



2020 SPRING TECHNICAL WORKSHOP

March 16-19, 2020

Loews Ventana Canyon Resort
Tucson, AZ

PROGRAM AGENDA

Monday, March 16, 2020

12:00 p.m. – 1:00 p.m.

Registration & Lunch

Location: Kiva Patio

1:00 p.m. – 5:00 p.m.

Working Group Meetings (ESIG Members & Invited Guests Only)

1:00 p.m. - 5:00 p.m.

Reliability Working Group

Location: Kiva A

Chair: **Jason MacDowell**, Senior Director, GE Energy Consulting

The Reliability Working Group will hold the fourth 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. The Task Force will also hold a working meeting to create educational material. The modeling task force will then cover modeling needs and updates for inverter-based resources. There will be a joint wrap-up discussion together with the Distributed Energy Resources WG to identify areas and needs for WG collaboration.

1:00 p.m. – 5:00 p.m.

Distributed Energy Resources (DER) Working Group

Location: Kiva B

Co-Chairs: **Bryan Palmintier**, Sr. Research Engineer & **Kelsey Horowitz**, Lead Researcher, NREL

The DER Working Group will explore opportunities and challenges for DER contributions to future energy systems, specifically: the role of DERs in Resource Adequacy, DER contributions to reliability in a high renewable future, non-technical challenges to achieving DER opportunities, and pathways for TSO-DSO interactions. Each topic will include a brief presentation/panel followed by a working group discussion around key opportunities, gaps, and a concrete action that we can use to advance corresponding research, integration, and/or education. The DER contributions to reliability in a high renewable future topic will be run jointly with the Reliability Working Group.

1:00 p.m. – 5:00 p.m.

Research and Education Working Group

Location: Salon L

Chair: Mark O'Malley, **Senior Research Fellow, NREL**

[Click here for agenda.](#)

ESIG, along with other collaborators globally (many of them ESIG members), is involved in developing a Global Power System Transformation (GPST) initiative. The core idea is to bring together the electricity system operators globally and to create a research ecosystem that solves in a collaborative way the challenges of going to very high variable renewable energy penetration levels. Then through outreach and education, the initiative will support the deployment of these systems globally. The GPST is in formation and the ESIG Research and Education WG is playing a pivotal role.

2:45 p.m. – 3:15 p.m.

Break

Location: Kiva Patio

6:00 p.m. – 8:30 p.m.

ESIG Board of Directors Meeting/Dinner

Location: Executive Boardroom

Tuesday, March 17, 2020

7:00 a.m. – 8:00 a.m.

Registration & Breakfast

Location: Kiva Patio

8:00 a.m. – 12:00 p.m.

Working Group Meetings (ESIG Members & Invited Guests Only)

8:00 a.m. - 12:00 p.m.

System Planning Working Group Meeting

Location: Kiva B

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

[Click here for agenda.](#)

The System Planning Working Group is launching a new, one-year initiative on Resource Adequacy based on the [Towards 100% Renewable Energy Pathways: Key Research Needs Report](#). The ESIG Resource Adequacy Initiative aims to explore how existing Resource Adequacy methods should change in light of the energy system transformation. The goal for this kick-off meeting is to gather input from ESIG members. Following the Spring Working Group Meeting, a small team of researchers, practitioners, and regulators will attend the Rocky Mountain Institute's eLab Accelerator where they will develop a plan for analyzing existing methodologies and creating new methodologies. At the Fall 2020 ESIG Workshop, the System Planning Working Group will present preliminary work evaluating existing Resource Adequacy methods and the plan for publishing peer-reviewed articles, blog posts, and webinars on Resource Adequacy. The first half of the Spring 2020 Working Group meeting will be traditional presentations from our speakers.

8:00 a.m. – 12:00 p.m.

