



2026 QUALIFYING CAPACITY AND RA COUNTING METHODOLOGY MANUAL



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1 INTRODUCTION

This manual outlines the California Public Utilities Commission’s (CPUC) qualifying capacity (QC) counting rules and the methodologies used to determine the QC values of Resource Adequacy (RA) resources for use by CPUC-jurisdictional load-serving entities (LSEs) in demonstrating compliance with their RA obligations.

Each year, CPUC staff coordinates with the California Independent System Operator (CAISO) staff in developing the annual Net Qualifying Capacity (NQC) list. CPUC provides CAISO with the QC values calculated using the methodologies described in this manual. CAISO evaluates these values for deliverability. When a resource’s QC is not fully deliverable to aggregate CAISO load, the QC is reduced to the resource’s deliverable capacity, resulting in its NQC. The NQC list identifies the amount of deliverable capacity that each resource may count toward RA requirements.

Beginning with the 2025 RA compliance year, the CPUC’s RA framework shifted to a 24-hour Slice-of-Day (SOD) framework. The QC methodologies have been updated, where applicable, to reflect changes in how resource capacity is accounted for under the SOD framework. Table 1 summarizes which resource categories have NQC applied to all 24 SOD slices and which do not.

Table 1. NQC Showing in Slice-of-Day Compliance Tools

NQC is Applied to All 24 SOD Slices	NQC is Not Applied to All 24 SOD Slices
Dispatchable and Non-Dispatchable Hydro, Nuclear, Cogen/CHP, Biomass/Biogas, Most Thermal and Natural Gas Resources	Solar, Wind, Batteries, Hybrid Resources, some Peakers, Demand Response

For most resource types, the underlying QC methodology remains unchanged. For other resource types, including variable energy resources (VERs), energy storage, hybrid and co-located resources, and demand response, the QC methodology or its application under the SOD framework has changed. These changes are described in the applicable sections of this manual.

Starting with the 2025 RA Compliance Year (CY), CPUC staff began using the Master Resource Database (MRD) to verify RA compliance under the SOD framework. The MRD is a compendium of physically identified resources eligible to provide RA capacity, including resources in the CAISO balancing area and specified imports. The NQC list is incorporated into the MRD, which also includes resource-specific information such as resource type, technology, battery efficiency, operational use limitations, and other information relevant to CPUC compliance. The MRD is used in the CPUC's LSE Showing Template to support accurate resource¹ representation in SOD RA filings. The QC methodologies described in this manual are used to determine resource capacity values reflected on the MRD and the QC value provided to CAISO for use in its processes. The CPUC's broader RA compliance requirements under the SOD framework are described in the [2026 Resource Adequacy and Slice of Day Guide](#).

This manual is structured to begin by providing the foundational elements of QC determination. Sections 2 through 4 describe how resource classifications, deliverability status, and data conventions inform QC calculations. Sections 5 through 12 then present the detailed QC calculation methodologies applicable to each resource classification.

¹ For purposes of this manual, the term "resource" refers to a generator with a resource ID on the CAISO Master Control Area Generation Capability List or CAISO Master File, as well as demand response resources, which may or may not be listed in those systems.

2 RESOURCE CLASSIFICATION

Resource classification is based on a resource's technology type and dispatchability status. This classification is necessary to accurately apply the adopted QC methodology to each resource. The primary sources used to establish a resource's technology type are the most recent publicly available Master Control Area Generation Capability List (Mastergen List) and CAISO Master File with additional sources used where appropriate.

