements |
|--|---|-------------------|----------------------------|
| Dispatchable | Use-limited | P-Max | 24 x 7 |
| | Conditionally available | | As available |
| | Use-limited and conditionally available | | |
| Non-dispatchable (includes run-of-river) | Non-use-limited (includes run-of-river) | Generation Output | |

- QC methodologies do not account for operating constraints reflected in actual bidding and scheduling of hydroelectric resources



Strawman Proposal for QC Counting Rules

Proposed exceedance methodology measures the minimum amount of capacity made available to the market by a resource in a certain percentage of hours

| Hydroelectric Categories | CAISO Bidding Requirements | % | Years | Based On | Hours |
|--|----------------------------|-----------------|---------------------|----------|---|
| Use-limited | 24 x 7 | 50 (Initial) | Rolling 10 Years | Bids | 24 hours |
| Conditionally available | Energy As Available | | | | Availability Assessment Hours (HE17-21) |
| Use-limited and conditionally available | | | | | |
| Non-use-limited (includes run-of-river) | | | | | |



Illustrative Example of Methodology

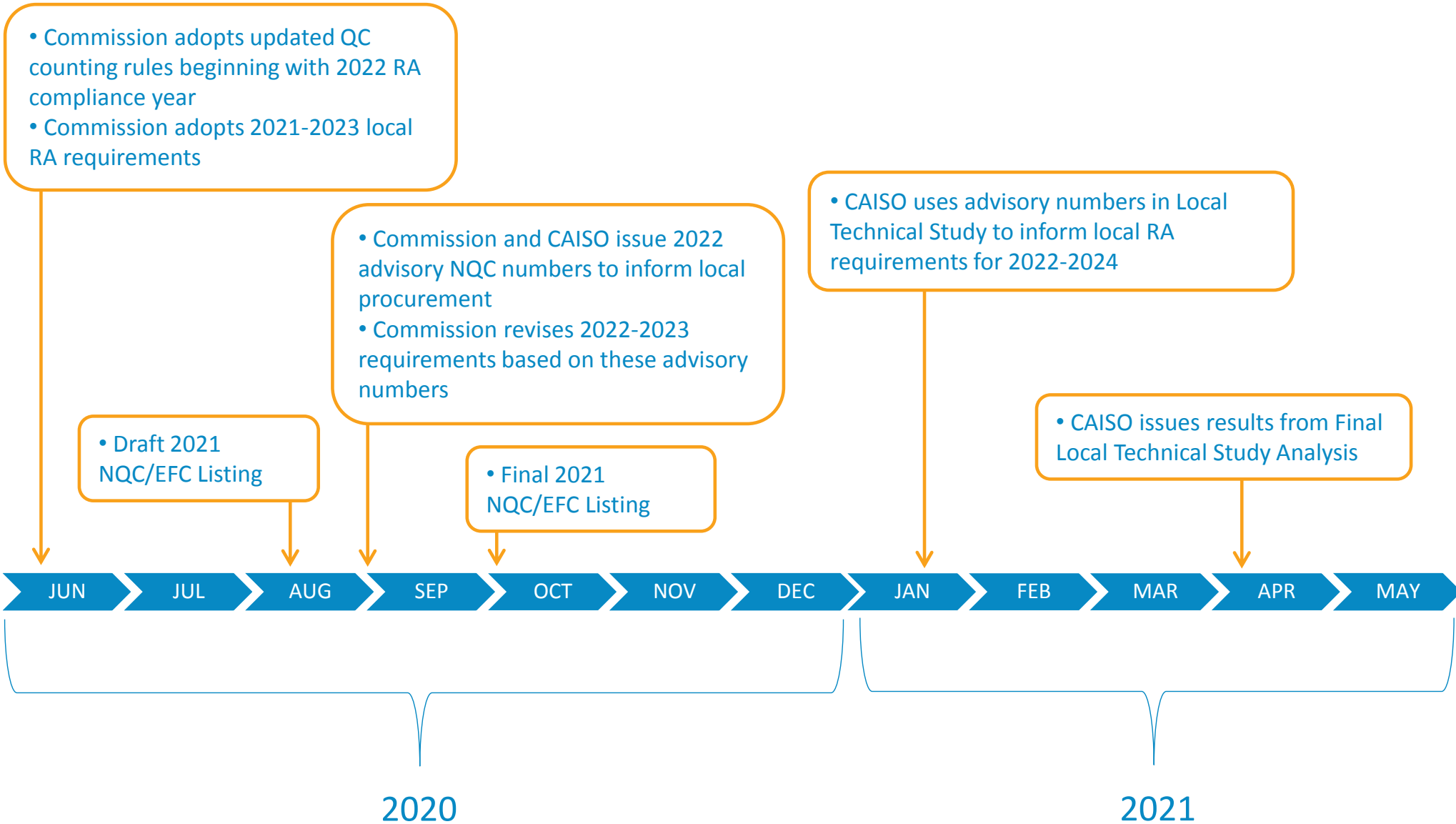
Data for Methodology for Counting Hydroelectric Resources