System Operations and Market Design Working Group

Location: Salon L

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

[Click here for agenda.](#)

At the ESIG Fall 2019 Workshop, this Working Group initiated a Task Force on Hybrid and Emerging Flexible Resources. The task force aims to be a working community to develop concepts around emerging co-located, hybrid and highly flexible resources. These approaches are rapidly growing for digitally-controlled, integrated technologies such as PV solar with battery storage, but the concepts may apply broadly to combined technologies, aggregated distributed energy resources, and hierarchies of devices on both transmission and distribution systems. For the first TF meeting, a panel has been assembled to discuss issues around integration of hybrid resources into market operations. Prior to attending, participants are encouraged to review materials at the ESIG [HyFlex webpage](#), and engage in discussion on the [groups.io discussion](#). Those materials will form the basis of the discussion, with panelists first providing a short overview of their thoughts, experiences and studies on the subject of market design and operations with hybrid resources, followed by a working group discussion.

8:00 a.m. – 12:00 p.m.

Tutorial: Inverters 101

Location: Kiva A

Co-Chairs: **Bryan Palmintier**, NREL & **Jason MacDowell**, GE

Fundamentals – Basic Definitions, Operation, Control and Taxonomy

Applications in Conventional Power Systems

A Fork in the Road – Grid Forming Inverters

Applications in Weak Grid and Low Inertia Conditions

Services from Converters

9:45 a.m. – 10:15 a.m.

Break

Location: Kiva Patio

12:00 p.m. – 1:00 p.m.

Lunch

Location: Kiva Patio

1:00 p.m. – 2:15 p.m.

Welcome and Overview Session

Location: Kiva A

Introduction

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

Local Welcome

Dallas Dukes, Vice President of Energy Programs and Pricing, Tucson Electric Power

Keynote Comments: Outlook for DER Development

Audrey Lee, Vice President, Energy Services, Sunrun

Keynote Comments: Integrating DER into Markets

Phil Pettingill, Director of Regional Integration, CAISO

Meeting Overview

Charlie Smith, Executive Director, ESIG

2:15 p.m. – 5:00 p.m.

Opening Plenary Session: Thinking About the Value of DER

Location: Kiva A

Chair: **Matt Schuerger**, Commissioner, Minnesota PUC

A Utility View of DER Value

Sam Whelan, Supervisor, Portfolio Planning and Rates, Holy Cross Energy

A Customer View of DER Value

Holly Lahd, Lead Program Manager, Energy & Sustainability, Target

A Regulator View of DER Value

Carl Linvill, Principal, Regulatory Assistance Project

A NERC View of DER Value

Mark Lauby, Senior Vice President & Chief Engineer, NERC

An ISO View of DER Value

James Pigeon, Manager, Distributed Resources Integration, NYISO

An Aggregator's View of DER Value

Cory Amthor, President, Enchanted Rock

3:15 p.m. – 3:45 p.m.

Break

Location: Kiva Patio

5:30 pm – 6:30 p.m.

Early Career Networking Meeting/Reception

Location: Bill's Grill

6:30 p.m. – 8:00 p.m.

Networking Reception & Poster Session

Location: Bill's Grill

Wednesday, March 18, 2020

7:00 a.m. – 8:00 a.m.

Breakfast

Location: Kiva Patio

8:00 a.m. – 5:00 p.m.

Workshop Parallel Sessions

8:00 a.m. – 10:00 a.m.

Session 1: Evolving Thinking on Resource Adequacy for High VG Scenarios

Location: Kiva A

Chair: **Bethany Frew**, Engineer, NREL

Resource Adequacy: Connecting Existing Methods, Tools, and Metrics with the Future Grid

Michael Milligan, Consultant

Changes in Capacity Value for Energy Storage and DR with Increasing VG Levels
Keith Parks, Senior Trading Analyst, Xcel Energy

RA Considerations for Renewable Integration in Japan
Kazuhiko Ogimoto, Project Professor, University of Tokyo, Japan

Securing RA in a VG World
Matthias Fripp, Associate Professor, University of Hawaii

Resource Adequacy and Markets
Rob Gramlich, President, Grid Strategies

8:00 a.m. – 10:00 a.m.