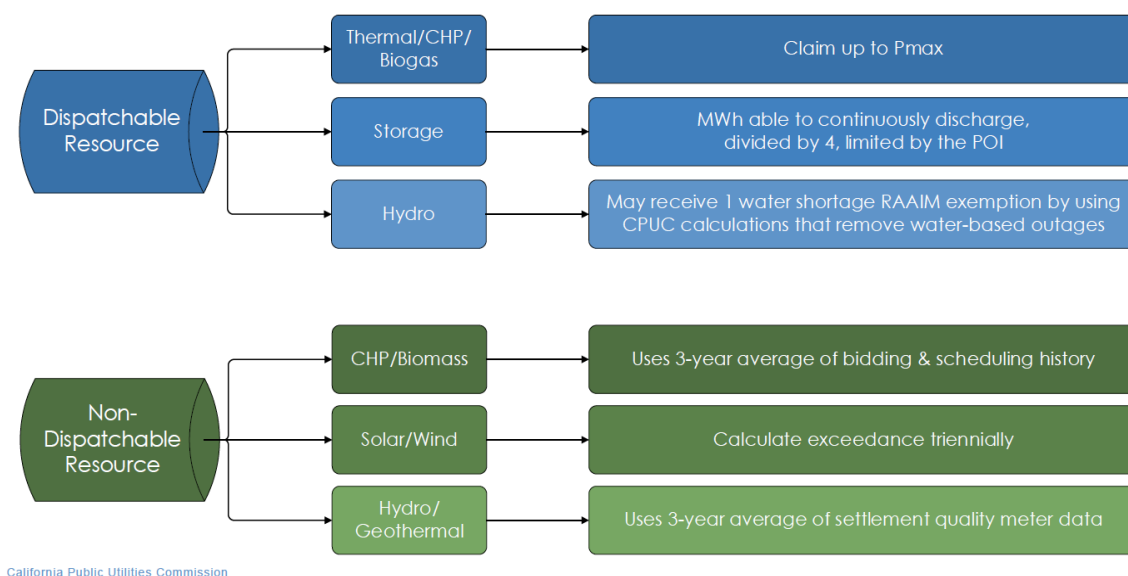
First, resources are grouped and classified according to the "Unit_Type" and "Energy_Source" fields in the public Mastergen List. Resources identified with an energy source of "wind" are classified as wind and resources with the energy source "sun" are classified as solar resources. Resources with "water" as their energy source are classified as hydro resources. Biomass and geothermal resources are generally classified using the Master Generation Capability Data List. Cogeneration resources are classified using the CAISO Master File and the CPUC Baseline Generator Unit List used for SERVM and RESOLVE.² Hybrid and co-located resources, which are renewable generators and battery storage located at the same point of interconnection (POI), are classified with assistance of the CAISO.

After resources are classified by technology type, they are sub-classified based on dispatchability status using Master File data that is reflected on the NQC List. A resource being dispatchable means that it can be increased or curtailed at the immediate instruction of the CAISO. This category of resource includes a variety of technologies such as steam turbines; combustion turbines; combined cycle gas turbines; reciprocating engines; energy storage; dispatchable combined heat and power (CHP); dispatchable

² ftp://ftp.cpuc.ca.gov/energy/modeling/cpuc_public_generator_list_servm_resolve.csv.

biomass and geothermal resources; some use-limited Demand Response. Non-dispatchable resources, on the other hand, are resources that cannot be increased or curtailed at the direction of the CAISO.³ These would be resources that are not able to control their dispatch, such as solar, wind, non-dispatchable biomass and geothermal, and non-dispatchable hydro and CHP. This Manual describes QC counting rules, beginning with non-dispatchable resources (Sections 5-7), followed by dispatchable resources (Sections 8-10), hybrid/co-located resources (Section 11) and demand response resources (Section 12). Figure 1 below presents a high-level diagram reflecting how resources are counted by dispatchability status and resource type.

Figure 1 Slice of Day Implementation – Resource Counting



Wind and solar resources receive QC values based on the exceedance methodology described in Section 5. Non-dispatchable cogeneration/CHP and biomass

³ Appendix A of the CAISO Tariff

facilities receive QC values according to Section 6, while non-dispatchable hydro and geothermal facilities follow the methodology in Section 7.

With the exception of storage, hybrid resources, and dispatchable hydro, most dispatchable generation resources receive QC values according to the methodology described in Section 8. Decision (D).20-06-031 adopted a voluntary QC methodology for dispatchable hydro resources. These generators may elect either the standard dispatchable methodology in Section 8 or the hydro-specific methodology described in Section 9.

Section 10 details the QC methodology for battery storage and how these values appear on the SOD template. Section 11 describes the QC methodology for hybrid and co-located resources, as adopted in D.20-06-031, where QC values for the VER and storage components are additive but limited by the point of interconnection (POI). Finally, Section 12 explains how Demand Response resources receive QC values under the LIP methodology.

3 DELIVERABILITY

Deliverability represents transmission capacity enabling the delivery of energy to the aggregate of load on the CAISO Controlled Grid at peak load, under a variety of modeled stressed conditions. Deliverability includes the annual Net Qualifying Capacity (NQC) of a generating facility, as verified through a Deliverability Assessment and measured in MW, which specifies the amount of resource adequacy capacity the generating facility is eligible to provide. If a resource is partially deliverable in any given RA year, as determined by CAISO NQC Deliverability Assessments, its QC is adjusted downwards to its partial deliverable capacity or NQC. In most cases, a resource is fully deliverable and there is no difference between QC and NQC. There are three other deliverability states a resource can have: interim deliverability, partial deliverability, or energy only (EO) deliverability.

