

Energy Storage As A Transmission Asset In Regional Markets

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Electric storage is unique because it can operate as both a generation and demand resource. Electric storage resources provide tangible value to the grid: They can stabilize the grid with voltage and reactive support, and ease the integration of intermittent resources.[1]

Although electric storage resources can provide significant benefits to regional electricity markets, their participation in these markets has been limited or restricted, due to the absence of appropriate market regulation. To overcome these restrictions, the Federal Energy Regulatory Commission issued FERC Order No. 841, which attempts to remove barriers to the participation of electric storage resources in regional capacity, energy and ancillary services markets.[2]

Specifically, FERC Order No. 841 and Order No. 841-A treat energy storage as a generation asset. Under these orders, designated electric storage resources, or ESRs, must be able to competitively participate in the wholesale electricity markets. This is important for market players, because the commission reaffirmed that energy storage can set the market clearing price just like any other resource in energy, capacity and ancillary services markets.

Although Order No. 841 acknowledges ESR participation in the wholesale markets, this rule does not cover compensation mechanisms for ESRs as a transmission asset, and most of the regional markets lack necessary market design and rules for compensating storage as a transmission asset. By neglecting transmission- and grid balancing service-related value streams of storage, the commission has not created market avenues for storage developers to reap the full benefits of their products.

This article focuses on voltage and reactive support services settled at the transmission level, not the market level, specifically in two regional markets: the Midcontinent Independent System Operator, or MISO, and ISO-New England, or ISO-NE. These two markets operate in multiple states, have long records of market operational history, and differ from each other in regional market structure.

At a financial transaction level, ISO-NE is a \$10 billion market, whereas MISO is worth \$3.5 billion.[3]



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States in the MISO market are vertically integrated, and most of the ISO-NE states are deregulated.

MISO has a one-year-forward voluntary capacity auction, while ISO-NE has a three-year forward capacity market, or FCM. MISO's 2019-2020 capacity prices are, on average, \$2.99 to \$24.30 per megawatt-day.[4] ISO-NE's capacity prices reached a floor in their latest auction at \$3.80 per megawatt-month.[5]

Market Rules for Storage in MISO

As of November 2019, MISO had 2,586 MW of grid-scale energy storage requests[6] under active study status in the Generator Interconnection Queue. Existing storage includes the 2,172 MW Ludington Pumped Storage facility[7] in Michigan, jointly owned by Consumers Energy and Detroit Edison.[8]

FERC partially accepted MISO's FERC Order No. 841 compliance filing on Nov. 21, 2019.[9] In this filing, MISO requested a delayed June 6, 2022, implementation date, due to market platform improvements currently underway. The commission agreed, but MISO must address certain outstanding matters within 60 days in a second compliance filing.

Matters to be addressed include why ESRs are excluded from Fast Start Resource participation. Currently, MISO has a Stored Energy Resource, or SER, market product for providing regulation services. MISO has argued that its SER-II market product category provides market opportunities for storage as outlined in Order No. 841.

But our focus here is Schedule 2 Reactive Supply and Voltage Control. As the table below shows, MISO has made at least 11 "document-less" interventions.[10] The outstanding question for the market participants is: How much market revenue is lost by continuing to compensate for reactive supply and voltage control in these transmission settlements?

Dockets on Reactive Supply and Voltage Control for MISO

S No	MISO Utility	Date and Docket Number
1	Wisconsin Public Service Corporation	2018-08-06 MISO Intervention Docket No. ER18-2115-000264255
2	Rail Splitter Wind Farm LLC	2018-10-02_Docket No. ER18-2487-000280829
3	Ameren Missouri	Ameren Reactive Power MISO Intervention ER19-433298938
4	Manitowoc Public Utilities	ER19-1368 Manitowoc Reactive Power Doc-Less 329844
5	Cooperative Energy	MISO Intervention EL19-49327100
6	Southern Indiana Gas & Electric Company	MISO Intervention ER19-1488 SIGECO Reactive Power 335183

7	NRG Cottonwood Tenant LLC	MISO Intervention ER19-1132328088
8	Cottonwood Energy Company LP	MISO Intervention ER19-1157328090
9	Stoneray Power Partners LLC	Stoneray Reactive Power MISO Intervention ER19-455298940
10	Alcoa Power Generating	2019-10-8 Docket No. ER20-6-000389684
11	Wolverine Power Supply Cooperative Inc.	2019-06-12 Docket No. ER19-2018-000354796

