



Regulation Market Issues Senior Task Force Proposal

Executive Summary

The Energy Storage Association (ESA) proposal is designed to solve PJM's operational concerns while ensuring that storage is properly valued and able to manage this market transition. Although the issues before the RMISTF are complex, our package boils down to a simple offer:

In exchange for giving up energy neutrality, remove the limits on storage

This is not to say that the ESA considers this the ideal solution—how to best use energy limited resources in organized markets is still very much an open question, and we look forward to more work in this area. However, given the limited scope of the RMISTF and that many broader issues will be addressed in future proceedings, this is an acceptable short-term solution.

We see the overall story of the RMISTF as:

- Accommodations for energy neutrality were perceived as limiting the amount of fast regulation PJM could accept, but the market structure did not reflect this.
- Why PJM's regulation signal is often out of balance for prolonged periods of time has been deemed out of scope, and remains an open question. We are particularly concerned by reports that operators lean on the regulation fleet to avoid uplift payments in the energy market.
- PJM has responded to this situation by designing a new RegD signal that ignores energy limits when necessary for system control.
- With this signal, there is no longer any justification for structural limits on the amount of RegD in the market—an energy unlimited fast regulation resource can do everything a RegA resource can and more. PJM's new signal can support 100% RegD.
- As the amount of RegD increases, the new RegD signal will become ever less energy neutral.
- Challenges following a less neutral signal will create a natural cap on the amount of short duration storage in the market and encourage development of longer duration resources. The ESA believes that this is the correct way to send an investment signal as to the optimal storage capacity. In this, we diverge from PJM and the IMM, who prefer an administratively set "MRTS curve."

As detailed below, our proposal follows this vision. We follow PJM's lead on system control issues, but prioritize a market-based, unit-specific approach over an administratively set one to determine the optimal mix of storage and non-storage resources. We supplement this core approach with a set of scheduling changes that harm no market participants but help storage owners meet more demanding performance obligations. In that, we may be anticipating future requirements that ISOs respect physical limitations of energy storage devices.

Detailed Proposal

The key elements of our proposal are:

1. **Use PJM’s proposed RegD signal, but place the signal definition in the Tariff.** As a threshold issue, we propose that the regulation signal definitions be moved to the tariff. For all intents and purposes, the regulation products are defined by the RegA and RegD signals. Those signals are not currently set in the tariff or manuals. This allows PJM to materially change the regulation products without FERC review. We believe that this violates the plain language of the Federal Power Act. It also inappropriately places PJM staff in the position of making competitively significant changes to RegA or RegD suppliers’ obligations without any external review as to if those changes are unduly discriminatory against one resource type or another.

That said, we believe PJM’s proposed conditionally neutral signal is well designed and appropriate, and include it in our proposal, subject to it being paired with an MRTS curve that accurately reflects its benefits. One of the attractive features of the conditional neutral signal is that it automatically adapts to the level of RegD on the market—because the signal sacrifices energy neutrality as needed to maintain system control, the new signal optimally controls ACE even with 100% RegD. This observation informs much of our proposal.

Our proposed tariff definitions of the regulation signals is:

The control signal sent to traditional Regulation resources will be optimized to minimize ramp rate, as further set forth in PJM Manuals. The control signal sent to dynamic Regulation resources will be optimized to minimize net energy demands, as further set forth in PJM Manuals.

2. **Calculate the Benefits Factor/MRTS Curve based on unit obligations, not predictions of class average performance. Place this procedure in the tariff.** The BF/MRTS curve, or at least the procedure to generate it, belongs in the tariff. That curve directly affects resource pricing and possibly settlement, and as such is part of a rate by any reasonable definition.

PJM’s proposed method for determining the MRTS curve is inconsistent with their proposed regulation signal, and discriminates against RegD resources. PJM has calculated the MRTS curve under the assumption that RegD resources are not able to follow the signal. This reduces the compensation received by all RegD resources, even those that are able to follow the regulation signal perfectly. Further, resources that are not able to follow the signal suffer a reduction in their performance score, effectively penalizing them a second time.¹

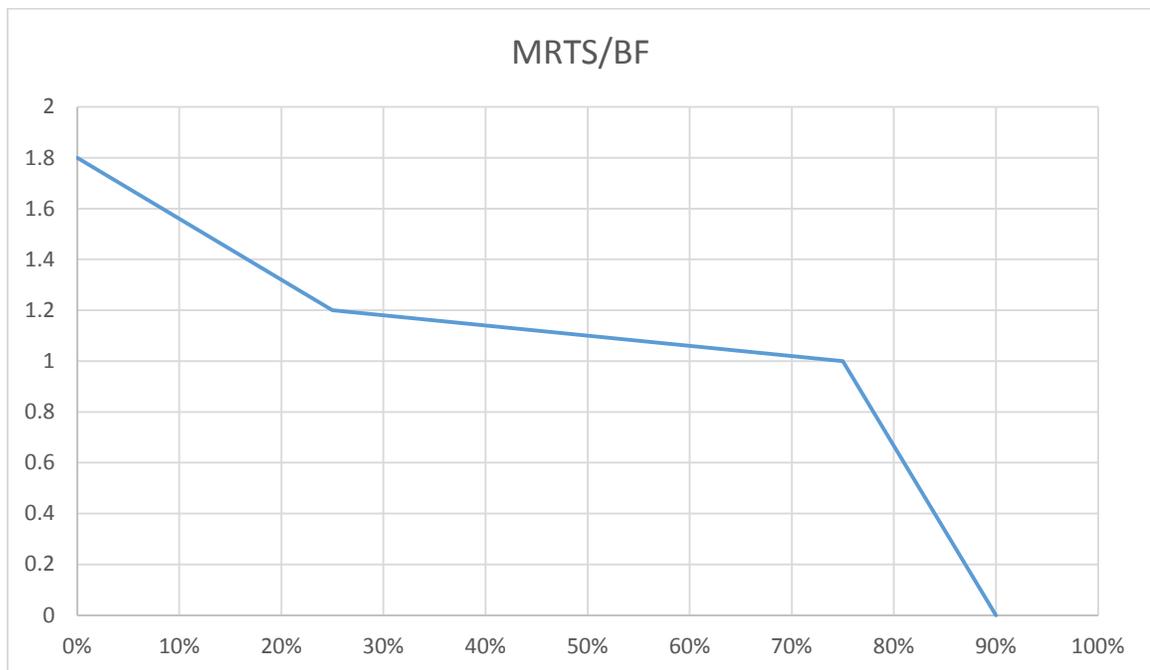
This approach to the MRTS curve sends a perverse investment signal to asset owners. Presumably, the long-term goal is to incent storage resource owners to increase the energy

