2018 SPRING TECHNICAL WORKSHOP

March 13-15, 2018

Loews Ventana Canyon Resort
Tucson, AZ

PROGRAM AGENDA

Tuesday, March 13, 2018

8:00 a.m. – 9:00 a.m.
Registration & Breakfast
Location: Kiva Patio

9:00 a.m. – 12:00 p.m.
ESI Tutorial – Energy Systems Integration – An Introduction
Location: Kiva A
Chair: **Mark O'Malley,** Chief Scientist for ESI, NREL

As the penetration levels of variable renewable energy increase in electricity systems, coupling with other energy vectors (e.g. fuels, heating/cooling) and energy infrastructures (e.g. transport, water) becomes increasingly important and necessary. This integration across the wider energy system is known as energy systems integration (ESI). The ESI Tutorial will briefly introduce the topic of energy systems integration, and further examine two aspects in greater detail. The tutorial will conclude with an outlook for the future, followed by a discussion period.

- Introduction and Overview of Energy Systems Integration – **Mark O'Malley**, NREL (35 min)
- Planning in an Integrated Energy System – **Jim McCalley**, Iowa State University (50 min)
- Transport in an Integrated Energy System – **Johan Driesen**, KU Leuven, Belgium (50 min)
- Outlook for Energy Systems Integration – **Mark O'Malley**, NREL (15 min)
- Open Discussion (15 min)

10:15 a.m. – 10:30 a.m.
Break
Location: Kiva Patio

12:00 p.m. – 1:00 p.m.
Lunch
Location: **Flying V**

1:00 p.m. – 5:15 p.m.
Working Group Meetings (UVIG Members & Invited Guests Only)

1:00 p.m. – 5:15 p.m.
Research and Education Working Group
Location: Executive Boardroom
Chair: **Mark O'Malley**, NREL

Agenda: This will be the inaugural meeting of the **Research and Education Working Group.** It will focus on defining and agreeing upon the scope, research direction, educational opportunities, and proposed events, activities and target outputs for 2018 and beyond.

1:00 p.m. – 3:00 p.m.
Reliability Working Group
Location: Kiva A
Chair: **Nick Miller**, GE

Agenda: The Reliability Working Group is focusing on some specific aspects of the 100% Renewables theme this year. At this meeting, we will discuss model validation with increasing renewable energy penetration, and some new reliability challenges associated with weak grids and system restoration.

1:00 p.m. – 3:00 p.m.
System Operation and Market Design Working Group
Location: Kiva B
Chair: **Aidan Tuohy**, EPRI

Agenda: This working group is focused on identifying and sharing current challenges and best practices in system operations and market design with increasing variable generation. This session will focus on one of those challenges, with the end goal of developing a fact sheet or other similar deliverable on the topic of market design challenges due to very high wind and solar penetration, as discussed in more detail in the WG agenda. Other potential future activities will also be discussed, with a review of progress since the last meeting.

3:00 p.m. – 3:15 p.m.
Break
Location: Kiva Patio

3:15 p.m. – 5:15 p.m.
Distributed Energy Resources (DER) Working Group - 100% Renewables: How do we see, communicate with and control large numbers of small DERs?
Location: Kiva A
Chair: **Debbie Lew**, GE

Agenda: Some visions for 100% Renewables include very high penetrations of DERs including rooftop PV. South Australia already reports 48% instantaneous penetration of rooftop PV. At high penetrations, it is essential to have visibility of, to have two-way communication to, and to be able to control output of the DERs. In this panel session we will discuss the various platforms and pathways for accomplishing these objectives. We will present case studies of rooftop PV and other DER pilots in Arizona Public Service, Salt River Project, San Diego, and elsewhere.

