

Regulation Performance Impacts

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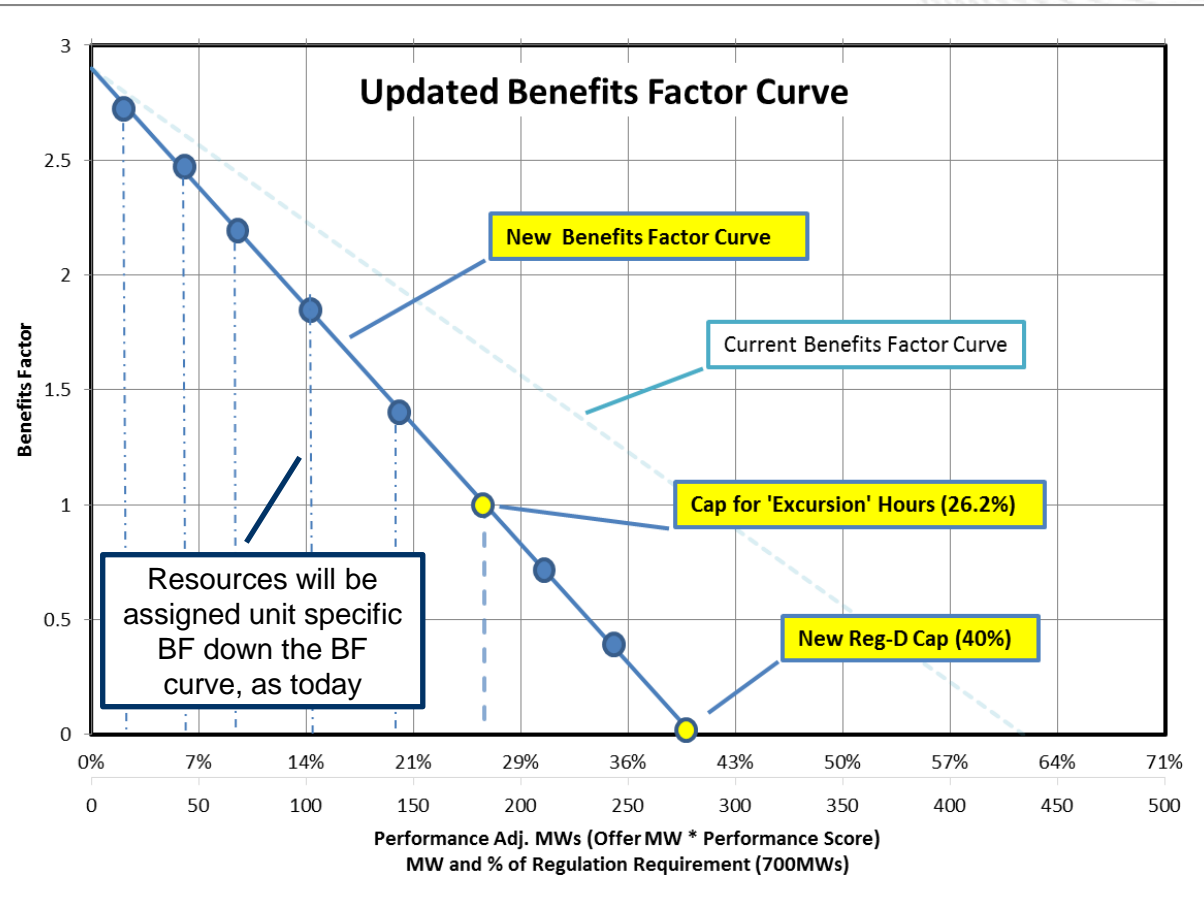
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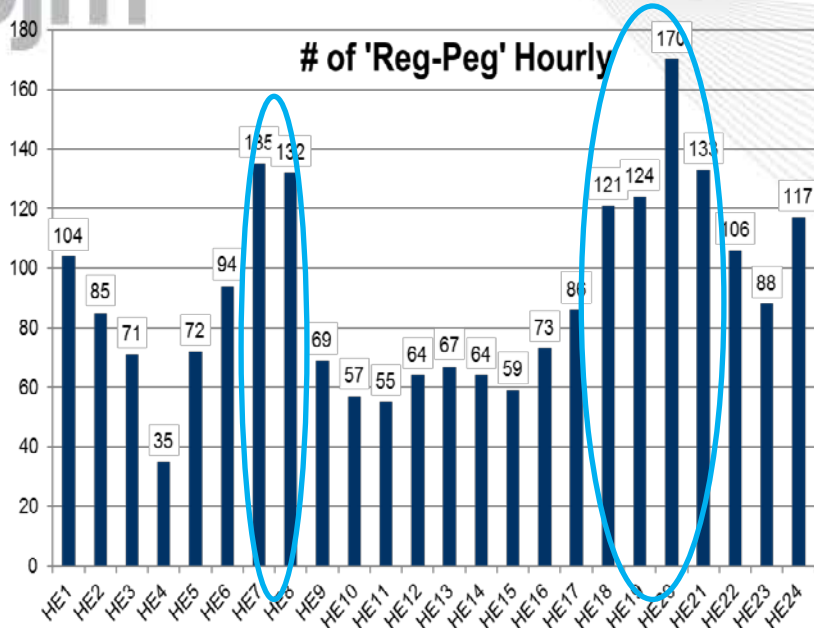
- Review of Issues and Proposed Solutions
- Benefits Factor Curve Adjustment
- Tie Breaker in Benefits Factor Ranking
- Path Forward