Session 2: Synchronous Condenser and Control System Considerations for Weak Grid Applications

Location: Kiva B

Chair: **Bob Zavadil**, Chief Operating Officer, EnerNex

Weak Grids to Condensers to Grid-Forming Inverters: The Right Progression?
Nick Miller, Principal, HickoryLedge LLC

Modeling and Simulation for Synchronous Condenser Applications – A Case Study
Dennis Woodford, President, Electranix

ERCOT Experience with Synchronous Condenser Application
Fred Huang, Manager of Regional Planning, Transmission Planning, ERCOT

Application Engineering Considerations for Synchronous Condensers
Jason MacDowell, Senior Director, GE Energy Consulting

Dynamic Stability Considerations for High VG Penetrations
Vahan Gevorgian, Chief Engineer, NREL

10:00 a.m. – 10:15 a.m.

Break

Location: Kiva Patio

10:15 a.m. – 12:00 p.m.

Session 3: Current Challenges with Transmission Planning – Where Are We?

Location: Kiva A

Chair: **Jay Caspary**, Director, R&D and Special Studies, SPP

Transmission Expansion Planning: The Role of the Queue and Cost Allocation
John Lawhorn, Sr. Director, Policy & Economic Studies, MISO

Transmission Expansion Planning: The Role of FERC
Rob Gramlich, President, Grid Strategies

Transmission Expansion Planning: The Role of Energy Price Formation
Dick O'Neill, Distinguished Senior Fellow, ARPA-E

Transmission Expansion Planning: A Canadian Point of View
David Jacobson, Interconnections & Grid Supply Planning Engineer, Manitoba Hydro

10:15 a.m. – 12:00 p.m.

Session 4: DER Integration and System Operation

Location: Kiva B

Chair: **Steve Beuning**, Vice President, Holy Cross Energy

Autonomous Energy Systems

Benjamin Kroposki, Director – Power Systems Engineering Center, NREL

DER and System Resilience

Deepak Ramasubramanian, Engineer Scientist III, EPRI

Communications, Control and Security for DER

Ted Burhans, Director, Emerging Technology and Innovations, Tucson Electric Power

Autonomous Control for DER Inverter Functions

Ric O'Connell, Executive Director, GridLab

Dynamic Voltage Stability of Distribution-level Volt-Var Control Systems

Matt Richwine, Founding Partner, Telos Energy

12:00 p.m. – 12:20 p.m.

Annual ESIG Membership Meeting

Location: Kiva A

12:20 p.m. - 1:15 p.m.

Lunch

Location: Kiva Patio

1:15 p.m. – 3:00 p.m.

Session 5: Market Design Evolution for High Share of Renewables

Location: Kiva A

Chair: **Eric Gimon**, Senior Fellow, Energy Innovation

A Forward Market for Clean Energy Attributes

Brendan Pierpont, Senior Electricity Sector Analyst / Expert, Sierra Club

Ensuring RA in Future High VG Scenarios – A View from CA

Phil Pettingill, Director, Regional Integration, CAISO

Elements of Market Design that Support High Renewable Penetration

Julia Matevosyan, Lead Planning Engineer, ERCOT

Impacts of Market Design on Storage Valuation

Erik Ela, Senior Technical Leader, EPRI

MISO's AGC Enhancements for Fast Ramping Resources

Jessica Harrison, Senior Director of R&D, MISO

1:15 p.m. – 3:00 p.m.

Session 6: Integrated Energy System Analysis

Location: Kiva B

Chair: **Kory Hedman**, Program Director, ARPA-E

US National Electrification Assessment
Geoff Blanford, Senior Technical Executive, EPRI

Joint Planning of the Gas and Electric System at the European Level
Antje Orths, Chief Engineer, Energinet, Denmark

Flexibility from Targeted Cool Storage Systems
Adam Valmoro, Regional Director, Viking Cold Solutions

Integrated Transportation-Energy System Modeling
Matteo Muratori, Engineer, NREL

3:00 p.m. – 3:30 p.m.

Break

Location: Kiva Patio

3:30 p.m. – 5:15 p.m.

Session 7: Sector Coupling & Flexibility

Location: Kiva A

Chair: **William D'Haeseleer**, Professor, KU Leuven, Belgium

Flexibility Improvements from Process Engineering
Michael Baldea, Associate Professor, University of Texas, Austin

Optimization for Energy Systems Integration
Christopher Clack, CEO, Vibrant Clean Energy

Electric Transportation Fleet Charging
Bernie Ernst, Group Manager, Grid Planning and Operation, Fraunhofer IEE, Germany

Flexibility in Industrial Production – A View on Status and Prospects
Elizabeth Endler, Program Manager, Shell Engineering

3:30 p.m. – 5:15 p.m.