3:15 p.m. - 5:15 p.m.
System Planning Working Group Meeting
Location: Kiva B
Chair: **Aaron Bloom**, NREL

Agenda: *The Interconnections Seam Study*

Wednesday, March 14, 2018

7:00 a.m. – 8:00 a.m.
Registration & Breakfast
Location: Kiva Patio

8:00 a.m. – 9:00 a.m.
Welcome and Overview Session
Location: Kiva A

Welcome
Ted Burhans, Tucson Electric Power

Introduction
Mark Ahlstrom, NextEra Energy Resources

Keynote
Market Initiatives in the Western Interconnection
Marie Jordan, Peak Reliability

Meeting Overview
Charlie Smith, UVIG

9:00 a.m. – 12:00 p.m.
Plenary Session: System Markets for Very High Penetrations of Renewable Energy
Chair: **Bruce Rew**, SPP

Impact of VRE on Wholesale Markets
Ryan Wiser, LBNL

CA Market Evolution in a World of Increasing DERs and Community Choice Aggregators
Amber Motley, CAISO

Challenges in Designing a 100% Renewable Power System
Matthias Fripp, U of Hawaii

LA 100
Eric Montag, LADWP

DC Transmission Options for a Continental US Seams Study
Aaron Bloom, NREL

DER Aggregation into NYISO's Markets
Vijaya Ganugula, NYISO

10:00 a.m. – 10:30 a.m.
Break
Location: Kiva Patio

12:00 p.m. – 12:45 p.m.
Annual Membership Meeting (Members Only)
Location: Kiva A

Membership Meeting and Board of Directors Election

12:45 p.m. – 2:00 p.m.
Lunch
Location: Flying V

2:00 p.m. – 5:30 p.m.
Workshop Parallel Sessions

2:00 p.m. – 3:30 p.m.
Session A-2 – Adequacy and Capacity Expansion with a Changing Resource Mix
Location: Kiva A
Chair: **Audun Botterud**, ANL

LOLE-Equivalent Capacity Expansion Models
Gord Stephen, NREL

Simplified Chronological Capacity Expansion Planning Model with Storage, Demand Response and Unit Commitment
Matthias Fripp, U of Hawaii

Capacity Expansion Planning Incorporating Variability and Uncertainty
Richard Tabors, Tabors Caramanis Rudkevich

Impact of Navajo Generating Station Retirement and Replacement with Renewable Energy
Tom Acker, Northern Arizona University

2:00 p.m. – 3:30 p.m.
Session B-2 – Integration of Transport into the Energy System
Location: Kiva B
Chair**: Mark O'Malley,** NREL

Automated Transport Systems in an Integrated Energy System
Robert Shorten, UCD, Ireland

Alternative Fuel Integration into Transport Systems
Johan Driesen, KU Leuven, Belgium

Smart Charging – What's Really Known About Costs, Benefits, and Customer Preferences
Sunil Chhaya, EPRI

Planning for Integrated Energy Systems
Chris Clack, Vibrant Clean Energy

3:30 p.m. – 4:00 p.m.
Break
Location: Kiva Patio

4:00 p.m. – 5:30 p.m.
Session A-3 - Technology and Models for Very High Renewable Penetrations
Location: Kiva A
Chair: **Bob Zavadil,** EnerNex

Introducing Flexibility into the Grid
Michael Walsh, Smart Wires

Modeling System Stability Behavior for System with 100% Converter Fed Generation
Deepak Ramasubramanian, EPRI

String Inverters – What's the Buzz?
Sham Ramnarain, Huawei

Essential Reliability Services from Wind and Solar Systems Combined with Energy Storage
Vahan Gevorgian, NREL

4:00 p.m. – 5:30 p.m.
Session B-3 - Gas System Coordination
Location: Kiva B
Chair: **Russ Philbrick**, Polaris Systems Optimization Inc.