- *Issue 1: The current benefits factor curve is not aligned with regulation signal types dispatched in operations. RegD control signal at times moves in the opposite of ACE control due to energy neutrality reset*
 - **Solution: Shift Benefits Factor Curve to the left (BF=0 at 40%) and during identified excursion hours implement a RegD ‘cap’ that will allow up to 26.2% (measured in Performance Adjusted MW) of the regulation requirement to be met with RegD resources**
- *Issue 2: Adjusted Total Cost formulation is ineffective in instances of RegD self-schedule and/or offered at \$0. The Market Clearing engine ‘block-assigns’ a benefits factor to these resources and does not optimally procure a RegA-RegD mix.*
 - **Solution: Implement tie-breaker logic for benefits factor ranking to allow unit specific benefits factors be assigned to all RegD Self-Scheduled and \$0 cost resources based on resource performance**

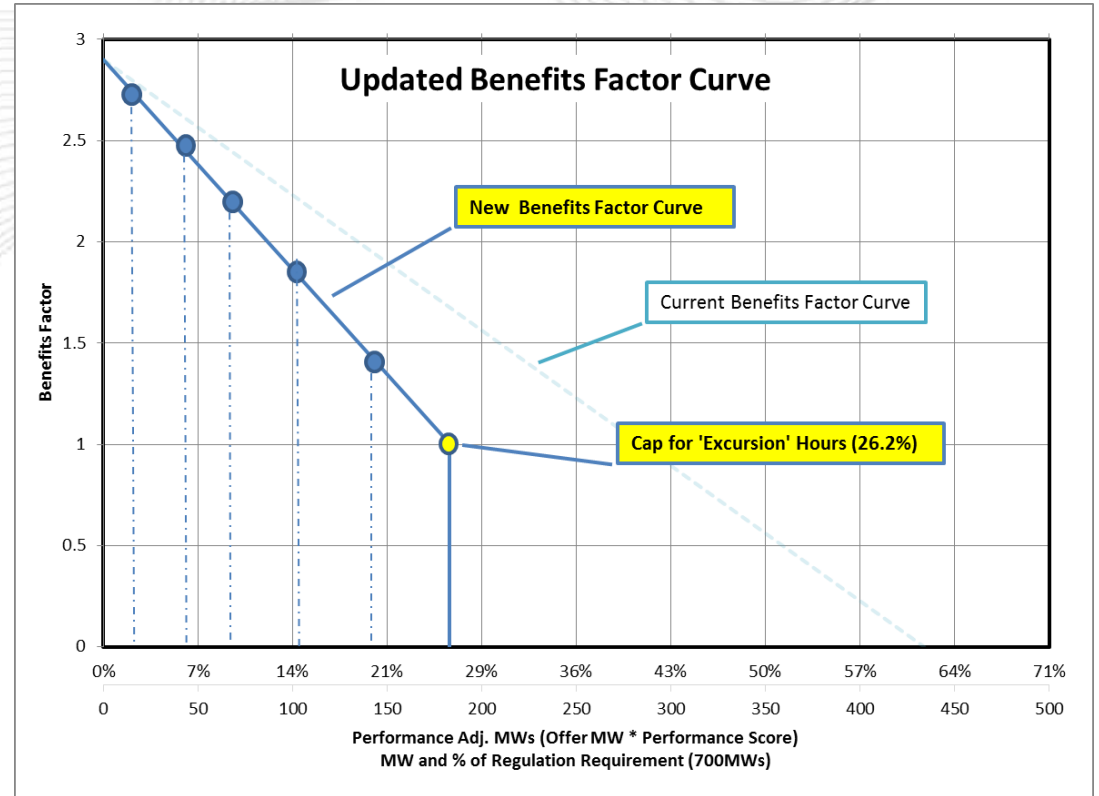
Benefits Factor Curve Adjustment

- Market and Operation analysis on a sample set of regulation hours determined an updated Benefits Factor curve to best optimize operations during all system conditions
- The Benefits Factor Curve will be shifted to the left (BF=1 @ 26.2% and BF=0 @ 40%) to allow for optimal system control from Regulation Resources
- Resources with BF < 1 will not be considered for RegD for “Excursion” hours. During these hours the Benefits Factor Curve will be implemented to commit economic RegD resources up to the RegD-RegA neutrality point (BF=1)





HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	HE11	HE12
40%	40%	40%	40%	40%	40%	26.2%	26.2%	40%	40%	40%	40%
HE13	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21	HE22	HE23	HE24
40%	40%	40%	40%	40%	26.2%	26.2%	26.2%	26.2%	40%	40%	40%



- “Excursion” hours were identified as hours where dispatch frequently manually moves the regulation signal
 - Excursion Hours: HE7, HE8, HE18, HE19, HE20, HE21
- During these hours the Benefits factor curve will be capped at BF=1 (26.2%)



Benefits Factor Curve Adjustment

- Adjusting the Benefits Factor Curve to 40% will allow up to ~280MW on-peak and ~210MW off-peak (Performance Adjusted MW) of RegD resources to be considered for regulation commitment
 - Translates to 329MW on-peak and 247MW off-peak Raw (Offer) MW (with average RegD performance equal to 0.85)
- During “Excursion” Hours, capping RegD at BF=1 will allow up to ~183MW on-peak (Performance Adjusted MW) of RegD resources to be considered for regulation commitment
 - Translates to 215MW on-peak Raw (Offer) MW (with average RegD performance equal to 0.85)
- Current qualified RegD Raw (Offer) MW total 600 MW

Regulation D	
Resource Type	Offer MW
Battery/Storage	136
DSR	15
Hydro	420
CT	110

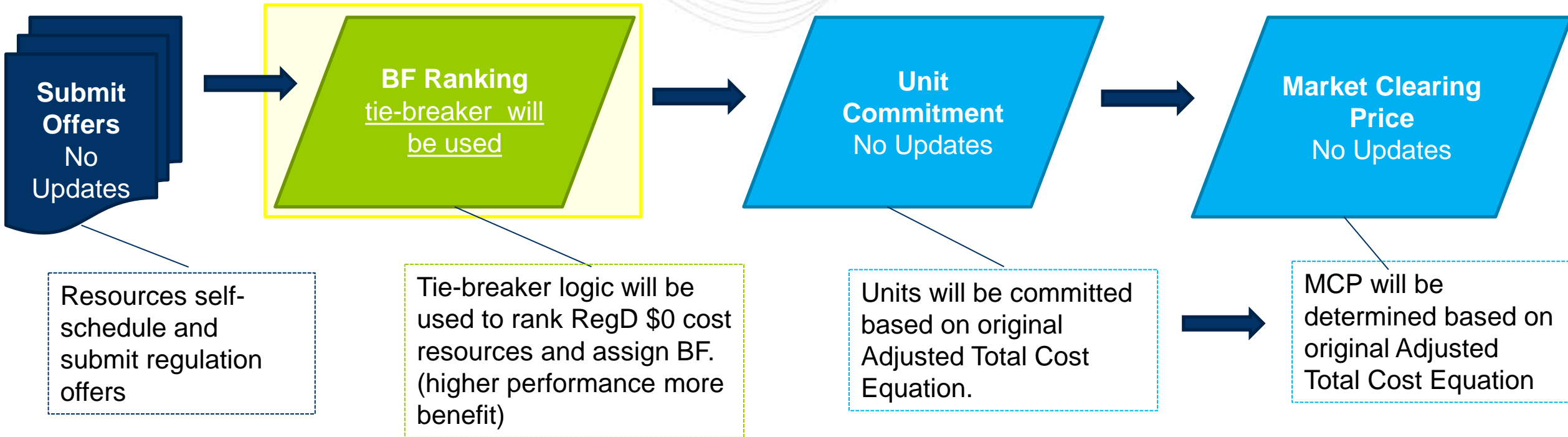
- A tie-breaker logic will be added to allow unit specific benefits factors to be assigned to self-scheduled & \$0 cost resources
 - Tie-breaker will be based on performance and only applied to the resources BF ranking

Benefit Factor tie-breaker logic:

If cost = \$0, rank with performance score (highest to lowest), else use current Adjusted Total Cost equation

$$The\ Adjusted\ Total\ Cost\ (\$)_{BF\ calc} = \left(\frac{Cap\$ + LOC\$ + Perf\$}{PS * BF} \right)$$

Tie- Breaker in Benefits Factor Ranking



- Benefits Factor Curve Adjustment and Benefits Factor Tie Breaker are provisional solutions
 - Updates pending Regulation Senior Task Force results
 - Benefits Factor Curve and Regulation Performance will be evaluated quarterly and reported to the Operating Committee
- Benefits Factor Curve may change pending signal tuning, performance scoring adjustments, and regulation requirement updates