1. The previous 10 years of day-ahead market self-schedules and economic bids for each hydroelectric resource.
 - For each hydroelectric resource, the day-ahead market self-schedules and economic bids shall correspond to the applicable bidding obligations.
2. For each hydroelectric resource, rank in descending order all of the included data and determine the QC from the value 50% of the way (or median) through the ranking.

| RANK | RESOURCE_ID | BID_DT | BID_HR | BIDS_OR_SS |
|------|-------------|-----------|--------|------------|
| 1 | HYDRO_UNIT1 | 1/5/2017 | 18 | 33 |
| 2 | HYDRO_UNIT1 | 1/5/2017 | 19 | 33 |
| 3 | HYDRO_UNIT1 | 1/5/2017 | 20 | 33 |
| 4 | HYDRO_UNIT1 | 1/5/2017 | 21 | 33 |
| 5 | HYDRO_UNIT1 | 1/1/2018 | 17 | 33 |
| 6 | HYDRO_UNIT1 | 1/1/2018 | 18 | 33 |
| ... | ... | ... | ... | ... |
| 219 | HYDRO_UNIT1 | 1/4/2016 | 18 | 31 |
| 220 | HYDRO_UNIT1 | 1/4/2016 | 19 | 31 |
| 221 | HYDRO_UNIT1 | 1/4/2016 | 20 | 31 |
| ... | ... | ... | ... | ... |
| 431 | HYDRO_UNIT1 | 1/21/2017 | 17 | 25.33 |
| 432 | HYDRO_UNIT1 | 1/21/2017 | 18 | 0.02 |
| 433 | HYDRO_UNIT1 | 1/21/2017 | 19 | 0.02 |
| 434 | HYDRO_UNIT1 | 1/21/2017 | 20 | 0.02 |
| 435 | HYDRO_UNIT1 | 1/21/2017 | 21 | 0.02 |
| 436 | HYDRO_UNIT1 | 1/22/2017 | 17 | 0.02 |
| 437 | HYDRO_UNIT1 | 1/22/2017 | 18 | 0 |
| 438 | HYDRO_UNIT1 | 1/22/2017 | 19 | 0 |
| 439 | HYDRO_UNIT1 | 1/22/2017 | 20 | 0 |
| 440 | HYDRO_UNIT1 | 1/22/2017 | 21 | 0 |



