



## 2019 FALL TECHNICAL WORKSHOP

**October 28-30, 2019**

Hilton Charlotte Center City  
Charlotte, NC

### PROGRAM AGENDA

#### **Monday, October 28, 2019**

7:00 a.m. – 8:00 a.m.

#### **Registration & Breakfast**

Location: Plaza

8:00 a.m. – 12:00 p.m.

#### **Tutorial: Future Directions for Market Design and System Planning**

Location: Carolina

Co-Chairs: **Bethany Frew**, NREL & **Mark Ahlstrom**, NextEra Energy Resources

Description: Various approaches are taken by system planners throughout the United States and world to ensure that adequate supply-side (and in some cases, also demand-side) resources exist to supply power and energy requirements for a future time and location. Some areas rely on competitive wholesale electricity markets—either with a capacity market that is linked to resource adequacy targets, or through an energy-only market with higher scarcity pricing caps—to signal for sufficient levels of resources. Other areas, namely those with regulated utilities, utilize conventional IRP processes to determine how many and what resources to build. Each approach has pros and cons, and the ongoing transformation of power systems around the world presents additional challenges and opportunities for ensuring resource adequacy. For example, traditional markets with marginal cost-pricing present a challenge for high renewable energy shares due to their near-zero marginal cost of generation, which depresses energy prices further than that already caused by expanded supply of low-cost natural gas and limited demand growth, making it difficult to recover capital costs in systems that operate for significant periods of time with a near 100% share of renewables. The evolution of electricity markets to recognize unique characteristics of renewable resources and incorporate models of ideal resources is essential.

This tutorial will first present an overview of current resource adequacy approaches in market and non-market areas. These include energy-only markets, energy plus capacity markets, and areas with resource adequacy constructs or conventional IRP processes. Then, an overview of electricity markets and how they could evolve in the future will be discussed. The theoretical discussions will be complemented by examples of planning and market design in each of the system design constructs presented, including potential future changes to those approaches.

Introduction

**Bethany Frew**, NREL

Brief resource adequacy (RA) overview  
**Aidan Tuohy**, EPRI

Current and future wholesale markets  
**Bethany Frew**, NREL

A Decentralized Markets Approach  
**Rob Gramlich**, Grid Strategies LLC

Long-term Markets Working with Short-term Energy Markets  
**Steve Corneli**, Strategies for Clean Energy Innovation

Discussion

Break

System planning examples and potential future approaches  
**Mark Ahlstrom**, NextEra Analytics

MISO: RA Requirement  
**Mia Adams**

ERCOT: Energy Only Market  
**Julia Matevosjana**

ISO-NE: Energy and Capacity Markets  
**Henry Yoshimura**

Duke: IRP  
**Ben Borsch**

Australia  
**Christian Schaefer**, AEMO

Discussion

10:00 a.m. – 10:30 a.m.

**Break**

Location: PCP/Carolina

12:00 p.m. – 1:00 p.m.

**Lunch**

Location: Plaza

1:00 p.m. – 5:15 p.m.

**Working Group Meetings (ESIG Members & Invited Guests Only)**

1:00 p.m. – 3:00 p.m.

**Reliability Working Group**

Location: North Carolina

Chair: **Jason MacDowell**, GE

Description: The Reliability Working Group will hold the third meeting of the High-Share of Inverter-Based Generation Task Force. This includes discussion and presentations around challenges and technology capability (including grid forming inverters) to address system reliability needs with high penetration of inverter-based resources. NERC will

present a new reliability guideline addressing improvements to interconnection requirements for inverter-based resources and the modeling task force will also cover modeling needs and updates for inverter-based resources.”

1:00 p.m. – 3:00 p.m.

**System Operation and Market Design Working Group**

Location: South Carolina

Chair: **Aidan Tuohy**, EPRI

**Title: System and Market Operations with Storage**

Description: This working group meeting will focus on operating issues related to the integration of various forms of energy storage, including batteries, pumped hydro and other storage mechanisms. Starting with discussion of current experiences of operating storage in markets and systems around the world, the panel will then discuss simulations of future operations with very high renewable penetration. The aim is to identify the major challenges for operating systems and options for integration of storage now and in the future.

1:00 p.m. – 3:00 p.m.

**Research and Education Working Group**

Location: Charlotte

Chair: **Mark O'Malley**, NREL

Description: Recognizing the growing demand for more activity in the research and education committee and a more structured approach, we will use this time to develop a focused plan to deliver on the priority demands. These demands include the research roadmap, the Towards 100% workshop report and follow ups, and the development of more educational material through the MOOC initiative.

3:00 p.m. – 3:15 p.m.