Market Rules for Storage in ISO-NE

ISO-NE had approximately 2,200 MW of grid-scale energy storage requests under active study status in the Interconnection Requests Queue as of December 2019, which was 11% of the total queue. Additionally, there were about 65MW of combined solar and storage projects in the queue as of December 2019.[11]

Existing grid-scale storage capacity is about 20MW.[12] In addition to a large pumped hydro storage capacity presence, 20MW of other electric storage capacity is installed that can supply power for 30 minutes instantaneously.[13]

On Feb. 25, 2019, FERC accepted ISO-NE's tariff revisions in compliance for Order No. 841 for energy storage resources to participate in wholesale electric markets.[14] ISO-NE's wholesale electricity market includes an energy market, an ancillary services market and a forward capacity market, or FCM. ESRs can participate in the FCM as a generator or a capacity resource.[15]

Schedule 2 describes the qualified reactive resources for providing adequate reactive supply and voltage control service.[16] MISO's Schedule 2 Reactive Supply and Voltage Control is the parallel to ISO-NE's Open Access Transmission Tariff — Schedule 2 Volt Ampere Reactive.[17] Qualified reactive resource providers need to meet Schedule 2 qualification requirements in order to be compensated.[18]

ISO-NE provides annual cost data[19] for each of the resources providing this volt ampere reactive, or VAR, service. For 2018, the total aggregate lagging VAR was 9,127 MVAR, and the average value of total qualified VARs was \$96/kVAR per year.[20]

On Feb. 29, 2019, FERC approved ISO-NE's request for revisions to the tariff, which established compensation provisions for energy storage as a reactive resource.[21] The purpose of ISO-NE's filing is to audit and compensate the reactive capabilities of storage, as they directly affect system operation.

Specifically, according to the revised tariff, “the VAR Capacity Cost (CC) Rate” will be established each year as of January 1 on a prospective basis for that calendar year and shall be the Adjusted CC Rate * Min (1, (1.2*Forecast Peak Adjusted Reference Load for the year/(SUM of all Qualified Reactive Resources' Summer Seasonal Claimed Capability))).” [22]

Conclusions

Although Orders No. 841 and 841-A exhort ISOs to allow ESR market participation as a generation asset, they do not require tariff modifications that compensate an ESR's additional ability to serve as transmission assets. MISO, for example, seeks compensation for storage as a transmission-only asset, or SATOA, outside of its Order No. 841 participation model.

In such a market scenario, MISO would control dispatch and charging, transmission customers would be charged or paid for net energy costs, and, most notably, utility planners may include SATOA in their transmission rate base and recover the cost of service.[23]

MISO's tariff modifications are not slated to be implemented until June 2022, but according to a filing with FERC, MISO can modify its tariff and prepare a market for SATOA by early 2020.[24] Both MISO and ISO-NE have already identified electric storage as a voltage and reactive support resource.

Order No. 841's recognition of storage as a generation asset is a step in the right direction. The order levels the playing field for storage across ISOs. Lacking an order, the California Independent System Operator's threshold of market participation was no less than 100 kW. MISO's was between 1 MW and 5 MW for certain market registrations.

Under FERC Order No. 841-A, the minimum participation threshold will be 100 kW for all ISOs. A federal order provides transparency and regulatory certainty to market participants that services provided by ESRs will be equally compensated as similar resources in the wholesale market.

However, by neglecting transmission and grid balancing service-related value streams of storage, the commission has not created market avenues for storage developers to reap the full benefits of their products. Certain services like voltage and reactive support remain location-based, and are compensated outside of the wholesale market structure. As renewables continue to comprise a greater fraction of U.S. generation and capacity resources, the need for grid balancing services like voltage and reactive support will increase.

With generator interconnection queue requests at both MISO and ISO-NE in the 2,000-2,500 MW range, now is the time for both these ISOs to start thinking about reactive supply and voltage control services having a location-based market mechanism like locational marginal price, or at least settle a price for a local resource zone much like a capacity price, not location-based transmission settlements.

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[1] Energy Storage Association, "Benefits of Energy Storage," retrieved from <https://energystorage.org/why-energy-storage/benefits/>.

[2] 162 FERC ¶ 61,127. Docket Nos. RM16-23-000; AD16-20-000; Order No. 841. Electric Storage

Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators, issued Feb. 3, 2018.

[3] For ISO-NE, <https://www.iso-ne.com/about/key-stats/markets#fcaresults>, and for MISO, <https://www.misoenergy.org/about/miso-strategy-and-value-proposition/miso-value-proposition/>.