Proposed Implementation Timeline



Appendix

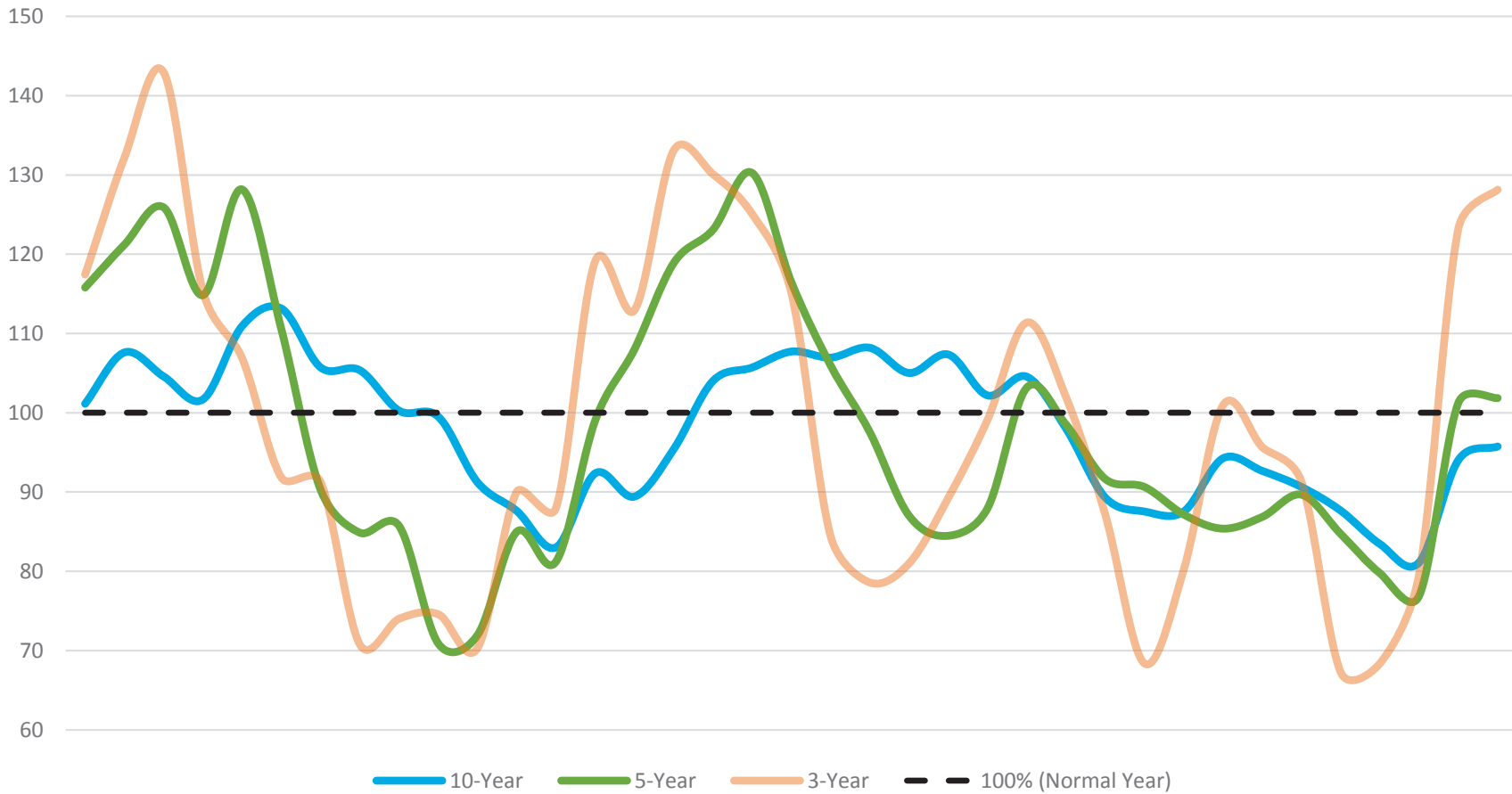


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Data Analysis – Review of Years

Rolling Average Years vs. "Normal" Year





Strawman Proposal – Detailed Steps

Set forth below is the specific exceedance methodology for hydroelectric resources, including the steps in the calculation and the data that must be obtained to implement the methodology.

