

Net OR Revenue

DA-PCG Calculation – Component 4



Introduction

Component 4 of the Day-Ahead Production Cost Guarantee (DA-PCG) calculation subtracts the net operating reserve (OR) revenue realized by generators whose real-time dispatch for energy is less than their day-ahead schedule for energy. The net OR calculation was presented to the Design Working Group using a simplified formula (did not show cancelled out variables). In response to a request to show the calculation including cancelled out variables, this paper details the net operating reserve (OR) revenue calculation used in the DA-PCG calculation and arrives at the simplified formula previously presented.

Brief Review of DA-PCG - Component 4

Component 4 is the net real time OR revenue earned by a generator in association with all operating reserve categories, up to the capacity that was included in that generator's day-ahead constrained energy schedule. The net OR revenue takes into account OR revenue earned less OR costs plus OR congestion management settlement credits (CMSC).

Net OR Revenue Calculation

$$\text{Revenue} = RTP_{OR} \times RTCS_{OR}$$

$$\text{Cost} = \int_0^{RTCS_{OR}} RTO_{OR}$$

$$CMSC_{CONS_ON} = \int_{RTUS_{OR}}^{RTCS_{OR}} RTO_{OR} - RTP_{OR} \times (RTCS_{OR} - RTUS_{OR})$$

$$CMSC_{CONS_OFF} = RTP_{OR} \times (RTUS_{OR} - RTCS_{OR}) - \int_{RTCS_{OR}}^{RTUS_{OR}} RTO_{OR}$$

Where

- CMSC_{CONS_OFF} = constrained off congestion management settlement credits
- CMSC_{CONS_ON} = constrained on congestion management settlement credits
- RTCS_{OR} = real-time operating reserve constrained schedule
- RTO_{OR} = real-time operating reserve offers
- RTP_{OR} = real-time operating reserve price

$RTUS_{OR}$ = real-time operating reserve unconstrained schedule

Constrained On

Net OR Revenue

$$\begin{aligned}
 &= \text{Revenue} - \text{Cost} + CMSC_{CONS_ON} \\
 &= (RTP_{OR} \times RTCS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + \left[\int_{RTUS_{OR}}^{RTCS_{OR}} RTO_{OR} - RTP_{OR} \times (RTCS_{OR} - RTUS_{OR}) \right] \\
 &= (RTP_{OR} \times RTCS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + \left(\int_{RTUS_{OR}}^{RTCS_{OR}} RTO_{OR} \right) - (RTP_{OR} \times RTCS_{OR}) + (RTP_{OR} \times RTUS_{OR}) \\
 &= (RTP_{OR} \times RTUS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + \left(\int_{RTUS_{OR}}^{RTCS_{OR}} RTO_{OR} \right) \\
 &= (RTP_{OR} \times RTUS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) - \left(\int_0^{RTUS_{OR}} RTO_{OR} \right) \\
 &= RTP_{OR} \times RTUS_{OR} - \int_0^{RTUS_{OR}} RTO_{OR}
 \end{aligned}$$

Constrained Off

Net OR Revenue

$$\begin{aligned}
 &= \text{Revenue} - \text{Cost} + CMSC_{CONS_OFF} \\
 &= (RTP_{OR} \times RTCS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + \left[RTP_{OR} \times (RTUS_{OR} - RTCS_{OR}) - \int_{RTCS_{OR}}^{RTUS_{OR}} RTO_{OR} \right] \\
 &= (RTP_{OR} \times RTCS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) + (RTP_{OR} \times RTUS_{OR}) - (RTP_{OR} \times RTCS_{OR}) - \left(\int_{RTCS_{OR}}^{RTUS_{OR}} RTO_{OR} \right) \\
 &= (RTP_{OR} \times RTUS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) - \left(\int_{RTCS_{OR}}^{RTUS_{OR}} RTO_{OR} \right) \\
 &= (RTP_{OR} \times RTUS_{OR}) - \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) - \left(\int_0^{RTUS_{OR}} RTO_{OR} \right) + \left(\int_0^{RTCS_{OR}} RTO_{OR} \right) \\
 &= RTP_{OR} \times RTUS_{OR} - \int_0^{RTUS_{OR}} RTO_{OR}
 \end{aligned}$$

The OR net revenue calculation for both constrained on and constrained off can be simplified as follows:

$$\text{Net OR Revenue} = RTP_{OR} \times RTUS_{OR} - \int_0^{RTUS_{OR}} RTO_{OR}$$