OPTIMIZING THE INTERCONNECTION PROCESS: Addressing Process and Technical Issues for Renewable and Distributed Energy Resources

August 14-15, 2017
Millennium Knickerbocker Hotel Chicago
Chicago, IL

POST-CONFERENCE WORKSHOP
Estimating Interconnection Costs and Revenues – Renewables and Distributed Energy Resources (DER)
TUESDAY, AUGUST 15, 2017
OVERVIEW

The landscape for the interconnection process has become increasingly complex. Challenges remain to federal and state regulations, requirements and procedures; regulatory issues facing owners of generation and transmission assets continue to evolve; and the electricity grid itself is facing unique challenges and circumstances as a variety of new technologies and distributed energy resources (DER) – solar PV, battery storage, microgrids – are moving into mainstream use and being integrated to the grid.

This conference will serve as a forum for all entities involved in the interconnection process to review process and technical issues for interconnecting grid-scale renewable energy and Distributed Energy Resource (DER) projects. It will discuss the process for interconnection utilized by different entities across the country, review project economics related to interconnection, identify the technical requirements of the interconnection process from start to finish, and evaluate potential regulatory and policy directions related to the recent FERC Notice of Proposed Rulemakings (NOPRs) on interconnection for both large generation and storage. Panel sessions will feature the perspectives of distribution, developers, utilities, and system operators to share their expertise and discuss best practices for optimizing the interconnection process.

LEARNING OUTCOMES

- Review the history and background of the renewable interconnection process
- Identify the latest regulatory changes and rulemakings in process on the state and FERC level
- Examine key regulatory and policy challenges impacting the interconnection process
- Evaluate how new technologies and a changing grid create new technical and operational challenges for interconnection
- Assess specific challenges for interconnecting:
  - Grid scale wind projects
  - Grid scale solar projects/community solar
  - Distributed solar photovoltaic (PV) systems
  - Battery storage technologies
- Review the interconnection process from the perspective and experiences of:
  - Investor-owned utilities in regulated and retail markets
  - Renewable and storage project developers
  - Independent System Operators (ISOs), Regional Transmission Organizations (RTOs), and Power Marketing Administrations (PMAs)
- Evaluate interconnection case studies across regional jurisdictions and project requirements for generator interconnection for specific RTOs, ISOs, and PMAs:
  - Midcontinent Independent System Operator (MISO)'s new Queue Reform
  - PJM Interconnection LLC
  - ISO New England (ISO-NE)
  - New York Independent System Operator (NYISO)
  - Electric Reliability Council of Texas (ERCOT)
  - Southwest Power Pool (SPP)
  - Western Electricity Coordinating Council (WECC)
  - SERC Reliability Corporation (SERC)
- Review common challenges with system studies and how to best conduct them
- Identify advanced modeling tools and techniques utilized by utilities and transmission owners leading the way in distributed energy resource (DER) and storage interconnection
- Evaluate the role transmission planning plays in the interconnection process
- Review key issues that cause delays in utility interconnection timelines, and solutions for expediting scheduling without sacrificing safety and reliability
- Review a value proposition analysis for projects from an interconnection standpoint
- Identify methods for estimating interconnection costs and considerations for keeping costs down
- Discuss opportunities to address inefficiencies and optimize the interconnection process for all entities involved
## AGENDA

