FERC Order 841: Electric Storage Participation in Markets

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Timeline

- November 4, 2016 FERC NOPR on Energy Storage and Distributed Energy Resources.
- February 15, 2018 FERC Final rule Electric Storage Participation Markets
- December 3, 2018
  - PJM ESR Accounting Proposal filing
  - PJM ESR Markets and Operations Proposal
- December 10, 2018 PJM limited answer to ESR filing
- March 5, 2019 PJM responds to protests and comments
- April 1, 2019 FERC Request for Additional Information
- May 1, 2019 PJM Response to FERC Questions
- May 16, 2019 FERC Order on Rehearing and Clarification
- May 14, 2019 PJM submits additional answers
- Dec 3, 2019 Implementation Issue Tracking
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<tr>
<td><strong>1.</strong> Can sell* energy, <strong>Capacity</strong>, and A/S (incl. Black Start etc.) the resource is technically capable of providing</td>
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<td><strong>2.</strong> Dispatched and <strong>sets price</strong> as seller and buyer</td>
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<td><strong>3.</strong> Bid parameters that account for ESR characteristics</td>
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<td><strong>4.</strong> Min market threshold is 100 kW</td>
<td>✓ = already in compliance</td>
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<td><strong>5.</strong> Stored MWh are billed at LMP as wholesale</td>
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*“Eligible to provide…”*
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

- Pumped Hydro: 96%
- Other Storage: 4%

** Data taken from Generation Queue and EIA 860
ESR Participation Model Overview

- ESRs will be modeled as one continuous resource
- PJM will not make commitment decisions in the ESR model
  - Start-up and no load cost will not be considered
- PJM will not manage state of charge
  - Resource owners use mode of operation, offers, and parameters
- 3 modes of operation:
  - Continuous, Charge & Discharge
- Parameters
  - Max/Min charge/discharge, etc
  - Ramp rate considered infinite only in continuous mode
ESRs can update their max charge and discharge limits hourly in day-ahead, and more frequently in real-time.

** State of charge telemetry will be requested for telemetered resources
Charge and Discharge Modes

Charge Mode

Discharge Mode

Max

Min

Max

Min

O MW
PJM maintaining the requirement, per manual 21, that capacity resources have a minimum 10 hour duration.

ESR capacity interconnection rights will be derated based on the total energy capability of the resource
- Total MWh/10h
## 2019 FERC 841 Manual Changes

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- **Information**
- **First Read**
- **Endorsement**
• Questions: esr@pjm.com

• Issue Tracking: Electric Storage Participation - FERC Order 841