



CAISO New Market DOP Ramping Logic

Requirements

1. Online resources shall ramp continuously from one DOT to the next, i.e., from the middle of a dispatch interval to the middle of the next dispatch interval.
2. Starting-up resources shall jump from zero up to P_{min} at the start of the dispatch interval and then ramp continuously to the DOT, i.e., from the start of the dispatch interval to the middle of that dispatch interval.
3. Shutting-down resources shall ramp continuously from the DOT to P_{min} at the end of the dispatch interval, i.e., from the middle of the dispatch interval to the end of that dispatch interval, and then jump from P_{min} down to zero.
4. The DOP shall jump vertically from the previous DOT to the “projected output” used for dispatch initialization, if different from the previous DOT. The projected output is extrapolated from the actual output (SE solution or telemetry) toward the previous DOT at the applicable ramp rate.
5. Resources shall have a feasible DOP ramp with respect to their applicable ramp rate, i.e., the DOP shall not ramp faster than the applicable ramp rate. The applicable ramp rate shall be the operational ramp rate unless: a) the resource is on Regulation (in any of the two consecutive dispatch intervals) in which case the regulating ramp rate is used; b) there is a ramp rate derate in effect for the first dispatch interval of the Time Horizon in which case the derated ramp rate is used; or c) the resource is crossing a forbidden operating range in which case the applicable ramp rate is derived by dividing the width of the forbidden operating range with the relevant crossing time.
6. The DOP ramp shall be “as smooth as possible,” i.e., as close as possible to the linear trajectory between the “projected output” and the DOT, unless the resource is crossing a forbidden operating range in which case the DOP ramp shall be equal to the applicable ramp rate. A smooth DOP ramp can be calculated by a process described in the next section.

DOP logic detail

Requirements 1 through 4 are straightforward. For Requirement 5, the regulating ramp rate becomes the applicable ramp rate in a dispatch interval when the regulation status is set in that interval and the DOP is within the relevant regulating range and not inside a forbidden operating range.

For Requirement 6, if the applicable ramp rate is the operational ramp rate, the DOP is linear from the “projected output” to the DOT if all operational ramp rates within that range are greater than or equal to that smooth linear ramp. Otherwise, the DOP is piece-wise linear with breakpoints at the output level when the operational ramp rate changes.

In the case of two operational ramp rates within the DOP range, a faster and a slower one, compared to the smooth linear ramp, the DOP must ramp at the slower ramp rate within the slower ramp range and then linearly to the start or end of the DOP range depending on whether the faster operational ramp rate is encountered before the slower one or vice versa.

In the general case where there are more than two operational ramp rates within the DOP range, there may be multiple DOPs that meet the requirements. It is assumed that a process similar to the cross-hourly ramping between Day-Ahead Schedules (in absence of Bids or OOS Instructions) is used to determine the DOP. The steps in this process are as follows:

1. Calculate the smooth linear ramp from the “projected output” to the DOT. Start by an initial DOP that uses the applicable operational ramp rate as it changes through the DOP range. This DOP reaches the DOT level at or before the DOT time because the DOT is feasible.
2. If the DOP reaches the DOT level at the DOT time, exit.
3. Loop chronologically (earlier first) through each DOP segment that corresponds to each operational ramp rate in the DOP range.
4. If the operational ramp rate of the DOP segment is less than the smooth linear ramp, skip this segment.
5. Reduce the DOP segment ramp until the DOP segment ramp becomes equal to the smooth linear ramp or the DOP reaches the DOT level at the DOT time.
6. If the DOP reaches the DOT level at the DOT time, exit, otherwise proceed with the next DOP segment.