Energy Storage Technology Advancement Partnership (ESTAP) Webinar

FERC 841 Compliance Update

Hosted by Todd Olinsky-Paul, Project Director, CESA

October 1, 2019







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Energy Storage Technology Advancement Partnership (ESTAP) (bit.ly/ESTAP)

ESTAP is supported by the U.S. Department of Energy Office of Electricity and Sandia National Laboratories, and is managed by CESA.

ESTAP Key Activities:

- 1. Disseminate information to stakeholders
 - ESTAP listserv >5,000 members
 - Webinars, conferences, information updates, surveys.
- 2. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment
- 3. Support state energy storage efforts with technical, policy and program assistance



ESTAP Project Locations:



Webinar Speakers







Dan Finn Foley Senior Analyst – Energy Storage, Wood Mackenzie Power and Renewables



Jason Burwen Vice President – Policy, Energy Storage Association **Todd Olinsky-Paul** Project Director, Clean Energy States Alliance (moderator)



Energy Storage Association



Thank you for attending our webinar

Todd Olinsky-Paul Project Director, CESA todd@cleanegroup.org

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Upcoming Webinar

Replacing Power Plants with Low-Income Residential Solar+Storage *Thursday, October 10, 1-2pm ET*

In this webinar, East Bay Community Energy and Sunrun will share details of a new project in California that will deploy solar and battery storage systems in low-income single-family and multifamily homes to offset the need for reliance on fossil-fuel powered peaker plants.

Read more and register at: <u>www.cesa.org/webinars</u>





Energy Storage Association

Energy Storage Markets and FERC Order 841 ESTAP Webinar

Jason Burwen Vice President, Policy October 1, 2019

www.energystorage.org

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In this presentation

- 1) Intro to FERC Order 841
- 2) Current compliance activities & complaints
- 3) What comes after Order 841





Why did FERC issue Order 841?

- "To remove barriers to the participation of electric storage resources in the capacity, energy, and ancillary service markets operated by Regional Transmission Organizations (RTO) and Independent System Operators (ISO)."
- "To enhance competition and, in turn, help to ensure that the RTO/ISO markets produce just and reasonable rates."
- "Furthermore, due to electric storage resources' unique physical and operational ... our actions here will help support the resilience of the bulk power system."



What is FERC Order 841?

- Clarifies and regularizes energy storage participation in wholesale markets for energy, ancillary services, and capacity
- Lays foundation for greater flexibility in wholesale market operations
- Compliance activities underway
 - Complaints by ESA and parties being litigated at FERC
 - Intended to have effective compliance by December 2019
 - Delays requested by NYISO, SPP, MISO
 - PJM & ISO-NE have been implementing manuals changes—face uncertainty from lack of FERC action
 - FERC has re-affirmed Order 841 against rehearing requests
 - NARUC and others petitioning DC Circuit for review, concern over applicability to DER storage as FPA violation



What FERC Order 841 Does & Does Not Do

- Order 841 <u>removes barriers</u> to storage by requiring RTOs to implement a "participation model" that...
 - Enables storage to provide all market services technically capable of providing
 - Implements bidding parameters or other means to reflect physical & operational characteristics
 - Enables storage projects as small as 100 kW to participate (including DER storage)
 - Regularizes buying and selling of energy at wholesale LMP for storage
- Order 841 does <u>not</u>...
 - Create or modify market products
 - Amend interconnection, transmission planning, or other RTO functions
 - Require larger changes to commitment, optimization, scheduling, and dispatch



ESA Concerns in RTO Order 841 Compliance Plans

- PJM
 - Dispute 10-hour duration for capacity qualification and market participation
- MISO
 - Dispute application of transmission fees to storage charging at ISO instruction resolved in rehearing order
- ISO-NE
 - Object to automatic redeclaration of storage energy output to meet reserve requirements being addressed in stakeholder committee
- NYISO
 - Object to bias against self-management of state of charge & lack of make-whole payments for storage in capacity market
 - Object to modifications of market mitigation rules new dockets at FERC expand on this
- Cross-cutting
 - Lack of or inappropriate utilization of commitment parameters (PJM, ISO-NE, NYISO)
 - Barriers to dual participation of DER storage (MISO, NYISO)
- Prospective
 - Lack of clarity for how to apply to hybrid resources (i.e., storage + generation)
 - Unclear market mitigation rules



Capacity Value of Storage

- PJM proposes to base ICAP on non-hydro storage output over 10 hours
 - Based on 20% penetration of storage = 30 GW of storage (!)
- ESA disputes PJM proposal as inappropriate barrier to capacity market
 - ESA-commissioned study finds 4 GW of 4-hr storage & 10 GW of 6-hr storage would contribute full capacity value
 - Mirrors proposed change in NYISO to vary capacity value by duration & incremental deployment level
 - MISO/SPP: 4-hr qualification for 100% capacity value; ISO-NE: 2-hr test (performance market)
 - If FERC accepts, PJM can dial up or down storage participation via manuals
- Uniform "capacity value" in tension with heterogeneous resources
 - Storage has limited energy
 - Generators have forced outage conditions
 - Renewables lack dispatchability
 - Demand resources are block-loaded

Different reliability contribution profiles → relative capacity contributions, which may change with supply mix