CAISO performs deliverability assessments several times a year consistent with the Generator Interconnection Procedure (GIP) study cycle. A Deliverability Assessment is required as part of the Large Generator Interconnection Procedures (LGIP).⁴ Existing resources retain priority for deliverability over new resources and existing deliverable resources are not expected to lose deliverability rights unless the resource is unable to produce its deliverable capacity for at least three consecutive years.⁵ The deliverability study provides new resources with information to

⁴ See Appendix U of the California ISO Tariff: <http://www.caiso.com/Documents/AppendixU-LargeGeneratorInterconnectionProcedures-asof-Nov27-2018.pdf>. See also: Section 5.1.3.4 of CAISO's Business Practice Manual for Reliability Requirements: <https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Reliability%20Requirements>.

⁵ The exception to this rule is reduction in deliverability caused by any degradations of the transmission system which are not repaired promptly, for example due to fires or other force majeure events.

understand which network upgrades are necessary to achieve full capacity deliverability status.

The ability of the output from a new generation project and existing generation to be delivered to aggregate load within CAISO during a resource shortage condition is evaluated pursuant to the ISO's LGIP and the CAISO Deliverability Assessment Methodology posted on the CAISO's website.⁶

The CAISO Tariff defines a generation project's deliverability as full deliverability, partial deliverability, interim deliverability, or energy only deliverability. Full Capacity Deliverability Status and Energy-Only Deliverability Status are the most common deliverability statuses, and equate to either 100% or 0% deliverability, meaning the resource receives either 100% or 0% of its QC, respectively as its NQC. Partial Deliverability Status is similar to Full Deliverability Status however applicable for only a portion of the resource (either in % or MW). Interim Deliverability Status is an interim designation that allows an Interconnection Customer that has requested Full Capacity Deliverability Status or Partial Capacity Deliverability Status to obtain non-zero Net Qualifying Capacity, as determined annually by the CAISO's NQC Deliverability Assessment, pending the in-service date of all the required Network Upgrades required for its requested Deliverability Status. This means the resource is deliverable anywhere from 0-100%, but only temporarily for that applicable RA year. The interim deliverable percent can go up or down in future years and is contingent on other developments, such as new generators that will reduce available deliverability or transmission upgrades that will create additional deliverability. A finding of deliverability does not ensure that a resource will not experience congestion, especially during non-peak periods, but the status is important for RA purposes.

⁶ <http://www.caiso.com/planning/Pages/GeneratorInterconnection/Default.aspx>.

CAISO performs deliverability studies for all resources that want to qualify for RA inside the CAISO BAA, regardless of their interconnection voltage. In order to be deliverable, new resources connected to the transmission system, must have either a Transmission Plan Deliverability (TPD) allocation or an approved deliverability transfer (at the same POI) from an older already deliverable resource (most likely retired). New resources connected to the distribution system have an additional option, a Distributed Generation Deliverability (DGD) allocation.⁷

⁷See section 40.4.6 of the CAISO Tariff for more information on the deliverability topic.

4 DATA CONVENTIONS USED FOR NON-DISPATCHABLE QC

CPUC staff rely on several standardized conventions when determining qualifying capacity (QC) values for non-dispatchable resources. These conventions vary depending on resource type, data availability, and whether the facility has reached commercial operation.

- For non-dispatchable hydro and geothermal resources, QC values are based solely on historical production data. CPUC staff use Actual Settlement Quality Meter Data, which reflect the hourly settled MWh injected into the CAISO-controlled grid. These data are obtained by subpoena from CAISO and are unit-specific and hour-specific.
- For pre-dispatch cogeneration and biomass facilities, QC calculations incorporate both settlement data and CAISO day-ahead bidding and scheduling data. The bidding and scheduling data represent the MW amount the resource offered or was scheduled to produce. When such data are missing or the actual settlement quantity exceeds the day-ahead dispatch, CPUC staff rely on the settlement data for that hour. These data are also collected through subpoena and are specific to each unit and hour.
- Variable Energy Resources (VERs) follow a distinct methodology. Instead of using month-by-month historical averages, their QC is determined using an exceedance method that compares historical settlement data against CAISO “Worst Day” demand levels. This approach produces exceedance profiles, which are multiplied by each resource’s Pmax to establish its RA value. Exceedance profiles are fixed for three-year periods before being refreshed.