¹ A close analogy would be if capacity resources were assigned a class average eFORD, compensated based on the corresponding UCAP but assessed penalties based on ICAP.

capacity of their units. But because the MRTS is a fleet average, owners who make these investments see no reward.

Our proposal is that the MRTS/BF be calculated based on the signal that RegD resources are asked to follow, with failures to perform handled on a unit-specific basis through performance scores. This is consistent with all other PJM markets and is the only approach that does not discriminate against well performing units.

In lieu of a BF/MRTS curve derived with this method, we have proposed a fairly flat curve based on our best estimate. We note that under the proposed conditionally neutral signal, RegD will never move against ACE, even with 100% RegD. Thus, the benefits factor should never drop below 1.0. However, in the interests of compromise and of making changes in small steps, we propose a curve that does drop off to preserve some role for RegA resources. Our proposed BF/MRTS curve reflects this:



Our proposed tariff language for the MRTS curve is:

The Office of the Interconnection shall calculate a Marginal Rate of Technical Substitution (MRTS) Curve between the dynamic Regulation signal and traditional Regulation signal. As further detailed in PJM Manuals, the MRTS Curve shall be calculated using engineering models to determine the combinations of the dynamic Regulation signal and traditional Regulation signal that provide equivalent system control, as measured by control metrics to be specified in PJM Manuals.

- 3. Pay all regulation resources the same price per effective MW.** We propose that both RegA and RegD receive the same payment for effective MW provided. This is implemented by settling RegD based on the average effective MW provided per performance adjusted MW—that is, if

200MW of RegD displaces 300MW of RegA, RegD should be paid at 1.5x the rate of RegA. This construct maintains equal pay for equal service.

4. **Scheduling changes to accommodate charge management.** The current storage fleet was built to follow a 15-minute energy neutral signal. Moving to the non-neutral signal places asset owners at significant operational risk. To manage this, we propose the package of scheduling reforms listed below. The theme of these reforms is to create ways for storage resources to schedule around their charge limits.
 - a. **Support flexible and inflexible resources:** Similar to how the synchronized reserves are scheduled now, we propose that regulation units be divided into inflexible (those that require significant lead time) and flexible units. Just as for SR, PJM can assign some portion of requirements to inflexible units prior to the operating hour, and assign the remainder to flexible units during the hour.
 - b. **Intra-hour drop out:** Currently, regulation resources can stop providing regulation during an operating hour with no financial penalty or effect on their performance score. We propose that units retain this right, but be required to ‘buy out’ of their commitment for the remaining 5-minute intervals they were scheduled for. When this happens, PJM would schedule replacement from the available flexible regulation resources. We are open to discussion of reasonable deviation-like charges in this case.
 - c. **Procure more RegA when needed:** ACE often exceeds the regulation requirement for extended periods of time. During those periods, the entire regulation fleet is pegged at +/-100%, effectively leaving PJM with no regulation control. We propose that once ACE has been at +/-100% for 15 minutes, PJM immediately acquire more RegA as needed to bring ACE back within the regulation range.
5. **Stricter Performance Scoring.** Stricter performance scoring is important. In particular, we believe that unit specific performance scores are the correct way for the market to account for energy-limited resources. By design, as the amount of RegD increases the new signal will become less energy neutral. Proper performance scoring will send the correct signal to asset owners when they need to invest in increased storage capability.

We propose using the precision score as the performance score, but are also open to the “cut off at 75% precision” approach in the PJM/IMM package.

6. **Keep Mileage Payments.** We propose to keep the status quo on performance payments: units make two part offers with capacity and performance components, and RegD receives performance payments based on the mileage ratio between the RegD and RegA signals.

Mileage payments are an important part of cost recovery for storage. Most storage technologies are only good for some number of charge/discharge cycles. The mileage payment is a reasonable approximation of these costs. The new conditionally neutral signal appears to push RegD resources harder, with more up and down motion than the current signal. This will decrease the service life of many deployed units. Keeping mileage payments is an appropriate way to recover those costs in market.

7. **Other Items.** We also:

- a. Have no explicit floor on RegD, other than where the BF/MRTS curve crosses 0.
- b. Keep the status quo for treatment of self-scheduled or zero offers.
- c. Agree with the PJM/IMM proposal to calculate LOC based on cheapest of price or most expensive of cost schedule.
- d. Keep the status quo on price-setting thresholds.

Questions and comments are welcomed.

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