Recent Findings on Capacity Value of Storage

Analysis of PJM (Current) by Astrape Consulting

Analysis of PJM Futures by NREL

Figure 2. Capacity Value of Storage in PJM Under Varying Durations and Penetrations

Duration (Hours)	Penetration (MW)	Capacity Displaced (MW)	Capacity Value (%)
2	1,000	1,000	100.00
2	2,000	2,000	100.00
4	1,000	1,000	100.00
4	2,000	2,000	100.00
4	4,000	3,996	99.90
4	8,000	7,648	95.60
6	1,000	1,000	100.00
6	2,000	2,000	100.00
6	4,000	4,000	100.00
6	8,000	8,000	100.00
6	10,000	9,789	97.89
6	12,000	11,200	93.33

Figure 3. Capacity Value of 4-Hour Storage in PJM-East and PJM-West Under Varying Levels of Renewable Energy (Source: NREL)



NYISO Tariff Filing

Durations (hours)	Less than 1000 MW	At and Above 1000 MW
2	45%	37.5%
4	90%	75%
6	100%	90%
8	100%	100%





Dual Participation of DER Storage

- While 100 kW units may participate, overall DER storage participation can be unclear
 - MISO proposes to limit and phase in "very small" storage participation
 - NYISO proposes to require BTM storage to elect only wholesale or only retail energy – de facto prohibition on dual participation
 - Subject to FERC rehearing on state authority to regulate DER participation
 - Compromise offered by AR PSC
- Important for both behind-the-meter storage and front-of-meter distribution-connected storage
 - Multiple-use frameworks sought to maximize utilization and value of storage for grid
- Challenges on accounting for wholesale versus retail transactions, method for conflicting dispatch
 - CA and NY seeking to enable dual participation providing guidance from retail side
 - More detail to come in FERC Docket RM18-9 on DER participation



Hybrid Storage + Generation Model

- Unclear how Order 841 will be applied to hybrid resources
 - ESA seeks a technical conference or notice of inquiry at FERC
- Several classes of issues merit discussion
 - Interconnection
 - Market participation
 - Capacity valuation
- ESA + GridStrategies have released <u>Enabling</u> <u>Versatility: Allowing Hybrid Resources to Deliver</u> <u>Their Full Value to Customers</u>
 - Summarizes main issues and potential remedies jumping off point for reforms

Enabling Versatility: Allowing Hybrid Resources to Deliver Their Full Value to Customers Rob Gramlich and Michael Goggin, Grid Strategies LLC Jason Burwen, Energy Storage Association September 2019 Energy Grid Strategies LLC Storage



Order 841 Starting Other Conversations

- Market products & designs to take advantage of storage flexibility
 - Fast frequency control
 - ERCOT to implement first US market for fast frequency response
 - Load/supply-shift product (as opposed to arbitrage
 - Improved energy price formation for flexibility
- Interconnection updates
 - Study methods that account for intended use (i.e., not charging on peak)
- Storage-as-transmission
 - Regulatory framework for "interconnection," RTO/ISO control, cost recovery, interactions with generation
 - Nov 5-6 FERC workshop may include discussion
 - Transmission planning methods and data





Energy Storage Association

Thank you

Jason Burwen j.burwen@energystorage.org

Potential effects of wholesale eligibility on the storage market

Dan Finn-Foley, Head of Energy Storage, Wood Mackenzie Power & Renewables October 2019





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Total FTM pipeline swells to over 67 GW following latest ISO cluster applications

This represents a 67% increase to the pipeline, following a pattern of rapid growth in Q2 and Q3 each year





U.S. front-of-the-meter energy storage pipeline market share, Q3 2015-Q2 2019 (%)

woodmac.com



• Most interconnection queues grew massively this quarter, which combined with several large-scale utility announcements increased the pipeline to record levels. While California did retake its position as the holder of more than 50% of the market, it only barely reached this benchmark, showing that other markets continue to

see interest. Source: Wood Mackenzie Power & Renewables



Name that ISO – occurrence of negative price signals by hour





Name that ISO – occurrence of negative price signals by hour





Percentage of 1-hour Intervals





Name that ISO – occurrence of negative price signals by hour





Southwest

Name that ISO – occurrence of negative price signals by hour





U.S. energy storage annual deployments will reach over 4.8 GW by 2024

Utility procurements, changing tariffs and grid service opportunities all drive the market forward



U.S. energy storage annual deployment forecast, 2012-2024E (MW)

Source: Wood Mackenzie Power & Renewables



U.S. market will reach 15.5 GWh in annual deployments by 2024

4-hour systems becoming the norm for front-of-the-meter systems; average BTM durations inch toward 3 hours

U.S. energy storage annual deployment forecast, 2012-2024E (MWh)





U.S. storage ITC forecast: Annual deployments reach 5.1 GW by 2024, up from annual deployments of 4.8 GW in base case

U.S. energy storage market outlook with storage ITC, 2019E-2024E (MW)





U.S. energy storage will be a \$5.1 billion market in 2024

Annual value to more double between 2019 and 2020



Source: Wood Mackenzie Power & Renewables. Note: Market size is reported as energy storage system deployment revenue (product of deployments and installed system prices).