- New non-dispatchable resources often produce electricity before their Commercial Operation Date (COD). Any pre-COD energy is treated as test data and is excluded from QC calculations. CPUC staff begin using historical production data only once a resource—or a phase of a resource—has achieved COD. The timing of COD also determines when the resource begins contributing data to the QC calculation. Facilities that reach COD by the 15th day of a month begin accruing data for that month, whereas those reaching COD on the 16th or later begin accruing data starting the following month.
- When non-VER facilities lack a full three years of historical production or bidding data due to a recent COD, CPUC staff generate QC values using a composite approach. For months with more than 15 days of usable settlement or scheduled MW data, the QC value reflects actual historical production. For the remaining months needed to complete the three-year dataset, staff apply technology factors associated with the resource type. For example, a facility that reached COD in July 2023 would have six months of actual data available for the 2025 QC year, with the balance of the 36-month period supplied by technology factors. Monthly QC values are calculated as the average of the corresponding months over the three-year period. In contrast, VERs do not use this composite method; instead, they rely exclusively on their exceedance profiles and the technology factors applicable to their location and technology.
- Technology factors are developed from the production of the statewide fleet of similar non-dispatchable generators during the RA Measurement Hours, usually the same as the CAISO's Availability Assessment Hours (AAH), which vary annually (Table 2 below). These factors represent expected production in hours relevant for grid reliability. When a new resource lacks three full years of data for any month, its QC for that month is determined by multiplying its Pmax by the

relevant technology factor (See **Equation 1** below). For VERs, the applicable value is the exceedance profile’s peak-hour production level.

Equation 1. QC for Non-Dispatchable Resources with no Available Dat

$$MonthlyQC_{Re\ source} = NDC_{Re\ source} * \frac{\sum_{ExistingNon-Dispatchable\ Re\ sources} MonthlyQC}{\sum_{ExistingNon-Dispatchable\ Re\ sources} NDC}$$

Table 2: RA Measurement Hours (in Pacific Standard Time)

Months	Hours
Jan-Feb	HE18 - HE22 ⁸ (5:00 p.m. - 10:00 p.m.)
Mar-May	HE17 - HE21 (4:00 p.m. - 9:00 p.m.)
Jun-Oct	HE16 - HE20 (3:00 p.m. - 8:00 p.m.)
Nov-Dec	HE18 - HE22 (5:00 p.m. - 10:00 p.m.)

⁸ HE indicates “hour ending”, or the 60 minutes that end at the numbered hour, in 24 hour time. For example, HE17 indicates the 60 minutes beginning at 16:00 (i.e. 4:00 p.m.) and ending at 17:00.

5 WIND AND SOLAR

The QC of wind and solar is based on a monthly exceedance methodology adopted in D.23-04-010 and refined in D. 24-06-004. This approach replaces the prior effective load carrying capability (ELCC) based approach adopted in D.17-06-027 and updated in D.19-06-026.⁹ This approach implements a monthly “Top 5 Days” methodology which identifies the highest-load days in each month and determines the exceedance level that best reflects resource performance during those stressed periods. That exceedance level is then applied to historical production data to produce month-hour profiles for each technology and region. The steps below outline how the monthly Top 5 Days exceedance methodology is implemented.

1. Profiles are delineated by both technology type and region. In the MRD, Solar resources are categorized into three technology types: Solar Fixed, Solar Tracking, and Solar Thermal. Wind resources are represented by a single technology type. Solar resources are developed for two regions Northern California (Norcal) and Southern California (Socal), while wind profiles include Norcal, Socal, Arizona (AZ), New Mexico (NM), and the Washington/Oregon (WA/OR) area.
2. Exceedance levels provide the likelihood that a resource will produce more energy than the value given. Exceedance levels indicate the output of a resource (% of nameplate) on at least X% of observations (e.g. 70%) for each month-hour pair.¹⁰

⁹ See 2020 Qualifying Capacity Methodology Manual

¹⁰ This can be understood as the reverse of a percentile, with a higher exceedance level is a more conservative number (i.e., 70% exceedance meaning that the number given is the 30th percentile of production).

- A. Six years of historical CAISO settlement quality data are used to derive both exceedance levels and values. This data is supplemented with modeled data where historical data is insufficient. The hourly average production for all days is divided by the nameplate MW of the resources, resulting in 24 slices of historical production per day for six years.
- B. The “worst days” are identified by selecting the five days with the highest load forecast per month, along with any days in which the CAISO called a “Flex Alert, Warning, Stage 1-3 Emergency, or Energy Emergency Alert 1-3 condition.”¹¹
- C. Exceedance levels are determined by minimizing LOLE in the worst days to identify unique exceedance levels for each month and for each technology type. A GRG nonlinear approach using an Excel Solver function is used and repeated until exceedance levels stabilize.
 - i. For each exceedance level, the difference is taken from the average worst day and the exceedance value, with 50% exceedance level as the starting point. The resulting month/hour overcounting or undercounting value is multiplied by two weighting coefficients and squared.
 - ii. Hourly coefficient based on reliability risk:
 - a) Loss of Load Expectation (LOLE) hours = 3
 - b) Availability Assessment Hours (AAHs) = 2
 - c) All other hours = 1
 - iii. Overcounting/undercounting coefficient, prioritizing minimization of overcounting relative to undercounting:

¹¹ D.23-04-010 p. 105.

