

January 22, 2016

Mr. Jeff Bladen
Midcontinent Independent System Operator, Inc.
P.O. Box 4202
Carmel, IN 46082-4202

Re: MISO Energy Storage Workshop – Request for Comments

Dear Mr. Bladen:

The Minnesota Energy Storage Collaborative, a project of the Energy Transition Lab, hereby submits, via electronic filing, its comments as requested during the recent MISO Energy Storage Workshop. Please contact me if you have any questions.

Sincerely,

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MISO Energy Storage Workshop Comments of the Minnesota Energy Storage Collaborative—Individual Members

The Minnesota Energy Storage Collaborative is a newly formed effort to bring together stakeholders around a common mission of accelerating energy storage in our state and region. The Energy Transition Lab (ETL) convened the first-ever Minnesota Energy Storage Summit at the University of Minnesota in July 2015; we appreciated the participation of MISO representatives during the conference. During the Summit, the nearly 200 attendees from the private, public, nonprofit, and academic sectors were polled in real time, and a broad consensus was reached around the goal of accelerating energy storage. Since then, the Energy Transition Lab formed several workgroups to discuss market, policy, and regulatory challenges, barriers, and opportunities relating to energy storage and to seek funding for researching and demonstrating important energy storage applications. ETL has also formed a steering committee, consisting of representatives from industry, utilities, state government, MISO, NGOs, private consultant experts, and the University of Minnesota, to guide the work of the Collaborative. In the coming months, the Energy Storage Collaborative will reach out to a broader group of interested stakeholders to help further formalize the organization and develop future steps.

These comments represent the views of the undersigned individuals only, as members of the Energy Storage Collaborative Steering Committee. The comments should not be attributed to other members of the Steering Committee or other participants in the Energy Storage Collaborative.

We commend MISO for conducting the Energy Storage Workshop and respectfully provide the following comments:

1. **MISO should allow aggregation of energy storage assets.** MISO should allow for small distributed energy storage resources, including those installed behind a physical utility meter on a utility customer's property, to be aggregated over multiple CPnodes for the purposes of market participation. This would allow maximum access to the MISO market at the early stages of energy storage deployment. The Demand Response Working Group (DRWG) has identified this issue as a barrier for participation of some demand response resources. Studying these issues together may be a more efficient use of MISO resources since the technical capabilities of DR assets are similar, albeit more limited, than energy storage.
2. **MISO should reduce the minimum MW limit for market participation of energy storage assets.** Aggregated distributed energy storage resources, including those installed behind a physical utility meter on a utility customer's property, as low as 100kW (total sum) should be allowed to participate in the MISO market. Other Independent System Operators, such as PJM, have established low minimum thresholds to remove barriers for market participation. Similar to our comments above, the DRWG has also identified this issue as a barrier to DR participation. MISO may find studying the operational impacts and necessary software upgrade needed to deal with lowering the minimum MW threshold for DR and energy storage assets simultaneously is a more efficient use of their limited resources.

3. **MISO should enable energy storage assets to provide multiple, stacked services in its markets.**

Energy storage resources capable of serving multiple market products should be allowed to do so. An example would be allowing a medium term energy storage resource to serve both as frequency regulation and qualify as a capacity resource in adequacy planning. MISO should study how storage assets can stack multiple services to determine operational feasibility and design applicable market products accordingly.

Currently, MISO has no market product which effectively represents the full suite of operational capabilities and services advanced energy storage technologies can offer to the electric grid. MISO introduced its Stored Energy Resource (SER) product in 2010 primarily to allow flywheel technology to enter the market. As such, this product is limited to supplying regulating reserve services, preventing emerging storage technologies from providing multiple services including energy, capacity, and ramping. MISO would allow a storage asset, such as a battery facility, to register as a generator, allowing it to participate in multiple markets. However, doing so would prevent the resource from optimizing between charging and discharging cycles. Clarity and specificity is needed for would-be market participants to have confidence developing energy storage projects in MISO's footprint.

Additionally, market rules and products should be technology agnostic, recognizing that the energy storage industry has a diverse set of technologies with a range of technical capabilities. MISO should recognize the value of all storage technologies when designing its market products, including thermal energy storage.

4. **MISO should further encourage fast-ramping resource participation in its ancillary services market.**

MISO should consider developing a fast ramping market product to fully compensate fast ramping resources. Studies have shown that fast ramping resources can reduce the total amount of resources needed to maintain grid stability. The loss of traditional rotating mass generation in favor of inverter based generation (wind, solar) will increase the need for fast ramping resources to maintain grid stability. Opening the market to fast-ramping resources will also free up conventional generation resources to participate more fully in the energy market.

In the context of the Clean Power Plan, increasing penetrations of renewable energy resources like wind and solar may increase the need for frequency regulation services, which energy storage is advantageously positioned to provide to MISO's system. MISO should include this long-term outlook in its analyses of energy storage.

5. **MISO should develop specific, simplified interconnection rules for energy storage.**

Energy storage resources should receive priority in MISO's interconnection queue. Because of the diversity of technical capabilities within the energy storage industry, MISO should develop interconnection standards for each type of energy storage to simplify the interconnection

process. In addition, behind-the-meter energy storage assets should be able to participate in MISO's markets and clarity is needed for how these assets can interconnect.

6. **MISO market participants should be allowed to choose between a generation classification or a transmission classification for an energy storage resource.** MISO currently allows this to happen and should continue to do so. MISO should include energy storage assets as a non-transmission alternative in its MTEP process, allowing storage the opportunity for cost recovery under Attachment FF should it be determined to be the least-cost solution to solving transmission reliability and/or congestion issues.

Sincerely,

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