Session 8: ESI Planning Optimization and Modeling Techniques

Location: Kiva B

Chair: **Lindsay Anderson**, Associate Professor, Cornell University

The Electricity-Water Interdependency
Vijay Vittal, Regents Professor, Arizona State University

Gas Electricity System Coupling
Line Roald, Assistant Professor, University of Wisconsin-Madison

Modelling Market Interactions
Bethany Frew, Engineer, NREL

Planning Towards a 100 Percent Renewable Electricity System
Michael Ferris, Professor, University of Wisconsin-Madison

Thursday, March 19, 2020

7:00 a.m. – 8:00 a.m.

Breakfast

Location: Kiva Patio

8:00 a.m. – 10:00 a.m.

Session 9: Operations Planning for Storage and Hybrid Power Plants

Location: Kiva A

Chair: **Tom Acker**, Professor, Northern Arizona University

The Rise of the Hybrid Power Plant

Will Gorman, Graduate Student Researcher, LBNL

HyFlex - Simplifying the Operation of PV Hybrids

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

Hydro Plus Storage

Thomas Mosier, Energy Systems Group Lead, INL

Assessment of Solar + Storage for Resource Adequacy and Ramp Control

Andrew Mills, Senior Scientist, LBNL

Renewable Generation Reserve Sharing Groups

Brendan Kirby, Consultant

DOE Energy Storage Grand Challenge

Alejandro Moreno, Director, Water Power Technologies Office & **Eric Hsieh**, Director, Grid Systems and Components, DOE

8:00 a.m. – 10:00 a.m.

Session 10: Challenges with High Inverter-Based Resource Penetration

Location: Kiva B

Chair: **Julia Matevosyan**, Lead Planning Engineer, ERCOT

A Grid Forming Converter Future Without Frequency Droop Control

Deepak Ramasubramanian, Engineer Scientist III, EPRI

Grid Forming Inverters, A Way Forward

Ralph Pfeiffer, Head of Network Codes and Connection Rules, Amprion GmbH, Germany, on behalf of ENTSO-E a.i.s.b.l., Belgium

Industry Focus on BPS-Connected Inverter-Based Resource Modeling

Ryan Quint, Senior Manager, Advanced Analytics and Modeling, NERC

Reliability and Security Assessment: Performance, Models, and Tools

Babak Badrzadeh, Manager, Operational Analysis and Engineering, AEMO, Australia and **Fred Huang**, ERCOT

Control System Stability for Converter Dominated Grids
Shahil Shah, Research Engineer, NREL

10:00 a.m. – 10:15 a.m.

Break

Location: Kiva Patio

10:15 a.m. – 12:00 p.m.

Closing Plenary Session - Nuclear and Renewables – A Match Made in Heaven or Hell?

Location: Kiva A

Chair: **Mark O'Malley**, Senior Research Fellow, NREL

The Size of the Problem

John Reilly, Senior Lecturer, MIT

Conventional Reactors and Hydrogen Production

Bethany Frew, Engineer, NREL

Experiences and Opportunities with Flexible Nuclear Power Plant Operations

Sherry Bernhoft, Sr. Program Manager, Nuclear Innovation Department, EPRI

Cost of Flexibility from Nuclear Power Plants

Nikhil Kumar, Director, Engineering Consulting Practice, Intertek

Small Modular Reactors and Flexibility

George Griffith, Relationship Manager, INL

12:00 p.m. – 12:25 p.m.

Working Group Meeting Summaries

Working Group Chairs:

Mark O'Malley, Senior Research Fellow, NREL

Aidan Tuohy, Principal Project Manager, EPRI

Aaron Bloom, Director, New Product R&D, NextEra Analytics

Bryan Palmintier, Sr. Research Engineer & **Kelsey Horowitz**, Lead Researcher, NREL

Jason MacDowell, Senior Director, GE Energy Consulting

12:25 pm – 12:30 pm

Closing Remarks

Charlie Smith, ESIG