**Break**

Location: PCP/Carolina

3:15 p.m. – 5:15 p.m.

**Distributed Energy Resources (DER) Working Group**

Location: North Carolina

Chair: **Bryan Palmintier**, NREL

**Title: Distributed Storage Value Stacking: Challenges and Opportunities**

Description: This working group meeting panel presentation will consider the challenges and opportunities for unlocking the wide-range of potential value streams for distribution-connected storage of all kinds including batteries, thermal storage, electric vehicles, and “virtual” storage through demand response from demand response and smart charging. The goal is to explore across a wide range of value streams, from fairly well defined bulk-grid energy and ancillary services that currently have clear market-based economic signals, but where distribution assets may face regulatory, structural, or implementation challenges; to customer-centric values such as demand charge management, self-consumption-focused solar tariffs, etc.; to difficult to economically realize values such as voltage management, upgrade deferral, and resilience.

3:15 p.m. - 5:15 p.m.

**System Planning Working Group Meeting**

Location: South Carolina

Chair: **Aaron Bloom**, NextEra Analytics

**Title: Modeling Storage in Planning Models**

Description: Battery storage is entering electricity markets faster than most people planned. This is creating a new rush to model how we should plan for storage in the future. This working group meeting will discuss recent updates to planning models to reflect the capabilities of storage and hybrid energy systems. The panel will be highly interactive and have a limited number of slides. Our goal at the end of the working group meeting will be to create a top 10 do's and don'ts for modeling storage.

6:00 p.m. – 8:30 p.m.

**ESIG Board of Directors Meeting/Dinner**

Location: Graves

**Tuesday, October 29, 2019**

7:00 a.m. – 8:00 a.m.

**Registration & Breakfast**

Location: Plaza

8:00 a.m. – 9:00 a.m.

**Welcome and Overview Session**

Location: Charlotte Mecklenburg

Introduction

**Mark Ahlstrom**, ESIG Board of Directors President, NextEra Energy Resources

Local Welcome and Keynote Comments: IRP Process of the Future

**Mark Oliver**, Managing Director, Integrated System Operations Planning, Duke Energy

Meeting Overview

**Charlie Smith**, Executive Director, ESIG

9:00 a.m. – 12:00 p.m.

**Opening Plenary Session: Considerations for the System of the Future**

Location: Charlotte Mecklenburg

Chair: **Bryan Hannegan**, President & CEO, Holy Cross Energy

Overview of Past, Current and Future Business Models and How They've Changed in Response to Decreasing Costs of Renewable

**Bruce Tsuchida**, Principal, The Brattle Group

Impacts of High VRE Futures on Demand-Side Decisions

**Joachim Seel**, Senior Scientific Engineering Associate, LBNL

On the Road to Dispatchable Variable Resources

**Chris Clack**, CEO, Vibrant Clean Energy

The Evolving Role of Energy Storage in Power System Planning and Operations

**Nick Miller**, Consultant

Unlocking the Full Value of Distributed Energy Resources

**Astrid Atkinson**, CEO & Co-founder, Camus Energy

Hydro Power and High Capacity Energy Storage

**Patrick Balducci**, Chief Economist, PNNL

10:15 a.m. – 10:45 a.m.

**Break**

Location: PCP/Mecklenburg

12:00 p.m. – 1:15 p.m.

**Lunch**

Location: Plaza

1:15 p.m. – 5:15 p.m.

**Workshop Parallel Sessions**

1:15 p.m. – 3:00 p.m.

**Session 2A – PPA's and Corporate 100% Renewables Targets – What Comes Next: A Panel Discussion**

Location: Charlotte Mecklenburg

Chair: **Derek Stenclik**, Founding Partner, Telos Energy

**Beth Wytiaz**, SVP, Global Environmental Operations Director, Bank of America

**Aaron Barr**, Principal Consultant, Wind Energy, Wood Mackenzie

**Lori Bird**, Director, US Energy Program, World Resources Institute

**Leandro Alves**, President, WindHQ

**Graham Furlong**, Managing Director of Business Development, Duke Energy Renewables

1:15 p.m. – 3:00 p.m.

**Session 2B – Offshore Wind Development**

Location: Carolina

Chair: **Mike Derby**, Program Manager, Wind Technology, DOE

Business Network for Offshore Wind – An Introduction

**Fara Courtney**, Consultant

Economics of Offshore Wind

**Girish Behal**, Director - Strategic Initiatives and Development, SNC-Lavalin, Canada

Wind Turbines for Offshore Wind Projects

**Walt Musial**, Manager Offshore Wind, NREL

European Experience with Interconnection of Offshore Plants

**Peter Jorgensen**, VP, Energinet, Denmark

Cable Connection Considerations for Offshore Wind Power Plants

**Dave Mueller**, Director, Energy System Studies, Enernex

3:00 p.m. – 3:30 p.m.