- a) Overcounting/positive = 2
 - b) Undercounting/negative = 1
- iv. The total sum of these values across the months/hours at each exceedance level is calculated in the Objective cell. Solver finds the exceedance level that minimize the Objective cell, subject to the following constraints:
- a) No overcounting greater than 10% in any hour relative to the Worst Day profile
 - b) No overcounting greater than 2% in LOLE hours relative to the Worst Day profile
 - c) Exceedance levels have a lower bound of 50% and upper bound of 85%¹²
3. Exceedance levels are then applied to historical monthly production, removing all values outside of the exceedance bounds.¹³ The resultant production profile for each technology type by region is then be applied hourly to the variable resource's Pmax, resulting in 24 values.
4. The single monthly QC value is based on production at peak hour. The peak hour of each month is then taken from the CEC's IEPR forecast to identify which slice will be used for the QC calculation, which is given to the CAISO.¹⁴ In case of the QC being 0, the minimum QC for a VER resource is 0.1.
5. Exceedance levels are updated every three years. Exceedance levels and the 24 monthly exceedance values that were calculated for the 2025 compliance year are

¹² Report on Resource Adequacy Slice of Day Implementation and Year Ahead Showings p. 24

¹³ If a month's exceedance level is 70%, the 30th percentile of values is chosen to be the profile in that month.

¹⁴ In 2025, the peak hours are Hour Ending (HE) 19 for January-April, HE18 for June/August/November/December, HE17 for July/September/October, and HE20 for May.

also locked for 2026 and 2027 as well. The only thing that may change in those years is changes of the peak hour based on the annual California Energy Demand (CED) forecast in the Integrated Energy Policy Report Update.

6 NON-DISPATCHABLE COGENERATION AND BIOMASS

Pursuant to D.15-06-063, a new classification was created for qualifying facilities that were QF cogeneration. Many of these facilities were in the process of migrating to contracts that allow for utility predispach and are called utility predispach facilities (UPF). This 'predispach' classification was adjusted in D.16-06-045 and expanded to apply to all cogeneration and biomass facilities that can bid or self-schedule in the day ahead market but are not fully dispatchable. If a cogeneration or biomass facility is dispatchable, it may request a QC value based on Pmax.

These decisions adopted a QC methodology which relies on bidding and scheduling history rather than settlement data. In hours where the resource was self-scheduled or bid into the day ahead market, the greater of the self-scheduled amount, day ahead market bid or settlement amount is used. In hours where the scheduling MW data is non-existent for a particular resource (the resource did not submit a MW schedule amount) or bidding and scheduling data are missing, the settlement data for that hour are used.

A month-specific average of the maximum of bidding/self-scheduling/production during the RA Measurement Hours (Table 2 above) is created to generate the QC for each resource. Cogen/biomass QC applies to all 24 slices in the CPUC SOD showing tool.

7 NON-DISPATCHABLE HYDRO AND GEOTHERMAL

Non-dispatchable hydro and geothermal resources receive monthly QC values based on a three-year rolling average of production during the RA Measurement hours identified in Table 2. Production for these facilities is calculated from settlement quality meter data only. The three most recent years of available data are used, for example, the QC for 2025 is calculated based on 2021-2023 data. Hydro and geothermal QC values apply across to all 24 slices in the CPUC SOD showing tool.

Each monthly value is calculated as an average of the production during the specified hours (Equation 2). Accordingly, 36 monthly average values are produced using this method.

Equation 2. Monthly Average Production for Non-Dispatchable Hydro and Geothermal Resources

$$Average_{Month}(MW) = \frac{\sum_{Month} Production(MWh)}{\sum_{Month} Hours(h)}$$

The monthly values are subsequently averaged over all the years of available data to calculate the final QC for each month (Equation 3).