### MONDAY, AUGUST 14, 2017

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:30 – 8:00 am</td>
<td>Registration and Continental Breakfast</td>
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<tr>
<td>8:00 – 8:45 am</td>
<td><strong>I. Introduction to the Interconnection Process and Associated Challenges</strong></td>
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<td>8:45 – 9:45 am</td>
<td><strong>Keynote Speech: Making Connections in a Time of Change</strong></td>
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<td>Joe Svachula, Vice President – Engineering and Smart Grid Technology, ComEd</td>
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<td>8:45 – 9:45 am</td>
<td><strong>Interconnection to the Electric Grid: A Brief History, Current Challenges, and Policy/Regulatory Landscape</strong></td>
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<td>• How the interconnection process works: traditional vs. renewable processes</td>
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<td>• How did we get where we are today with the interconnection process and rules?</td>
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<td>• Background/history of FERC standard interconnection agreements and procedures for generators</td>
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<td>• Current status of FERC generator interconnection requirements</td>
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<td></td>
<td>• The role of state rules and procedures for interconnection</td>
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<td>• Potential regulatory and policy directions for renewable and DER interconnection</td>
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<td>o Proposed reforms to FERC large generator interconnection processes to improve the efficiency of interconnection requests and remove barriers to development</td>
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<td>o Storage interconnection and the direction where FERC looks to be headed with its new storage NOPR as well as its interconnection docket</td>
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<td>• Adapting rules for storage devices in front of and behind the meter (i.e., DER aggregation)</td>
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<td>• Queue Reforms – attempt to speed up queue processing and increase certainty regarding the cost of interconnection</td>
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<td>• What does meaningful queue reform look like?</td>
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<td>• Notable regional queue reforms and new attempts</td>
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<td></td>
<td>Andrew Kaplan, Partner, Pierce Atwood</td>
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<td>Rhonda Peters, Principal, InterTran Energy Consulting (invited)</td>
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<td>9:45 – 10:00 am</td>
<td>Morning Break</td>
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<td>10:00 – 11:15 am</td>
<td><strong>The Developer Perspective: Lessons Learned on Interconnection from Around the Country</strong></td>
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<td>This session will describe lessons learned and experiences with the interconnection process, hearing from the perspective of renewable project developers. The session will generally describe a renewable developer’s process for interconnecting renewable and storage projects, and then discuss specific projects the developers have developed and interconnected in jurisdictions across the country. The session will describe interconnection case studies in traditional bilateral markets with entities such as Southern Company and TVA, as well as in the grid-operated regions of MISO, PJM, NYISO, ERCOT, SPP, and WECC. There will also be a discussion on C&amp;I and community solar interconnection trends in the Midwest.</td>
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<td></td>
<td>Ravi Bantu, Director – Transmission, Americas, RES Americas</td>
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<td>Enrique Silva, Senior Manager – Transmission and Interconnection, First Solar</td>
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<td>Russ Young, Senior Vice President of Operations, SoCore Energy</td>
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“High quality of attendees and topics!”

Manager, Transmission & Interconnection, 8minutenergy
II. Regional Interconnection Requirements, Studies and Planning: RTO's/ISO's/PMAs

11:15 am – 12:00 pm  MISO: New MISO Queue Reform Process to Address Continuing Delays
The Midcontinent Independent System Operator (MISO) is a RTO operating in the Midwest, Southern United States, and in Manitoba Canada. MISO is in the process of changing the Generation Interconnection page to reflect the FERC Order ER17-156-000 that conditionally accepts MISO’s Queue Reform, effective 01/04/2017. These changes are intended to help MISO address what it describes in its filings as “significant delays” in the generator interconnection queue, and prepare for anticipated “significant new renewable and gas development” in the footprint in response to the changing regulatory landscape. This session will discuss the process and requirements for generator interconnection and the recent changes, evaluating:
• Queue policies, procedures, deadlines and requirements
• Considerations for site location and available points of interconnection
• Making requests and applying for interconnection
• Required and optional studies and analyses
• Interconnection agreements for a generator
• MISO Queue Reform
• Accommodating significant new renewable and gas development
• Addressing issues in the Definitive Planning Phase (DPP)
• Optimizing the restudy process
• Addressing other concerns

Vikram Godbole, Director, Resource Utilization, MISO

12:00 – 1:00 pm  Group Luncheon

1:00 – 1:45 pm  PJM Interconnection Process
This session will discuss the process and requirements for generator and storage interconnection in the PJM Interconnection LLC, an RTO that is part of the Eastern Interconnection grid in the United States. The session will describe PJM’s current process and reasons it is done this specific way. It will also describe possible updates to the PJM’s interconnection process that FERC and stakeholders are reviewing, including the possibility of a future co-siting and interconnecting process for connected renewable and storage projects. Specifically, the session will describe:
• Queue policies, procedures, deadlines and requirements
• Considerations for site location and available points of interconnection
• Making requests and applying for interconnection
• Required and optional studies and analyses
• Interconnection agreements for a generator