**Break**

Location: PCP/Mecklenburg

3:30 p.m. – 5:15 p.m.

**Session 3A - System Planning for Energy Storage**

Location: Charlotte Mecklenburg

Chair: **Aaron Bloom**, Director New Product R&D, NextEra Analytics

Assessment of Solar + Storage for Resource Adequacy and Ramp Control  
**Andrew Mills**, Sr Scientist, LBNL

Opportunity for Peaking Capacity from Battery Energy Storage  
**Paul Denholm**, Sr Analyst, NREL

Energy Storage Optimization for Solar Power Plant Applications  
**Andrew Oliver**, Chief Technology Officer, RES Group

Duty Cycle and Battery Life  
**Taylor Kelly**, Director, Energy Storage, Intertek

3:30 p.m. – 5:15 p.m.

**Session 3B - System Planning for High VRE Penetration**

Location: Carolina

Chair: **Ryan Quint**, Sr. Manager, Advanced Analytics and Modeling, NERC

ISO-NE System Operational Analysis and Renewable Integration Study  
**Amro Farid**, Associate Professor, Dartmouth University

Multiple Timescale PV Model for Dynamics and Scheduling  
**Jin Tan**, Sr. Engineer, NREL

Flexibility Assessment of the Western Interconnection  
**Thomas Carr**, Western Interstate Energy Board (WIEB)

Integration of Economic and Reliability Planning  
**Juliano Freitas**, Manager of Economic Planning, Southwest Power Pool (SPP)

5:30 pm – 6:30 p.m.

**Early Career Networking Meeting/Reception**

Location: Salon Coastal

6:30 p.m. – 8:00 p.m.

**Networking Reception & Poster Session**

Location: Plaza

**Wednesday, October 30, 2019**

7:00 a.m. – 8:00 a.m.

**Breakfast**

Location: Plaza

8:00 a.m. – 9:45 a.m.

**Workshop Parallel Sessions**

8:00 a.m. – 9:45 a.m.

**Session 4A - System Operations Considerations for High Penetration Scenarios**

Location: Charlotte Mecklenburg

Chair: **Aidan Tuohy**, Principal Project Manager, EPRI

Australian Experience with Synchronous Condenser Applications

**Babak Badrzadeh**, Manager, Operational Analysis and Engineering, AEMO, Australia

ERCOT Experience with Synchronous Condenser Applications

**Julia Matevosjana**, Lead Planning Engineer, ERCOT

Uncertainty in System Operations Due to Severe Weather Events

**Josh Novacheck**, Electricity System Research Engineer, NREL

T&D System Congestion Management – A Case Study

**Frank Kreikebaum**, SVP of Products and Solutions, Smart Wires

8:00 a.m. – 9:45 a.m.

**Session 4B - Market Design Evolution for High Share of Renewables**

Location: South Carolina

Chair: **Rob Gramlich**, Founder & President, Grid Strategies

The RTO, Markets and Decarbonization

**Udi Helman**, Helman Analytics

A National Energy Market Simulator

**Sorrell Grogan**, Sr Engineer, Operational Analysis and Engineering, AEMO, Australia

MISO's Short-Term Reserve Product to Address Renewable Uncertainty

**Akshay Korad**, Market Design Engineer, MISO

Renewable Energy Development in China: Market Design and Practice

**Guohui Xie**, SGERI, China

9:45 a.m. – 10:15 a.m.

**Break**

Location: PCP/Mecklenburg

10:15 a.m. – 12:15 p.m.

**Closing Plenary Session – Creating the Future - A Panel Discussion**

Location: Charlotte Mecklenburg

Panel Moderator: **Mark Ahlstrom**, President, ESIG Board of Directors

A View from a Regulator

**Matt Schuerger**, Commissioner, Minnesota Public Utilities Commission

A View from the ISO

**Dave Olsen**, Chair, California ISO Board of Governors

A View from a Small Utility

**Bryan Hannegan**, President & CEO, Holy Cross Energy

A View from Europe

**Peter Jørgensen**, Vice President, Energinet, Denmark

A View from Washington

**James Hoecker**, Counsel & Advisor, WIRES, Former FERC chair

A View from the Research World

**Martin Keller**, Laboratory Director, NREL

A View from the Policy Advocates

**John Moore**, Director, Sustainable FERC Project, National Resources Defense Council

12:15 p.m. – 12:30 p.m.

**Working Group Meeting Summaries & Closing Remarks**

**Mark O'Malley**, NREL/ESIG