



FERC Order on Energy Storage

Laura Walter
Lead Market Strategist, Emerging Markets
Market Implementation Committee
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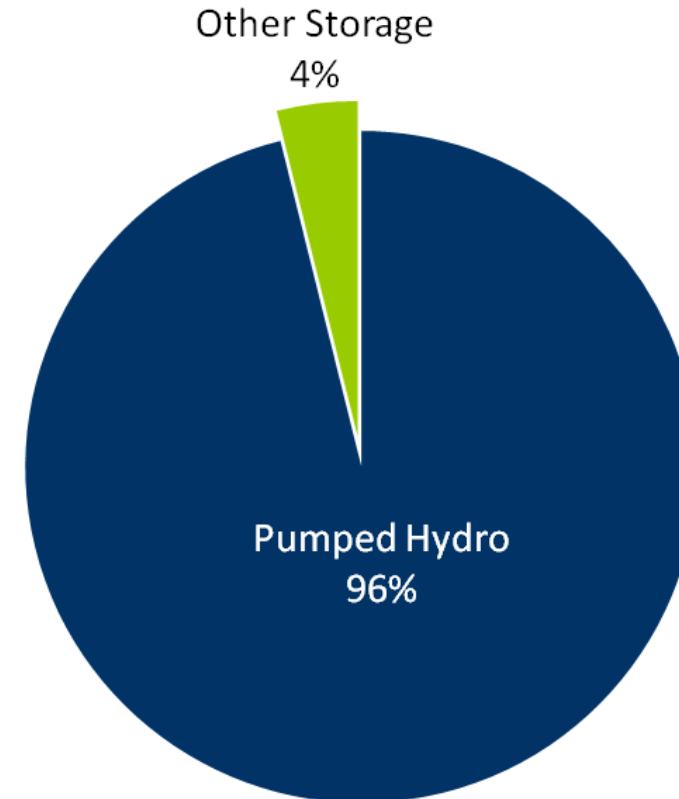
- November, 2016: FERC Notice of Proposed Rulemaking on Energy Storage and Distributed Energy Resources.
- February, 2018: FERC [final rule on storage](#) ...
 - **Filing due Dec 3, 2018.**
 - Implementation due Dec 3, 2019.

- April 4, 2018 Education Presentation at MIC
- Special MIC Sessions
 - May 10, 2018 1-4 PM
 - June 14, 2018 1-4 PM
 - June 27, 2018 1-4 PM
 - August 3, 2018 1-4 PM
 - September 14, 2018 1-4 PM

Electric Storage Resource Definition

- Electric Storage Resource (**ESR**)= “a resource capable of receiving electric energy from the grid and storing it for later injection of electric energy back to the grid.”
- Connected at: transmission, distribution, or behind a customer meter.
 - PJM has ESR at both T and D today, none behind a meter **that inject.**
- Excludes demand response.
- Includes pumped hydro

Over 5,300 MW of Electric Storage Resources currently in PJM



** Data taken from Generation Queue and EIA 860

	Possible change needed	Home
1. Can sell* energy, <u>Capacity</u> , and A/S (incl. Black Start etc.) the resource is technically capable of providing	Rule tweaks	MIC on ESR
2. <u>Dispatched</u> and <u>sets price</u> as seller and buyer	Rule tweaks and software	MIC on ESR
3. Bid parameters that account for ESR characteristics	Rule tweaks and software	MIC on ESR
4. Min market threshold no larger than 100 kW	N/A	N/A
5. Stored MWh are billed at LMP as wholesale	Rule tweaks, PowerMeter	DERS

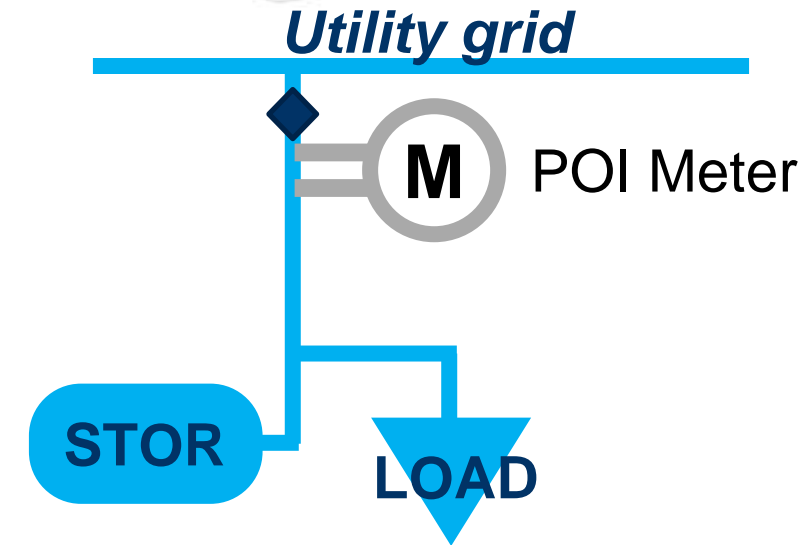
* “Eligible to provide...”

- ESR charging and discharging: provide bids, set price or be a price taker, and be dispatched as a wholesale seller or buyer
 - De-rate capability to meet minimum run time requirements
 - Pumped hydro implementation today does ~none of these.
- Pumped Hydro: no change required, but: pumped hydro eligible to use new ESR rules.
- Metering and Accounting considerations
- Make Whole and Lost Opportunity Cost required when dispatched off-cost, both discharging and charging.

Revise the tariff to allow ESRs to de-rate their capacity to meet minimum run-time requirements.

- Current 24 hour duration requirement with 10 hour exceptions
- “Must offer” and cost offer requirements given duration limits.
- How to “de-rate” to meet 10 hour exception duration requirement.

- Energy that the ESR takes off the grid and later returns to the grid is “Wholesale Stored Energy”, billed at wholesale at LMP.
- Consistent with PJM proposal in the DER Subcommittee.
- DERS plans to continue handling this component (more work still required).
 - Metering and Accounting considerations





Is PJM Management of ESR “State Of Charge” Required?

- Requirement: participation model must “...*account for the physical and operational characteristics of electric storage resources through bidding parameters or other means*”.

Mandatory list of characteristics to account for:

- **State of Charge**
- **Max/Min State of Charge**
- **Max/Min Charge Limit**
- **Max/Min Charge Time**
- **Max/Min Run Time**
- **Min Discharge Limit**
- **Min Charge Limit**
- **Charge/Discharge Ramp Rate**

- Order: <http://pjm.com/-/media/documents/ferc/orders/2018/20180215-rm16-23-000.ashx>
- PJM Request for Clarification: <http://pjm.com/-/media/documents/ferc/filings/2018/20180316-rm16-23-000-ad16-20-000.ashx>