David Egan, Manager Interconnection Projects, PJM Interconnection

1:45 – 2:30 pm  Northeast Interconnection Challenges: ISO-NE and NYISO
This session will focus on interconnection processes in the northeast, describing challenges currently being experienced by the ISO New England (ISO-NE) and New York Independent System Operator (NYISO). The session will identify inefficiencies in the interconnection process and describe how they create larger problems, with regards to the scheduling of project development in the region and meeting state and regional renewable policy goals. Along these lines, the session will evaluate:
• General challenges for interconnecting with facilities
• Considerations for interconnection costs based on site location
• Current areas of congestion in the northeast and challenges moving power to where it is actually needed
• How best to address needs for costly infrastructure upgrades
• Considerations for a more efficient queue process to meet renewable and policy goals

Paul Hibbard, Principal, Analysis Group
MONDAY, AUGUST 14, 2017 (CONTINUED)

2:30 – 2:45 pm  Afternoon Break

III. Electric Utility Interconnection Practices

2:45 – 3:15 pm  Interconnecting Commercial Wind Projects in MISO Territory  
MidAmerican Energy Company is midwestern energy company wholly encompassed by the territory of MISO. This session will discuss the utility’s experiences and challenges with the interconnection process, focusing on large wind projects. The session will consider how MISO’s Queue Reform will impact scheduling, system studies processes, and upfront costs for project developers during the interconnection process and other considerations moving forward.

*Micahel Snodgrass, Wind Engineer, MidAmerican Energy Holdings Company*

3:15 – 4:30 pm  Ramping up Renewables in Illinois: Scaling up Utility Interconnection Operations in Response to Changing Policy  
This session will present on changing energy policies in Illinois resulting from the “Future Energy Jobs Bill,” which will mandate considerable development of renewable generation – both grid-scale wind and solar as well as distributed generation (DG) – in the state. Two electric utilities operating in Illinois will then describe their interconnection process challenges and experiences to date. It will focus on how they are preparing their interconnection process and team as a result of the new state policy, which is predicted to significantly increase applications in the interconnection queue.

*Moderator: Bradley Klein, Senior Attorney, Environmental Law & Policy Center*  
Anthony Star, Director, Illinois Power Agency  
Brian Cuffle, Supervisor - Distribution Design, Ameren  
Jim Eckert, Principal Contract Specialist - Interconnection & System Studies, ComEd

4:30 – 5:00 pm  Puget Sound Energy: Open Access Transmission Tariff (OATT) Scheduling Challenges  
The West is different – with over 38 balancing authorities, multiple planning regions, and the overlay of the CAISO Energy Imbalance Market (EIM) as well as FERC jurisdictional, governmental and non-jurisdictional entities, the interconnection process is becoming increasingly complex. This session will present on Puget Sound Energy’s interconnection process, lessons learned, and current challenges with Open Access Transmission Tariff (OATT) Scheduling, evaluating:

- Elements of a successful project
- Study process and timelines
- Generator interconnection & NERC compliance
- Customer options to shorten timelines
- Coordination with affected systems
- Additional timeline considerations
- Joint ownership
- Generation interconnection success factors
- Interconnection agreements

*Laura Hatfield, Contract Manager, Transmission Policy & Contracts, Puget Sound Energy (PSE)*

5:00 – 6:00 pm  Networking reception

“Really well run conference with great variety of experts who are engaging and well versed on topic. Great way to meet professionals in your field.”