NERC's Assessment Activities on Gas Coordination and Retirements
Tom Coleman, NERC

Current Gas System Operating Practices and Constraints
Daniel Baldwin, Kinder Morgan

Incorporating Gas System Vulnerabilities into Reliability Assessment and System Control
David Schweizer, PJM

New Tools for Coordination of Gas and Electric System Planning
Anatoly Zlotnik, LANL

6:30 p.m. – 8:00 p.m.
Annual Awards Reception
Student Poster Session
Location: Bill's Grill

Thursday, March 15, 2018

7:00 a.m. – 8:00 a.m.
Breakfast
Location: Kiva Patio

8:00 a.m. – 9:30 a.m.
Workshop Parallel Sessions

8:00 a.m. – 9:30 a.m.
Session A-4 - Power System Reliability with Increasing Renewables Penetration
Location: Kiva A
Chair: **Charlton Clark**, DOE

Status Update on Primary Frequency Response in PJM
David Schweizer, PJM

Black Start and System Restoration with Wind and Solar?
Sebastian Achilles, GE

Essential Reliability Services from Solar Plants
Mahesh Morjaria, First Solar

What We Learned About PV Converter Performance from the Blue Cut and Canyon 2 Events
Ryan Quint, NERC

8:00 a.m. – 9:30 a.m.
Session B-4 - Distributed Energy Resources (DER) Integration
Location: Kiva B
Chair**: Debbie Lew**, GE

The Load Model Challenge of the Future
Ryan Quint, NERC

Comparison of IEEE 1547, CA Rule 21 and Hawaii DG Interconnection Requirements
Aidan Tuohy, EPRI

DERs and System Planning
Obadiah Bartholomy, SMUD

The Role of Standards in Grid Integration of Renewables
Jason MacDowell, GE

9:30 a.m. – 10:00 a.m.
Break
Location: Kiva Patio

10:00 a.m. – 12:15 p.m.
Closing Plenary Session – Future Trends and Needs and International Collaboration
Location: Kiva A
Chair: **Mark Ahlstrom,** NextEra Energy Resources

Future Research on Systems with 100% Converter Fed Generation
Vijay Vittal, ASU

Real-world Operating Challenges of Increasing Renewable Penetration Scenarios on the Electric System
Nick Miller, GE

Wholesale Market Evolution in China
Caixia Wang, SGERI, China

Future Research Needs for Energy Systems Integration
Mark O'Malley, NREL

What Difference Energy Policy Makes for Future Energy Systems
William D'haeseleer, KU Leuven

Research Needs for Co-optimization of Multi-level Integrated Electricity Systems
Lindsay Anderson, Cornell University

Feedback from Working Group Meetings
Working Groups Chairs

12:15 p.m. – 12:20 p.m.
Closing Remarks
Charlie Smith, UVIG

Thursday Afternoon – Optional Tour, DOE-GMLC Meeting, and Board of Directors Meeting

Optional Tour – NRG Solar - Avra Valley Plant & Solar Zone at UA Tech Park

UVIG members are invited to a half-day tour on Thursday, March 15 featuring stops at NRG's 26 MW tracker plant just outside of Tucson and the Solar Zone at the University of Arizona Tech Park. Click the links below for additional information on each these:

NRG Avra Valley Plant

Solar Zone - University of Arizona Tech Park

The group will leave the hotel at 12:30 p.m. on Thursday and return to the hotel at approximately 6:00 p.m. If any attendees plan to fly out of Tucson that evening, the shuttle will drop you off at the airport at approximately 5:00 p.m. A boxed lunch will be included with this tour. Please register early as we only have room for 25 attendees. Cost is $120.

1:00 p.m. – 5:00 p.m.
DOE-GMLC Meeting: Multi-scale Production Cost Modeling Project
Location: Kiva B

This is a DOE Grid Modernization Lab Consortium project on improving the computational speed and model fidelity of production cost modeling. Specifically: 1) geographic decomposition, (2) temporal decomposition, (3) MIP warm-starting, and (4) stochastic optimization approaches.

Download Meeting Agenda

2:00 p.m. – 6:00 p.m.
UVIG Board of Directors Meeting
Location: Sonora