Data for Methodology for Counting Hydroelectric Resources

- The previous 10 years of day-ahead market self-schedules and economic bids for each hydroelectric resource.
- For each hydroelectric resource with a 24/7 bidding obligation, the day-ahead market self-schedules and economic bids shall correspond to all hours of the day. For each hydroelectric resource with an as-available bidding obligation, the day-ahead market self-schedules and economic bids shall correspond to the five Availability Assessment Hours (“AAH”) hours of each day of the month.
- For each hydroelectric resource, rank in descending order all of the included data and determine the QC from the value 50% of the way (or median) through the ranking.

The specific methodology set forth is based on providing an appropriate level of confidence that each hydroelectric resource will be reasonably made available to the CAISO during its respective hours of bidding obligations. The AAH corresponds to the operating period when high demand conditions typically occur and when the availability of RA capacity is most critical to maintaining system reliability [CAISO Tariff Section 40.9.3.1(a)(2)(A)].

The proposed methodology shall provide a higher level of confidence in capturing the inherent challenges related to counting hydroelectric resources. Specifically, it can better reflect hydrological conditions, weather patterns, Federal Energy Regulatory Commission licensing, state fish and wildlife agencies, storage levels and upstream and downstream powerhouses that can impact resource availability.

Appendix B

Hydro County Joint Proposal

HYDRO COUNTING JOINT PROPOSAL

Following the Working Group meeting PG&E, SCE, and the CAISO have worked through the non-consensus items and agreed on the following methodology and implementation date, summarized in the table below.

| CATEGORY | Joint Proposal |
|--------------------------|--|
| Hydroelectric Categories | CAISO Designated Hydro with Storage (Optional) |
| Methodology | Monthly Exceedance |
| Years | Rolling 10 Years |
| Weighting | 80% weight to 50% exceedance 20% weight to 10% exceedance |
| QC Value | Monthly Value |
| Based On | Self-Schedules and/or Economic Bids |
| Hours | Availability Assessment Hours |
| Outages | Exclude Mechanical Outages |
| Application of RAAIM | RAAIM-Exempt for water availability capacity derates |
| Implementation Timeframe | RA Year 2021 |

The agreed-upon methodology calculates a monthly QC based on the previous 10 years of same-month bid-in availability. For each month, the historical offered capacity in the Availability Assessment Hours is used to calculate a 50% exceedance (or median) and a 10% exceedance value. The 50% exceedance value is weighted 80% and the 10% exceedance value is weighted 20% to determine the monthly QC value.

This methodology serves as an option, and not a requirement for hydro resources. Hydro resources also have an option to continue to use the approach currently being used in deriving QC. Hydro resources can choose between the two approaches based on their own needs. The CAISO will update its rules to give resources that elect this optional counting methodology a RAAIM exemption for water availability-related outages. Resources that elect this optional counting methodology will continue to be subject to RAAIM for mechanical failure and other non-water availability related outages. Hydro resources that do not elect this optional hydro counting methodology will be able to show their full NQC as currently determined and will continue to be subject to RAAIM under existing CAISO rules.

The other non-consensus item was the implementation timeframe. PG&E's concern was that a 2021 implementation would create a misalignment with the values used in the LCR study and the LCR requirements. This misalignment could reveal capacity shortfalls in local areas and may increase the possibility of waivers until additional capacity is developed in the local area. Should such deficiencies in local areas occur due to the derating of hydro in the local area, the CPUC should take this into consideration when evaluating waiver requests. SCE and PG&E agree that the LCR studies should use the QC (adjusted for deliverability) based upon the optional calculated values described above to better inform the available capacity needs in the local area. Given that the CAISO will be reliant on PG&E and SCE for the provision of the data necessary to make the capacity calculation described above, PG&E and SCE agree that such data will be made available to the CAISO for purposes of the LCR study process regardless of the option each have chosen for RA compliance in any year. With recognition of the potential increase in waiver requests until such time as options to address local area deficiencies through the LCR process can occur, SCE, PG&E, and CAISO support a 2021 implementation.