Unforced Capacity Evaluation Overview

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An unforced capacity construct ensures resources' capacity values reflect availability

- Unforced capacity evaluations promote procurement of the most dependable and reliable resources up front by accounting for historical unavailability in their capacity value
  - Current PRM, forced outage substitution rules, and RAAIM have proven inadequate to replace capacity on forced outage, moving to a UCAP construct would allow the ISO to eliminate complicated and ineffective forced outage substitution rules
- UCAP dynamically changes with the fleet's forced outage rate
  - Relying solely on the PRM, which is a static value, may lead to over/under procurement if future outage rates change
  - Under UCAP, the PRM would no longer need to explicitly account for forced outage rates, and the 4-6% of the current 115% PRM could be removed. The PRM would now only need to cover operating reserves and forecast error

A seasonal availability factor methodology can be used to determine UCAP values

- In prior comments in this proceeding the CAISO recommended using a seasonal availability factor based approach for UCAP determinations during the tightest system conditions by looking at the hourly RA Supply Cushion
- Resource availability factors incorporate historical forced and urgent derates and outages to determine the resource's expected future availability and contributions to reliability
- Basic UCAP methodology can be used for dispatchable thermal resources
- CAISO recognizes that this baseline methodology may not be appropriate for all resource types and will provide recommendations on augmented methodologies to determine these resource's average availability in the next workshop

Resource availability can be calculated on a seasonal basis measured on tight RA supply cushion hours

- This approach considers different impacts of availability during seasons across the year to better reflect unit reliability
- A low RA supply cushion indicates the system has fewer assets available to react to unexpected outages or load increases, indicating a high real-time system resource adequacy risk
- This method captures how tight the system would be if we only had the RA fleet to rely on - Makes no assumptions about economic energy, because with tightening conditions across the West this may no longer be a viable assumption, or prudent design of the RA program

Defining the Tightest RA Supply Cushion Hours

- **RA Supply Cushion = Daily Shown RA** (excluding wind and solar) **– Planned Outages – Opportunity Outages – Urgent Outages – Forced Outages – Net Load – Contingency Reserves**
- RA Supply cushion represents how much shown RA MWs are leftover after we take into account outages, serving net demand, and covering contingency reserves
- Contingency Reserves represents Regulation Up, Spin and Non-Spin Reserves
- Measured in MWs
- Because net load is a 5 minute measure, to convert the supply cushion into an hourly value we take the mean of the supply cushion across all 12 RTD intervals to represent the supply cushion in each operating hour

Assess applicable outages during the top 15-20% of tightest RA supply cushion hours

- The CAISO recommends looking at forced outage rates under a subset of hours that represent the hours of greatest RA supply risk
- The CAISO is working with our development team to collect data to calculate the RA supply cushion for the last three years and will provide this during the UCAP workshop on January 19, 2021 workshop
- Advantages of this approach
  - Penalizing resources for being on a forced outage when the grid needed them
  - These assessment hours can fall at any point in the day, and thus resources are incentivized to always be available
  - Simpler than an EFORd methodology (allows for utilization of OMS rather than GADs data)
  - Provides consistency across evaluation periods, and more predictable risk of any one outage on a resource's capacity value
  - Preliminary data indicates that observations for majority of days and covers a large enough sample size

Seasons selected to calculate UCAP values can be align with Slice of Day

- UCAP seasons can be modified to align with the seasons selected in the Slice of Day framework, such as those proposed by PG&E
- If the Slice of Day framework elected to retain the monthly showings, as suggested in the SCE proposal, CAISO could calculate UCAP for two seasons, and apply the UCAP value to the relevant month
- The CAISO initially proposed to calculate seasonal UCAP values for:
  - Peak Months: May - October
  - Off-Peak Months: November – April

Summary of UCAP steps (formulas in appendix)

1. Determine UCAP assessment hours by identify which hours fall into the top % of tightest supply cushion hours for each season
2. Determine hourly unavailability factors (HUF) by looking at forced and urgent outages for each UCAP assessment hours each season
3. Determine seasonal average availability factors (SAAF) using one minus the average HUFs for each season of prior year
4. Determine weighted seasonal average availability factors (WSAAF) by multiplying the prior three year SAAFs by (45% Y1, 35% Y2, 25% Y3)
5. Apply WSAAFs for each season to deliverable capacity (DQC) to determine monthly NQC (On-peak and Off-peak) values for each resource

Unforced capacity evaluations can be incorporated into the NQC process

- CAISO could conduct a two step process to assess resources' QCs that include resources' deliverability and availability
  - Step 1: Conduct resource deliverability assessment and adjust QC for deliverability, creating Deliverable QC (DQC) for the resource
  - Step 2: Apply non-availability factor to DQC, resulting in the NQC value for the resource under the UCAP construct
    - Capacity value will still be expressed in terms of NQC, addressing stakeholder concerns about existing contracts
    - Must Offer Obligation will be in terms of DQC

APPENDIX: UCAP FORMULAS

Proposed UCAP calculation steps

- CAISO would determine each resource's Hourly Unavailability Factor (HUF) for each of the top % tightest RA Supply cushion hours per season

$$\textbf{Hourly Unavailability Factor} = \frac{\textbf{Forced} + \textbf{Urgent Outage Impacts}}{\textbf{Pmax}}$$

- CAISO would utilize the average of Hourly Unavailability Factors (HUF) for each season for each of the past 3 years to create a Seasonal Average Availability Factor (SAAF) for each resource

$$\textbf{Seasonal Average Availaility Factor} = 1 - \frac{\sum \textbf{Hourly Unavailability Factors}}{\textbf{Number of Observed Hours}}$$

Proposed UCAP calculation steps (continued)

- CAISO proposed the following percentage weights for the availability factor calculation by year from most recent to most historic: 45-35-20%
- In other words, the following percentage weights will be applied to the seasonal availability factors:
  - 45% weight for the most recent year's seasonal availability factor
  - 35% weight on the second year
  - 20% on the third year
- CAISO would then apply proposed weighting to each of the three previous annual periods (for each on-peak and off-peak season) to create Weighted Seasonal Average Availability Factors (WSAAF)

$$\textbf{Weighted Seasonal Average Availability Factor} = \textbf{Annual Weighting} * \textbf{Seasonal Average Availability Factor}$$

Proposed UCAP calculation steps (continued)

- Once the Weighted Seasonal Average Availability Factors (WSAAF) are established for each season of each of prior 3 years, CAISO would sum the factors and apply them to each resource's DQC to determine the resource's seasonal UCAP/NQC ratings

$$\textbf{On Peak UCAP/NQC} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Summer}} * \textbf{DQC}$$

$$\textbf{Off Peak UCAP/NQC} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Winter}} * \textbf{DQC}$$