Equation 3. Final QC of Non-Dispatchable Hydro and Geothermal Resources

$$FinalQC_{Month} = \frac{1}{\{NumberOfYearsOfData_{Month}\}} * \sum_{AllYearsOfData} Average_{Month}$$

Technology factors are also created for each resource type based on average output of the fleet of resources during the RA Measurement Hours. New, non-

dispatchable resources with less than three years of historical production data for any month receive QC for missing months based on multiplying the resource's Pmax by the applicable technology factor (Equation 4).

Equation 4. QC for Non-Dispatchable Resources with no Available Data

$$MonthlyQC_{Re\ source} = NDC_{Re\ source} * \frac{\sum_{ExistingNon-Dispatchable\ Re\ sources} MonthlyQC}{\sum_{ExistingNon-Dispatchable\ Re\ sources} NDC}$$

8 DISPATCHABLE GENERATION

Dispatchable generation resources, excluding energy storage (hybrid resources, short-duration energy storage (SDES) and long-duration energy storage (LDES)) and hydro resources, receive NQC values based on their available capacity,¹⁵ subject to the deliverability checks described in Section 3. The Scheduling Coordinator of the resource submits a proposed QC value to the CAISO, along with a reference to the resource's most recent maximum power plant output (Pmax) test¹⁶ that is in CAISO's Master File. This information is submitted to the CAISO in a standard format through the Customer Interface for Resource Adequacy (CIRA) system.¹⁷ The CAISO then reviews the submitted value for consistency with the resource's Pmax and deliverability status. If the proposed QC value is less than or equal to the Pmax and the maximum deliverable capacity, it is accepted as the NQC value. If not, the Pmax or maximum deliverable amount (if below Pmax) is accepted as the NQC value. In SOD, the NQC value is applied across all 24 slices of day for all dispatchable resources, except for use-limited resources, including battery storage, demand response, hybrid resources, and certain gas peakers.¹⁸

¹⁵ See also, Section 5 of CAISO's Business Practice Manual for Reliability Requirements: <https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Reliability%20Requirements>.

¹⁶ California ISO coordinates with SCs for resources to schedule Pmax tests at a time selected by the SC. Generally, SCs select the timing of a Pmax test to demonstrate output of the resource at or near its maximum possible output.

¹⁷ See <http://www.caiso.com/Documents/NetQualifyingCapacityRequestForm.xls>.

¹⁸ See D.23-04-010

9 DISPATCHABLE HYDRO

A new QC methodology for dispatchable hydro was adopted in D.20-06-031, with implementation beginning in 2021. The methodology is based on the amount of capacity bid or self-scheduled into the CAISO market during the RA measurement hours over the previous 10 years. For example, QC for 2025 is calculated based on 2014-2023 data. Derates of capacity bid are included if they are related to water availability, but not if they are due to mechanical outages.

When available, staff use outage data such as the North American Electrical Reliability Corporation's (NERC) Generating Availability Data System (GADS) data to identify mechanical derates. The amount of the mechanical derate is added to the amount bid so that any bids below the Pmax can be attributed to lack of water, not mechanical derates.

Then, for each month of the 10-year period, a median (50 percent exceedance) and 10 percent exceedance values are derived based on the bidding and/or self-scheduled data discounting mechanical derates. To determine monthly QC values, the median value is weighted 80 percent and the 10 percent exceedance value is weighted 20 percent.

This methodology serves as a default approach for all dispatchable hydro resources although it is voluntary. Generators may request to raise their monthly NQC value to their maximum deliverable capacity. However, an exemption from CAISO Resource Adequacy Availability Incentive Mechanism (RAAIM) penalties for water availability-related derates will not apply to generators that increase their QC value.

10 ENERGY STORAGE

Battery Storage is a unique dispatchable use-limited resource. Most storage resources are 4-hour resources, with some that are of longer or shorter duration. In D.14-06-050, it was determined that the QC for all storage would be the MW it can produce for 4 hours in a row. This is calculated by dividing the Energy per Cycle (MWh) in the MRD by 4, with its Pmax as its maximum NQC value. Energy per Cycle is the difference between the MAX_CONT_ENERGY_LIMIT (the amount of energy that a storage resource can hold) and the MIN_CONT_ENERGY_LIMIT (the minimum amount of energy that a storage resource must always hold). Table 3 summarizes the relationship between energy storage durations and NQC.

Table 3. Storage QC Calculation

Storage Duration	Energy Available per Cycle (MWh)	Pmax (MW)	NQC (MW)
4-hours	80	20	20
2-hours	80	40	20
8-hours	80	10	10

In the SOD framework, energy storage resources may be shown up to Pmax across the day until their Energy per Cycle is fully used, or they may be optimized to be shown below their Pmax depending on hours of need in the SOD Showing Tool. The MRD also contains information important to storage use in CPUC compliance, such as whether a unit can cycle multiple times and what its round-trip efficiency (RTE) losses are. Storage resources also require LSEs to procure excess capacity to account for charging needs and efficiency losses. These requirements are a part of the SOD framework but are not contained in the NQC value.

