

GRID-CONNECTED STORAGE INTERCONNECTION AND OPERATIONS

Technical and Policy Guidelines

April 18, 2017
Sheraton Denver Downtown Hotel
Denver, CO



EUCI is authorized
by IACET to offer
0.8 CEUs for the
symposium

OVERVIEW

Interconnection standards dictate the technical, legal, and procedural requirements that customers, project developers and utilities must follow for interconnecting new generation to the electric grid. These measures are necessary to ensure safe, secure and economic proper functioning of the electric system. Interconnection requirements vary by region, as determined by the authority responsible for regional system integrity, the transmission company's operating guidelines and technology attributes.

This symposium will provide an introduction to important aspects of general interconnection standards and requirements specifically applicable to energy storage projects. It will also explore what possible refinements to FERC processes and market mechanisms can exploit and expand the opportunities and value associated with grid-connected storage applications.

LEARNING OUTCOMES

- Review the history, background, and current FERC requirements for interconnecting battery storage on the grid
- Evaluate FERC technical requirements and prospective regulatory and policy directions for grid-connected storage
- Discuss RTO/ISO-specific interconnection project requirements and processes
- Examine project requirements and lessons learned from storage interconnection in PJM Interconnection
- Analyze the economics of storage technologies at the point of interconnection
- Review techniques to optimize grid-connected storage operations
- Identify methods to enhance system benefits and performance visibility of grid-connected storage
- Discuss policy and technical considerations to improve the process for energy storage interconnection



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AGENDA

TUESDAY, APRIL 18, 2017

7:30 – 8:00 am

Registration and Continental Breakfast

8:00 – 9:00 am

Interconnecting Battery Storage on the Electric Grid: Overview and Background

- History and Background
 - General control and interconnection issues
 - Relevant Interconnection Standards and Rules
- General Standards
 - Distribution systems standards
 - Transmission system requirements
- Benefits of Grid-Connected Battery Storage and Grid Applications
 - Generator or load benefits and qualities
 - Flexibility and versatility
 - Providing of primary frequency response
 - Dependability and reliability
 - Transmission and generation asset for stable grid connect
- Challenges to Grid-Connected Battery Storage
 - Lack of information on how to make initial connection
 - Costs
- Importance of Federal and State Rules and Procedures
 - Status of Interconnection and cost recovery policies
 - Regional policies that create barriers

Rhonda Peters, Principal, InterTran Energy Consulting

9:00 – 9:45 am

Current FERC Technical Requirements and Prospective Regulatory & Policy Directions for Grid-Connected Storage

- FERC Generator Interconnection Agreements and Procedures
 - Requirements for FERC large generation interconnection agreements (LGIA) and large generator interconnection procedures (LGIP)
 - Requirements for FERC small generation interconnection agreements (SGIA) and small generator interconnection procedures (SGIP)
- FERC Addressing Evolving Grid – Updates from 2005-2016
- FERC 2016 Notice of Proposed Rulemakings (NOPRs):
 - Reform of generator interconnection procedures and agreements
 - Electric storage participation in markets operated by RTO's and ISO's
 - Primary frequency response
- Storage/Distributed Energy Resources in RTO/ISO Markets – FERC's Proposal for Reforms
- Generator Interconnection Procedures and Agreements Reforms

Jennifer Chen, Attorney, Sustainable FERC Project

9:45 – 10:00 am

Morning Break

AGENDA

TUESDAY, APRIL 18, 2017 (CONTINUED)

10:00 – 11:00 am

RTO/ISO-Specific Interconnection Project Requirements and Process

A big challenge interconnection customers face is that the interconnection process is not standardized across various regions in North America. This session will present some of the interconnection processes in main jurisdictions, evaluating lessons learned from a developer's perspective.

- FERC LGIR process
- Interconnection process in various ISO's
 - MISO
 - NYISO
 - PJM
 - SPP
 - BPA
 - WECC
- Challenges faced by interconnection customers
- FERC's role in the LGIP
- Interconnection process for storage projects
 - Lessons learned

Ravi Bantu, Director – Transmission, Americas, RES Americas

11:00 – 11:45 am

Project Requirements and Process for Storage Interconnection in PJM Interconnection

This session will discuss how PJM Interconnection LLC, an RTO that is part of the Eastern Interconnection grid in the United States, is strategizing how best to accommodate battery storage and other new technologies into their traditional queue process for project interconnection. The session will describe PJM's current process and reasons it is done this specific way, and also describe possible updates to the PJM's interconnection process that FERC and stakeholders are reviewing, including the possibility of a co-siting and interconnection process for connected renewable and storage projects. Specifically, the session will describe:

- Queue policies, procedures, deadlines and requirements
- Making requests and applying for interconnection
- Required and optional studies and analyses
- Interconnection agreements for a storage project developer
- Integrating new processes into PJM's interconnection process

Andrew Levitt, Senior Market Strategist – Emerging Markets, PJM Interconnection (PJM)

11:45 am – 12:45 pm

Group Luncheon

12:45 – 2:00 pm

Economics of Storage Technologies at the Point of Interconnection

Interconnecting new renewable power plants and storage projects involves navigating the many rules and regulations of the given grid region, and assessing potential pricing impacts for different sites to evaluate the most economically advantageous area. This session will address the economics of project interconnection from a cost analysis perspective, discussing:

- Pricing dynamics and economic forecasts for different storage technologies
- Evaluating optimal storage sites for point of interconnection based on economics and pricing impacts
 - Considerations with system infrastructure
 - Co-location of storage with distributed generation
- Ways utilities can monetize and make value in storage interconnection process
- Hurdles and risks that can negatively impact prices
- Capacity performance and capacity revenues

Bill Babcock, Managing Consultant, PA Consulting

Jared Smith, Consultant, PA Consulting

AGENDA

TUESDAY, APRIL 18, 2017 (CONTINUED)

2:00 – 2:45 pm

Procurement and Contracting Considerations for Energy Storage Facilities

This session will evaluate key issues for utilities and developers related to contracting and procurement energy storage facilities. The presenter will discuss her case-studies with California utilities that are in the process of procuring utility-scale storage facilities, addressing:

- Competitive bidding for storage procurement and policy compliance
- Considerations for preparing and designing procurements for storage facilities
- Future contracting for storage to allow for improvement and advancement of storage technologies over time
 - o California case-studies for future procurement of storage in 2019
- When and how to contract for storage given its rapid technological advancements
- Determining length for a storage contract
- Mitigating risk of technology degradation in storage contracts
 - o Overbuilds vs. replacements

Barbara Sands, Senior Energy Market Consultant, PA Consulting

2:45 – 3:00 pm

Afternoon Break

3:00 – 4:15 pm

Grid-Connected Storage Operations: Enhancing System Benefits and Performance Visibility

This session will address what system issues prevail when storage is connected to the grid and how they can be monitored and managed. It will discuss how ensuring optimal operational results correlate with the interconnection planning process. It will address:

- Transmission and grid infrastructure planning needs and analyses for battery storage interconnection
- How transmission upgrades paid for in the interconnection process can translate—or not—to transmission rights that are essential for the storage project
- Creating a meaningful grid – battery communication
- Performance characteristics of energy storage technology types on the grid -
 - o Lithium-ion batteries
 - o Fuel cell/hydrogen storage
 - o Compressed air storage
 - o Redox flow batteries
- Qualities and capabilities needed for energy storage to reap its full value related to improving grid performance and operations
- Optimizing grid-connected battery storage to enhance renewable energy performance
 - o Aiding the integration of renewables
 - o Balancing the intermittency of renewable resources
 - o Control of supply/demand

Kristen Ardani, Solar Technology Markets and Policy Analyst, National Renewable Energy Laboratory (NREL)

Rhonda Peters, Principal, InterTran Energy Consulting

Jim Eckert, Principal Contract Specialist – Interconnection & System Studies, ComEd (invited)

AGENDA

TUESDAY, APRIL 18, 2017 (CONTINUED)

4:15 – 5:00 pm

Closing Panel Discussion: Improving the Processes for Energy Storage Interconnection

- Creating market mechanisms to better value energy storage benefits (shifting energy, frequency regulation, and other ancillary benefits)
 - Financial mechanisms and tariffs
- Changes needed to outdated interconnection rules, studies and processes to properly accommodate the interconnection of energy storage assets
- Issues affecting demand response/behind the meter energy storage systems at the distribution level: how does the industry account for their increased deployment onto the grid?
- Identifying and resolving serious issues and conflicts between FERC and State jurisdiction relevant to larger energy storage projects in the development stage that will affect power flows on major transmission lines that cross state boundaries
- Markets and areas for next significant markets for energy storage in the U.S. – what are the barriers and how can they be overcome?
- Best practices for making the interconnection process as efficient and cost-effective as possible

Moderator: Barbara Sands, Senior Energy Market Consultant, PA Consulting

Kristen Ardani, Solar Technology Markets and Policy Analyst, National Renewable Energy Laboratory (NREL)

Jared Smith, Consultant, PA Consulting

Ravi Bantu, Director, Transmission, Americas, RES Americas

5:00 pm

Symposium Adjourns



REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

INSTRUCTIONAL METHODS

Case Studies, PowerPoint presentations and panel discussions will be used in program.

PROCEEDINGS

The proceedings of the course will be published, and one copy will be distributed to each registrant at the course.

EVENT LOCATION

A room block has been reserved at the Sheraton Denver Downtown Hotel, 1550 Court Place, Denver, CO 80202, for the night of April 17, 2017. Room rates are \$199 plus applicable tax. Call **1-303-893-3333** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is March 20, 2017 but as there are a limited number of rooms available at this rate, the room block may close sooner. **Please make your reservations early.**

IACET CREDITS



EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the ANSI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

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PLEASE REGISTER

GRID-CONNECTED STORAGE INTERCONNECTION AND OPERATIONS — TECHNICAL AND POLICY GUIDELINES SYMPOSIUM: APRIL 18, 2017: US \$995
EARLY BIRD on or before MARCH 31, 2017: US \$895

How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

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OR Enclosed is a check for \$ _____ to cover _____ registrations.

Substitutions & Cancellations

Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before March 17, 2017 in order to be refunded and will be subject to a US \$195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCL event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCL's liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices at (201) 871-0474.