



## Regulation Market Issues

### ***Problem/Opportunity Statement***

The marginal benefit function is not correctly defined and it is not consistently applied throughout market construct.

This problem warrants consideration in the PJM stakeholder process as it has contributed to known operational and market issues.

The marginal benefit factor function used in the regulation market should be reviewed and revised as appropriate.

The use of the marginal benefit function in the regulation market optimization should be reviewed and revised as appropriate.<sup>1</sup>

The application of the marginal benefit function in pricing and settlement be reviewed and revised as appropriate.<sup>2</sup>

### ***Explanation and Effects***

The marginal benefit factor defines the substitutability between RegA and RegD resources in meeting the regulation requirement. The effectiveness and efficiency of the regulation market depends on the marginal benefit factor function being defined by the actual tradeoff between RegA and RegD MW in providing regulation. If the marginal benefit factor function is incorrectly defined the resulting combinations of RegA and RegD would not represent the least cost solution to meet regulation requirements.

PJM has, under times of system stress, observed issues with regulation performance when the proportion of effective MW from RegD resources exceeds 42 percent (equivalent to RegD of

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<sup>1</sup> See Fast Response Regulation (RegD) Resources Operational Impact Problem Statement and the IMM's Regulation Market Review presentation which were presented at the May 5, 2015 Operating Committee. See <<http://www.pjm.com/committees-and-groups/committees/oc.aspx>>, accessed May 4, 2015.

<sup>2</sup> See Fast Response Regulation (RegD) Resources Operational Impact Problem Statement and the IMM's Regulation Market Review presentation which were presented at the May 5, 2015 Operating Committee. See <<http://www.pjm.com/committees-and-groups/committees/oc.aspx>>, accessed May 4, 2015.

23 percent or more of actual MW based on the current marginal benefit function).<sup>3</sup> The system issues are a result of PJM buying too much RegD as a proportion of total regulation. The issues also indicate that the marginal benefit factor function used by PJM is incorrectly describing the operational relationship between RegA and RegD. PJM's current marginal benefit factor function is, at least in some hours, overvaluing RegD as a substitute for RegA in the optimization.

The IMM has also determined that the current market optimization/market solution does not correctly account for the amount of effective MW being provided by RegD. Rather than calculating the total effective MW contribution of RegD MW on the basis of the area under the marginal benefit function curve, the current regulation market optimization assigns all RegD resources with the same effective price the lowest marginal benefit factor associated with last RegD MW at that price. The incorrect accounting of effective MW within the optimization construct has resulted in an inefficient combination of RegA and RegD and a purchase of more than the efficient level of RegD than necessary to meet PJM's defined regulation requirement.

The current market design does not send the correct price signal to the RegD resources. The price sent to RegD resources in settlement is inconsistent with the price used in the optimization. This is due to an inconsistent application of the marginal benefit factor within the regulation market construct. The marginal benefit factor is used in the optimization to determine the relative value of additional MW of RegD but it is not used in the pricing observed in the pricing and ultimate settlement for RegD. Instead, PJM uses a miles ratio on the performance component of price. This causes resources that follow the RegD resources to always realize a slightly higher price than the same resource if it followed the RegA signal, regardless of the actual marginal relationship between RegA and RegD resources. This has caused the realized prices paid to RegD resources to be too low when the marginal benefit factor is greater than 1 and the realized prices paid to be RegD resources to be too high when the marginal benefit factor is less than 1. The latter case is contributing to PJM's operational issues.

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<sup>3</sup> Fast Response Regulation (RegD) Resources Operational Impact Problem Statement, Presented at the May 5, 2015 Operating Committee. See <<http://www.pjm.com/committees-and-groups/committees/oc.aspx>>, accessed May 4, 2015.