Regulation Market Pricing Issue

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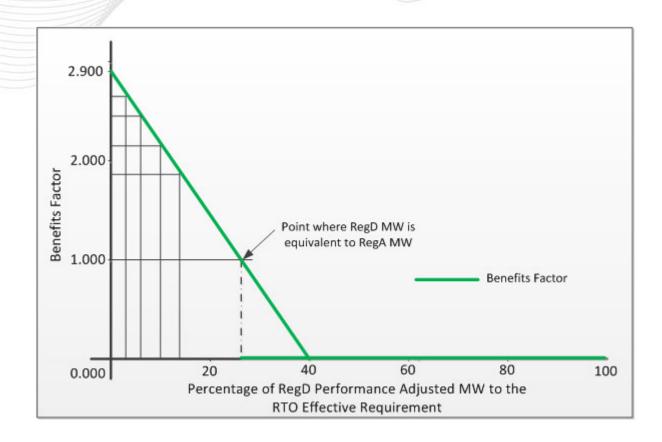Markets and Reliability Committee

October 25, 2018

- Performance Based Regulation became effective October 1, 2012 and compensated resources based on:
  - Benefits Factor (BF)
  - Mileage
  - Performance Score (PS)

- OC Special Sessions – Regulation Performance Impacts
  - Revised Benefits Factor curve and floored the RegD BF at 1 during excursion hours (Dec 2015)

- Regulation Market Issues Senior Task Force
  - Modified the regulation signal in January 2017 and subsequently removed the BF floor in August 2018 based on operational analysis
  - MRC endorsed the joint PJM/IMM package to use Marginal Rate of Technical Substitution (MRTS) instead of the BF in June 2017
    - Submitted a 205 filing that was rejected by FERC and the solution was never implemented

- Regulation resources are cleared in ASO 1 hour before the operating hour
    - Priced in LPC every 5 minutes

- Self-Scheduled and $0 offers are cleared first, then remaining resources are cleared up to requirement in economic order

- RegD Benefits Factor ranges between 2.9 and 0

- RegA Benefits Factor = 1

- Performance score below 40% will not clear

$$RMCP = \text{Adj. Capability Offer} + \frac{Capability\ Offer}{Benefits\ Factor\ *\ Performance\ Score}$$

$$\text{Adj. Performance Offer} + \frac{Performance\ Offer\ *\ Mileage}{Benefits\ Factor\ *\ Performance\ Score}$$

$$\text{Adj. LOC}\ \ \frac{LMP\ -\ Marginal\ Cost}{Benefits\ Factor\ *\ Performance\ Score}$$

Any offer or LOC will increase drastically if the BF and/or PS are very low values

$$\text{RMCP} = \frac{Capability\ Offer}{Benefits\ Factor * Performance\ Score} = \frac{\$0/MWh}{0.001 * 0.80} = \$0/MWh$$

$$\frac{Performance\ Offer * Mileage}{Benefits\ Factor * Performance\ Score} = \frac{\$0/MWh\ * 34.14}{0.001 * 0.80} = \$0/MWh$$

$$\frac{LMP - Marginal\ Cost}{Benefits\ Factor * Performance\ Score} = \frac{\$15/MWh - \$10/MWh}{0.001 * 0.80} = \frac{\$5/MWh}{0.0008} = \$6{,}250/MWh$$

Even with a $0 offer, a difference of $5 in LOC can create a $6,250 Clearing Price

- Currently all calculations are being done consistent with market rules

- PJM has brought forward a narrowly crafted Problem Statement and Issue Charge and a proposed solution for voting by the MRC today

- Proposed Solution: Floor Benefits Factor in market clearing at .1 instead of 0
  - Minor updates are required to section 3.2.7 of Manual 11
  - One sentence added to Schedule 1, section 3.2.2(j) of the Operating Agreement
    - MC approval now necessary given addition of OA/OATT language

- The proposed solution would limit the ratio to 10 MW of RegD to provide 1 MW of RegA

- This would have impacted only 2.5% of all hours in the last year

- No software changes needed for implementation. Change could be implemented immediately upon FERC approval.

Appendix

PJM proposes .1 as the BF floor. PJM believes this level strikes a balance between minimizing the number of hours impacted by the change and minimizing the ability of minimally effective resources to affect the clearing price.

BF Floor	# of Hours Affected	% of Hours Affected
0.01	39	0.38%
0.02	70	0.68%
0.03	95	0.93%
0.04	116	1.13%
0.05	143	1.40%
0.1	264	2.58%
0.2	387	3.79%
0.25	441	4.31%

Data from 8/1/2017 – 9/30/2018