In D.26-07-008, the Commission defined long-duration energy storage (LDES) as storage capable of discharging at P_{max} for eight hours or longer and modified the excess-energy counting rules to provide additional flexibility for these resources. While excess energy for all storage resources is determined based on energy production from non-storage resources, LDES resources receive a multiplier tied to their discharge duration through the “Forward Charging Period” (FCP) construct. The energy sufficiency requirement for LDES resources may be met according to Table 4.

Table 4. LDES Forward Charging Period Multiplier

Storage Duration	Forward Charging Period
(hours)	(multiplier)
[≥8-<12)	2
[≥12-<16)	3
[≥16-<20)	4
[≥20-<24)	5
[≥24-<48)	6
[≥48-<72)	7
≥72+	8

In the SOD Compliance Tool, the energy required for an LDES resource is divided by its applicable multiplier. This results in the following equation: [Charging Requirement] = [Energy per Cycle] / [Round Trip Efficiency] / [FCP Multiplier]. For example, a 10 MW 24-hour storage resource would be able to discharge 240 MWh (the Energy per Cycle). If its RTE were 50%, it would have a 480-MWh charging requirement prior to the FCP multiplier. With the 6x multiplier, it would only have a charging requirement of 80 MWh.¹⁹

¹⁹ See D.26-07-008, pg. 180-181 for more examples.

Pumped storage hydro (PSH) is a unique type of storage that is given a dispatchable hydro calculation but operates like a storage resource. D.26-07-008 differentiated between open-loop and closed-loop storage, finding that closed-loop storage should be treated like LDES resources, demonstrating excess capacity in order to show on an LSE's RA Showing, with the appropriate FCP multiplier depending on duration. Open-loop PSH has access to natural water flows and does not currently have to demonstrate excess capacity.

11 HYBRID AND CO-LOCATED RESOURCES

Hybrid and co-located resources are configurations in which energy storage and generation share the same point of interconnection (POI). Under D.20-06-031, *hybrid* resources are those that operate in the CAISO market under a single resource ID, while *co-located* resources operate under one or more resource IDs. D.23-04-010 collectively refers to both configurations as *paired* resources.

D.23-04-010 adopted a new QC methodology, abrogating the previous methodology adopted in D.20-06-031.²⁰ The methodology is an additive approach for both resource classes, where the NQC of the storage resource and the VER are summed together for hybrid resources and separated for co-located resources. The total capacity of the hybrid or co-located resource is capped at the POI limit.

Under SOD counting rules, the first step to calculating the QC for paired resources is to calculate the VER QC and the storage QC components separately, which is described above.²¹ For hybrid resources, the single-value QC of the storage component is added to the single-value QC of the VER component. The summed QC is limited by the resource's Pmax, which is also its POI. Hybrid resources are shown on the NQC list as a single resource ID, but on the MRD they are shown with sub-IDs identifying individual components. For example, a hybrid resource may have one sub-ID for the storage component (with the appellation “_LESR”) and one for the solar component (with the appellation “_SUN”). If the added components of the hybrid resource exceed Pmax, then the QC of the solar component is reduced until the NQC

²⁰ See the 2020 QC Methodology Manual.

²¹ The methodology for VER QC is Section 5 and the methodology for Storage QC is Section 10.

equals the Pmax.²² However, if the storage component is equal to the Pmax, then the QC of the storage component will be reduced by 0.1 and that value will be allocated to the solar component for those months.²³ These adjustments will not change the way that the components are shown on the SOD compliance tool as long as they are not shown at max capacity simultaneously to exceed the Pmax.

Co-located resources are shown separately on the NQC list and the MRD, which means that each co-located resource is given a unique resource ID. In a similar way to the haircut applied to hybrid resources, co-located resource NQC is limited by their POI. If there is a POI limitation, CAISO adds a deliverability cap to the co-located VER resources to make the summed NQCs equal to the POI. However, like with hybrids, this haircut will not prevent the paired VER from providing RA value and charging sufficiency and its MWh production is assumed to remain in the CPUC showing tool. At the same time, the CPUC showing tool will apply the POI to aggregate co-located resources so that there is no hour where the POI is exceeded.²⁴

To make sure that VER resources will have enough MWh to charge storage resources, there is a State-of-Charge test in the SOD Compliance Tool that will test if enough production exists to charge hybrid/co-located storage resources. If the paired storage has a grid-charging limitation, then the paired VER must provide the full charge required for the storage to maintain NQC value. Storage NQC will be given a haircut in

²² For example, given the solar component QC for HYBD_ID is 20, the storage component QC is 20, and the Pmax is 30, on the MRD it would be shown as HYBD_ID_SUN = 10 MW and HYBD_ID_LESR = 20 MW.