Engineer, Lincoln Clean Energy, LLC
TUESDAY, AUGUST 15, 2017

7:30 – 8:00 am  Continental Breakfast

8:00 – 9:00 am  Distributed Energy Resource (DER) and Storage: Interconnection and Operations
• Overview of how Distributed Energy Resource (DER) interconnection differ from centralized
  generation interconnection
• Technical analyses
• Application of technology type
• Managing interconnection of various DER resources (PV, Storage, Wind, CHP, etc.) to the existing
  utility grid
• Grid connected storage
• Benefits and challenges
• Improving the processes and standards for energy storage interconnection
• Optimizing grid-connected battery storage to enhance renewable energy performance
• DER interconnection analysis components – voltage fluctuation, reverse power flow, device
  operations, and time-series analysis
• Coordinating utility side-engineering work for various DER interconnections
• Tips for streamlining DER interconnection practices
Evan Hebert, General Engineer - Distributed Energy Resources Planning & Analytics, PEPCO Holdings Inc.
Tom Greenwood-Madsen, Principal Engineer – System Development, ATCO Electric
Howard Smith, Manager, Distributed Energy Resources Policy, Southern Company

9:00 – 9:30 am  Comparing Utility Interconnection Timelines for Small-Scale Solar PV
Interconnection standards and procedures are designed to allow electric customers to safely connect
distributed generation (DG) systems to the grid. Even as distributed solar photovoltaic (PV) systems
become a common element of the power landscape, the interconnection process can be lengthy and
problematic for solar customers and installers, thereby boosting overall system installation costs and
delaying the benefits of PV generation. As DG penetration levels increase, utilities are likelier to deny
DG system interconnection by raising safety and grid reliability concerns, further complicating and
delaying the interconnection process. However, many utilities -- even some with high levels of DG
penetration -- process and approve customer interconnection through quick, streamlined processes,
illustrating that solutions to existing challenges are within reach. This session will present on key issues
that cause delays, as well as best practices and innovative solutions for expediting the interconnection
process without sacrificing safety and reliability. It will draw from research results based on surveys
and interviews with PV installers and utility interconnection staff, as well as reports and regulatory
proceedings in key states.
Chelsea Barnes, Director – Policy Services, EQ Research

9:30 – 9:45 am  Morning Break

9:45 – 10:30 am  Analyzing the Value Proposition for Projects Based on Interconnection
• Overview of value analysis model – how it relates to interconnection process from start to finish
• Financial metrics utilized
• Impact analysis and assessing project value proposition and projected timeline
  o Pilot site analysis
  o Local impact analysis
  o Regional directives
David South, Senior Principal - Energy & Utilities, West Monroe Partners
10:30 – 11:45 am  

Closing Panel Session: Optimizing the Interconnection Process

- Addressing problems and removing barriers in the renewable and DER interconnection process
  - How might – or should – interconnection processes and cost allocation rules be designed to accommodate a changing transmission system landscape as a result of variable resources that are distant from load, and/or smaller-scale distributed resources?
- Grid design and operational improvements for more efficient penetration of renewable energy
- Smarter ways to provide grid connections for renewable and storage project developers
- Regulatory and policy updates that would better enable clean energy integration
- New technologies to help integrate renewables
- Debating FERC’s generator interconnection policy: is it conducive to efficient generation development?
- Changes and updates to current practices that would enable:
  - Schedule certainty
  - Cost certainty
  - Considerations for overall system reliability planning
- Conference recap and moving forward:
  - What are participants hopefully walking away with from this conference in terms of what works and what does not across the regions’ interconnection processes?
  - What should be the top three action items for FERC and/or common to all regions?
  - What are the most important items in vertically-integrated, state regulated contexts?
  - What are the most important items in competitive market contexts?

Moderator: Paul Hibbard, Principal, Analysis Group

Evan Hebert, General Engineer - Distributed Energy Resources Planning & Analytics, PEPCO Holdings Inc.
Laura Hatfield, Contract Manager – Transmission Policy & Contracts, Puget Sound Energy (PSE)
Bill Babcock, Managing Consultant, PA Consulting
POST-CONFERENCE WORKSHOP

Estimating Interconnection Costs and Revenues – Renewables and Distributed Energy Resources (DER)

TUESDAY, AUGUST 15, 2017

12:30 – 1:00 pm  Registration
1:00 – 4:00 pm  Workshop Timing

OVERVIEW

Interconnecting new renewable power plants and distributed energy resources (DER), such as battery storage, 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, focusing on key considerations related to price impacts and overall project value.

