2019 Fall Technical Workshop

CHARLOTTE, NC

October 28 - 30, 2019

28 Monday

7:00 – 8:00 a.m.

8:00 a.m. – 12:00 p.m.

Registration & Breakfast **Location:** Plaza

Tutorial: Future Directions for Market Design and System Planning **Location:** Carolina

Co-chairs: **Bethany Frew**, Engineer, NREL
Mark Ahlstrom, President, ESIG Board of Directors

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, Engineer, NREL

Brief resource adequacy (RA) overview
Aidan Tuohy, Principal Project Manager, EPRI

Current and future wholesale markets
Bethany Frew, Engineer, NREL

A Decentralized Markets Approach
Rob Gramlich, Founder and President, Grid Strategies LLC

Long-term Markets Working with Short-term Energy Markets
Steve Corneli, Principal and Owner, Strategies for Clean Energy Innovation

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10:00 – 10:30 a.m.

Break

Location: Plaza

System planning examples and potential future approaches
Mark Ahlstrom, President, ESIG Board of Directors

MISO: RA Requirement
Mia Adams, Senior Manager, Market Strategy, MISO

ERCOT: Energy Only Market
Julia Matevosjana, Lead Planning Engineer, ERCOT

ISO-NE: Energy and Capacity Markets
Henry Yoshimura, Director of Demand Resource Strategy, ISO-NE

Duke: IRP
Benjamin Borsch, Director, IRP and Analytics, Duke Energy

Australia
Christian Schaefer, General Manager, Energy Systems Engineering, AEMO, Australia

12:00 – 1:00 p.m.

Lunch

Location: Plaza

1:00 – 3:00 p.m.

Reliability Working Group

Chair: **Jason MacDowell**, GE

Location: North Carolina

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 – 3:00 p.m.

System Operation and Market Design Working Group

Chair: **Aidan Tuohy**, EPRI

Location: South Carolina

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 – 3:00 p.m.

Research and Education Working Group

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

Location: Charlotte

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.

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3:00 – 3:15 p.m.

Break

3:15 – 5:15 p.m.

Distributed Energy Resources (DER) Working Group

Chair: **Bryan Palmintier**, NREL

Location: North Carolina

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

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 – 5:15 p.m.

System Planning Working Group Meeting

Chair: **Aaron Bloom**, NextEra Analytics

Location: South Carolina

Title: Modeling Storage in Planning Models

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 – 8:30 p.m.

ESIG Board of Directors Meeting/Dinner

Location: Graves

29 Tuesday

7:00 – 8:00 a.m.

Registration & Breakfast

Location: Plaza

8:00 – 9:00 a.m.

Welcome and Overview Session

Location: Charlotte Mecklenburg

Introduction
Mark Ahlstrom, President, ESIG Board of Directors

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

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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 – 10:45 a.m.

Break

Location: PCP/Mecklenburg

12:00 – 1:15 p.m.

Lunch

Location: Plaza

1:15 – 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

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1:15 – 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 Jørgensen, VP, Energinet, Denmark

Cable Connection Considerations for Offshore Wind Power Plants
Dave Mueller, Director, Energy System Studies, Enernex

3:00 - 3:30 p.m.

Break

Location: PCP/Mecklenburg

3:30 - 5:15 p.m.

Session 3A - System Planning for Energy Storage

Location: Charlotte Mecklenberg

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

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3:30 - 5:15 p.m.

Session 3B - System Planning for High VRE Penetration

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

Location: Carolina

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 – 6:30 p.m.

Early Career Networking Meeting/Reception

Location: Salon Coastal

6:30 – 8:00 p.m.

Networking Reception & Poster Session

Location: Plaza

30 Wednesday

7:00 – 8:00 a.m.

Breakfast

Location: Plaza

8:00 – 9:45 a.m.

Session 4A - System Operations Considerations for High Penetration Scenarios

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

Location: Charlotte Mecklenburg

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

Power Flow Control as an Accelerator for Renewable Integration
Frank Kreikebaum, SVP of Products and Solutions, Smart Wires

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8:00 – 9:45 a.m.

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

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

Location: North Carolina

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 – 10:15 a.m.

Break

Location: PCP/Mecklenburg

10:15 a.m. – 12:30 p.m

Closing Plenary Session – Creating the Future - A Panel Discussion

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

Location: Charlotte Mecklenburg

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

Working Group Meeting Summaries & Closing Remarks
Mark O'Malley, NREL/ESIG

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