²³ For example, a hybrid resource with a Pmax of 50 MW, a storage size of 50 MW, and a solar size of 50 MW would have an additive NQC of 50, with the storage NQC size being 49.9 and the solar NQC size being 0.1 across all months.

²⁴ Appendix A, D.23-04-010.

situations where the paired VER is unable to fully charge grid-restricted storage resources.

Additionally, EO resources that are paired with storage resources can count towards charging sufficiency requirements for both co-located and non-co-located resources. Per D.26-07-008, co-located EO resources may count for charging sufficiency for storage that is not co-located. They can count up to the POI limit or, in case the storage resource does not have 100% deliverability, up to the deliverability cap.

12 DEMAND RESPONSE

In D.09-06-028, the CPUC directed that the QC of demand response (DR) resources be based on the Load Impact Protocols (LIPs) adopted by D.08-04-050.²⁵ LIPs are used to measure DR program performance on an *ex-post* basis and to forecast anticipated performance (or available capacity) on an *ex-ante* basis.²⁶ However, the LIPs provide much more information than 12 monthly QC values. More detailed information on the updated LIP requirements is provided in Appendix C of D.24-12-003.

The LIPs must be followed by the entity requesting that the DR resource be eligible to count for RA. That entity must work with Energy Division staff to provide the LIP information described below for the DR resource to receive QC values.

The monthly CPUC RA QC methodology for DR resources, as adopted in D.23-04-010, is the expected (*ex-ante*) load impact measured over the RA measurement hours. DR resources are required to be available for at least four consecutive hours within the five-hour window.²⁷ The RA measurement hours, reflected in Table 2, align with the CAISO AAHs, which were most recently revised in D.25-06-048. Similar to solar and wind, DR has shaped profiles that are used in CPUC compliance and a single QC value that is used in CAISO systems. CPUC staff shape the profiles by taking the hourly

²⁵ The discussion of the LIPs in this manual does not in any way impact the requirements of any previous decision in the DR proceedings or any other uses of the LIPs besides QC calculations. The LIPs are detailed in Appendix A to D.08-04-050; http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/81979.PDF.

²⁶ Load Impact Protocol Process Guide Version 6.1; [final-lip-filing-guide-v61.pdf](#)

²⁷ D.23-06-029. OP 6

estimates provided²⁸ according to the LIPs for third party demand response providers (DRPs). The hourly shapes are aggregated by DRP. The single QC value for the CAISO is calculated using the average of the expected (*ex-ante*) load impact during the appropriate measurement hours shown in Table 2 above.²⁹

IOU DR QC counting rules are the same as third party DRP. However, the DR QC values are allocated and counted as a DR “credit” instead of a unique resource for CPUC compliance.

Additionally, the NQC for DR resources is grossed up from the LIP profiles to add back the effects of the Distribution Loss Factor (DLF) adder.³⁰ The DLF is an estimate for how much energy is lost at the distribution level of energy provision. Because DR does not use a distribution system to provide energy, any capacity that the DR represents gets the DLF, as calculated below.

$$\text{DR RA Value} = \text{DR Load Impact} * \text{Distribution line loss factors}$$

Pursuant to D.21-06-029 and D.23-06-029, the DLF for third-party DR resources will be embedded in the QC value of the DR resource starting in 2022. Thus, only the DLFs as established by D.10-06-036 for each IOU TAC are applicable:

²⁸ If assumptions underlying the LIP estimates for a particular program are unreasonable, CPUC staff accordingly adjusts the load impacts.

²⁹ In D. 26-07-008, the Commission moved from providing the CAISO the peak showing value to the average of the values within the AAH window.

³⁰ Prior to the 2024 RA compliance year, the Commission also used a Transmission Loss Factor (TLF) and a Planning Reserve Margin (PRM) as adders. The original formula was adopted in D.10-06-036 and subsequently adjusted in D.15-06-063, D.21-06-029, and D.23-06-029.

Table 5. DLF Adders for Demand Response

	PG&E	SCE	SDG&E
Peak, distribution losses only	1.067	1.051	1.071