LEARNING OUTCOMES

• Evaluate economic and pricing impacts of project interconnection based on price
• Identify economic hurdles and risks that can negatively impact prices
• Assess high level value impacts based on design & interconnection considerations

WORKSHOP AGENDA

I. Renewable & Distributed Energy Resources (DER) Market Overview
II. Nodal Market Background
   a. Nodal price formation
   b. Key constraints
   c. Using and interpreting shift factors
III. Transmission and Market Considerations
   a. Identifying an economically advantageous site area
   b. Estimating market prices in interconnection node
   c. Economic hurdles and risks
IV. Distribution and Market Considerations
   a. Identifying an economically advantageous site area
   b. Estimating market prices
   c. Economic hurdles and risks
V. Project Revenue and Value
   a. Output variability and revenue impacts
   b. Output variability and capacity revenues/penalties
   c. Factoring generation and operating performance to market price
   d. Valuation Examples

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WORKSHOP INSTRUCTORS

Bill Babcock  
Managing Consultant, PA Consulting Group

Bill Babcock has over 30 years of experience in consulting and economic research for clients in the energy industry. He has conducted a wide variety of strategic planning studies, market and technology assessments, and financial analyses for both private and public sector clients in all segments of the energy industry, including electricity, oil, natural gas, coal, and renewable resources. For the last 20 years, he has used nodal electricity market models (e.g., GE MAPS, PROMOD IV and AURORAxmp) to value generation and transmission assets and conduct detailed cost-benefit analyses for a broad range of electric industry clients in North America -- including merchant generators, large investor-owned electric utilities, energy service companies, public power companies, ISO/RTOs, energy trade associations, and financial institutions. Mr. Babcock’s recent work has focused on helping his clients successfully meet the business challenges created by the radical changes taking place in the electric power and fuels markets. During the past five years, he has provided expert market support on generation asset transactions totaling more than $15 billion.

Christopher Loeb  
Consultant Analyst, PA Consulting

Christopher Loeb is a Consultant Analyst in PA's Global Energy & Utilities practice. His experience spans the design, development, production and evaluation of energy storage, alternative fuel production and water purification technologies, additionally, he has experience in fundamental power modeling, nodal analysis and commodity forecasting.

“Very informative conference!”
Transmission Account Executive, Bonneville Power Administration
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Please contact Maggie Field at mfield@euci.com or 720-988-1250 for more information.

INSTRUCTIONAL METHODS

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

REQUIREMENTS FOR SUCCESSFUL COMPLETION

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

REGISTER 3, SEND THE 4TH FREE

Any organization wishing to send multiple attendees to this conference may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.

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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.

EUCI is authorized by IACET to offer 1.0 CEUs for this conference and 0.3 CEUs for the workshop

EVENT LOCATION

A room block has been reserved at the Millennium Knickerbocker Hotel Chicago, 163 E Walton Place, Chicago, IL 60611, for the nights of August 13-14, 2017. Room rates are $189 plus applicable tax. Call 1-312-751-8100 for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is July 28, 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.
REGISTRATION INFORMATION

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Please Select

- OPTIMIZING THE INTERCONNECTION PROCESS: ADDRESSING
  PROCESS AND TECHNICAL ISSUES FOR RENEWABLE AND
  DISTRIBUTED ENERGY RESOURCES CONFERENCE AND WORKSHOP
  AUGUST 14-15, 2017 | CHICAGO, IL: US $1795
  Early bird on or before July 28, 2017: US $1595

- OPTIMIZING THE INTERCONNECTION PROCESS CONFERENCE ONLY
  AUGUST 14-15, 2017 | CHICAGO, IL: US $1395
  Early bird on or before July 28, 2017: US $1195

- POST CONFERENCE WORKSHOP ONLY
  AUGUST 15, 2017 | CHICAGO, IL: US $595
  Early bird on or before July 28, 2017: US $495

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

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Company

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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 July 14, 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 EUCI 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, EUCI’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 303-770-8800.

EUCI reserves the right to alter this program without prior notice.