[4] MISO, “2019/2020 Planning Resource Auction (PRA) Results,” April 12, 2019, retrieved from https://cdn.misoenergy.org/20190412_PRA_Results_Posting336165.pdf.

[5] ISO-NE, “New England’s Forward Capacity Auction Closes with Adequate Power System Resources for 2022-2023,” Feb. 6, 2019, press release, retrieved from https://www.iso-ne.com/static-assets/documents/2019/02/20190206_pr_fca13_initial_results.pdf.

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[7] DTE Energy, “Consumers Energy and Detroit Edison Announce Major Maintenance and Upgrade Project at Ludington Pumped Storage Plant,” Feb. 7, 2011, press release, retrieved from <https://www.prnewswire.com/news-releases/consumers-energy-and-detroit-edison-announce-major-maintenance-and-upgrade-project-at-ludington-pumped-storage-plant-115506389.html>.

[8] Consumers Energy, “Pumped Storage Hydro Electricity,” retrieved from <https://www.consumersenergy.com/company/what-we-do/electric-generation/pumped-storage-hydro-electricity>.

[9] 169 FERC ¶ 61,137. Docket Nos. ER19-465-000; ER19-465-001; Order on Compliance Filing, Issued November 21, 2019.

[10] FERC, “Document-less Intervention,” <https://www.ferc.gov/docs-filing/efiling/document-less-intervention.pdf>.

[11] ISO-NE, “ISO New England Application Portal,” December 2019, retrieved from <https://irtt.iso-ne.com/reports/external>.

[12] ISO-NE, “Tomorrow’s Energy Mix: Resources on the Way IN,” retrieved from <https://www.iso-ne.com/about/key-stats/resource-mix#on-the-way-in>.

[13] Christopher Parent, “The Expanding Role of Energy Storage in the Regional Power System,” April 18, 2018, retrieved from https://www.iso-ne.com/static-assets/documents/2018/04/esa_parent_final.pdf.

[14] 166 FERC ¶ 61,146. Order Accepting Tariff Revisions. Docket No. ER19-84-000, Issued Feb. 25, 2019.

[15] Carissa Sedlacek, “New Capacity Qualification for Energy Storage Resources, Forward Capacity Market,” Feb. 18, 2019, retrieved from <https://www.iso-ne.com/static-assets/documents/2019/02/fcm-new-capacity-qualification-energy-storage.pdf>.

[16] ISO-NE, “ISO New England Ancillary Service Schedule 2 Business Procedure. Revision No. 6,” retrieved from <https://www.iso-ne.com/static->

assets/documents/2019/05/a03_tc_2019_05_16_sched2_bp_r6_cln.pdf.

[17] ISO-NE, "Open Access Transmission Tariff (OATT) – Schedule 2 Volt Ampere Reactive (VAR)," retrieved from <https://www.iso-ne.com/markets-operations/settlements/understand-bill/item-descriptions/oatt-schedule2-var>.

[18] ISO-NE, "ISO New England Ancillary Service Schedule 2 Business Procedure. Revision No. 6," schedule 3.2.1.1.1, retrieved from https://www.iso-ne.com/static-assets/documents/2019/05/a03_tc_2019_05_16_sched2_bp_r6_cln.pdf.

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[19] ISO-NE, "Schedule 2 – VAR Annual Capacity Cost Rate Report," retrieved from <https://www.iso-ne.com/isoexpress/web/reports/billing/-/tree/schedule-2---var-annual-capacity-cost-rate-report>.

[20] ISO-NE, "Schedule 2 – VAR Annual Capacity Cost Rate Report," retrieved from <https://www.iso-ne.com/isoexpress/web/reports/billing/-/tree/schedule-2---var-annual-capacity-cost-rate-report>. Data is retrieved from https://www.iso-ne.com/static-assets/documents/2017/12/WW_VARCCRATE_ISO_2019010100_20181227200307.CSV.

[21] ISO-New England Inc. and New England Power Pool Participants Committee, Docket No. ER19-____-000, "Revisions to Reactive Capability Audit Provisions," Aug. 2, 2019, pp. 4-5, retrieved from https://www.iso-ne.com/static-assets/documents/2019/08/reactive_capability_audit.pdf.

[22] Ibid, p. 112.

[23] Midcontinent Independent System Operator Inc., Docket No. ER20-____-000, "Proposed Tariff Revisions for Storage as a Transmission Only Asset," p. 5.

[24] Ibid.